

Task Force for Enhancing the Reputation of Casualty Actuaries  
March 2008



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# **Task Force for Enhancing the Reputation of Casualty Actuaries**

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## **INTRODUCTION**

The credibility of casualty actuaries became an issue in November 2003 when Standard and Poor's (S&P) published its critical article on the actuarial work product. S&P stated that "Actuaries are signing off on reserves that turn out to be wildly inaccurate. It's an abysmal track record." The credibility of casualty actuaries was the top casualty actuarial story of 2003 based on the annual survey of CAS leaders. The September 2004 CAS Board meeting included a half-day retreat to address the issue and came up with a list of recommendations. The Task Force on Actuarial Credibility (TFCRED) was established to study the Board's ideas and come up with a list of recommended actions. The charge of the TFCRED was "To identify, prioritize, and investigate the feasibility of possible strategies for enhancing the perceived credibility of the actuarial profession, and to develop action plans for implementing strategies considered to have the greatest potential for high impact." Patricia Teufel was named as chair. Members of the TFCRED included Robert Deutsch, Thomas Ghezzi, Paul O'Connell and Terri Vaughn. These members were selected to represent both writers and users of actuarial opinions and to bring a wide range of expertise to the table. The report of the TFCRED was presented to the CAS Board at its Spring 2005 meeting.

To assist in implementing the initiatives recommended in that report, the Task Force for Enhancing the Reputation of Casualty Actuaries (TFREP) was created. The TFREP was charged as follows: "The Task Force is responsible for implementing those objectives of the Actuarial Credibility Task Force report that are determined to be CAS-led activities. The Task Force oversees and directs the reputation-related efforts of the other involved CAS committees."

The report of the Task Force on Actuarial Credibility contained six objectives as follows:

- A. Enhance transparency of the actuary's conclusions by identifying differences between the "best estimates" of management and the actuary.
- B. Enhance the public's understanding of actuarial estimates and refine actuarial methodologies.
- C. Improve the transparency of actuarial estimates by providing the changes from one reporting period to the next within the actuarial report.
- D. Enhance the quality of corporate governance for property/casualty insurers by educating audit committees and/or boards of directors on the roles and responsibility of the appointed actuary.
- E. Enhance self-governance of the actuarial profession with respect to reserve opinions by requiring the appointed actuary to provide an explanatory document with the ABCD whenever the change in the actuary's reserve estimate over a defined period of time exceeds certain predetermined thresholds.

- F. Incorporate the actuarial statement with the Jurat page of each property/casualty insurance company's Annual Statement.

Each of these six objectives gave rise to specific tasks assigned to various organizations. The first four objectives include recommendations directed to the CAS.

The TFREP held its first teleconference in September 2005. In January 2007 the TFREP was reconstituted with a new chairman and several new members. The new Task Force was instructed to evaluate the progress made on each of the CAS's assigned objectives and identify whether additional research or work was needed. Each of the tasks attributable to the four objectives was discussed among the entire Task Force. The Task Force was then divided into subgroups, with each subgroup assigned to write up final recommendations for a particular objective. These recommendations are presented in this report.

Although several years have passed since the original critical S&P report, this time was needed to fully appreciate the complexity of the issues involved in this subject. In addition, now is an appropriate time to take action for the following reasons:

- The CAS Centennial is rapidly approaching. The CAS has spent considerable time and effort in creating and refining its centennial goal. Enhancing the reputation of the casualty actuary is an essential ingredient in realizing this goal.
- Enterprise Risk Management is becoming an integral part of all organizational efforts. The CAS Risk Management Committee was created to assess the strengths and vulnerabilities of our own organization. This committee has identified the reputation of casualty actuaries as one of the major risk factors that the CAS needs to address.
- Many of the report recommendations of the TFCRED center on education, research, communication and professionalism. These concerns align with many of those discussed in the recently released CRUSAP report.
- The original criticism was levied in 2003 at a time when the property/casualty insurance business was in the soft side of the underwriting cycle. As such, contributing to reserves inadequacies were insufficient premium rates, combined with poor underwriting and risk selection processes. This confluence of causes indicates a need for greater communication among the ratemaking, underwriting, and reserving functions. As the underwriting cycle is once more turning toward the soft side, we have an opportunity to address these issues in a timely manner.
- There are international efforts underway to standardize communication with respect to uncertainty, presenting an opportunity for the CAS to consider alternatives to current language in its communications on risk.
- Principle Based Reserving is being introduced in the life and health insurance market. There might be some application of these governing regulations for the P&C market in the future. This effort will also require more explicit discussion of risk and represents another opportunity for the CAS.

## GENERAL OBSERVATIONS AND RECOMMENDATIONS

- While the TFREP has focused on reserving issues, the reputation of casualty actuaries can be diminished or enhanced by activities in all aspects of the profession.
- Despite a lot of activity on the part of the CAS we could again find ourselves the subject of “S&P”-type criticism when the cycle turns.
- Communication with our publics is of utmost importance. The CAS leadership has to take definitive action in this area.
- The CAS needs to continue its efforts to bridge the gap between education in new methods and implementation of those methods in practice.
- The CAS needs to continue its research efforts. Although a lot of important work has been done, no one stochastic method has yet been identified as the best method, nor have the available methods been categorized as being more appropriate in particular circumstances.
- The CAS should commission a paper focused on the actuarial pitfalls related to a soft market and how to deal with them.
- The CAS should form a task force to investigate the possibility of the CAS supplementing the activities of the ABCD.
- The CAS needs to evaluate the effectiveness of the public interface activities of the American Academy on behalf of the CAS and determine what, if any, additional communication efforts are needed and which organization is better positioned to meet these needs.

## RECOMMENDATIONS BY OBJECTIVE

- Objective A: The CAS should continue to work with the NAIC’s Casualty Actuarial Task Force <sup>1</sup> on enhancements to the Statements of Actuarial Opinion (SAO) to ensure that the SAOs and related reports are responsive to the needs of their users. A specific recommendation with respect to the Actuarial Opinion Summary (AOS) is included in Objective C. The CAS should open a dialogue with the rating agencies to encourage them to make use of actuarial skills in their evaluation of the financial strength of insurance companies.
- Objective B1: The CAS should assemble a comprehensive “glossary” of actuarial terms and their meanings, not only addressing discussion of uncertainty but other potentially ambiguous terms. Casualty actuaries should also provide their principals with interim benchmarks to test emergence of losses compared to what would be expected based on the estimation method used. Stochastic processes have the advantage of not only providing estimates of ultimate losses and estimates of losses during the next year but also the probabilities assigned to those and other possible amounts.
- Objective B2: The CAS should continue to provide education and training in the area of probabilistic class of models as well as their diagnostics. In addition,

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<sup>1</sup> In January 2008 the name of this Task Force was changed to the Casualty Actuarial and Statistical Task Force.

actuaries need to be trained in communicating the results of a probabilistic reserve analysis to a nontechnical audience. The CAS should continue its research efforts in distributional reserving models.

- Objective C: The CAS should work together with the NAIC's Casualty Actuarial Task Force and regulators to incorporate temporal changes in reserve positions within the Actuarial Opinion Summary. In addition, the possibility of requiring additional explanatory information when the temporal differences in reserve estimates relative to given benchmarks exceed a predetermined threshold should be explored. The CAS should solicit feedback from regulators as to what they have learned from the current AOS.
- Objective D: The CAS should work together with the AAA's Committee on Property and Liability Financial Reporting (COPLFR) to maximize the distribution of COPLFR's recent Public Policy Overview, "An Overview for Audit Committee Members of P/C Insurers: Effective Use of Actuarial Expertise." The CAS should also work with COPLFR to develop a session at its annual Effective P/C Loss Reserve Opinions: Tools for the Appointed Actuary seminar (boot camp) specifically focused on communication to corporate governors, including the new Public Policy Overview and relevant sections of the CRUSAP report. The CAS should develop an interactive session for its meetings targeted at communication with corporate governors. The CAS should also devote a section of the CAS Web site which would make available all the relevant publications on this topic.

These recommendations are discussed more fully in the sections that follow.

## **OBJECTIVE A – Public Disclosure of the Actuary's Reserve Estimates**

**Objective A:** "To enhance the transparency of the actuaries' conclusions by clearly identifying the differences, if any, that exist between management's 'best estimate' of the loss and loss adjustment expense reserves as of a valuation date and the actuaries' 'best estimate' of the reserve need as of that valuation date within the statement of actuarial opinion."

### **Background:**

This recommendation ultimately proved to be the most controversial recommendation of the Task Force on Actuarial Credibility.

The Task Force on Actuarial Credibility at the time recognized the potential controversy, but believed that public disclosure was the most effective way of communicating differences between the actuaries' estimates and managements' recorded reserves. The Task Force noted that, during the "soft" part of an underwriting cycle, company managements often have a more favorable view of the ultimate losses than the actuarial estimates would suggest; these differences may stem from many factors, including management's more optimistic view of the pricing disciplines, the benefits of re-

underwriting efforts, or trends in frequency and severity. When the Standard & Poor's article was published in 2003, it was quite common for management's recorded reserves to be below the appointed actuary's point estimate reserve, although within the actuary's range of reasonable reserve estimates. In many cases, the adverse development that was being reported by managements in these years had been anticipated in prior actuarial estimates. The TFCRED felt that public disclosure of these differences, while controversial, was ultimately in the best interest of users of the statements of actuarial opinion and the public.

Recognizing the potential controversy associated with this recommendation, the Task Force on Actuarial Credibility solicited observations from the actuarial community prior to finalizing its recommendation. A Membership Advisory Panel survey was developed, specific to this recommendation; MAP survey results were provided to the CAS Board in conjunction with the TFCRED report. The MAP survey confirmed that this recommendation would be controversial. The survey respondents generally agreed that enhanced disclosures were needed to better inform users of the statements of actuarial opinions, but had wide disagreement on what the specific elements of the disclosures should be.

With the issuance of the TFCRED report, it became obvious that the actuarial community, particularly actuaries involved in financial reporting, had serious reservations concerning this recommendation. A second survey was conducted, this time specifically geared to those actuaries who either served as appointed actuary, regulatory actuary, or were otherwise involved in financial reporting. Some of the concerns expressed by this group were:

- The principals for statements of actuarial opinion include company management, boards of directors, and statutory regulators. Modifications to the statement of actuarial opinion should be guided primarily for the benefit of these principals. Should others wish to rely on actuarial work products, their role would better be explicitly recognized as an additional (or independent) principal for the actuaries' work.
- Recognizing the high level of uncertainty in any actuarial estimate, it was believed that public disclosure of the actuaries' "best estimate" might, in fact, diminish the reputation of the actuary, since the estimate would almost certainly be proven to be "wrong" in hindsight. With the publication of a single actuarial point estimate, users of actuarial opinions might believe that there was more certainty in the reserve estimates than actually exists, since the inherent uncertainty in the estimate would not be fully understood.
- The publication of the actuary's "best estimate" potentially would place the actuary in an adversarial role with management, as there would be undue emphasis on resolving differences between the actuaries' estimate and managements' recorded reserves. Rather, the actuaries should be investing in discussions with management on the underlying trends and the implications of those trends on the ultimate value of the liabilities.

## Progress to Date:

Statements of Actuarial Opinion rendered in accordance with Annual Statement Instructions promulgated by the National Association of Insurance Commissioners (NAIC) represent the most visible and largest component of the work governed by ASOP 36: *Statement of Actuarial Opinion Regarding Property/Casualty Loss and Loss Adjustment Expense Reserves*.

The NAIC relies heavily on its Casualty Actuarial Task Force (CATF) in considering recommendations affecting the statement of actuarial opinion. CATF had formed a Working Group to develop a revision of the Annual Statement Instructions for the Property Casualty Statement of Actuarial Opinion in the summer of 2001, prior to the S&P article. With this initiative, regulators expressed a clear desire for additional disclosure within the Opinion, specifically regarding the meaning of the term “a reasonable provision.”

The most heavily debated issue that the Working Group dealt with was the degree of disclosure desired. There was a constituency of regulators favoring more disclosure within the Opinion than was ultimately implemented. There was a constituency of Interested Parties who favored delay and further study. Despite the debate on this issue, there was clear consensus among regulators that further delay in implementation was not acceptable.

CATF immediately took steps to develop the Property Casualty Actuarial Opinion Model Law, which was adopted by the NAIC in September 2003. The Model Law requires confidential disclosure in the Actuarial Opinion Summary (AOS) of either the appointed actuary’s point or range estimate(s) compared to the company’s recorded reserves for each statutory entity. As of year-end 2006, approximately 40 states and the District of Columbia require submission of the Summary by domestic insurers. The number will continue to increase as more states adopt the Model Law (which will become an NAIC accreditation standard after 2009) or a comparable regulation. This approach to disclosure provides regulators with information upon which to determine the need for regulatory inquiry, if not intervention, in a timely manner. Regulators find additional value in this confidential document over time, as it can reveal changes from year to year between the actuary’s estimates and the carried reserves.

The NAIC implemented revised (and current) *Instructions* for year-end 2004 and these Instructions continue today. As noted above, public disclosure of the appointed actuary’s indications, either point or range is not required; rather, the disclosures are made on a confidential basis, through the newly created Actuarial Opinion Summary. Major issues that influenced that NAIC decision to require **confidential** disclosure included:

- NAIC Statements of Statutory Accounting Principals (SSAP) 55 places responsibility for the carried reserves on management. Regulators advocate management reliance on and consideration of actuarial advice when establishing

loss-related liabilities. However, there are legitimate reasons for the carried reserves to vary from the appointed actuary's estimates that underlie an Opinion. Among those reasons are:

- The Qualified Opinion: In this situation there would not be an appropriate comparison to the carried liabilities, as the actuary's opinion excludes a material reserve segment(s).
  - The "Post Hoc" Opinion: In some cases, the appointed actuary works independent of management and develops indications without knowledge of the carried reserves, or after management has made its decision regarding the carried reserves.
  - The Roll Forward: In some cases, the appointed actuary's work is based on data valued prior to year end. It is possible for significant events, such as catastrophes, or routine transactions to occur in the roll forward period that create differences between the carried reserves and actuarial indications.
- Public disclosure of an indicated reserve deficiency, before regulators have the opportunity to take action, is not in the interests of policyholder protection.

In response to the issuance of the report of the Task Force on Actuarial Credibility, CATF again considered the advisability of public disclosures. CATF deferred action on the Task Force recommendation, noting that the NAIC Blanks changes had only been implemented for year-end 2004 and that the regulators preferred to evaluate the quality and usefulness of the information provided in the Actuarial Opinion Summary for their purposes.

CATF also noted that the NAIC process for Blanks changes take time and often spans multiple years. It can take up to three years for an adopted change to appear in a filed Annual Statement. The process is an open process, however, with ample opportunity for comments from Interested Parties (including, but not limited to, the actuarial profession).

Similarly, the Actuarial Standards Board directed its Casualty Committee to consider the Task Force recommendation to modify current Standards of Practice. The Casualty Committee noted the widespread disagreement among actuaries with respect to this recommendation and tabled consideration until a consensus view developed within the casualty actuarial community.

## **Recommendations:**

### Summary

The CAS should continue to work with the NAIC's Casualty Actuarial Task Force on enhancements to the Statements of Actuarial Opinion to ensure that the SAOs and related

reports are responsive to the needs of its users. A specific recommendation with respect to the Actuarial Opinion Summary (AOS) is included in Objective C. The CAS should open a dialogue with the rating agencies to encourage them to make use of actuarial skills in their evaluation of the financial strength of insurance companies.

### Discussion

With respect to the NAIC and state insurance department regulators, we believe that the Actuarial Opinion Summary provides appropriate disclosure on the position of management's carried reserves relative to the appointed actuary's point estimate reserve and/or within the range of reasonable reserve estimates developed by the appointed actuary. Such disclosure, albeit confidential, allows the regulator to evaluate movements in the company's reserves over time and to assess the relative accuracy of estimates prepared by the appointed actuary. We believe that the disclosures proposed by the TFCRED were implemented for the regulatory users of NAIC opinions through the Actuarial Opinion Summary. The Casualty Actuarial Society should expect that its members, as well as properly trained nonactuaries, who are employed in regulation will make appropriate use of this information in evaluating the financial condition of property/casualty insurance companies. No further action is required at this time on the part of the profession.

With respect to the Company's management and board of directors, we believe that the Actuarial Report, required by the NAIC Instructions for Statements of Actuarial Opinion and by ASOP 41: *Actuarial Communications* for opinions rendered in other settings, provides appropriate disclosures on the methodology, assumptions and specific conclusions reached by the actuary. Such documentation provides these principals with the underlying information that they need to make informed decisions regarding the loss and loss adjustment expense reserves. Other recommendations of the TFCRED and of the TFREP specifically address actions that might be considered to enhance the effectiveness of actuarial communications.

With respect to other users (including, but not limited, to rating agencies), the TFREP has spent considerable time discussing the responsibilities of the actuarial profession to nonprincipals. Particularly during a soft underwriting cycle, the risk that there could be substantive differences between management's carried reserves and the actuary's estimated reserve is high. Nonprincipals who access the statement of actuarial opinion could reach inappropriate conclusions regarding the adequacy of the reserves. However, the actuarial profession has no direct responsibility to these secondary users of our work product.

In the course of their work, rating agencies implicitly evaluate the adequacy of a company's loss and loss adjustment expense reserves. In many cases, this evaluation is performed by individuals who are not professionally qualified as actuaries. The CAS may wish to initiate dialogue with representatives from each of the rating agencies to encourage them to make better use of actuarial skills in their evaluations of the financial strength of insurance companies. Such encouragement might begin with a recommendation that the rating agencies employ actuaries to assist in the evaluation of

loss and loss adjustment expense reserves, but could extend to positioning actuarial skills within the broader enterprise risk management framework.

## **OBJECTIVE B1 – Enhance Public Understanding of Actuarial Estimates**

Objective B1 is “to enhance the public’s understanding of actuarial estimates, including the ‘best estimate’ and the range of all reasonable reserve outcomes, as well as estimates of the range of all possible settlement outcomes.”

### **Background:**

#### Consistent Terminology

To accomplish this objective, casualty actuaries must have a common understanding regarding these terms and concepts:

- Range of financial outcomes
- Actuarial or “best” estimate
- Range of reasonable estimates

#### Range of Financial Outcomes

With knowledge available at a point in time, there usually is a range of possible financial outcomes arising from a given future contingent risk or portfolio of risks, some of which may be more likely than others. The entire range of possible financial outcomes along with their likelihood, given the information available at a point in time, is the “distribution of outcomes” for the future contingent risk or risks at that time. The distribution of outcomes may not be known or knowable at the time the actuary is making an estimate.

An actuary usually uses past history that is believed to be relevant to develop an understanding of the related future outcomes and often gains insight into the relative likelihood of the outcomes near the “middle” of the distribution. This assessment can be based on one or more of the following:

- The actuary’s subjective understanding of the risks evaluated
- The results of one or more deterministic actuarial methods
- The results of one or more underlying models, often with statistical underpinnings
- Other approaches

#### Actuarial or “Best” Estimate

Given this assessment, the actuary will often be required to provide a single number or “actuarial estimate” that in some sense distills the distribution of possible outcomes for use in a particular situation. Its selection depends on the context in which the actuarial estimate will be used. These two facts — the presence of a distribution of possible future outcomes and the need for an actuary to provide a single actuarial estimate relating to that distribution — are often at the root of the public’s misunderstanding of what is meant by

an actuarial estimate. There can often be a variety of metrics that might be considered to be “reasonable” representations of the distribution.

“Best estimate” is not well-defined. Different professionals, including different actuaries, may use it to mean different things. In addition, not all actuaries agree on a single definition that fits in all reporting situations. It could be the mean (the statistical average over the entire distribution of outcomes). It could be the median (the “half-way” point in the distribution of outcomes where half the possible outcomes are below and half are above). It could be the mode (the point in the distribution of outcomes with the highest likelihood of occurring). Or it could be something else. Some actuaries intentionally select their “best estimates” to be optimistic, conservative, or neutral. ASOP 43 defines yet another term, “Actuarial Central Estimate” for use in certain situations.

The confusion is further compounded by a particular reporting situation in which an actuarial estimate is to be used. In many situations, accounting rules state that the balance sheet liability for unpaid losses should reflect management’s best estimate of the underlying obligations. An actuary reviewing this balance sheet item in a merger situation for a buyer of an insurer may be serving his/her principal by deriving an actuarial estimate of that liability that is as high as “reasonable” while one working for a seller may tend toward an estimate that is as low as “reasonable.” This difference may exist even if both actuaries have derived the same assessment of the distribution of outcomes, as they would have adjusted their estimates, implicitly or explicitly, for their principal’s view of the risk in using the estimate.

Sometimes actuaries talk in terms of “reasonable estimates,” again without specific definition. Although a “reasonable estimate” may not have a statistical meaning, it often refers to the results of actuarial method(s) using reasonable assumptions. Unfortunately, our publics, and sometimes actuaries themselves, make the leap from this definition to conclude that it is reasonably likely that the actual outcome will be equal to or “close” to the “reasonable estimate.” When differences occur, the actuary is faulted for doing a poor job, where in reality the deficiency could very well be in the communication of results rather than in the results themselves.

Historically actuaries’ training has focused on getting “the answer.” Traditional applications (rates and reserves) aim for a single number, e.g., a single booked reserve or a single rate charged. Often the actuary would develop a “feel” for the uncertainty involved by looking at alternative methods, but the focus has historically been on “reasonable” alternatives without any quantification of just how reasonable those alternatives really were or how wide the distribution of possible outcomes is around the estimate. Current actuarial training does not give the actuary the necessary tools to quantify uncertainty or to clearly communicate that uncertainty.

Compounding the question of the selection of the metric used to characterize the distribution is that the distribution of outcomes is usually not known and may not even be knowable by the actuary when the analysis is being performed. The distribution needs to be estimated in some fashion. As mentioned earlier the actuary might use the results

of one or more traditional deterministic actuarial methods, along with personal knowledge, judgment, and experience to derive a subjective view of the distribution of outcomes. The actuary might also attempt to use more rigorous methods to make that assessment. In either case, the actuary should recognize that in assessing the distribution of outcomes there are three possible causes of uncertainty that come into play. They are model, parameter and process uncertainty.

- Model uncertainty stems from the differences between the model and the actual risk process being reviewed.
- Parameter uncertainty stems from the parameters not being what they are estimated to be, even if the model is correct.
- Process uncertainty is also referred to as stochastic uncertainty and stems from actual outcomes being random.

Another aspect of actuarial estimates that is misunderstood is the distinction between an estimate and a forecast. An estimate is a value that is considered reasonable based on the information available to the actuary at the time the estimate is made and is often a representative point within a range. A forecast is considered by many to be a prediction of what will happen in the future. Actuaries are generally aware that their estimates are not intended to be forecasts, but many in the public seem to be less aware of this difference. Therefore, it is important that this distinction between estimates and forecasts be included in any definitions of actuarial terms.

#### Range of Reasonable Estimates

There is also no clear definition of “range” of estimates. Is it the range from the methods applied or is it the result of a statistical analysis? In what manner does it reflect parameter uncertainty, if at all? Is it supposed to be a range of reasonably likely outcomes or of reasonable estimates? Actuaries know it’s not the range of possible results, but do our principals? This distinction between the range of financial outcomes (possible results) and reasonable estimates is critical, as the two ranges are likely to have very different characteristics and are often confused by our publics.

The wording on what can cause or what has caused changes in estimates is usually too vague to be helpful. Sometimes the wording dealing with uncertainty, even though precise, may not convey the appropriate meaning to the actuary’s publics. Different actuaries use different terminology to convey the same meaning. Helping the user of the report to understand the context and implications of this numerical measure is as important as the quantitative assessment itself.

Actuaries are quantitative professionals working in a qualitative world. The actuary’s jargon and descriptions may be precise, but may not convey the proper meaning to the actuary’s principal, who often does not have the quantitative tools or training that the actuary does. Compound this with the possibility that different actuaries may be telling the same principal the same information, but using different words to do it, and it becomes clear that we as actuaries need consistency in our language and need to educate our principals in what that language means.

## Recommendations:

### Summary

The CAS should assemble a comprehensive “glossary” of actuarial terms and their meanings, not only addressing discussion of uncertainty but other potentially ambiguous terms. Casualty actuaries should also provide their principals with interim benchmarks to test emergence of losses compared to what would be expected based on the estimation method used. Stochastic processes have the advantage of not only providing estimates of ultimate losses but also estimates of losses during the next year along with probabilities assigned to those amounts.

### Discussion

The casualty actuarial community needs to agree on common language to discuss actuarial estimates and their variability in plain English using terms such as “likely”, “unlikely”, “remote”, etc. We need to agree on common language to describe how we assess uncertainty, again in plain English. As a first step, each of us needs to be clear on what we mean by the terminology that we are using. We should avoid terms like “high” and “low” without an explanation of the meaning of those words. And also, we should educate our publics with easy-to-understand examples as to what our words and methods mean.

Giving terms a perceived precision that they do not have does neither actuaries nor their principals a service. If an actuarial estimate is calculated as a statistical mean using either a rigorous or subjective assessment of the distribution of outcomes, then the actuary should say that and also should describe the distribution of outcomes used in that derivation. Without knowledge of the distribution used, no statistical mean or “actuarial central estimate” has any real meaning. If an actuarial estimate is a judgmental selection based on the estimates from a number of different methods, disclosing that is also of value to the principal.

Unfortunately certain terms used in the vernacular have significantly different meanings than their statistical definition. Take “expected,” for example. In the statistical sense the definition is precise — the expected value is the mean, the average over a distribution of outcomes. The Merriam-Webster online dictionary (<http://www.merriam-webster.com/dictionary/expected>) defines *expect* as

“to consider probable or certain <*expect* to be forgiven> <*expect* that things will improve> b: to consider reasonable, due, or necessary <*expected* hard work from the students> c: to consider bound in duty or obligated <they *expect* you to pay your bills>”

and continues in its synonyms section to indicate that *expect*

“implies a high degree of certainty and usually involves the idea of preparing or envisioning”

in contrast to concepts as “hope.” Clearly, unless an outcome is reasonably predictable, the statistical meaning of *expected* and the vernacular meaning are quite different, with

the latter implying a very high likelihood of occurring and the former not necessarily conveying such a meaning.

Compare the following two statements:

- “My actuarial estimate is \$x and is taken as an average over what I consider to be reasonably likely outcomes, using assessments of relative likelihoods determined using actuarial judgment. In my assessment it is just as likely that the true outcome will be between \$x<sub>1</sub> and \$x<sub>2</sub> as it will be outside those values (this represents the middle 50%, between the 25<sup>th</sup> and 75<sup>th</sup> percentiles) and while possible, it is very unlikely it will be below \$x<sub>3</sub> or above \$x<sub>4</sub> (the 5<sup>th</sup> and 95<sup>th</sup> percentiles respectively).”
- “My best estimate is \$x with a range of reasonable estimates from \$x<sub>1</sub> to \$x<sub>2</sub>.”

The first clearly presents the principal with more useful information than the second.

Along these lines some common terminology for discussing probabilities might also prove useful. The following was derived by the General Insurance Reserve Oversight Committee of the Faculty of Actuaries and Institute of Actuaries in the UK.

<b>Indicative percentile</b>	75%	90 % approx	95 % approx	99% approx
<b>Wording ‘below’ percentile</b>	Fairly likely that the outcome will lie below this estimate	Likely that the outcome will lie below this estimate	Very likely that the outcome will lie below this estimate	Extremely likely that the outcome will lie below this estimate
<b>Wording ‘above’ percentile</b>	Reasonable chance that the outcome could lie above this estimate	Possible but unlikely that the outcome will lie above this estimate	Possible but very unlikely that the outcome will lie above this estimate	There is a possibility, albeit remote, that the outcome will lie above this estimate

A worthwhile project for casualty actuaries would be to assemble a comprehensive glossary of actuarial terms and their meanings, not only addressing discussion of uncertainty (as above) but other potentially ambiguous terms.

Another type of important information actuaries can provide to assist our principals is to provide interim benchmarks to test emergence of losses compared to what would be expected with our models. Many stochastic methods not only provide estimates of ultimate losses but also estimates of amounts during the next year, along with probabilities assigned to those amounts. If, for example, the observed values during the next year are “fairly likely” given the model, there might be little reason to question that model. If, however, there is a “remote possibility” that the observed values could occur based on the model, the actuary might revisit the models to obtain a better understanding

of what is happening. In addition, this type of benchmarking can be the impetus for finding cogent, useful, and believable explanations for changes in actuarial estimates.

These goals can only be accomplished if actuaries begin to think more in terms of models that provide not only “projections” but also a sense of the distribution of financial outcomes. This transition will require a greater emphasis on stochastic approaches throughout the syllabus as well as a concerted effort to learn to communicate these concepts more clearly to our publics and to apply that learning in practice.

## **OBJECTIVE B2 – Refining Actuarial Methodologies**

Objective B2 is “to refine actuarial methodologies for estimating the underlying probability distributions for the range of loss and loss adjustment expense reserves, facilitating greater consistency in the approaches used by actuaries and improved transparency of financial reporting disclosures.” Furthermore, the Task Force concluded, “...the situation would be improved if actuaries were better able to estimate the underlying probability distributions using more scientific methods. This calls for a focus on the advancement of the tools and techniques used to estimate loss and loss adjustment expense reserves, and possibly on the education of actuaries.”

### **Background:**

To achieve these ends, the TFCRED recommended:

- A special interest seminar on stochastic reserving
- A call for papers on advanced reserving techniques
- Addition of a track on the exam syllabus focused on estimation of probability distributions

Significant progress has been made on each of the above recommendations.

Though the TFCRED called for “more scientific methods” and “the advancement of tools,” methodologies to estimate probability distributions of unpaid loss and loss expense liabilities already exist. Many have been described in various publications and have been in use since the early 1990s. The 1994 CAS Forum, dedicated to the 1994 Variability in Reserve Prize Program, was particularly fruitful in surfacing proposals for such methodology. Many of the published methods are tractable enough to apply in spreadsheets, with no advanced programming capabilities required.

The following section discusses the broad classes of available models and then provides a brief inventory of some popular methods. A cited bibliography is included at the end of this report. The list of methods and papers included herein is not meant to be exhaustive.

## Methodologies

The available models for calculating distributions of reserves (or unpaid loss, more precisely) fall into several categories: 1) factor- or link ratio-based models, 2) collective risk models, and 3) regression models.

### *Factor-Based Models*

Factor- or link ratio-based models start with conventional actuarial loss development models as their basis and compute variances from historic actual versus expected values. Five models are discussed briefly below, three calculate standard errors of reserve estimates in a closed form and two calculate distributions via simulation methods.

- Mack [8]
  - Mack presented a recursive formula of standard errors for individual accident years and all years combined. A subsequent ASTIN paper [9] incorporated the use of a tail factor.
  - This method rests on explicit assumptions required to make model and variance formulas applicable, e.g., development periods are uncorrelated. Assumptions must be tested.
  - Mack’s model calculates a standard error of unpaid loss estimate, not a distribution. Distributional forms can be hypothesized and fit with method of moments parameter estimates.
  
- Murphy [10]
  - Murphy proposed a regression methodology that replicates link ratio results — weighted average, straight average, or regression models.
  - Regression assumptions must be satisfied.
  - Variance formulas are therefore regression-based.
  - Like Mack, Murphy doesn’t compute a distribution *per se*. Distributional form must be postulated (based on regression assumptions)
  
- Holmberg [7]
  - Holmberg proposed a link ratio-based model that relaxes the usual assumption that accident years and development periods be uncorrelated (e.g., Mack).
  - This model includes methodology to estimate correlations and uses them in the computations of the variance of the reserve estimate.
  
- England & Verrall [3] (bootstrapping)
  - Bootstrapping is popular in Europe. It is a simulation method based on link ratios.
  - Re-sampling of error terms is used to simulate triangles, which are redeveloped to ultimate with each iteration.
  
- Hodes, Feldblum, and Blumsohn [6] (HFB)
  - HFB is also a simulation method based on link ratios.

- Unlike bootstrapping, link ratios are simulated based on a lognormal assumption.
- HFB explicitly adds parameter risk (based on a paper by Kreps).

### *Regression Models*

Unlike Murphy above, the broader class of regression models does not seek to replicate link ratio results, but creates models of entirely different structures. Two such examples are as follows.

- Halliwell [4]
  - In 1996, Halliwell proposed a generalized least squares model for reserve estimates and their variances.
  - A subsequent paper introduced the notion of conjoint estimation with paid and incurred loss.
- Zehnwirth [12]
  - Zehnwirth has published numerous papers on regression methods as applied to loss reserving (and is a software vendor for the same).
  - This model fits development patterns in the accident year, calendar year, and development year dimensions simultaneously against the log of incremental loss (preferably per exposure).
  - Recent research has led to the joint estimation of distributions across lines of business simultaneously to reflect correlations.

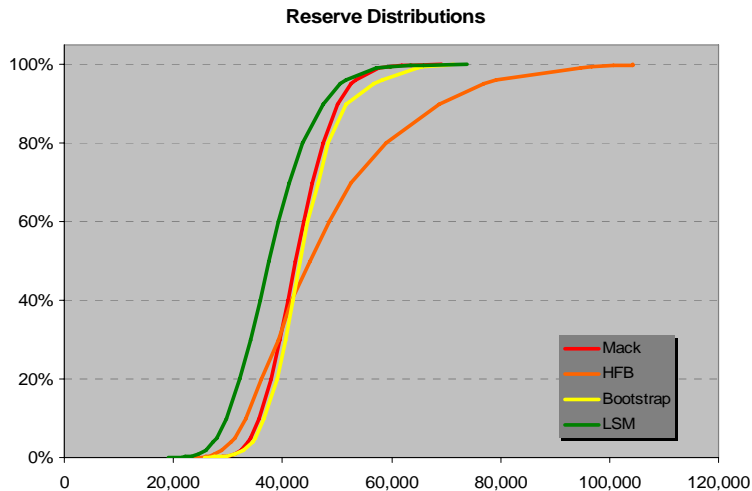
### *Collective Risk Models*

Hayne [5] published an example of an application of collective risk theory to the problem of estimating reserve distributions. Hayne’s model reflected a variable frequency and severity by accident year, but did not reflect parameter risk.

### Comparison of Methods

The existence of a variety of competing models highlights a perennial issue for the actuary. Beyond “methods,” actuaries will need to apply more rigor and discipline in identifying the appropriate method(s) and then applying it (them) accordingly. Each method may (likely will) yield different results for means *and* distributions. Following is an example based on actual data. Paid general liability occurrence loss data was modeled with Mack, Murphy (LSM model), bootstrapping, and HFB. The same tail factor was used for each method, but, in all other respects, the model answer was accepted without further judgment. Model reserve estimates were \$43 million, \$38.4 million, \$43 million, and \$48.6 million, respectively. The mean of the four estimates is \$43.25 million, which also seems to be approximately the median and the mode. If, for illustration, \$43 million was selected as the estimate of required reserves, the range of competing estimates about the selected value is almost +/- 12%. The existence of this sort of variability is typical of reserving exercises.

Now consider the broader issue of the distribution of reserves. The distributions (below) varied widely, as well. (Note: methods that produce only standard errors were assumed to be lognormal for this illustration.)



In the GL example, the above distributions are shifted left or right consistent with the relative location of the mean estimates. However, the shape of the distributions varies, as well. Actuaries will be called upon to 1) exercise appropriate diagnostics and judgment to choose the best probabilistic model(s), and 2) communicate this added layer of complexity to their (typically nontechnical) stakeholders.

Communication issues aside, the selection of methods should be made more rigorous, based on the back testing of critical assumptions. Each method rests on unique explicit or implicit assumptions. These assumptions must be tested to validate the models as they apply to a given situation. Venter [11] proposed a series of assumptions for assessing the validity of a link ratio model. Venter's diagnostics on link ratio models include:

- Testing for statistically significant slope and intercept terms between consecutive evaluations of losses
- Residuals v. cumulative losses (heteroscedasticity)
- Residuals v. time (serial correlation)
- Correlations between development periods
- Calendar period distortions

Regression-based models rely on explicit assumptions for regression methodology to produce best linear unbiased estimates. These regression assumptions, too, can (must) be tested.

### Future Research

While distributional models exist, additional research is necessary.

In the current environment, the actuary analyzes the available data with a suite of models and uses the output of these models to select an actuarial estimate. This analysis is conducted at a level at which the data is preferably both homogenous and credible. Actuarial point estimates at the detailed level can be simply added to compute a company total. The same is not true for reserve distributions: the convolution of distributions to compute a total risk distribution is far more complicated, requiring estimates of the correlations between modeling lines. (Papers do exist in this area, as well. Cf. Brehm [1] or Clark [2].)

Model results are conditioned on the underlying data and the circumstances underpinning the business. Actuaries currently do not have good predictive or causal models that relate the expected value and distribution of the unpaid loss and loss expense liability to underlying economic variables. Such models would explicitly condition loss reserve estimates and their distributions on underlying economic forecasts. Inclusion of variation in underlying economic variables should better reflect the process and parameter risk surrounding loss liabilities. Linkage to economic time series would make valuations and models more readily explainable to stakeholders.

### **Recommendations:**

#### Summary

The CAS should continue to provide education and training in the area of probabilistic class of models as well as their diagnostics. In addition actuaries need to be trained in communicating the results of a probabilistic reserve analysis to a nontechnical audience. The CAS should continue its research efforts in distributional reserving models.

#### Discussion

Substantial judgment is required to reconcile conflicting “best” estimates of unpaid loss and loss expense emanating from competing models, input data, and assumptions. The problem confronting the actuary is compounded greatly when moving up to higher moments and distributional estimates.

Significant theory and practice exists to provide the actuary with tools for the estimation of reserve distributions. However, substantial diligence will be required in order to select the best model. We recommend continued training and curriculum for actuaries, perhaps as part of the annual reserve seminar, to become expert users of the probabilistic class of models as well as their diagnostics. Furthermore, the added complexity of dealing in distributions will require a new level of communications to stakeholders. We recommend the development and delivery of training material to assist actuaries in communicating the results of a probabilistic reserve analysis to a nontechnical audience.

We also recommend additional research in distributional reserving models. In particular, further developments in the estimation of correlation models, causal models, and the incorporation of economic scenario generators are critical.

## **OBJECTIVE C**

The statement of this objective is:

“To improve the transparency of actuarial estimates by providing the changes from one reporting period to the next within the actuarial report.”

### **Background:**

The TFREP looked at the many ways actuarial estimates are organized and communicated and recognized that no single format would be appropriate for all entities. It is also uncertain if any public disclosure would be consistently understood by the users of insurance company financial statements. The November 2003 S&P article criticized the actuarial profession for certifying reserves that later become “wildly inaccurate.” An enhancement to the disclosures surrounding the risks and variability surrounding reserves estimates is needed. Also, an enhanced disclosure could provide more information regarding the need for regulatory action.

The TFREP believes that the Actuarial Opinion Summary (AOS) best serves as the vehicle for this objective. Some advantages of using the AOS to communicate temporal changes in reserve positions are:

1. Confidentiality, as the AOS is not in the public domain
2. Sufficient history, as the AOS is now in its third year for most opinions
3. Disclosure, as the AOS allows for comparisons between company-carried reserves and the actuary’s range or point estimate, as well as comparisons of either over time
4. Benchmarking, as the AOS may be formatted to tie reserve development to surplus requirements and other measures
5. Specificity, as the AOS allows for varying expectations among entities – for example, a company with long-tailed business will presumably show larger temporal variation than a company with short-tailed business.

The following is a proposed sample Actuarial Opinion Summary exhibit. The current AOS requires information with respect to the actuary’s range of estimates, the actuary’s point estimate, the company’s carried reserves and the difference between the company’s carried and the actuary’s estimated reserves evaluated at year’s end. The proposed AOS expands the number of evaluation points, includes the surplus for each year and displays the resulting one-year development to surplus ratio. The TFREP recognizes that any guidelines or templates will not be included in time for the 2007 AOS, but could be refined and introduced for the 2008 AOS. If the implementation of this requirement was for the 2008 Annual Statement, then, the AOS could conceivably include 4 years of comparisons since its introduction in 2005.

Company X - Actuarial Opinion Summary  
December 31, 2007

<u>All Years</u>	Evaluated at 12/31/05			Evaluated at 12/31/06			Evaluated at 12/31/07		
	Net Reserves (000's)			Net Reserves (000's)			Net Reserves (000's)		
	Low	Point	High	Low	Point	High	Low	Point	High
A. Actuary's Range Estimate	758,183		890,352	826,495		947,141	923,732		1,040,141
B. Actuary's Point Estimate		818,000			896,818			976,928	
C. Company's Carried Reserves		808,000			875,000			972,000	
D. Difference Between Company's Carried and Actuary's Estimate	(49,817)		82,352	(48,505)		72,141	(48,268)		68,141
E. Range Variance as % Surplus	-12.8%		21.1%	-12.1%		18.0%	-11.6%		16.4%
One-Year Reserve Development Surplus		390,000			10,000			(4,000)	
1-Yr Reserve Development as a % of Surplus					2.5%			-1.0%	
<u>All Prior Years</u>									
A. Actuary's Reestimation of Range-Prior Years				733,603		819,125	789,495		892,141
B. Actuary's Reestimation of Point-Prior Years					756,735			835,818	
C. Company Carried Reserves-Prior Years					754,000			830,000	
D. Difference Between Company's Carried and Actuary's Estimate-Prior Years				(20,397)		65,125	(40,505)		62,141
E. Prior Years Range Variance as % of Prior Year's Surplus				-5.2%		16.7%	-9.8%		15.0%

The TFREP recognizes a few questions will need to be resolved. For example:

- How many years should be included in the multiyear comparisons in the AOS?
- What are the implications of a new actuary having been appointed within the disclosure period?
- Should the document be made public in case of insolvency or certain regulatory actions?

There have been additional discussions within the TFREP about including more information, and in regard to how the disclosures of "change in reserve position" in the AOS should be categorized. Some possible dimensions are

- Line of business (e.g., property, automobile, liability);
- Loss perspective (e.g., gross, ceded, net of reinsurance);
- Liability item (e.g., losses, ALAE, ULAE);
- Range point (e.g., low, central, and high estimates);
- Comparison basis (e.g., denominators such as surplus or premium).

**Recommendations:**

Summary

The CAS should work together with the NAIC's Casualty Actuarial Task Force and regulators to incorporate temporal changes in reserve positions within the Actuarial Opinion Summary. In addition, the possibility of requiring additional explanatory information when the temporal differences in reserve estimates relative to given

benchmarks exceed a predetermined threshold should be explored. The CAS should solicit feedback from regulators as to what they have learned from the current AOS.

### Discussion

At this time, the TFREP makes the following recommendations:

1. The CAS should work jointly with regulators, through the Casualty Actuarial Task Force of the NAIC, to develop templates for future disclosures in the AOS relating to this objective. Work may begin now, though it is recognized that CATF actions generally are implemented over a period of several years
2. The CAS should solicit and review feedback from regulators on what they have learned from the current AOS. A questionnaire may be an appropriate data-gathering approach
3. The CAS should consider recommending requirements to CATF when temporal differences in reserve estimates relative to benchmarks exceed a predetermined threshold. For example, the actuary could be required to include an explanatory note in the AOS when year-over-year indicated reserves for the same line of business and the same loss perspective exceed 25% of surplus.

### **Objective D**

The statement of this objective is:

“To increase the visibility of the appointed actuary within the corporate governance arena. To enhance the quality of corporate governance for property/casualty insurers by educating audit committees and/or boards of directors on the roles and responsibility of the appointed actuary.”

### **Background:**

As discussed earlier, the objectives of the TFREP may be viewed in terms of three basic components: research, education, and communication. Objective D is largely a communication objective, yet the core competencies of the CAS as reflected in its Centennial Goal (CG)<sup>2</sup> are primarily research and education. However, the CG also calls for CAS members to be “recognized as experts” in their competencies, and it directly follows that such recognition requires communication. In fact, nearly all of the Significant, Attainable, and Measurable (SAM) Goals<sup>3</sup> which support the CG heavily

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<sup>2</sup> The Centennial Goal reads: “The CAS will be recognized globally as a leading resource in *educating* casualty actuaries and conducting *research* in casualty actuarial science. CAS members will advance their expertise in pricing, reserving and capital modeling, and leverage their skills in risk analysis to become *recognized as experts* in the evaluation of enterprise risks, particularly for the property and casualty insurance industry.”

<sup>3</sup> The ten SAM goals include liaison activities, sales of publications, a high profile for its Web site, and user surveys.

reflect a communication component or the *dissemination* of casualty actuarial research and education to various users. Therefore, even though directed at a specific set of users, Objective D embodies a challenge which is bound to involve activities outside the traditional “comfort zone” of the CAS. The specific tasks which emanate from efforts to achieve Objective D must be collaborative, creative, and well-vetted by CAS leadership.

Perhaps as a result of this context, we have only a limited number of recommendations which largely focus on support of existing and planned collaborative activities. However, numerous solutions are being delivered to CAS members with support from organizations with stronger communication missions and competencies, such as the American Academy of Actuaries (Academy). For example:

1. The Academy’s well-known Committee on Property and Liability Financial Reporting (COPLFR) recently published a Public Policy Overview document entitled “An Overview for Audit Committee Members of P/C Insurers: Effective Use of Actuarial Expertise.” This document is directly addressed to corporate governors and covers the roles of actuaries in setting loss reserves, actuarial considerations for board and audit committee members, and a discussion of checklists and benchmarks useful for these principals.
2. The Academy’s seminar on “Effective P/C Loss Reserve Opinions: Tools for the Appointed Actuary,” widely known as “opinion boot camp,” began in 2005 and has been very successful and well-attended. This seminar includes sessions dedicated to improving the documentation and communication of loss reserve opinions to corporate governors.<sup>4</sup> In November and December 2007 the CAS jointly sponsored two Webinars with the AAA on two topics from the “opinion boot camp.”
3. The Critical Review of the U.S. Actuarial Profession (CRUSAP) devoted one of the six sections of its report to “Actuarial Communications,” including an analysis of “Communication by Actuaries to the Users of Their Services.” It discussed a survey of nonactuaries (79 responses) in which 55% of respondents felt actuaries did an acceptable job of communicating the nature and limitations of actuarial work. Further, a significant majority felt a need for improvement in actuarial communications skills to users. Three of the 19 key recommendations of the CRUSAP report directly address visibility concerns nearly identical to those addressed in Objective D.<sup>5</sup> While these recommendations were general to all users of actuarial work, the report noted insurance company directors as a key audience.

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<sup>4</sup> Two 90-minute sessions at the boot camp cover “Data and Documentation,” including “coordination with independent auditors,” and “Difficult Situations,” including “strategies and responsibilities for delivering messages to managements and boards.”

<sup>5</sup> The recommendations were: require training and demonstrated proficiency in communications skills, develop a Web site specifically directed at users and the public, and retain a communications firm to perform a study of the current communications activities of U.S. actuarial organizations.

## **Recommendations:**

### Summary

The CAS should work together with COPLFR to maximize the distribution of COPLFR's Public Policy Overview. The CAS should also work with COPLFR to develop a session at its annual "boot camp" specifically focused on communication to corporate governors, including the new Public Policy Overview and relevant sections of the CRUSAP report. The CAS should develop an interactive session for its meetings targeted at communication with corporate governors. The CAS should devote a section of the CAS Web site to relevant publications on this topic.

### Discussion

Our recommendations follow the theme of optimizing existing communication vehicles to enhance the ability of actuaries to effectively communicate with corporate governors. They are as follows:

1. Maximize the distribution of the Academy Public Policy Overview by encouraging COPLFR to cite it in its annual Practice Note on P/C Statements of Actuarial Opinion, and by encouraging CAS members (with a mass communication) to read and distribute it to their appropriate principals in a timely manner.
2. Encourage COPLFR to consolidate discussion of communication to corporate governors during the "boot camps" by offering a specific agenda item or session dedicated to this topic and discussing the Overview and the relevant sections of the CRUSAP report.
3. Develop a highly interactive concurrent session for CAS gatherings targeted at communications with corporate governors. Include tools such as Q&A scripts between an actuary and audit committee member, and role playing games offering audience participation and practice in both written and "on the spot" oral communications. Survey and incorporate the results of previous concurrent sessions directly or tangentially devoted to this topic.
4. Develop a "Company Director and Audit Committee Resources" page of the CAS Web site linked to the home page, which contains the report of this Task Force, links to the recent Overview and CRUSAP report, relevant Actuarial Standards of Practice, and similar material.

## **IMPLEMENTATION**

Some guidelines for carrying out the recommendations as set forth in this report are as follows:

- All activities related to credibility initiatives need to be assigned to the appropriate vice president. Position descriptions need to be updated to reflect these responsibilities.

- Cycle reports should include progress to date on reputation-related tasks.
- The CAS Risk Management Committee should be given an oversight role for all reputation-related projects.
- All these changes can be implemented at the discretion of the Board. No changes are required to the CAS Constitution or Bylaws.
- An ERM approach should be used to monitor the effectiveness of the activities and indicate a need to change strategies when necessary.
- The approach taken above should be broad enough to allow for the identification of possible new reputation risks and flexible enough to allow the implementation of new systems, if necessary, to deal with these risks.

## **CONCLUSION**

The Task Force for Enhancing the Reputation of Casualty Actuaries is pleased to present this report to the Board. We request that the Board accept the report and dismiss the Task Force with thanks.

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