



Learning to trust your digital actuary

**New technologies can automate loss
reserve analysis, providing insurers
with more timely data and deeper
insights**

Analytics in insurance

Insurance is a data-rich industry where competition based on understanding risks and costs has a long history dating back to the earliest days of Edward Lloyd's coffee house. The modern era of advanced predictive analysis is sometimes credited to Progressive Insurance growing its business through substandard auto risks in the 1990s. Others soon followed, launching a wave of modeling innovation that spread across nearly all lines of business. Management teams, out of necessity, embraced these new approaches or risked being left far behind their competitors.

Model acceptance in pricing greased the skids for new applications of advanced analysis in claim management, marketing, agency management, and human resources. Today, companies are investing in new capabilities to improve these operational areas, trusting that they will achieve their desired outcomes whether for revenue growth, risk reduction, or cost savings.

Loss reserve analysis, in contrast to other business functions, has been mostly unaffected by technological advances. Over the years, paper and pencils gave way to calculators, computers, and reserving software that helped to drive incremental improvements. Despite modern computing power and huge advances in most areas of the business, a typical loss reserve analysis today would be mostly familiar to actuaries from 100 years ago.

It stands to reason that if new loss reserving methods can take full advantage of current day computing power and modern algorithms, we actuaries could achieve dramatic gains in the efficiency and efficacy of our analysis. Prototype analyses are achieving promising initial results, but to realize the benefits of reserve automation, management will have to learn to trust increasingly opaque systems. The perceived transparency of existing loss reserve analyses will likely be replaced by rapid feedback of automated systems. Continuous feedback of actual results versus frequent forecasts will likely drive acceptance of automated methods despite an increased reliance upon a "black-box" solution.



Loss reserve analysis – A historical perspective

The actuarial profession as we know it today came into being early in the 20th century out of the need to measure contingent liabilities. For much of our history, actuarial analysis has been viewed as complex; some might even argue incomprehensible. Many insurance leaders have learned to accept that actuarial science is far from transparent. Quarterly “deep dives” with massive actuarial reports are common but often fail to provide business leaders with timely actionable information and insights that they desire. Modern presentation capabilities can help, but optimal solutions to leadership’s needs are elusive. Over confidence in prior estimates and the relatively slow cadence of quarterly reserve analyses are key challenges.

Good actuaries who provide insight into their analyses create transparency, or at least the appearance of transparency for their principals and clients. But this insight comes at a cost when an actuary builds on prior conclusions with incremental data; there is a risk of a bias favoring stability of the results rather than responsiveness to change. When present, this bias is a form of anchoring, where prior information tends to be given greater consideration than the new information. As a result, the actuary’s prior results may become “sticky” and resistant to change.

In addition to anchoring on prior estimates, it is also common practice to perform detailed analyses of liabilities annually while using a lighter touch to refresh estimates over short intervals (e.g., months or quarters). Logically, an actuary may argue that the quantity of new information from the most recent data has only limited value, i.e., it is not “credible.” Thus, in-depth analyses repeated over short recurring intervals would require too many resources and yield too little new insight to be justified. However, long intervals between analyses risks perpetuating underperforming businesses until losses accumulate over several years. Similarly, conservative estimates and subsequent “favorable” reserve development masks useful information and often leads to two versions of the truth, one from the corporate

actuary and another from the pricing actuary. In either case, new technology may enable more frequent analyses to better support both reserving and pricing decisions.

New approaches are being applied to reserving; generalized linear models (GLMs) and other advanced methods are used to estimate insurance liabilities and/or develop information to better inform traditional reserving practices (e.g., claim analysis). Proponents of these methods point to back testing, which demonstrates improved accuracy versus traditional reserve analysis. While most advanced methods are designed to improve the accuracy of reserve estimates, few have focused on efficiency gains to increase the frequency of reserve analyses.

Advanced methods represent exciting advances in actuarial capabilities, but their reliance upon similar or sometimes larger resource requirements prioritizes accuracy improvements over efficiency gains. As a result, actuaries are still mostly constrained to using the same resources and similar cadence of detailed annual reviews and lighter touch quarterly updates. This stands in stark contrast to the efficiency gains in other industries that have truly capitalized on rapid advances in technology.

A conceptual leap forward in loss reserving is needed to break the anchoring effect and vastly increase the frequency of reserve analyses. Machine learning algorithms will likely enable review of all historical data equally and with the same rigor in every iteration of the analysis. When biases introduced by prior conclusions are stripped away and comprehensive analysis can be deployed in days or hours, rather than weeks or months, managers can spot trends and react to problems faster than ever before.

Loss reserving is mired in reliance on 20th century analytic methods and professional judgment despite strong evidence that well-constructed statistically sound algorithms almost always outperform humans. First movers will likely capitalize on technology as those in other industries have done, to act swiftly in response to changing conditions and opportunities.

Reserve automation – The new frontier

Cognitive automation is a blanket term for the convergence of robotic process automation, machine learning, cognitive computing, and advanced analytics that are driving unprecedented changes in all types of businesses. There is no reason to expect that actuarial loss reserve analysis will be immune to these forces. Initial prototypes using machine learning are already showing great promise. Data scientists using established algorithms (e.g., decision trees) are producing estimates that stand up to back testing and may already match the performance of humans using traditional liability analysis.

These prototypes are only the beginning of the story; machine learning applied to actuarial data yields good results in a fraction of the time required by teams of actuaries. Thus the capability already exists to reduce the cycle time and increase the frequency of fully analyzing all available data, thereby breaking the reliance upon prior analyses and reducing the risk of an anchoring bias from prior estimates. There is no doubt that we will see random fluctuations in estimates from one analysis to the next, but we will likely also find trends and patterns in the business more quickly than with conventional methods.

Successful prototypes with substantial efficiency gains over existing methods suggests that the aura of the inevitable rise of cognitive automation in other industries may not be far off for loss reserving. Beyond the initial successes using existing actuarial data, we might envision advances in machine learning algorithms making greater use of lower level claim data to yield greater depth of analysis than is currently practical. Efficiency distinguishes machine learning from other recent advanced actuarial methods and is a key to maximizing the benefits of cognitive automation of loss reserving.

As we consider how to extract value from the emerging science of reserve automation, history provides an interesting analogue from the world of computerized chess.

In 1997, IBM's Deep Blue beat world champion Garry Kasparov and in the years to follow, no human was competitive against their computer foes. However, a world-class player with the aid of a computer will often dominate today's computerized competitors. Similarly, cognitive methods may enable actuaries to perform comprehensive analyses with greater frequency and devote more human time to investigation of trends and other patterns. This layer of human intervention may be essential to winning acceptance of reserve automation, which would otherwise require excessive faith in analyses that are increasingly complex and difficult to interpret.

The "black box" nature of reserve automation presents challenges, especially for management teams and boards accustomed to detailed explanations of changes from quarter to quarter. Their insistence on transparency arises from an inherent need to understand and therefore trust the estimates of their actuaries. However, before dismissing reserve automation as unacceptably opaque, consider an extreme example. Assume that we had a system that always produced the right answer with little effort. Like a child's toy, the Magic 8 Ball for loss reserving, with one turn the correct answer was displayed. The answer conveys no understanding, it is completely mysterious, but because it is correct and highly efficient, the tool is invaluable.

Fortunately, this example is extreme; reserve automation tools are not complete mysteries just as existing actuarial methods are not completely transparent. The truth lies somewhere along a continuum, admittedly with reserve automation shifted toward the more complex end of the spectrum. However, we may achieve acceptable transparency by increasing the frequency of "full" reserve analyses from quarterly to monthly (or weekly) and pairing reserve automation with human interaction. Reserve automation may also benefit from a sharper focus on model validation and learnings from other emerging analytics.

Digital trust in automatic reserving

Borrowing the concept of digital trust from customer analytics provides useful considerations for reserve automation. In its common and broadest form, digital trust involves customers, data and errors, and misuse or unintended consequences of related analytics. Four pillars of digital trust are (1) Quality, (2) Accepted Use, (3) Accuracy, and (4) Integrity. The pillars of digital trust are equally applicable in the context of loss reserve analysis and provide a framework for management and regulators to assess the actuary's analysis.

The first pillar, **Quality**, relates to the fundamental building blocks of the analysis. Are the data management practices appropriate? Is the data timely, internally consistent, and complete? Data quality assurance for first-generation machine learning approaches that build on existing actuarial data should not be significantly different from current quality requirements for actuarial data formats and segmentations.

As reserve automation evolves into second-generation approaches that depart from traditional actuarial data structures, **Accepted Use** considerations will likely become increasingly important. Confirmation that the estimation methods being developed are fit for their intended purpose will take on heightened importance. The use, segmentation, and manipulation of data will have to be appropriate, documented, suitable for its intended purpose, and defensible.

Assurance established by adhering to quality and accepted use standards will be meaningless if the analytics cannot achieve an acceptable level of **Accuracy**. Predictions and

insights must provide timely actionable information that reflects reality. We must also consider that loss reserve models may be held to higher standards of precision than models used for purposes where directional indications are sufficient. Increased frequency of reserve analysis (e.g., from quarterly to weekly) is likely to be one factor in monitoring accuracy.

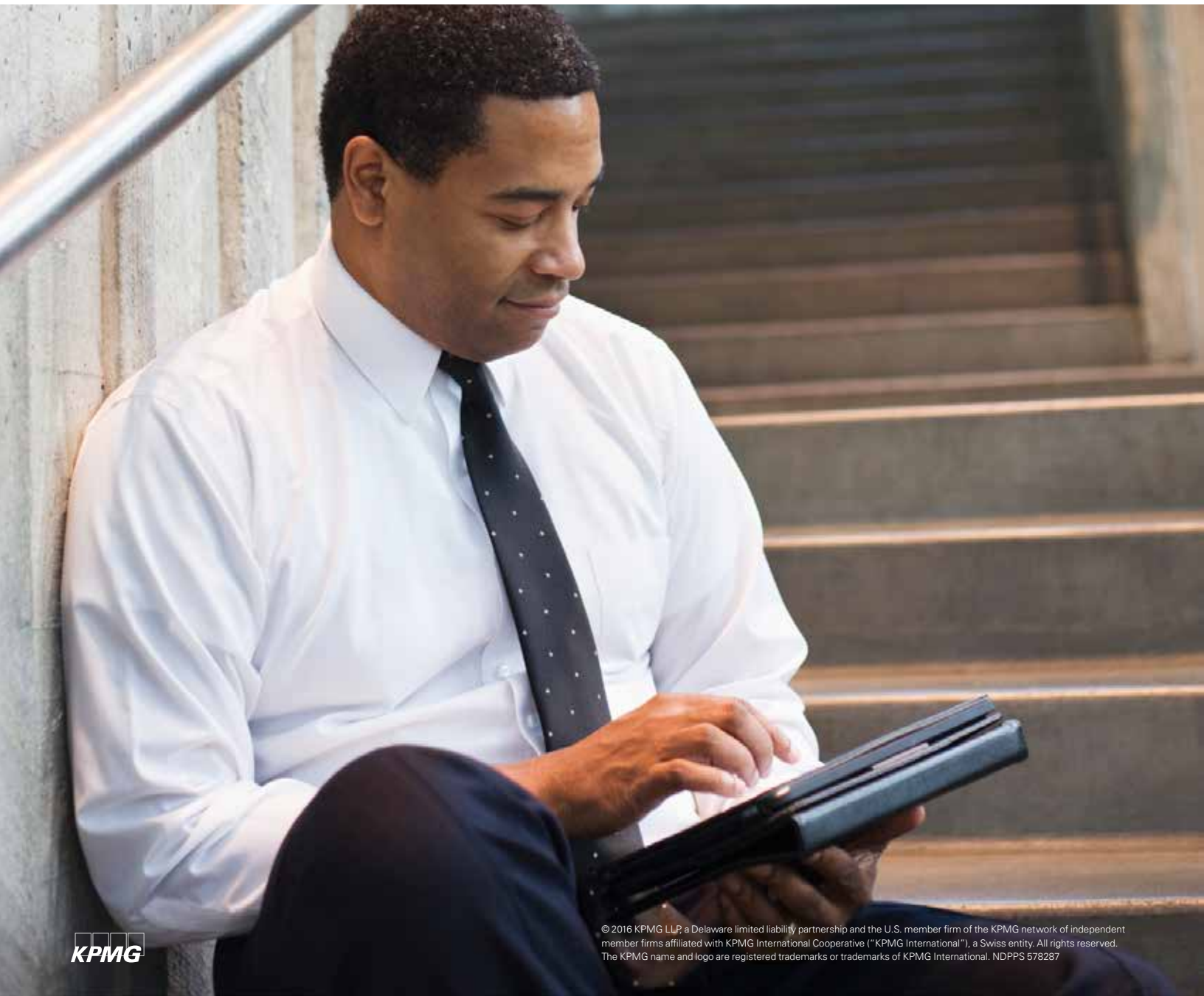
Lastly, the data, models, and resulting predictions must be managed ethically and with the utmost attention to the **Integrity** of the estimates. Methods that rely upon actuarial judgment or are prone to manipulation could be compromised by perception of bias.

Assuring trust in reserve models is an ongoing process leveraging concepts from model validation. As with model validation, digital trust requires end-to-end consideration of data, assumptions, calculations, and use of results. Executives may never fully achieve the level of transparency that they perceive in their existing practices, but trusted approaches capitalizing on new methods and technology have great potential to improve actuarial analysis of loss reserves.

Reserve automation can enable actuaries to focus on trends, patterns, and unexpected results in the analysis or higher level analyses and the application of actuarial judgment in the usage of these new methods. With efficiencies realized, some of the realized resources can be deployed into building and maintaining the required pillars of digital trust.

Conclusions

Predictive modeling in pricing unleashed a wave of innovation that is still advancing after 25 years. First movers realized large advantages through asymmetrical market information. Reserve automation offers the same potential advantages to reduce costs, outmaneuver less agile competitors, capture profitable market share, and exit problematic markets as expeditiously as possible.



How KPMG can help

KPMG LLP (KPMG) believes that property and casualty insurers are on the cusp of an exciting new wave of innovation. Companies that fail to embrace this innovation risk falling behind their competitors and relying on suboptimal initiatives that will ultimately fail to fulfill their intended purpose.

Automated loss reserving is a new way of thinking and a new way of working. But to achieve its full benefits, companies will have to gain confidence in new methods and decommission old processes. At the same time, insurers can gain valuable insight and new product management capabilities during the early stages of automation.

KPMG can help companies make the most of this innovation, by working to determine an appropriate future state, prove concepts, and create road maps to provide structure and governance as new business models are implemented.

KPMG realized many years ago the power data and analytics (D&A) can bring to our clients in helping them fulfill their business objectives. Through our investments, we have accelerated our position in the marketplace, making us a valuable partner to organizations seeking to leverage advanced analytics and business intelligence tools and methods. KPMG possesses a large team of actuaries, data scientists, and a central resource of more than 175 D&A practitioners whose sole purpose is to support our teams in identifying and implementing the best D&A solution for our clients.

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