

Communicating Uncertainty

**2009 Conference of Consulting Actuaries
Annual Meeting – November 4, 2009
Session 44**

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“Uncertainty is the spice of life!”

“Communicating about
uncertain things is tricky”

Why?

Example

- The Cubs will win the 2010 World Series

Example

- Next year's pension contribution will be \$5.8 million

What's the Difference?

- Relevance
- Expertise
- Reliance

The Importance of Today's Topic To the Actuarial Profession

- Our profession isn't about removing uncertainty
- It's about facilitating good decision-making in the face of uncertainty
- To the public,
 - What we do is relevant
 - We are “experts”
 - The public relies on us

How is actuarial science like
the weather?

Weather

- There is a weather science: meteorology
- The experts, meteorologists, make forecasts, not predictions
- Weather forecasting:
 - is not about getting it right
 - rather, it's about combining meteorological expertise with effective communications
 - with a purpose of facilitating good, relevant decision-making by the public

Weather

- The meteorological profession does a good job of communicating uncertainty
- From the public's perspective:
 - common means of communicating useful information that we all use to “risk manage” our way around weather

Weather Forecasting

- Common vocabulary:
 - Low pressure systems
 - Prevailing winds,
 - Etc.
- There is **uncertainty**, but:
 - a common understanding of expectations,
and
 - likelihood percentages abound

Weather Forecasting

- Effective visual displays convey relevant information at a glance
 - Facilitates intuitive near-term forecasting by the **user**
- There is an understanding among users that fat tail events will occur (hurricanes, tornados, etc.)
- This facilitates informed preparedness behaviors
 - for both short term and long term

Short Term Planning - Example

- I am planning a trip to New York - tomorrow
- I consult a national weather map on my computer
 - looking for weather systems that may be headed toward either Chicago or New York.
- Based on my understanding of how weather patterns move, I can anticipate possible delays at either O'Hare or LaGuardia.
 - I do this analysis virtually instantly.

Short Term Planning - Example

- I may adjust short term travel plans accordingly.
 - I may decide to leave tonight instead of tomorrow morning
 - Or, I may invoke back-up plans

Long Term Planning - Example

- I'm planning a wedding in 2010
 - I want an outdoor wedding

Long Term Planning - Example

- I pick June
 - Likely dry
 - Likely warm
 - Likely not hot and humid
- But – nothing is certain!
- And, I am not a meteorologist

Long Term Planning - Example

- But, I am a risk manager!
- Implicitly, I have come to understand concepts about weather related to
 - The mean
 - The standard deviation
 - Fat tails
- I develop my wedding plans accordingly

Conclusion

- The meteorological profession does a good job of communicating uncertainty
 - Common vocabulary
 - Common understanding of the mean, standard deviation, tails
 - Effective displays and efficient communications
 - The public understands the usefulness and limitations of bare-bones forecasts
 - Shared responsibility for weather-related decisions
 - We don't shoot the messenger!



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- Frank Todisco, FSA, MAAA, EA – Interim Chair, Actuarial Standards Board Pension Committee, and Senior Pension Fellow, American Academy of Actuaries.

Disclaimer

- All statements are the views of the individual presenters and are not official positions of any organization.

Communicating Uncertainty and the Pension ASOPs

- What the ASOPs say now
- What new initiatives are being pursued
- What *should* the ASOPs say about uncertainty?

“Uncertainty” vs. “Risk”

- Risk = numerically measurable?
- Risk = “bad outcome” portion of uncertainty?
- A semantic diversion

ASOP 41, Actuarial Communications

- Existing ASOP 41:
 - Nothing about communicating uncertainty.

First Exposure Draft: ASOP 41 rewrite

- Nothing direct about communicating uncertainty
- 4.1.c: Disclose “any limitations or constraints on the use or applicability of the actuarial findings” -- could be construed...

First Exposure Draft: ASOP 41 rewrite

- 2008 Comment Letters:
 - Some suggestions to address risk, either in 41 or in a new cross-practice standard

ASOPs 27 & 35, selection of assumptions

- Only address best-estimate / reasonable assumptions, for measuring obligations, but not risk

ASOP 35, demographic assumptions

- Section 3.1: “A reasonable assumption is one that is ...not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.”

ASOP 27, economic assumptions

- Section 3.1: “The actuary should determine the best-estimate range for each economic assumption, and select a specific point from within that range. In some cases, the actuary may present alternative results by selecting different points within the best-estimate range.”

ASOP 4, Measuring Pension Obligations

- Rewritten, 2007
- Prior ASOP 4: Nothing about uncertainty.

Aside: Structure of an ASOP

- Section 1: Scope, effective date,...
- Section 2: Definitions
- **Section 3:** Guidance on factors to consider, appropriate techniques, etc.
- **Section 4:** Disclosure

New ASOP 4

- Section 3.15, Volatility -- If assignment includes analysis of potential range of future costs, sources of volatility to consider

New ASOP 4

- Section 4.1.I -- Disclose:
 - Statement, appropriate for audience, indicating that future measurements may differ significantly from current; sample statement given; **and**
 - Analysis of range of future results, if part of assignment, along with factors used; **or**
 - Or, statement that actuary did not perform such an analysis due to scope of assignment

ASOP 27 Request for Comments (2008)

- Q7: “Is there a need for guidance concerning the selection of economic assumptions for purposes other than measuring pension obligations (for example, for measuring pension risk)?...”

ASB Pension Committee: Current Projects

1. ASOP 27 review (concerns include BER, FE)
 2. Economic value of pension liabilities
 - 3. Assessment and disclosure of risk**
 4. Assumptions regarding mortality improvement
- 1,2,&3 overlap. Revisions to multiple standards, or new standard

Assessment and Disclosure of Risk

- Techniques
 - Sensitivity analysis
 - Deterministic scenario analysis
 - Stochastic scenario analysis
 - Fat tail / outlier testing
 - Option pricing
 - Risk-free value minus actuarial value (what it would cost to get rid of the risk)

Assessment and Disclosure of Risk

- Considerations
 - Purpose of measurement, audience
 - Who bears the risk?

 - Choices of metrics in which to express risk (e.g., funded status, contribution rates, expense, ...)

 - Multiplicity of risks -- economic, demographic

Assessment and Disclosure of Risk

- Considerations (cont'd)
 - Size of plan relative to size of sponsor
 - Financial health, financial risk, of plan sponsor
 - Correlation between plan financials and sponsor financials
 - Bad economic scenarios will damage the plan sponsor at the same time that they damage the plan)

Assessment and Disclosure of Risk

- Problems with stochastic analysis
 - Mean and standard deviation are themselves uncertain; so output is not genuine probabilities
 - Assumption of Normal Distribution might be erroneous
 - Fat tails, black swans
 - After disaster strikes, it doesn't really matter that the probability had been very low
 - Again, correlation between plan and sponsor

Assessment and Disclosure of Risk

- For an ASOP, perhaps:
 - “Section 3” guidance about the selection and use of these risk-assessment techniques, including advantages and shortfalls (with some of these qualifications being disclosed)
 - “Section 4” trickier: What to disclose about the existence and magnitude of risk? How prescriptive? What mandatory elements, if any? What if sponsor won’t pay for it?

Possible Approaches to Disclosure

(or to any ASOP issue)

- Prescriptive and arbitrary (bright lines)
- Prescriptive
- In-between
- Principles-based

Approaches to ASOPs

- US ASOPs
 - “principles-based”
 - “not narrowly prescriptive”
(Introduction to the ASOPs, sections 3.1.7, 3.1.1)
- Sometimes practitioners seem to want more prescription, other times not

Approaches to ASOPs

- Non-US ASOPs often more principles-based
- Often include numerous requirements for the actuary to assess pension risks and disclose them to the plan trustees

(Committee looked at UK, Ireland, Australia, Netherlands, Canada)

Examples of approaches to disclosure (and other areas)

- Prescriptive and arbitrary:
 - Provide sensitivity analysis, showing PV at discount rate +/- 200 basis points
 - Change ASOP 44 to mandate a corridor of no more than +/- x%
- Prescriptive
 - Provide a sensitivity analysis

Examples of approaches to disclosure

- Principles-based
 - Approach can be summarized as “Here’s the concept. Do it. And take it seriously.”

Principles-based disclosure example: UK

“...the actuary must advise the trustees on the potential impact on the scheme of the risks associated with any proposed policy...**The level of comment in relation to each risk must be commensurate with the actuary’s view of the significance of that risk in relation to the scheme. Detailed figures are not a requirement, but a passing comment will not be sufficient in relation to any risks where the actuary considers that the impact of the risk on the scheme could be material**” (Guidance Note 9, “Funding Defined Benefits - Presentation of Actuarial Advice,” section 2.5. Emphasis mine.)

Principles-based disclosure example: UK

- UK standard also identifies specific risks to comment on (not exclusively) and specific impacts to consider (e.g., solvency, stability of contributions), so not devoid of guidance.

Prescriptive/Arbitrary Standards

- Advantage
 - Clarity
- Disadvantage
 - Standard becomes a safe harbor. Actuaries drop their professional judgment and manage to the standard.

Principles-Based Standards

- Advantage
 - Can use professional judgment to fit the particular situation
- Disadvantage
 - How to interpret?
 - Different actuaries may comply with different degrees of thoroughness.

Questions?



November 4, 2009

Communicating Uncertainty

Agenda

- ▣ Set the context for the discussion
- ▣ Health Care Case Study
 - Uncertainty in Health Care
 - Alternative Techniques
- ▣ Recommendations

Context

- ▶ What are the responsibilities of the actuary versus the consultant
- ▶ Health Care as the framework for the discussion
- ▶ Audience for our conversation is HR and sometimes Finance, but most HR

Case Study

- ▶ Mid-sized client with approximately 5,200 employees
- ▶ Self-insured pricing exercise
- ▶ High recent experience
 - 6 months of current year paid claims
 - Most recent 3 months of paid claims were considerably high
- ▶ Finance was concerned with the methodology for pricing and the pricing exercise for next year (Finance wanted to use the 3 months of experience annualized and trended for next year's pricing)

Uncertainty in Health Care

Short List (list could be much longer)

- ▣ Trend
- ▣ High Cost Claims
- ▣ Random Fluctuations
- ▣ Changes in Provider Reimbursements
- ▣ External Factors (changes in the economy, etc.)

Case Study

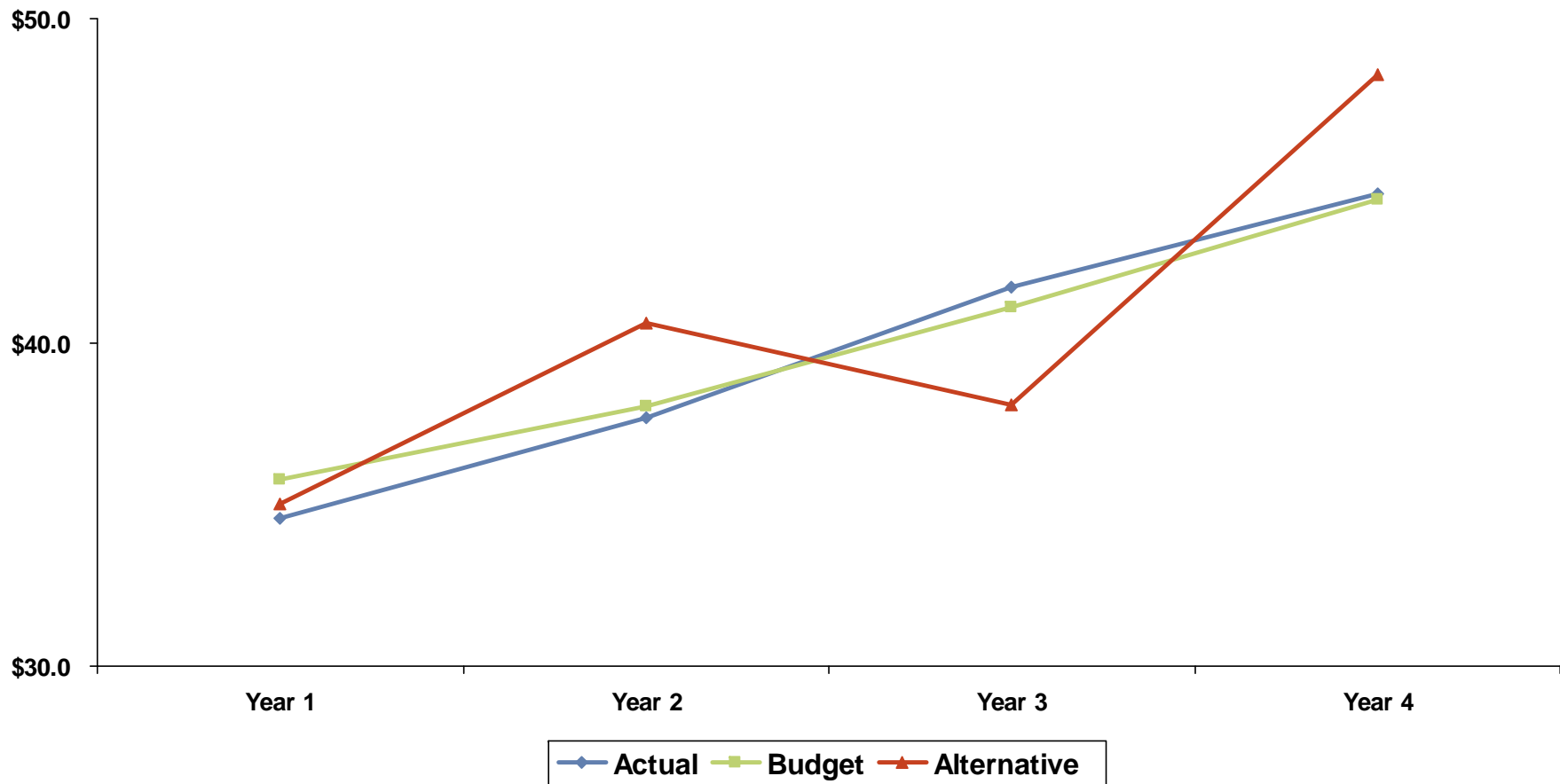
- ▶ Current Year Budget of \$43.3 Million
 - \$41.1 Million (medical and prescription drug claims)
 - \$2.2 Million (administrative costs)
- ▶ Prior Year claims had increased at approximately 8% annually (\$38.04 Million in prior year claims)
- ▶ Current 6 months of claims \$20.55 Million
- ▶ Most recent 3 months of claims were significantly high
 - Jan-March claims of \$9.375 Million
 - April-June claims of \$11.175 Million

Case Study

- ▶ Finance wanted to use the April-June claims of \$11.175 Million for the future year projection
- ▶ Annualized most recent 3 months of claims and trend forward to future year ($\$44.7 \text{ Million} \times 8\% \text{ Trend}$) or \$48.275 Million in claims
- ▶ Historically, there was a lot of variability in the claims
- ▶ Approach: Retrospectively review prior claim experience and use the most 3 month claim methodology to compare to actual claims

Case Study

Comparison of Actual Claims, Budget Methodology and Alternative Finance Approach



Case Study

- Result: Finance understood the variability and uncertainty in the claims and agreed to the standard methodology for budgeting
- Additional outcome, Finance became proactive in the health care discussion

Alternative Approaches

Short List (list could be much longer)

- ▣ Retrospective Study/Review Past Experience
- ▣ Range Estimates versus Point Estimate
- ▣ Scenario Test
- ▣ Outlier Study
- ▣ Stochastic Modeling

Recommendations

- Know the audience
 - Who will be the end user?
- Frame the conversation
- Open up the Black Box
 - Embrace the uncertainty
- Help your end user understand the uncertainty