Antitrust Notice

- The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.
- Under no circumstances shall CAS seminars be used as a means for competing companies or firms to reach any understanding – expressed or implied – that restricts competition or in any way impairs the ability of members to exercise independent business judgment regarding matters affecting competition.
- It is the responsibility of all seminar participants to be aware of antitrust regulations, to prevent any written or verbal discussions that appear to violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.
- The opinions in this presentation are those of the speakers and do not necessarily represent the views of KPMG or the CAS.

Agenda

- Learning objectives
- What is data visualization
- Getting Started and Reserving Applications
- Demo: Reserving Visuals in Power BI
- Applications across the organization
- Demo: Management Reporting in Tableau
- Best Practices
- Q&A
Learning objectives

- Understand the approach, considerations, and possibilities for incorporating DV
- Identify where to apply DV in reserving and your organization
- Be familiar with various DV software, their requirements, and their benefits
- Recognize the benefits of using DV
- Enhance dialogue and understanding by making DV effective and engaging

What is Data Visualization?

- Intelligent graphs and charts facilitate data discovery and risk-based analysis
- Dynamic dashboards that enable users to interact with significant amounts of data to generate insights
- Flexible visuals that can aggregate or dissect data to analyze its dimensions and KPIs
- Collaboration and communication tool to interface with a variety of users

Why data visualization?

- 90% of information transmitted to the brain is visual
- 93% of communication is non-verbal
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
- Presentations with visuals are 80% more persuasive than those with words alone
Why data visualization?

Numbers don’t do it justice

English statistician Francis Anscombe demonstrated value of graphical data with four data sets having virtually identical statistical properties.

A Picture Paints a Thousand Words

Visualization makes it possible to understand large amounts of data quickly and see the differences.

Knowledge check #1

What percentage of information transmitted to the brain is visual?

A: 100%
B: 90%
C: 75%
D: 40%

Where to begin…

You want to incorporate a data visualization software, but don’t know where to begin.
Getting Started

Our experience has highlighted a few key lessons learned/areas of focus in implementation:

- Project scope
- Stakeholder needs
- Data sourcing
- Organizational change management
- System access controls
- Input management & review
- Auditor/regulator access (for core financial visuals)
- Visualization software selection

These areas must be planned and managed effectively to ensure a successful business transformation.

Approach

Gathering Data and building Visuals are enhanced with Collaboration

**Data**
- Select – Discuss, understand and select data that supports purpose
- Collect – Collect, import, aggregate all relevant data sources
- Process – Process and validate to produce meaningful information
- Enrich – Transform or enrich the data to make it more meaningful and dynamic

**Visualization**
- Create – Develop and design visuals with dashboards
- Validate – Review and test results with existing reports
- Collaborate – Receive input and feedback
- Test – Company users test workbook
- Enhance – Evolve and enhance visuals iteratively

**Collaboration**
- Release workbook to users
- Train users
- Transfer knowledge
- Update/enhance visuals
- Release workbook to users
- Train users
- Transfer knowledge
- Update/enhance visuals

Data Sourcing

- Inventory of data sources – can be in various formats and from multiple sources:

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional servers</td>
<td>Visualization software offers direct interfacing with ODBC and OLEDB servers</td>
<td>SQL Server, Oracle, Hadoop</td>
</tr>
<tr>
<td>Standard table files</td>
<td>Traditional table and data file formats are supported as well</td>
<td>Excel, CSV, text, Access</td>
</tr>
<tr>
<td>Web sources and APIs</td>
<td>Non-traditional cloud-based connections are supported and can be accessed through add-ins or direct connections supported by third-party vendors</td>
<td>Salesforce, Google Analytics, Twitter</td>
</tr>
</tbody>
</table>
Data Sourcing Continued

- Software interfaces – common data upload features:

<table>
<thead>
<tr>
<th>Uploaded Feature</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upload templates</td>
<td>Source specific upload interfaces</td>
<td>SQL Server, Oracle, Hadoop, Power BI</td>
</tr>
<tr>
<td>Query/Code view</td>
<td>SQL/ETL programming oriented data interface</td>
<td>ETL Script View (QlikView), Power BI</td>
</tr>
<tr>
<td>Pre-processing</td>
<td>Automated data preparation</td>
<td>Data Interpreter (Tableau), Associative Engine (QlikView), Power BI</td>
</tr>
</tbody>
</table>

Knowledge check #2

What should be considered prior to building a visualization dashboard?

A. Validation of the visual results in relation to existing reports
B. Education of end users on how to drill and analyze results using DV tools
C. The visual maintenance plan for keeping source data up to date
D. Identification and validation of an appropriate data set to power the desired dashboard

Applications in Actuarial Reserving

- Gather and prepare data
  - Discover errors in the data
  - Select lines of business for review based on maturity, volume, and volatility of segmented lines
  - Find anomalies prior to completing analyses
- Perform analysis
  - Discover trends at the lowest and aggregated levels
  - Allow approvers to conduct own research
  - Focus on core causes and change drivers
  - Show cause/effects through interactive visuals versus static powerpoint or tables
  - Increased dialogue and cleaner messaging
  - Dashboards tailored to the audience providing transparent communication
- Review and approve
  - Monitor areas of concern
  - Quickly translate insight into action
  - Coordinate across all stakeholders improving strategic decision-making across the organization
- Analyze and communicate
  - Take action
  - Monitor areas of concern
  - Quickly translate insight into action
  - Coordinate across all stakeholders improving strategic decision-making across the organization
Application across the Organization

Unifying the Organization

- Finance: Dynamic reports improved efficiency, transparency, and richer insights with convergence of claims, pricing, reserving and underwriting.
- Claims: Multi-dimensional views of data identified potential fraud attributes earlier.
- Underwriting: Enhanced granular data view identified exposures driving loss ratio deterioration.
- Pricing: Price monitoring visualization identified areas of biases in new versus renewal, which caused increasing disparity between pricing and actual rates.

Past Benefits

- C-Suite: Driving insights across the organization.

Benefits by Role in the Organization

- Corporate/BU/LoB Executives:
  - Monitor trends and drill down into the detail on-demand.
  - Reduce delays in recognizing favorable or unfavorable developments.
  - Clear view on the bigger picture.
  - Efficient creation of management information reporting.

- Underwriting/Actuarial Leads:
  - Spot trends and drill down into the detail on specific claims, all in one place.
  - Increase speed of recognition and root cause analysis.
  - Enhance ability to see the bigger picture.

- Actuarial Manager/Staff:
  - Do I buy something in store? Yes/No/Other.
  - Brand Preference, Availability/Schedule, Ability to Pay.
  - Consumer Profile, Weather aside, will I go to the store? Yes/No.
  - Given the weather, do I go to the store? Shopping Triggers, Other.

- Marketing:
  - By definition, the "No" paths are not modeled because they cannot be observed in the sales and traffic data.
Benefits across the Organization

- Earlier warning on trouble areas that can be monitored for development
- Empowered actuarial staff and managers with a clearer purpose and a broader understanding
- More accurate reserving decisions and reduced volatility in reserves
- Increased dialogue and clearer messaging between the actuarial department and key stakeholders
- Cleaner presentation to key external stakeholders, including analysts and shareholders

...ultimately leading to improved strategic decision making across the organization

Storyline Process

- Visuals create “storylines” to streamline messaging around business problems and performance in an interconnected manner.
- Headline information is rolled up through the organizational structure to reflect Alternate Management View

- Linked numbers from bottom-to-top
- Hierarchical roll-up
- Matrix transparency across hierarchies
- Summary stories at all levels

Demo: Management Reporting in Tableau
Knowledge check #3

Which of the following was observed in the demo?

A. The connection between reserve selections and the underlying claims that drove reserve changes
B. Detailed information on the underlying drivers of the change
C. Trend information informing the user on experience changes over time
D. All of the above

ASOP 41 – Actuarial Communications

Definition 2.1: A written, electronic, or oral communication issued by an actuary with respect to actuarial services.

3.1.1 Form and Content
The actuary should take appropriate steps to ensure that the form and content of each actuarial communication are appropriate to the particular circumstances, taking into account the intended users.

3.1.2 Clarity
The actuary should take appropriate steps to ensure that each actuarial communication is clear and uses language appropriate to the particular circumstances, taking into account the intended users.

3.6 Oral Communications
Where the actuary has a concern that the oral communication may be passed on to other parties, the actuary should consider following up with an actuarial document.

4.1 Disclosures
Responsible actuary, intended user and purpose, limitations or constraints

Leading practices

Do’s and Don’ts for effective and engaging visuals
Leading practices - Choosing charts

- Organize
  - Ordered bar chart
  - Flow chart
  - Venn diagrams

- Important data point
  - Single big number
  - Donut chart
  - Photograph

- Purposeful Charts
  - Bubble chart / tree map
  - Pie chart
  - Word cloud

- Compare categories
  - Bar chart
  - Side-by-side comparison
  - Pie chart
  - Stacked bar chart

- Correlations or distributions
  - Scatter plots
  - Box & whiskers
  - Histogram

- Change by time or location
  - Line chart
  - Timeline
  - Area chart
  - Map

- Leading practices – Do’s and Don’ts

<table>
<thead>
<tr>
<th>Do</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Margin to Carried</td>
<td>Estimated Margin to Carried</td>
</tr>
</tbody>
</table>

- Correlations or distributions
  - Scatter plots
  - Box & whiskers
  - Histogram

- Do’s and Don’ts

<table>
<thead>
<tr>
<th>Do</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carried Reserves</td>
<td>Carried Reserves</td>
</tr>
</tbody>
</table>

- Leading practices – Do’s and Don’ts

<table>
<thead>
<tr>
<th>Do</th>
<th>Don’t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carried Reserves</td>
<td>Carried Reserves</td>
</tr>
</tbody>
</table>

- Data Validation
  - Leading practices
  - Do’s and Don’ts

- Change by time or location
  - Line chart
  - Timeline
  - Area chart
  - Map
Leading Practices - Colors

- Avoid red/green combinations for those that have color blindness
- See Color Brewer, designed by Cynthia Brewer, to get information on well-designed palettes
  - Categorical – distinct groups
  - Sequential – quantitative differences
  - Diverging – quantitative differences

Knowledge check #4

Which of the following charts should you use for relationships between two continuous variables?

- A. Scatter Plot
- B. Bubble Cloud
- C. Pie Chart
- D. Timeline
Thank you