Questions to Answer

Why are past water damage claims no longer predictive of future claims experience?

What would “good practices” include for actuaries pricing water damage for property products?
Agenda

- Purpose
- Scope
- Approach

- Significance of water damage claims
- Shortcomings of historic-based pricing methods
- Why is the past no longer predictive?
- Why is this issue crucial for water damage?

- Actuarial perspective
- Regulatory perspective
- Global company perspective
- Claims and underwriting perspective

- Global research papers
- Impact of climate change

- Data identification
- MRAT
- Coding claims data
- Prioritization of property pricing
- Collective effort
- Emerging models

Background Discussion

Statement of the Issue

Current Canadian Practices

Global Alternatives

Good Practices for Canadian P&C Actuaries
Background Discussion

- Purpose
- Scope
- Approach
### Purpose

**First Iteration (December 2011)**

<table>
<thead>
<tr>
<th>A. Measure risk at geographical level</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ How can local conditions be measured?</td>
</tr>
<tr>
<td>■ What information is currently available?</td>
</tr>
<tr>
<td>■ What work is underway?</td>
</tr>
<tr>
<td>■ How are the results formatted? How can they be formatted to be most useful to this audience?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Measure risk of individual exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Key ways that insureds can limit or prevent losses?</td>
</tr>
<tr>
<td>■ What is the influence of property characteristics?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Illustrate approaches to use (A) and (B) in pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Project future water losses</td>
</tr>
<tr>
<td>■ Allocate losses by geography and risk</td>
</tr>
</tbody>
</table>

**Second Iteration (August 2012)**

<table>
<thead>
<tr>
<th>A. Statement of the issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Shortcomings of historic methods</td>
</tr>
<tr>
<td>■ Why is the past no longer predictive?</td>
</tr>
<tr>
<td>■ Why is this issue crucial for water damage?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Current Canadian practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ Survey Canadian insurers regarding current practices</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Global alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ What are insurers in other countries doing?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. Perform qualitative assessment of best practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>■ How to make the most of current resources?</td>
</tr>
<tr>
<td>■ Compare and contract different methods</td>
</tr>
<tr>
<td>■ Describe methods that work best in various situations</td>
</tr>
</tbody>
</table>

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Scope

Home insurance policy covers damage caused by:

- Water main breaks (aqueducts)
- Overflowing sanitary installations (i.e., washing machine that overflows, leaking hot water tank or broken water main).

Optional Above Ground Water

- Sudden and accidental leaking of rain or snow
- Sudden and accidental discharge, backing up or overflow of rain water gutters, eavestroughs or downspouts

Optional Ground Water and Sewer

- Sudden and accidental seepage of underground or surface water
- Sudden and accidental discharge, backing up or overflow from sewer connections
- Rising of the water table

Not Covered

- Overland flooding
Approach

- Literature Review
- Personal Interviews
- Questionnaires

9 insurers
2 CAT modelling firms
2 provincial regulators
3 actuarial consulting firms
2 industry organizations
Statement of the Issue

- Significance of water damage claims
- Shortcomings of historic-based pricing methods
- Why is the past no longer predictive?
- Why is this issue crucial for water damage?
Significance of water damage claims

Aviva media release
April 10, 2013
Approximately 40 per cent of all home insurance claims are the result of water damage... and the average cost of water damage claims rose 117%, from $7,192 in 2002 to over $15,500 in 2012, a year in which the company paid out over $111 million in property water damage claims.

“The majority of insurers indicated that water damage currently represents the principal source of claims, and some suggested that this is the result of an increase in the frequency and severity of precipitation.”

AMF insurer survey on climate change 2011

<table>
<thead>
<tr>
<th>Kind of Loss</th>
<th># of Claims</th>
<th>Paid Claims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>4%</td>
<td>31%</td>
</tr>
<tr>
<td>Water</td>
<td>48%</td>
<td>47%</td>
</tr>
<tr>
<td>Theft</td>
<td>18%</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>30%</td>
<td>14%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: IBC presentation delivered at a Fire Safety Forum.

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## Shortcomings of historic-based pricing methods

<table>
<thead>
<tr>
<th>Fundamental Assumption</th>
<th>Extraordinary Events</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Past is predictive of the future</strong></td>
<td><strong>Does not consider extraordinary changes</strong></td>
</tr>
<tr>
<td>■ Rely on historical relationships between claims and exposures/premiums</td>
<td>■ Assume no changes would result in future relationships that are different from those observed</td>
</tr>
<tr>
<td>■ Rely on historical reporting and payment relationships</td>
<td>■ Changes to internal or external environments would invalidate fundamental assumption</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Data Shifts</th>
<th>Data Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trends change</strong></td>
<td><strong>Sufficient and reliable data not available</strong></td>
</tr>
<tr>
<td>■ Without adjustments, traditional methods will not capture increase in claim counts and costs that may result from climate change, aging/inadequate infrastructure, and changing lifestyles</td>
<td>■ Detail and accuracy of internal data vary from insurer to insurer</td>
</tr>
<tr>
<td>■ Policy language may change over time</td>
<td>■ Lack of available external data</td>
</tr>
</tbody>
</table>
Why is the past no longer predictive?

- Climate Change
- Aging Infrastructure
- Human Behaviour
- Lifestyle Changes

Past is no longer predictive
Climate change

In an 80 year forecast period, climate change alone will result in only a 30% increase in water-related insured losses. (Chad Shouquan Cheng, Qian Li, Guilong Li, and Heather Auld)

Climate change happens over decades and is not necessarily a major contributing factor to the increase in water damage claims that the industry is experiencing. (Catastrophe modelling firm)

Increase in claim cost due to climate change spread over 60 years – represents relatively small increase each year. (Institute of Actuaries of Australia)
Aging infrastructure

“[Infrastructure] being operated beyond [its] intended design life and capacity”
(Institute for Catastrophic Loss Reduction)

“In older subdivisions, infrastructure capacity may be designed to a lower standard.”
(Institute for Catastrophic Loss Reduction)

“The cost of identifying and addressing infrastructure vulnerability to a future climate during construction is much cheaper than the cost of restoring infrastructure after it has been damaged.”
(Climate Change Adaptation Project)

“Design safety margins may not last through the full operational life of an infrastructure system.”
(Nodelcorp Consulting Inc.)

“[Safety] margins may be consumed by day-to-day uses/activities.”
(Nodelcorp Consulting Inc.)

Many believe that the aging and inadequate infrastructure contributes substantially to the rising frequency and severity of water damage claims for the Canadian P&C industry.
### Lifestyle Changes

- **Increased number of people living in condominiums**
  - More appliances in units
  - Quality of construction materials

- **Increased number of finished basements**
  - Basements used as entertainment centres
  - Rental properties

- **Extended periods of time away from home**
  - Less time and attention paid to dwellings

- **Busy lives and attitudes towards prevention**
  - Leaky faucet is household problem with greatest proportion of ‘longer than one month’ repair time

### Human Behaviour

- **Construction**
  - Age/quality of construction
  - Pace of construction
  - Building codes
  - Urban sprawl

- **Human Behaviour**
  - Budgeting heuristics
  - Safety-first behaviour
  - Under-weighting the future
  - Myopic behaviour
  - Procrastination
  - Underestimation of risk
Why is this issue crucial for the peril of water?

Frequency & Severity = Rate Adequacy
Current Canadian Practices

- Actuarial perspective
- Regulatory perspective
- Global company perspective
- Claims and underwriting perspective
## Current Water Damage Practices

Describe your current processes for quantifying the effect of water damage loss potential for the purpose of ratemaking. Strengths and weaknesses?

- General linear models (GLMs) and traditional techniques
- Reliance on historical experience is reducing the predictive power
- Lack of industry data for benchmarking and modelling purposes

## Actuarial Skill Set and Tools

Do you believe that actuaries have the requisite skill set and tools to be able to address the issue of water damage risk?

- Resources dedicated to pricing of water damage risk lag behind automobile
- Lacking the credible data necessary to conduct such analyses
- Tools need better data to be effective. Rethink water damage modelling similar to catastrophe models
### Water Damage Claims vs. Financial Health

Are you concerned about the potential effect of water damage claims to the financial health of P&C companies?

- Not as much as hail and windstorm
- Not in terms of strain on capital, but do consider impact on annual net income
- Believe insurers are being vigilant in water damage exposure

### Management of Water Damage Risk

Do you see water damage risk addressed specifically in the risk management procedures of the companies you regulate?

- Water damage is in its “infancy stage of risk management procedures”
- Insurers are sensitive to this risk and are taking specific actions to mitigate the impact of water-related claims and of future water events
Global company perspective

<table>
<thead>
<tr>
<th>Organizational Collaboration</th>
<th>Sharing of Actuarial and Other Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No significant collaboration</strong></td>
<td><strong>Does not appear to be topic of discussion</strong></td>
</tr>
<tr>
<td>■ Very little sharing of intelligence</td>
<td>■ Water damage risk not a topic at inter-firm global meetings</td>
</tr>
<tr>
<td>■ Irrelevant global data to Canadian market</td>
<td>■ No real tools that can help better assess water damage in Canada</td>
</tr>
<tr>
<td>■ Coverage of water damage very different in Canada than the international market</td>
<td></td>
</tr>
</tbody>
</table>
## Claims and underwriting perspective

### Prevention and Mitigation Efforts

**What current prevention and mitigation efforts are in place to address water damage risk?**

- Insurers may require certain preventive actions before providing coverage
- Offer discounts for applying a wide range of adaptation practices
- Human behaviour limits effectiveness

### Role of Government

**Do you believe that the government has a role to play in addressing the factors giving rise to increased water damage?**

- Threat of regulatory intervention is low, but could increase overall costs due to compliance
- Building code standards
- Addressing aging municipal infrastructure
Global Alternatives

- Global research papers
- Impact of climate change
Global research papers

“Climate change and its impact on building water damage”
Gjensidige Forsikring and the Norwegian Computing Centre

“Construction of rating territories for water-damage claims”
Stockholm University

“Spatial Analysis of Frequency and Severity for Water versus Non-water Homeowners Claims in California”
California Department of Insurance

“Predictive Modeling of Multi-Peril Homeowners Insurance”
Variance Journal (Volume 6 Issue 1)

“Quantifying the Impact of Non-Modeled Catastrophes on Homeowners Experience”
CAS Forum (Winter 2003)
Impact of climate change

Paper: Climate change and its impact on building water damage

Collaboration between:
- Gjensidige Forsikring
- Norwegian Computing Centre

Authors:
- Ola Haug
- Xeni K. Dimakos
- Jofrid F. Vårdal
- Magne Aldrin

Abstract:
Establish claims model linking water damage from external sources on private buildings with selected weather data

Who & What

Data

Method

Conclusion

Insurance Data:
- Insurance claims and exposure data from Gjensidige Forsikring between 1997 and 2006
- Excludes catastrophes

Climate Data:
- Observed data (1961-2006)
- Modelled data (1961-1990) and (2071-2100)
- Precipitation, temperature, runoff, and snow water equivalent

Generalized Linear Models
- Claim frequency
- Claim severity
- Climate data
- Geographical data

Scenarios
- Based on two CO₂ scenarios
- High population growth and economic development
- Environmental conservation and sustainable growth

Output
Combine claim and climate data and project future claim payments under both scenarios

Result
- Claims increase under both scenarios
- Expected payments increase 20% under high growth scenario and 15% under sustainable growth scenario
- Subject to regional variability and differences
Good Practices for Canadian P&C Actuaries

- Data identification
- MRAT
- Coding claims data
- Prioritization of property pricing
- Collective effort
- Emerging models
Identification of and access to data required for pricing

- Age and type of roof
- Landscaping
- Have you cleaned your eaves and downspouts within the past year?
- Are your downspouts directing water 6 feet away from your home?
- Condition of foundation
- Has your basement ever flooded?
- Are there any unsealed cracks in your foundation?
- Slope of driveway
- Are the sewer grates in front of your home clear of debris?
- Do you have a backwater valve? A sump-pump?
- Do you pour fats and cooking oils down the sink?
Municipal Risk Assessment Tool (MRAT)

May enable insurers to identify relevant variables for decision-making in pricing and underwriting. Insurers’ claims data could be matched with municipal infrastructure data in models such as GLMs.

May improve availability of insurance coverage for sanitary sewer backups.
Coding claims data

Claims Data

Ability to Link Data

Exposure Data
Prioritization of property pricing
Collective effort

CIA + Insurance Industry + Government

Data to Help Understand Water Damage Risks
## Emerging Models

<table>
<thead>
<tr>
<th>Oasis Loss Modelling Framework</th>
<th>Computational Hydraulics International</th>
<th>Ambiential</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Description</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>■ Open architecture framework</td>
<td>■ Software for storm water, sanitary water, and watershed modelling</td>
<td>■ Flood risk assessment</td>
</tr>
<tr>
<td>■ Catastrophe modelling</td>
<td>■ Currently used exclusively by engineering firms and municipalities</td>
<td>■ Considers geographical and building structural data</td>
</tr>
<tr>
<td>■ Not-for-profit</td>
<td>■ Relies on detailed infrastructure data to analyze water-related events</td>
<td>■ Uses input from weather experts to model extreme weather events</td>
</tr>
<tr>
<td><strong>Primary Objectives</strong></td>
<td><strong>Use for Water Damage</strong></td>
<td><strong>Assistant to Insurer</strong></td>
</tr>
<tr>
<td>■ Encourage transparency</td>
<td>■ This is a foundation for a water damage model that incorporates infrastructure data to provide frequency and severity projections.</td>
<td>■ Flood risk mapping</td>
</tr>
<tr>
<td>■ Build community of resources</td>
<td>■ Implementation Challenges</td>
<td>■ Exposure mapping</td>
</tr>
<tr>
<td>■ Stimulate innovation</td>
<td>■ Tremendous data requirements</td>
<td>■ Catastrophe modelling</td>
</tr>
<tr>
<td>■ Create viable environment</td>
<td>■ Municipal data restrictions</td>
<td>■ Building vulnerability test</td>
</tr>
<tr>
<td><strong>Use for Water Damage</strong></td>
<td>■ High cost to produce model</td>
<td>■ Loss estimation</td>
</tr>
<tr>
<td>Plug-and-play nature of model facilitates water damage module to be added to framework.</td>
<td>■ No current insurance module</td>
<td></td>
</tr>
</tbody>
</table>
Questions?
Thank you

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