CYBER LIABILITY

Insurance Trends

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Radost Wenman, FCAS, MAAA

October 11, 2018
About the Presenters

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  • Senior Consulting Actuary, San Ramon, CA
  • CABA Secretary/Treasurer
  • CAS Cyber Liability Task Force Member
  • Cyber Liability essay published by Joint Risk Management Society

• **Radost Wenman**, FCAS, MAAA
  • Consulting Actuary, San Ramon, CA
  • CAS Predictive Analytics in Capital Modeling Working Party Member
  • CAS Actuarial Review Committee Member
Agenda

- Definitions
- NAIC Model Act
- Current Statistics
- Insurance Company Practices
- Analysis Techniques
- Available Data
- Questions
Definitions

- Incident: A security event that compromises the integrity, confidentiality or availability of an information asset
- Breach: An incident that results in confirmed disclosure of data to an unauthorized party

_Vocabulary for Event Recording and Incident Sharing (VERIS)_
Definitions – Types of Cybercrime

- Cyber extortion
- Cryptojacking
- Identity theft
- Credit card fraud
- Ransomware
- Cyber espionage
Definitions – Insurance Coverages

- Data breach response and liability
- Computer attack
- Network security liability
- Media liability
- Funds transfer fraud
- Cyber extortion
NAIC Model Law

• Section 1 Title
• Section 2 Purpose and Intent
• Section 3 Definitions
• Section 4 Information Security Program
• Section 5 Investigation of a Cybersecurity Event
• Section 6 Notification of a Cybersecurity Event
• Section 7 Power of Commissioner
• Section 8 Confidentiality
• Section 9 Exceptions
• Section 10 Penalties
• Section 11 Rules and Regulations
• Section 12 Severability
CURRENT STATISTICS

NotPetya

Anthem

Equifax

City of Atlanta

Anthem

Target

Facebook

German Steel Mill

San Francisco Municipal Transit Authority

WannaCry
Data Breaches - 2017

• 2,600,968,280 records breached in 2017
  – 7,125,940 every day
  – 296,914 every hour
  – 4,949 every minute
  – 82 every second

• 1,765 breach incidents in 2017

Source: 2017 The Year of Internal Threats and Accidental Data Breaches
Findings from the 2017 Breach Level Index
https://breachlevelindex.com/
Breach Sources

Number of Breach Incidents by Source in 2017

- Malicious Outsider: 1269
- Accidental Loss: 326
- Malicious Insider: 4
- Hactivist: 1
- State Sponsored: 164

Number of Breach Records by Source in 2017

- Malicious Outsider: 0%
- Accidental Loss: 76%
- Malicious Insider: 23%
- Hactivist: 1%
- State Sponsored: 0%

Source: 2017 The Year of Internal Threats and Accidental Data Breaches
Findings from the 2017 Breach Level Index
Breach Types

Number of Breach Incidents by Type in 2017

- Identity Theft
- Financial Access
- Account Access
- Existential Data
- Nuisance

Number of Breach Records by Source in 2017

- Identity Theft
- Financial Access
- Account Access
- Existential Data
- Nuisance

Source: 2017 The Year of Internal Threats and Accidental Data Breaches
Findings from the 2017 Breach Level Index
Records Breached by Industry

Source: 2017 The Year of Internal Threats and Accidental Data Breaches
Excludes “Other”
Findings from the 2017 Breach Level Index
Cybercrime’s Economic Impact

<table>
<thead>
<tr>
<th>Region (World Bank)</th>
<th>Cybercrime % of GDP Low</th>
<th>Cybercrime % of GDP High</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>0.69%</td>
<td>0.87%</td>
</tr>
<tr>
<td>Europe &amp; Central Asia</td>
<td>0.79%</td>
<td>0.89%</td>
</tr>
<tr>
<td>East Asia &amp; Pacific</td>
<td>0.53%</td>
<td>0.89%</td>
</tr>
<tr>
<td>South Asia</td>
<td>0.24%</td>
<td>0.52%</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>0.28%</td>
<td>0.57%</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>0.07%</td>
<td>0.20%</td>
</tr>
<tr>
<td>MENA</td>
<td>0.06%</td>
<td>0.16%</td>
</tr>
<tr>
<td>World</td>
<td>0.59%</td>
<td>0.80%</td>
</tr>
</tbody>
</table>

Source: Economic Impact of Cybercrime - No Slowing Down
February 2018
McAfee
## Crisis Service Costs 2014-2017

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Minimum</th>
<th>Average</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Guidance</td>
<td>341</td>
<td>112</td>
<td>53,133</td>
<td>14,922</td>
<td>2,500,000</td>
</tr>
<tr>
<td>Forensics</td>
<td>276</td>
<td>265</td>
<td>141,479</td>
<td>35,175</td>
<td>3,860,000</td>
</tr>
<tr>
<td>Notification</td>
<td>138</td>
<td>14</td>
<td>234,011</td>
<td>13,323</td>
<td>5,520,000</td>
</tr>
<tr>
<td>Credit/ID Monitoring</td>
<td>118</td>
<td>10</td>
<td>112,886</td>
<td>5,511</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Other</td>
<td>71</td>
<td>149</td>
<td>80,643</td>
<td>10,295</td>
<td>2,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>446</td>
<td>14</td>
<td>248,980</td>
<td>35,577</td>
<td>8,209,000</td>
</tr>
</tbody>
</table>

Source: Net Diligence 2017 Cyber Claims Study
## Legal Costs 2014-2017

<table>
<thead>
<tr>
<th></th>
<th>Cases</th>
<th>Minimum</th>
<th>Average</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Damages Defense</td>
<td>64</td>
<td>319</td>
<td>120,606</td>
<td>15,500</td>
<td>2,500,000</td>
</tr>
<tr>
<td>Legal Damages Settlement</td>
<td>37</td>
<td>1,502</td>
<td>254,851</td>
<td>50,000</td>
<td>4,800,000</td>
</tr>
</tbody>
</table>

Source: Net Diligence 2017 Cyber Claims Study
## Regulatory Defense and Fines 2014-2017

<table>
<thead>
<tr>
<th>Regulatory Defense and Fines</th>
<th>Cases</th>
<th>Minimum</th>
<th>Average</th>
<th>Median</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory Action Defense</td>
<td>10</td>
<td>25,163</td>
<td>696,524</td>
<td>83,750</td>
<td>5,791,000</td>
</tr>
<tr>
<td>Regulatory Action Fines</td>
<td>2</td>
<td>28,943</td>
<td>44,634</td>
<td>44,634</td>
<td>60,324</td>
</tr>
</tbody>
</table>

Source: Net Diligence 2017 Cyber Claims Study
### US Insurance Companies

<table>
<thead>
<tr>
<th>Calendar Year</th>
<th># of Companies Writing Cyber Insurance</th>
<th>DWP Millions</th>
<th>Loss &amp; LAE Ratio</th>
<th>Loss &amp; DCC Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>119</td>
<td>1,003</td>
<td>41.5%</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>140</td>
<td>1,348</td>
<td>47.6%</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>170</td>
<td>1,842</td>
<td></td>
<td>32.4%</td>
</tr>
</tbody>
</table>

Source: AON Benfield US Cyber Market Update, July 2018
INSURANCE COMPANY PRACTICES

NotPetya

Anthem

Equifax

City of Atlanta

Target

Anthem

Facebook

San Francisco Municipal Transit Authority

Yahoo!

German Steel Mill
# Personal Lines Insurance

## Identity Theft or Identity Fraud Expense

<table>
<thead>
<tr>
<th>Limit of Liability</th>
<th>Lost Income Per Day Maximum</th>
<th>Total Lost Income Limit</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25,000</td>
<td>$250</td>
<td>$5,000</td>
<td>Included</td>
</tr>
<tr>
<td>$50,000</td>
<td>$500</td>
<td>$10,000</td>
<td>$80</td>
</tr>
<tr>
<td>$100,000</td>
<td>$1,000</td>
<td>$20,000</td>
<td>$125</td>
</tr>
</tbody>
</table>

## CYBER EVENT, IDENTITY RESTORATION, AND FRAUD LOSS COVERAGE

Coverage may be provided to assist an insured who has experienced identity fraud or other fraud events or who has experienced a cyber attack or cyber extortion event. This includes case management services and contingent credit monitoring. Premium = $25.00

Source: Insurance Company Homeowners Filings
Cybersecurity – Commercial Underwriting

- General Information
  - Gross Revenues – Prior, Current and Projected
  - Gross Revenues from internet sales
  - Date business established
  - Number of individual devices
  - Website URLs and static IP addresses
- Data Held by Applicant
  - Number of unique records – employees, customers, other
- Relationships with third parties (5 questions)
- Internal policies and compliance with standards (8 questions)
- Management of privacy exposures (1 question)
- Encryption (2 questions)

Source: Insurance Company Commercial Filing
Cybersecurity – Commercial Underwriting

- Computer systems controls (13 questions)
- Employees and physical security (7 questions)
- Security testing and auditing (1 question)
- Backup and archiving (1 question)
- Business continuity and incident response planning (1 question)
- Content control (3 questions)
- Security incident and loss history (6 questions)
- Prior insurance (2 questions)
- Increased Limits Application (14 questions)

Source: Insurance Company Commercial Filing
Cybersecurity – Commercial Pricing

• Business Groups
  – Primary personal information is relative to employees
  – Keep financial or account number information on customers
  – Keep customers’ social security numbers
  – Educational institutions
  – Municipalities

• Revenue

• Number of Records
How to Measure Cyber Risk?

Qualitative
What an Actuary Would Not Do!
- Risk Matrices
- Weighted Scores

Quantitative
What an Actuary Would Do!
- Monte Carlo
- Bayesian

Source: *How to Measure Anything in Cybersecurity Risk* (Hubbard & Seiersen, 2016)
## Risk Matrices – Design

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>SEVERITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negligible</td>
</tr>
<tr>
<td>Frequent</td>
<td>1 &lt;=200K</td>
</tr>
<tr>
<td>Likely</td>
<td>4 (30%, 50%]</td>
</tr>
<tr>
<td>Occasional</td>
<td>3 (10%, 30%]</td>
</tr>
<tr>
<td>Unlikely</td>
<td>2 (1%,10%]</td>
</tr>
<tr>
<td>Rare</td>
<td>1 &lt;=1%</td>
</tr>
</tbody>
</table>

*Note: MED indicates Medium, HIGH indicates High, LOW indicates Low.*
Risk Matrices – Are they Useful?

Perceived Benefits

- Intuitive
- Simple
- Easy to Explain
- Easy to Update
- Visual Appeal
- Minimal Quant Skills

YES!
# Risk Matrices – Useful? Not So Much!

## Inconsistency in Ranking

<table>
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</tr>
<tr>
<td>Frequent</td>
<td>1</td>
</tr>
<tr>
<td>Likely</td>
<td>&lt;=200K</td>
</tr>
<tr>
<td>Occasional</td>
<td>30%*2M</td>
</tr>
<tr>
<td>Unlikely</td>
<td>1</td>
</tr>
<tr>
<td>Rare</td>
<td>&lt;=1%</td>
</tr>
</tbody>
</table>

### Example Calculation
- 55% of 2M = 1.1 M
- 30% of 15M = 4.5 M

Inconsistency in ranking can occur when 55% of 2M is not aligned with the expected severity level of 1.1 M.
Risk Matrices – Useful? Not So Much!

Range Compression

severity

50K 250K 5M 40M

1% 20% 40% 60%

Range Compression

Risk 1 = .02*10M = 200K
Risk 2 = .10*40M = 4M

Risk 2
Risk 1 = 40
Risk Matrices – Useful? Not So Much!

- Clustering of Scores
- Categories Are Arbitrary
- Distortion of Relative Distances
- Correlations among Risks
## Better Solution – Monte Carlo

<table>
<thead>
<tr>
<th>Event</th>
<th>Probability of Event</th>
<th>90% CI of Impact</th>
<th>Expected Loss</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Limit</td>
<td>Upper Limit</td>
<td></td>
</tr>
<tr>
<td>Event A</td>
<td>2.0%</td>
<td>$ 40,000</td>
<td>$ 200,000</td>
<td>$ 2,016</td>
</tr>
<tr>
<td>Event B</td>
<td>5.0%</td>
<td>$ 500,000</td>
<td>$ 2,000,000</td>
<td>$ 54,643</td>
</tr>
<tr>
<td>Event C</td>
<td>10.0%</td>
<td>$ 400,000</td>
<td>$ 2,500,000</td>
<td>$ 116,785</td>
</tr>
<tr>
<td>Event D</td>
<td>15.0%</td>
<td>$ 100,000</td>
<td>$ 5,000,000</td>
<td>$ 215,104</td>
</tr>
<tr>
<td>Event E</td>
<td>20.0%</td>
<td>$ 25,000</td>
<td>$ 500,000</td>
<td>$ 33,850</td>
</tr>
<tr>
<td>Event F</td>
<td>12.0%</td>
<td>$ 200,000</td>
<td>$ 5,000,000</td>
<td>$ 193,677</td>
</tr>
<tr>
<td>Event Y</td>
<td>40.0%</td>
<td>$ 200,000</td>
<td>$ 2,000,000</td>
<td>$ 323,201</td>
</tr>
<tr>
<td>Event Z</td>
<td>2.0%</td>
<td>$ 1,000,000</td>
<td>$ 10,000,000</td>
<td>$ 80,800</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>$ 5,000,000</td>
</tr>
</tbody>
</table>
Better Solution – Visualizing Risk

- Probability of Exceeding Loss
- Total Loss
- Inherent Risk
- Risk Tolerance
- Residual Risk

5M

Risk Tolerance

Inherent Risk

Residual Risk

64%

$1,000,000

$10,000,000

$100,000,000

0%

10%

20%

30%

40%

50%

60%

70%

80%

90%

100%
Better Solution – Further Improvements

- Calibrate Experts
- Decompose Frequency and Severity
- Bayesian

\[ P(A|B) = \frac{P(B|A) \cdot P(A)}{P(B)} \]
Cybersecurity Databases

- Javelin Strategy
- Breach Level Index
- FBI
- Ponemon
- Homeland Security
- ITRC
- Sonicwall
- Symantec
- Verizon
- Privacy Rights Clearinghouse
- BakerHostetler
Questions
Join Us for the Next APEX Webinar

Thursday, November 15
2:00 p.m. ET
Registration is Open

State of the Florida Homeowners Market

Derek Freihaut
Art Randolph
Final notes

• We’d like your feedback and suggestions
  • Please complete our survey

• For copies of this APEX presentation
  • Visit the Resource Knowledge Center at Pinnacleactuaries.com
Thank you for your time and attention

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