Session 101L, ERM and Economic Capital Model for Health Companies and ORSA

Moderator/Presenter:
Marcus A. Such, ASA, MAAA

Presenters:
Manchiu Chan, FSA, MAAA
Marizze C. Seeth, ASA
Christopher Suchar, FCAS, MAAA
SOA Health Meeting 2018
Session 101

ERM and Economic Capital Model for Health Companies and ORSA

June 26, 2018
ERM AND ECONOMIC CAPITAL MODELING (ECM)
ERM and Economic Capital (EC) Model Growth Paths

Maturity Level

Two Parallel Tracks

Qualitative ERM
- Risk governance
- Risk identification
- Risk impact assessment
  - Often on broad scale (1 to 10)
  - Heat maps, directional information

Quantitative ERM
- Risk appetite and tolerance limits
- Measuring risk impacts — dollar quantification
- Dashboards — cost/benefit relative to other financial measures

Foundational ECM
- Initial models
- Focus on financial risks – assets and underwriting
- Use of ESG
- Reflects correlation and diversification

Robust ECM
- Robust enterprise models
- Quantifying mitigation effects
- All risks included
- Fully integrated with planning and management processes
Best Practices for Economic Capital Models

Robust risk models on both sides of the balance sheet

- Economic Scenarios – Calibrated to all the volatility of the 20th and 21st centuries
- Assets – Market risk
- Assets – Credit risk
- Insurance – Reserving risk
- Insurance – Underwriting risk
- Strategic and Operational risk
- Non-insurance Operations

- Depends on investment strategy – less important for health insurers
- Less important for health insurers due to relatively quick benefit payouts
- Much more important to health insurers due to systemic changes

Stochastic and stress testing capability

- Must be able to stochastically stress whole enterprise at once
- Must also be able to run deterministic stress tests

Unified, integrated model of all assets and liabilities

- Modeling distinct business entities and at the consolidated enterprise level in the same ECM framework
- Modeling management actions, integrated within the model
- “Capital Fungibility” – Flows of capital and funds between entities must reflect reality
- Liquidity risk evaluated in a consistent ECM framework

The “Use Test” – Model must be transparent and granular enough to be used by management
Stochastic ECMs – Pros and Cons

Pros

- Provides probability statements for capital adequacy ➔ Provides basis for allocating the cost of capital, to support better financial performance metrics ➔ Critical to creating greater value for management beyond compliance
- Provides better framework for addressing interactions between risk factors

Cons

- Additional work beyond what is require for a pure scenario testing approach (but the good news is all work done on a scenario testing basis can be leveraged)
- Additional management “education” required
BUSINESS APPLICATIONS OF A STOCHASTIC ECM
Capital Adequacy Assessment

- To assess capital adequacy, use the ECM to project ranges of balance sheet capital.
- The downside ends of the ranges are compared to key regulatory or rating agency thresholds — need to demonstrate a “small” probability of capital shortfall (how small depends on audience).

Ranges of Projected Capital

- Blue line = average projected capital
- Bottom of yellow box = 10th percentile, i.e., 1-in-10 year downside
- Bottom of vertical line = 1st percentile = 1-in-100 year downside
- Compare this to minimum capital thresholds such as the blue or red line

Capital Adequacy & Risk Tolerance — Key Choices

Capital Adequacy Metric

- Policyholder Surplus
- Shareholders’ Equity
- Free Cash Flow
- Earnings

Capital Adequacy Standard

- Regulatory or Rating Agency Threshold
- Debt Rating or Bond Default Threshold

Time Horizon

- 1 Year, 3 Years, 5 Years (can produce very different answers)
Capital Adequacy – Measure, Threshold & Time Horizon

Many companies will use bond rating probability of default as a proxy/threshold for evaluating their solvency.

- S&P Corp Bond Default Rate: Single A, 1-Year = 0.07% (i.e., 99.93% chance of not defaulting)
- At the 0.07% probability level, at the end of Year 1 the Capital level falls to about $600M

- S&P Corp Bond Default Rate: Single A, 5-Year = 0.35% (i.e., 99.65% chance of not defaulting)
- At the 0.35% probability level, at the end of Year 5 the Capital level falls to negative $73M

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.07%</td>
<td>651</td>
<td>708</td>
<td>739</td>
<td>781</td>
<td>815</td>
</tr>
<tr>
<td>0.10%</td>
<td>600</td>
<td>491</td>
<td>224</td>
<td>28</td>
<td>(346)</td>
</tr>
<tr>
<td>0.20%</td>
<td>600</td>
<td>526</td>
<td>280</td>
<td>99</td>
<td>(207)</td>
</tr>
<tr>
<td>0.35%</td>
<td>600</td>
<td>539</td>
<td>355</td>
<td>148</td>
<td>(73 )</td>
</tr>
<tr>
<td>0.50%</td>
<td>600</td>
<td>566</td>
<td>392</td>
<td>206</td>
<td>11</td>
</tr>
<tr>
<td>1.00%</td>
<td>601</td>
<td>595</td>
<td>468</td>
<td>320</td>
<td>184</td>
</tr>
<tr>
<td>2.00%</td>
<td>601</td>
<td>624</td>
<td>541</td>
<td>446</td>
<td>321</td>
</tr>
<tr>
<td>2.50%</td>
<td>601</td>
<td>629</td>
<td>561</td>
<td>482</td>
<td>381</td>
</tr>
<tr>
<td>5.00%</td>
<td>606</td>
<td>647</td>
<td>623</td>
<td>598</td>
<td>542</td>
</tr>
<tr>
<td>10.00%</td>
<td>616</td>
<td>663</td>
<td>674</td>
<td>690</td>
<td>687</td>
</tr>
<tr>
<td>25.00%</td>
<td>632</td>
<td>687</td>
<td>719</td>
<td>767</td>
<td>800</td>
</tr>
<tr>
<td>50.00%</td>
<td>650</td>
<td>711</td>
<td>751</td>
<td>804</td>
<td>850</td>
</tr>
<tr>
<td>75.00%</td>
<td>669</td>
<td>734</td>
<td>778</td>
<td>833</td>
<td>889</td>
</tr>
<tr>
<td>90.00%</td>
<td>688</td>
<td>753</td>
<td>799</td>
<td>857</td>
<td>919</td>
</tr>
<tr>
<td>95.00%</td>
<td>699</td>
<td>764</td>
<td>811</td>
<td>871</td>
<td>937</td>
</tr>
<tr>
<td>97.50%</td>
<td>708</td>
<td>773</td>
<td>821</td>
<td>883</td>
<td>953</td>
</tr>
<tr>
<td>98.00%</td>
<td>710</td>
<td>775</td>
<td>824</td>
<td>885</td>
<td>957</td>
</tr>
<tr>
<td>99.00%</td>
<td>717</td>
<td>783</td>
<td>831</td>
<td>894</td>
<td>971</td>
</tr>
<tr>
<td>99.50%</td>
<td>722</td>
<td>791</td>
<td>839</td>
<td>902</td>
<td>983</td>
</tr>
<tr>
<td>99.60%</td>
<td>724</td>
<td>792</td>
<td>842</td>
<td>905</td>
<td>986</td>
</tr>
<tr>
<td>99.80%</td>
<td>728</td>
<td>802</td>
<td>850</td>
<td>910</td>
<td>993</td>
</tr>
</tbody>
</table>

XYZ Company
Capital ($ in millions)

Determine Required Capital

- Calculate/find the 0.35 percentile for Capital held at Year 5 (2021) from the simulation run.
- Take the Capital held at the beginning of the simulation (Time=0) and subtract the present value of the 0.35 percentile for Capital held at Year 5 (using 5 year treasury yield as of 12/31/2017).
- The result is the “Required Capital”, i.e. the minimum capital level as of 12/31/2017 that will satisfy the chosen risk tolerance.

### XYZ Company
**Capital ($ in millions)**

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td>651</td>
<td>708</td>
<td>739</td>
<td>781</td>
<td>815</td>
</tr>
<tr>
<td><strong>Std Dev</strong></td>
<td>27</td>
<td>38</td>
<td>67</td>
<td>101</td>
<td>146</td>
</tr>
<tr>
<td><strong>0.07%</strong></td>
<td>599</td>
<td>459</td>
<td>203</td>
<td>10</td>
<td>(389)</td>
</tr>
<tr>
<td><strong>0.10%</strong></td>
<td>600</td>
<td>491</td>
<td>224</td>
<td>28</td>
<td>(346)</td>
</tr>
<tr>
<td><strong>0.20%</strong></td>
<td>600</td>
<td>526</td>
<td>280</td>
<td>99</td>
<td>(207)</td>
</tr>
<tr>
<td><strong>0.35%</strong></td>
<td>600</td>
<td>539</td>
<td>355</td>
<td>148</td>
<td>(73)</td>
</tr>
<tr>
<td><strong>0.50%</strong></td>
<td>600</td>
<td>566</td>
<td>392</td>
<td>209</td>
<td>11</td>
</tr>
<tr>
<td><strong>1.00%</strong></td>
<td>601</td>
<td>595</td>
<td>468</td>
<td>320</td>
<td>184</td>
</tr>
<tr>
<td><strong>2.00%</strong></td>
<td>601</td>
<td>624</td>
<td>541</td>
<td>446</td>
<td>321</td>
</tr>
<tr>
<td><strong>2.50%</strong></td>
<td>601</td>
<td>629</td>
<td>561</td>
<td>482</td>
<td>381</td>
</tr>
</tbody>
</table>

### XYZ Company
**Capital ($ in millions)**

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Held</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required Capital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                                      |      |      |      |      |      |
| Held                                 |      |      |      |      |      |
| Less: 0.35 percentile @ end of Year 5 (discounted) |      |      |      |      |      |
| Required Capital                     |      |      |      |      |      |

Capital Allocation Approach

- Capital itself is not actually sub-divided and allocated to individual segments of the business. All of the capital in a business entity is, in principle, available to support each business segment.

- It is meaningful, however, to allocate the cost of capital to individual business segments. Each segment must bear a share of the total cost of capital for the enterprise (the cost of capital may be a certain return expected by investors, or a certain internal growth rate target).

- How do you fairly allocate the cost of capital in an economically rational manner? It is generally accepted that, qualitatively, the allocation should be proportional to each business segment’s contribution to the enterprise’s total risk.

- Industry practice is converging on an approach known as “Co-Measures” (also sometimes referred to as the “RMK approach” after a paper by Ruhm, Mango and Kreps) because this approach is analytically powerful, transparent and useful to a broad management audience.
### Capturing Profit Measures by Risk Segment

#### Capital Allocation Using Ruhm-Mango-Kreps Algorithm

*Through Year-End 2018 ($ in millions)*

<table>
<thead>
<tr>
<th>Risk Segments</th>
<th>(1) Total Mean Profit/(Loss) (Tax-Adjusted)</th>
<th>(2) Tail Mean Profit/(Loss) (Tax-Adjusted)</th>
<th>(3) = (1) - (2) Allocation Basis (Total Mean - Tail Mean)</th>
<th>(4) Capital Allocation</th>
<th>(5) Allocated Required Capital</th>
<th>(6) = [(1)/(5)+1]^0.2 - 1 Annualized Risk Adjusted ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit from Investments</td>
<td>119</td>
<td>111</td>
<td>8</td>
<td>2.5%</td>
<td>20</td>
<td>48%</td>
</tr>
<tr>
<td>Government</td>
<td>80</td>
<td>(147)</td>
<td>226</td>
<td>72.0%</td>
<td>565</td>
<td>3%</td>
</tr>
<tr>
<td>Large Group</td>
<td>358</td>
<td>325</td>
<td>33</td>
<td>10.4%</td>
<td>82</td>
<td>40%</td>
</tr>
<tr>
<td>Individual/Sm Group</td>
<td>93</td>
<td>46</td>
<td>47</td>
<td>15.1%</td>
<td>118</td>
<td>12%</td>
</tr>
<tr>
<td>Totals</td>
<td>650</td>
<td>335</td>
<td>315</td>
<td>100.0%</td>
<td>785</td>
<td>13%</td>
</tr>
</tbody>
</table>

### Profit Measures Definitions

1. **Total Mean Profit/(Loss)**
   - Invested Assets – average cumulative profit from investments (income & gains) for ALL paths at the end of Year 5
   - Business Segments – average cumulative underwriting profit or operating income for ALL paths at the end of Year 5

2. **Tail Mean Profit/(Loss)**
   - Invested Assets — average cumulative profit from investments (income & gains) for the *paths at the risk tolerance threshold* at the end of Year 5
   - Business Segments — average cumulative underwriting profit or operating income for the *paths at the risk tolerance threshold* at the end of Year 5

3. **Allocation Basis**
   - Total Mean Profit/(Loss) minus Tail Mean Profit/(Loss) measures each segment’s shortfall at the enterprise risk tolerance level

### Illustrative Capital Allocation Example

#### Capital Allocation Using Ruhm-Mango-Kreps Algorithm
Through Year-End 2018 ($ in millions)

<table>
<thead>
<tr>
<th>Risk Segments</th>
<th>(1) Total Mean Profit/(Loss) (Tax-Adjusted)</th>
<th>(2) Tail Mean Profit/(Loss) (Tax-Adjusted)</th>
<th>(3) = (1) - (2) Allocation Basis (Total Mean - Tail Mean)</th>
<th>(4) Capital Allocation</th>
<th>(5) Allocated Required Capital</th>
<th>(6) = [(1)/(5)+1] (^{0.2} - 1) Annualized Risk Adjusted ROE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit from Investments</td>
<td>119</td>
<td>111</td>
<td>8</td>
<td>2.5%</td>
<td>20</td>
<td>48%</td>
</tr>
<tr>
<td>Government</td>
<td>80</td>
<td>(147)</td>
<td>226</td>
<td>72.0%</td>
<td>565</td>
<td>3%</td>
</tr>
<tr>
<td>Large Group</td>
<td>358</td>
<td>325</td>
<td>33</td>
<td>10.4%</td>
<td>82</td>
<td>40%</td>
</tr>
<tr>
<td>Individual/Sm Group</td>
<td>93</td>
<td>46</td>
<td>47</td>
<td>15.1%</td>
<td>118</td>
<td>12%</td>
</tr>
<tr>
<td>Totals</td>
<td>650</td>
<td>335</td>
<td>315</td>
<td>100.0%</td>
<td>785</td>
<td>13%</td>
</tr>
</tbody>
</table>

#### Notes

- **(4) Capital Allocation**
  - Using the “Allocation Basis” column (3), this column calculates the proportion of each risk segment’s needs to the total.

- **(5) Allocated Required Capital**
  - Total “Required Capital” of $785M is allocated to the risk segments based upon the “Capital Allocation” percentages in column (4).

- **(6) Annualized Risk Adjusted ROE**
  - Measures the cost of capital for each of the risk segments.

---

“Required Capital” = the minimum capital level as of the beginning of the simulation (Time=0) that will satisfy the chosen risk tolerance.

ECONOMIC CAPITAL MODELING APPROACH
The Economic Capital Model Is Based on P&L Forecasts

- The main moving parts of the ECM correspond directly to the lines of a P&L
- The best estimate for each line item is tied directly to the financial planning process
- The variability of each item is based on (1) analysis of data, (2) substantial input from business leaders and (3) economic factors
- The result is a model that produces realistic scenarios of possible P&L and balance sheet outcomes
- This will support the key metrics required for ORSA reporting and other risk-based analyses
The Results of ECM Feed Back into the Planning Process

- The range of potential results from the stochastic P&L is used to allocate the firm's capital based on each unit's potential to create losses for the firm.
- The cost of that capital is then deducted from the expected profits of the unit.
- The result is a measure of "risk adjusted profit" or "economic profit".
- This then feeds back into the planning process as a key input to target-setting for prices and profitability.

Ranges of Possible Results

Potential for UW Loss Translates to Capital Need

Risk-Adjusted P&L

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Avg. Prem.</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Prem. Written</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Prem. Earned</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Medical Claims</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Expenses</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Net UW Gain</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
<tr>
<td>Allocated Capital</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Cost of Alloc. Cap.</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
<tr>
<td>Economic Profit</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
<td>XXX,XXX</td>
</tr>
</tbody>
</table>

Profit Targets for Planning Process
Economic Capital Model — Implementation Stages

- Inventory risk factors
  - Prioritize by impact
  - Identify basis for risk assumptions (actuarial data, risk assessments, etc.)
  - Determine suitable approach for each risk
- Develop scenarios for each risk factor
  - How bad can it get?
  - One year vs. multi-year impacts
  - Management/market responses
- Run scenarios through P&L and balance sheet
- Aggregate distributions of scenario results to generate capital risk metrics
# Potential Risks & ECM Treatment

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Trend</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality Ratings</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyber Security Risk</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Competitor Behavior</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Regulatory Rate Approvals</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Risk Driver Variability – Government Segment

GOVT: Medical Trend Rate

GOVT: Simulated CMS Star Rating (Internal)

GOVT: Cyber Security Risk Dollar Impacts ($ in 000's)

P&L Results Variability – Government Segment

GOVT Membership

GOVT PremiumRevenue ($000s)

GOVT MedicalClaimsExpense ($000s)

GOVT OperatingMargin ($000s)

One Adverse Path vs Plan Expectation – Government

Cause-and-effect modeling “tells the story”, leading to greater transparency & understanding ...

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected (Plan)</td>
<td>$31,708,046</td>
<td>$41,313,837</td>
<td>$46,943,544</td>
<td>$56,710,310</td>
<td>$65,987,192</td>
<td>$76,644,742</td>
</tr>
<tr>
<td>Total Revenue (Higher / Lower)</td>
<td>(0) $</td>
<td>(0) $</td>
<td>(0) $</td>
<td>- $</td>
<td>0 $</td>
<td>(0) $</td>
</tr>
<tr>
<td>Total Cost of Benefits (Higher / Lower)</td>
<td>(0) $</td>
<td>(11,230,794) $</td>
<td>(29,375,587) $</td>
<td>(107,197,984) $</td>
<td>(96,990,810) $</td>
<td>(88,929,023) $</td>
</tr>
<tr>
<td>Net Admin Expense (Higher / Lower)</td>
<td>$ - $</td>
<td>- $</td>
<td>- $</td>
<td>- $</td>
<td>- $</td>
<td>- $</td>
</tr>
<tr>
<td>Actual (Path = 951)</td>
<td>$31,708,046</td>
<td>$30,083,042</td>
<td>$17,567,956</td>
<td>(50,487,673) $</td>
<td>(31,003,619) $</td>
<td>(89,975,109) $</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected (Plan)</td>
<td>$1,104,868,979</td>
<td>$1,204,289,981</td>
<td>$1,261,176,105</td>
<td>$1,354,775,921</td>
<td>$1,441,210,812</td>
<td>$1,539,520,398</td>
</tr>
<tr>
<td>IT Operational Risk Impact</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
</tr>
<tr>
<td>Cyber Security Risk</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$37,496,749 $</td>
</tr>
<tr>
<td>Membership Impact</td>
<td>$- $</td>
<td>$- $</td>
<td>$0 $</td>
<td>$0 $</td>
<td>$(13,196,996) $</td>
<td>$(35,610,359) $</td>
</tr>
<tr>
<td>Actual (Path = 951)</td>
<td>$1,104,868,979</td>
<td>$1,215,520,775</td>
<td>$1,290,551,691</td>
<td>$1,461,973,905</td>
<td>$1,538,201,622</td>
<td>$1,628,449,421</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected (Plan)</td>
<td>$1,210,883,595</td>
<td>$1,320,802,066</td>
<td>$1,383,693,888</td>
<td>$1,487,438,343</td>
<td>$1,583,529,875</td>
<td>$1,692,878,672</td>
</tr>
<tr>
<td>Membership Impact (Internal CMS Star)</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
</tr>
<tr>
<td>Membership Impact (Competitor CMS Star)</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
</tr>
<tr>
<td>Prem Rev PMPM Impact (CMS Star)</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
<td>$- $</td>
</tr>
<tr>
<td>Mgt Reactions (Mbrship &amp; Prem Rev PMPM)</td>
<td>$(0) $</td>
<td>$(0) $</td>
<td>$- $</td>
<td>$0 $</td>
<td>$(0) $</td>
<td>$(77,690,829) $</td>
</tr>
<tr>
<td>Actual (Path = 951)</td>
<td>$1,210,883,595</td>
<td>$1,320,802,066</td>
<td>$1,383,693,888</td>
<td>$1,487,438,343</td>
<td>$1,583,529,875</td>
<td>$1,615,187,844</td>
</tr>
</tbody>
</table>

At a very basic level, Operating Margin is much lower than expected due to higher Cost of Benefits and lower Revenue.

Higher Cost of Benefits heavily driven by unfavorable Medical Trend with some impact from Cyber Security Risk.

Management response is to increase prices (limited) & shed membership – lower membership lowers the Cost of Benefits, but also Revenue.

Stochastic ECMs – Pros and Cons

Pros

- Provides probability statements for capital adequacy ➔ Provides basis for allocating the cost of capital, to support better financial performance metrics ➔ Critical to creating greater value for management beyond compliance
- Provides better framework for addressing interactions between risk factors

Cons

- Additional work beyond what is require for a pure scenario testing approach (but the good news is all work done on a scenario testing basis can be leveraged)
- Additional management “education” required
Conning, Inc., Goodwin Capital Advisers, Inc., Conning Investment Products, Inc., a FINRA-registered broker dealer, Conning Asset Management Limited, Conning Asia Pacific Limited and Octagon Credit Investors, LLC are all direct or indirect subsidiaries of Conning Holdings Limited (collectively, “Conning”) which is one of the family of companies owned by Cathay Financial Holding Co., Ltd., a Taiwan-based company. Conning has offices in Boston, Cologne, Hartford, Hong Kong, London, New York, and Tokyo.

Conning, Inc., Conning Investment Products, Inc., Goodwin Capital Advisers, Inc., and Octagon Credit Investors, LLC are registered with the Securities and Exchange Commission (“SEC”) under the Investment Advisers Act of 1940 and have noticed other jurisdictions they are conducting securities advisory business when required by law. In any other jurisdictions where they have not provided notice and are not exempt or excluded from those laws, they cannot transact business as an investment adviser and may not be able to respond to individual inquiries if the response could potentially lead to a transaction in securities.

Conning, Inc. is also registered with the National Futures Association. Conning Investment Products, Inc. is also registered with the Ontario Securities Commission. Conning Asset Management Limited is Authorised and regulated by the United Kingdom’s Financial Conduct Authority (FCA#189316), and Conning Asia Pacific Limited is regulated by Hong Kong’s Securities and Futures Commission for Types 1, 4 and 9 regulated activities. Conning primarily provides asset management services for third-party assets. Conning predominantly invests client portfolios in fixed income strategies in accordance with guidelines supplied by its institutional clients.

All investment performance information included within this material is historical. Past performance is not indicative of future results. Any tax related information contained within this presentation is for informational purposes only and should not be considered tax advice. You should consult a tax professional with any questions.

For complete details regarding Conning and its services, you should refer to our Form ADV Part 2, which may be obtained by calling us.

Legal Disclaimer

©2018 Conning, Inc. This document and the software described within are copyrighted with all rights reserved. No part of this document may be distributed, reproduced, transcribed, transmitted, stored in an electronic retrieval system, or translated into any language in any form by any means without the prior written permission of Conning. Conning does not make any warranties, express or implied, in this document. In no event shall Conning be liable for damages of any kind arising out of the use of this document or the information contained within it. This document is not intended to be complete, and we do not guarantee its accuracy. Any opinion expressed herein is subject to change at any time without notice.

This document contains information that is confidential or proprietary to Conning (or their direct and indirect subsidiaries). By accepting this document you agree that: (1) if there is any pre-existing contract containing disclosure and use restrictions between your company and Conning, you and your company will use this information in reliance on and subject to the terms of any such pre-existing contract; or (2) if there is no contractual relationship between you and your company and Conning, you and your company agree to protect this information and not to reproduce, disclose or use the information in any way, except as may be required by law.

ADVISE®, FIRM®, and GEMS® are registered trademarks of Conning, Inc. Copyright 1990-2018 Conning, Inc. All rights reserved. ADVISE®, FIRM®, and GEMS® are proprietary software published and owned by Conning, Inc.

This material is for informational purposes only and should not be interpreted as an offer to sell, or a solicitation or recommendation of an offer to buy any security, product or service, or retain Conning for investment advisory services. This information is not intended to be nor should it be used as investment advice.
Operationalizing the ERM Framework in a Health Company
Agenda

I. Enterprise Risk Management Framework
II. Risk Oversight & Aligned Assurance
III. Enterprise Risk List Formulation
IV. Risk Appetite Metric Development
V. Risk Dashboard Components
VI. Aetna’s Current Risk Metric Compilation
VII. Streamlining Risk Assessment & Risk Monitoring
VIII. Own Risk Solvency Assessment (ORSA)
Enterprise Risk Management Framework

Board & Risk Committee Engages & Monitors ERM

Decision Influencing

Stress Scenarios: Quantification, Evaluation & Testing

Solvency/Capital Assessment & Management

Risk Monitoring & Controls

Identify & Assess Risks

Internal Audit Risk Sharing

Risk Champion Discussions on Risk Identification

Setting Tolerance Limits

Enterprise Strategy

Risk Appetite Analysis

ERM Process with Risk Committee(s) Oversight

Testing Tolerance Limits

Board & Risk Committee Engages & Monitors ERM

Decision Influencing

Stress Scenarios: Quantification, Evaluation & Testing

Solvency/Capital Assessment & Management

Risk Monitoring & Controls

Identify & Assess Risks

Internal Audit Risk Sharing

Risk Champion Discussions on Risk Identification

Setting Tolerance Limits
Risk Oversight & Governance

Risk Committees Structure

- Audit Committee
- Senior Executive Risk Committee
- Operating Risk Committee
- Risk Champions
- Business Operations (First Line of Defense)

Aligned Assurance with:
- Enterprise Strategy
- Internal Audit
- Regulatory Compliance

Fosters a risk culture both on a top down and bottom up approach in efforts to fully embed the ERM framework in the operations.
Enterprise Risk List Formulation

ERM Risk Dashboards

Enterprise Strategy Alignment

SERC and ORC Input

Operational Forces

Risk analysis for emerging trends

Internal Audit, Data Analytics Alignment

Research & External Sources

Enterprise Risk List
Risk Appetite Metric Development

- Research: CEB, and other consultants
- Existing Risk Appetite Metrics
- Risk Champion Input
- Current & past reports (e.g. MENTOR, PMR, Enterprise Tracker)
- Risk Dashboards Process
- Data Feed
Risk Dashboard Components

The dashboard for each enterprise risk highlights its business risks, controls, metrics, as well as other factors impacting its risk management.

### 2018 Enterprise Risk Management Dashboard

**Enterprise Risk**
- Risk Definition

**Risk Champion**
- Name
- Title

**Alignment of Business Risks to Heat Map**

<table>
<thead>
<tr>
<th>No.</th>
<th>Risk Explanation</th>
<th>Individual Risk Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Future Risk State, Limitations, Opportunities, Risk Interconnectivity**

- **Future Risk State**
  - On the Heat Map, a risk projection is requested (where do you project your Enterprise risk to be in 12 months).

- **Limitations (In Risk Mitigation)**
  - What is preventing 100% effectiveness in risk mitigation?

- **Inter-Connected Enterprise Risks**
  - What are some potential opportunities when risks are successfully mitigated?
Aetna’s Current Risk Metric Compilation

Current Risk Metric Breakdown

Key Risk Metrics

Risk Categories
- Consumer Focused Risks
- Cyber Risks
- Financial Risks
- Operational Risks
- Regulatory Risks
- Strategic Risks
- Talent Risks

Impactful Enterprise Risks

Risk Metrics

50 Key Risk Metrics

20

150 Risk Metrics
Streamlining Risk Assessment and Risk Monitoring

Harnessing the capabilities of a risk management platform to enhance ERM processes

AUTOMATE THE PROCESS

Each component of the risk dashboard will live in the platform and automatically be sent to dashboard delegates for update.

SIMPLIFY INPUT

Input questionnaires will allow metric owners and dashboard delegates to quickly input all info in one place.

PROVIDE INSIGHTS

Risk metric information will provide meaningful insights with reporting tools.

Tone in social media:
Annual average negative sentiment as a % of overall sentiment
Own Risk Solvency Assessment

The ORSA is a document which:
- Is required by State insurance regulators
- Explains the company’s risk management framework and capital management policies
- Affirms solvency under extreme duress
- Assists in evaluating risk appetite parameters for strategic endeavors

Our ORSA has been used as a component for evaluating the standard for ORSA filing within the health industry.

ORSA Report Sections

Executive Summary

I. Qualitative Sections:
- a) Culture & Governance
- b) Risk Identification & Prioritization
- c) Risk Appetite, Tolerances and Limits
- d) Risk Management & Controls
- e) Risk Reporting

II. Quantitative Measurements:
- 1. Economic Capital
  - a) Simulation
  - b) Stress Scenarios
- 2. Prospective Risk Solvency Assessment

Inter-relationships of Stress Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress Scenario Examples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Pandemic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Economic Recession &amp; Financial Market Disruption</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Questions?

Thank you!