THE Art OF RISK

Back of a Napkin
Actuarial Estimates

Presented by:
Mujtaba Datoo, ACAS, MAAA, FCA | Actuarial Practice Leader

parma
public agency risk management association
46th Conference & Expo

AON
Empower Results®

You are a Pool Board Director

You have 15 to 30 minutes to review and approve your actuarial report at the board meeting.

What do you look for?

Are the results reasonable?

Discussion points

- Set the framework for key estimates
- Extract the key estimates
  - Actuarial report
  - Financial statement
- Apply the back of a napkin estimates approach

Tips

- Know and understand the key estimates needed for due diligence
- Round values to easy, whole numbers
  - e.g. round $19,375,419 to $20M.
- Don’t sweat the details

Focus on key estimates

1. Outstanding losses
   - Unpaid losses from prior years to be paid out in the future
2. Future (next year's) contributions
   - Projected losses
   - Expenses
3. Net position (surplus)
   - Solvency measure
4. Variability

How the estimates fit in a financial statement

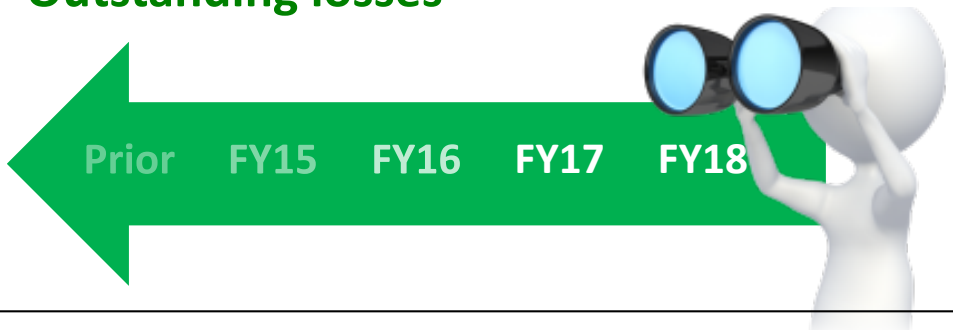
- Outstanding losses – *Statement of Net Position* (balance sheet)
- Contributions – *Statement of Revenues* (income statement)
- Payouts – *Statement of Cash Flows*
- Net position (aka surplus)
  - Surplus = assets *minus* liabilities - Balance sheet
  - Change in surplus - Income statement

Focus on key estimates

1. Outstanding losses
   - Unpaid losses from prior years to be paid out in the future
2. Future (next year's) contributions
   - Projected losses
   - Expenses
3. Net position (surplus)
   - Solvency measure
4. Variability

Two time perspectives

Outstanding losses



June 30, 2018

Projected contributions

Outstanding losses

- Unpaid amount as of
  - Fiscal year-end June 30, 2018
  - Accounting date, e.g. quarter end March 31, 2019
- Comprised of:
  - Case reserves – estimated by claim adjuster or staff
  - IBNR – estimated by actuary
- Where do you find it?
  - Balance sheet
  - Actuarial report

Case reserves

- Case reserves are known
  - Set claim-by-claim
  - Provided by staff or TPA at regular intervals: monthly or quarterly
  - Boards generally approve/discuss large claims

- How much IBNR to add to case reserves to obtain total outstanding losses?

IBNR definition

- IBNYR: Claim not yet reported
  - About 5% to 10% of IBNR
- IBNER: Not enough reserved
  - Additional amount above case reserves to estimate ultimate settlement/payout
  - About 90% to 95% of IBNR
- Generally estimated in aggregate

Two approaches to estimate outstanding losses

1. Start with prior year's estimate
2. Use current year's case reserves to estimate IBNRs

1st Approach

Start with prior year's estimate

Two environments

1. Stable, steady-state
2. Large changes:
   - Large exposure changes
     - e.g. added fleet of cars or new buildings
     - +/- membership
   - Large or catastrophic claims emergence

Estimate outstanding losses in a stable environment

- Preliminary estimate:
  - Start with prior year's o/s losses, e.g. $20M
  - Reflect growth (exposure and loss rate), e.g. 2%
  - Current year's o/s loss estimate = $20M + (2% x $20M) = $20.4M
- This works in steady state or stable environment
- What is a stable environment?
  - Additional losses incurred in new year = approximately annual loss payments

Estimate outstanding losses with large exposure changes

- Additional o/s losses =

  (exposure increase) x (loss rate) x (unpaid factor)
- Unpaid factor varies by coverage:
  - WC – 50%
  - Liability – 25%
  - Property – 20%
- Example:
  - New member with $100M payroll; WC loss rate = $1.50 per $100 payroll
  - Additional o/s losses = ($100M) x ($1.50/100) x (50%) = $750,000
  - Current year's o/s loss estimate = $20M + $0.75M = $20.75M

Estimate outstanding losses with large claims emergence

- Start with prior year's o/s losses, e.g. $20M
- Add case reserves on large claims
- Add IBNR (10% to 20% of case reserves)
- Example:
  - Two large claims reserved at $1M and $3M
  - Increase due to large claims = ($1M + $3M) x 20% = $4.8M
  - Current year's o/s loss estimate = $20M + $4.8M = $24.8M

2nd Approach

Estimate IBNR

IBNR ratio

- O/S = case reserves + IBNR
- IBNR = IBNR ratio x case reserves
- Ratio varies by coverage
  - Short tail, e.g. PR and APD – lower ratio
  - Medium tail, e.g. auto liability – mid range ratio
  - Long tail, e.g. WC – higher ratio

IBNR ratio ranges

	0%	10%	25%	50%	75%	100%	125%	150%	200%
WC					75% to 125%				
GL				40% to 100%					
PR		10% to 25%							
AL				50% to 75%					
Excess LI								150% to 200%	
Large claims		10% to 20%							
Limited to SIR	0%								

Estimate outstanding losses using IBNR ratio

- Outstanding losses = case reserves + (IBNR ratio x case reserves)

- Example:
  - WC case reserves = $10M
    Selected IBNR ratio = 125%

    IBNR = 125% x $10M = $12.5 M
    O/S losses = $10M + $12.5 = $22.5M

Payouts

- In a stable, mature program,
  - Fiscal year payout = approximately new year's incurred losses
- Approximate number of years to pay out liabilities = outstanding losses / fiscal year payout
  - Example: $20M/$5M = 4 years
- This metric ranges from 2 to 5 years
  - Varies by coverage: short tail vs long tail
  - If it changes from previous years, then ask why

Investment income and discounting

- If discounting, then outstanding losses decrease by about:

	Discount Rate		
	1%	2%	3%
WC	-4%	-8%	-12%
GL	-1%	-3%	-4%

- Example
  - Undiscounted o/s losses = $20M for GL; 1% discount rate
  - Discounted o/s losses = $20M x (100%-1%= 99%) = $19.8M
  - If discounting, then surplus increases by discount amount = $200,000

Reserve opinion

- Actuaries opine on the reasonability of outstanding losses in totality
- Final selection is management's "best estimate"
- Board accepts the actuarial report and signs off on the financial estimate – their fiduciary responsibility

Focus on key estimates

1. Outstanding losses
   - Unpaid losses from prior years to be paid out in the future
2. Future (next year's) contributions
   - Projected losses
   - Expenses
3. Net position (surplus)
   - Solvency measure
4. Variability

Two time perspectives

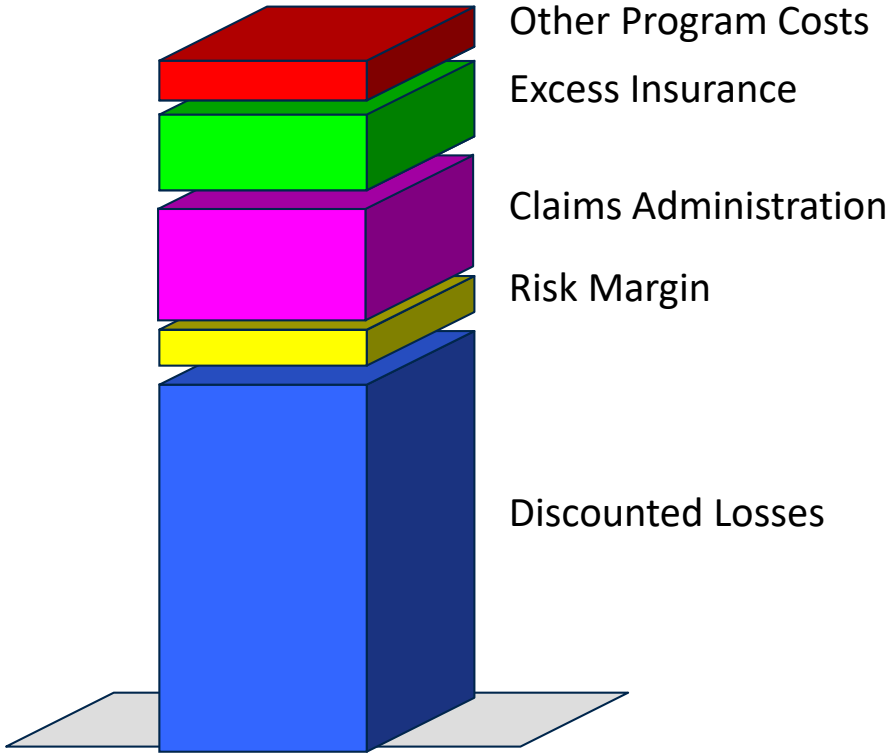
Outstanding losses

June 30, 2018

Projected contributions

Contribution components

- Contributions comprised of:
  - Expected ultimate losses
  - Discounted or full value
  - Investment income anticipated
  - Risk margin
  - Claims administration
  - Excess insurance
  - Other program costs
- Contribution rate:
  - Divide contribution by exposure, (e.g. payroll per $100 for WC)



Project next year's losses

- Start with prior year's loss rate, e.g. $1.50 per $100 payroll
  - Or you can average last few years' rates – *well, then it is not back of the napkin!*
- Trend forward to next year's loss rate
  - Loss cost trend (excess of exposure growth)
  - Ranges from 1% to 3%
- Exposure growth
  - e.g. payroll (2% to 3%); or
  - +/- membership; or
  - +/- TIV

Project next year's losses—Example

- Current year's loss rate = $1.50 per $100 payroll
- Next year's rate $1.50 x 1.02
  - Assume loss rate trend = 2%
- Current year's payroll = $100M
  - Assume payroll trend = 3%
- Next year's losses
  = (Current loss rate x 1.02) x (current exposure x 1.03)
  = ($1.50 per $100 of payroll x 1.02) x ($100M x 1.03)
  = $1.6M

Estimate expenses

- Expenses range from 20% (1/5) to 33% (1/3) of premiums (contributions)
  - Select 25%
  - Assume 75% loss ratio
  - Equivalent to adding 33% (= 25% divided by 75%) of projected losses
- Select high end of range if paying commissions

Estimate contributions—Example

- Estimated losses = $1.6M
- Expenses = 33% of losses
  - 1/3 of $1.6M ≈ $0.5M
- Contributions = losses + expenses
  = $1.6M + $0.5M = $2.1M

Reinsurance costs

- Start with prior year's and add percentage change
- Changes vary from 0% (flat) to 10%
  - Subject to market cycles
- (Re) Insurance market highly capitalized
- Negotiable – review your long-term large claims experience

Estimate reinsurance costs

1. Find average annual excess losses
2. Add provision for:
   a) Development and trend, and
   b) Reinsurer's expenses

Estimate reinsurance costs

- Review large claims above a threshold (near the SIR)
- Find average annual losses above threshold for 10 to 15 years
- Adjustments to average annual losses:
  - Add about 50% to average annual losses to account for development & trend
  - Add about 50% for reinsurer's expense and risk loading
  - Reinsurance cost = average annual losses
    + 50% x average annual losses
    + 50% x average annual losses
    = 2 x average annual losses

Estimate reinsurance costs, Beware!

- This approach provides the low end of the estimate
- Entity's experience may not be credible, hence may be combined with reinsurer's applicable book of business
  - Your entity/pool may not have large claims

Focus on key estimates

1. Outstanding losses
   - Unpaid losses from prior years to be paid out in the future
2. Future (next year's) contributions
   - Projected losses
   - Expenses
3. Net position (surplus)
   - Solvency measure
4. Variability

Net position

- Key solvency metric
- Regulatory minimum
- Pool governance policy
- Shown on balance sheet as of the current accounting date

Surplus metrics

- Use surplus to estimate financial ratios
  - Claim liabilities/surplus
    - e.g. $20M/20M = 1:1
  - Contributions/surplus
    - e.g. $15M/20M = 0.75:1
  - Surplus/SIR
    - e.g. $20M/1M = 20:1
  - Etc., like RBC,
    - e.g. 600%, Authorized Control Level is at 200%
- Review several metrics and changes over time
- AGRiP has developed a database for such ratios

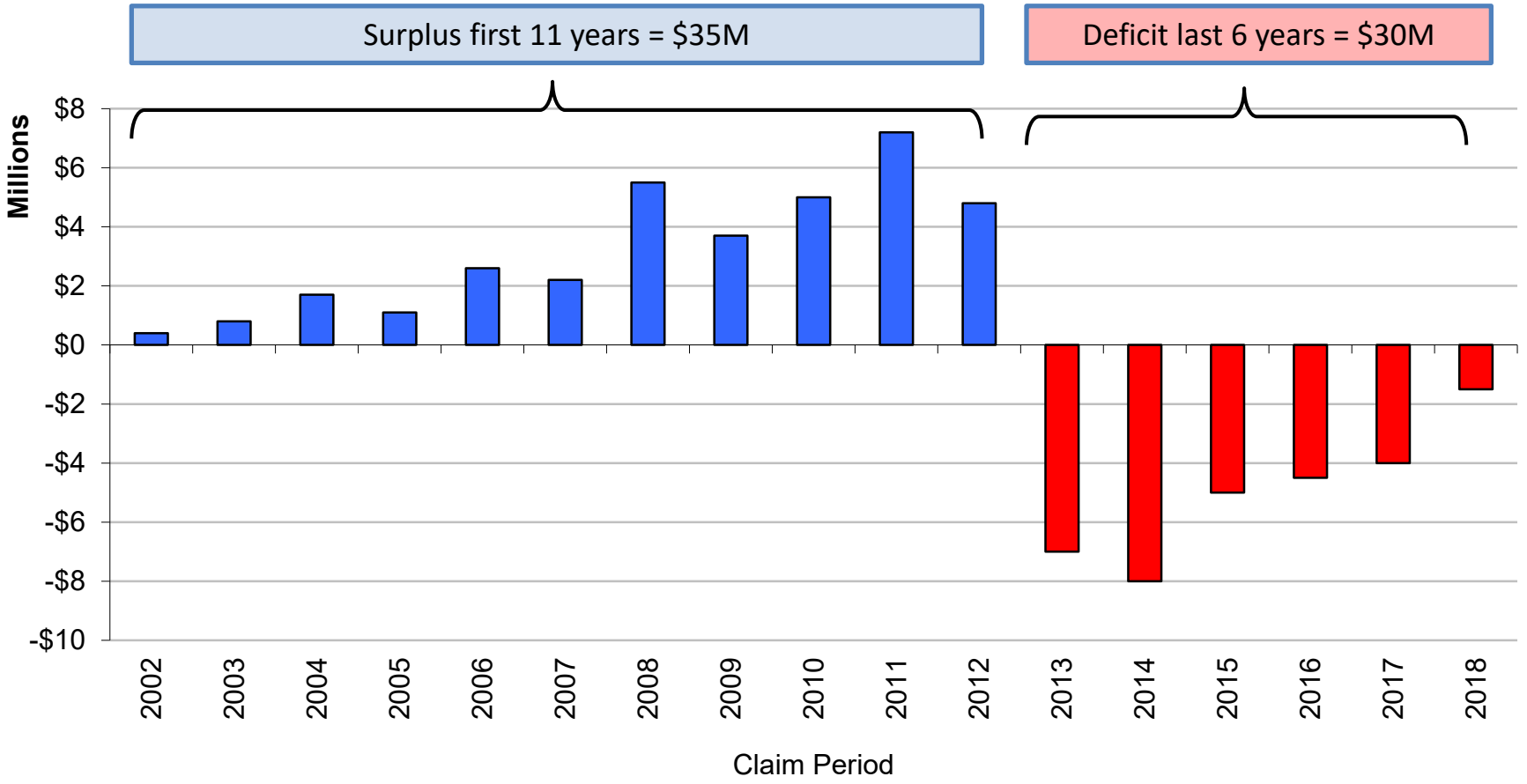
Surplus accumulation

- Surplus built up gradually over time
  - Release surplus gradually, too!
- Sources of accumulation
  - Favorable underwriting results
    - Losses emerged less than expected
  - Investment income
  - Addition to contributions
- Board policy/regulatory guidelines determine how much (minimum) surplus is needed

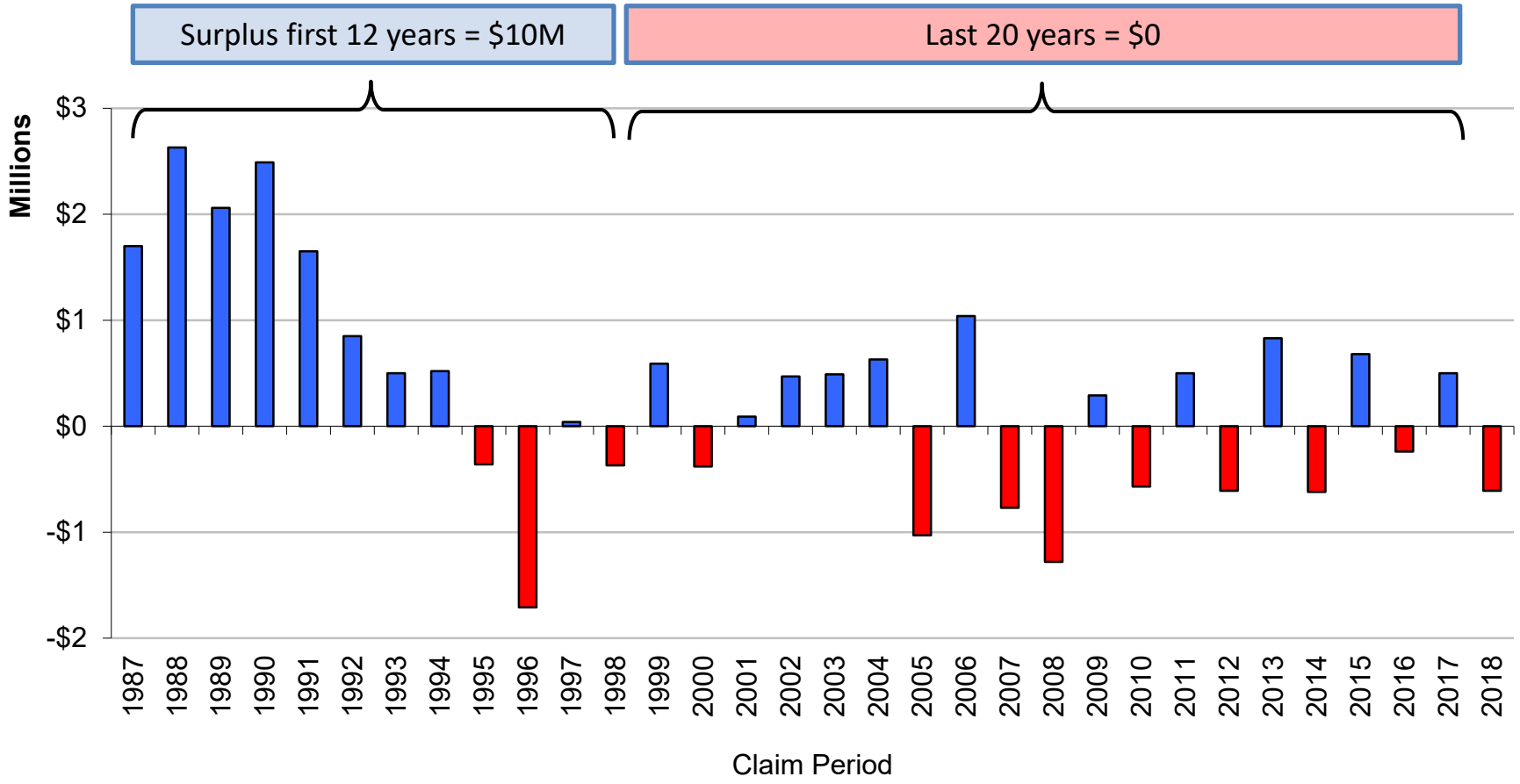
Accumulated surplus decomposition

- Review how surplus accumulated
- Today's surplus position needs to be viewed over a longer time horizon

Surplus at June 30, 2018 = $5M



Surplus at June 30, 2018 = $10M



Focus on key estimates

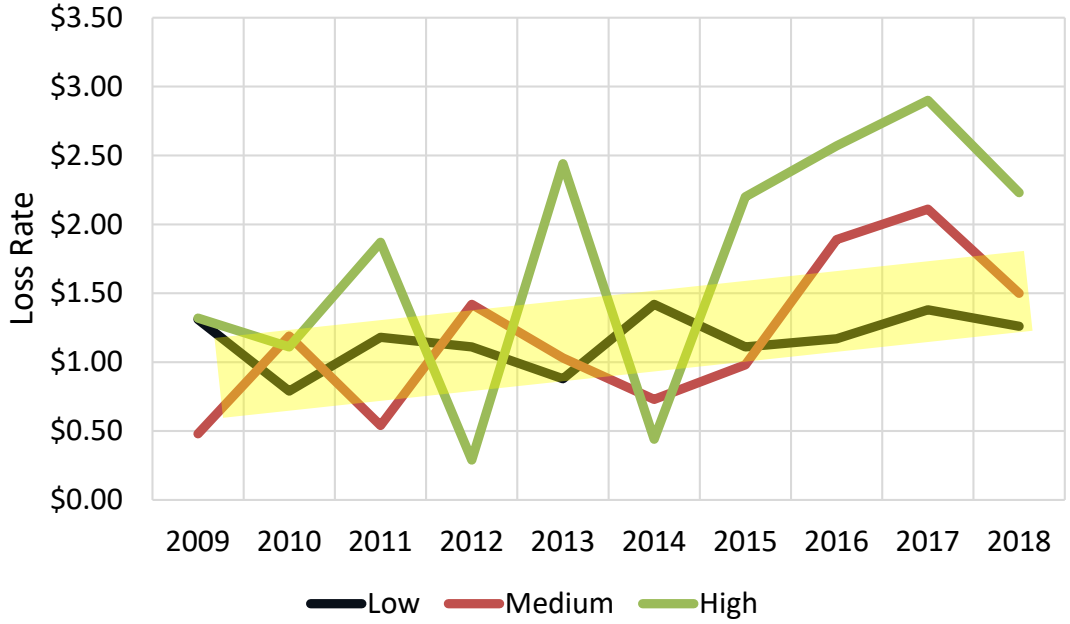
1. Outstanding losses
   - Unpaid losses from prior years to be paid out in the future
2. Future (next year's) contributions
   - Projected losses
   - Expenses
3. Net position (surplus)
   - Solvency measure
4. Variability

Variability

- Referred to as “confidence levels”
- Statistical measure of variability in loss experience
- Various measures:
  - Standard deviation, Coefficient of Variation (CV), Value at Risk (VaR)
  - Simulation of aggregate losses and ensuing percentiles
  - Produces returns in years
    - e.g. I in 10 years (90% confidence level) or 1 in 100 years (99% confidence level), etc.

Variability

- Review 10-year loss rate graph
- If approximately straight line, less variability
- If zig-zagging, more variability



Confidence level factors—Example

- Projected 2019 losses = $10M
- Want 80% confidence level for 2019 funding
- Experience is “medium” variable
- 80% confidence level losses = $10M x 1.25 = $12.5M

Variability	Confidence Level		
	70%	80%	90%
Low	1.05	1.15	1.25
Medium	1.10	1.25	1.45
High	1.15	1.50	1.75

Case study

- This is for illustration.
- To customize your entity's factors, use average of last three years

Case study: Estimate outstanding losses

	As of 12/31/17	Growth Factor	As of 12/31/18
Approach 1 – Steady State			
(A) Outstanding Losses	$30M	5%	$31.5M
Approach 2			
(B) Case Reserves			$20M
(C) IBNR Ratio			40%
(D) IBNR (B x C)			$8M
(E) Outstanding Losses (B + D)			$28M

Case study: Payouts

	Amount
Outstanding Losses as of 12/31/18	$32M
2018 Loss Payments	$10M
Ratio (~ Years to Pay Liabilities)	3 years

Case study: Estimate contributions

	2018	Trend	2019
Losses			
(A) Loss Rate per $100 Payroll	$1.60	3%	$1.65
(B) Payroll	$725M	2%	$740M
(C) Projected Losses (A x B / 100)	$11.6M		$12.2M
Expenses			
(D) Expense Ratio	33%		33%
(E) Projected Expenses (C x D)	$3.9M		$4.1M
Total Contributions (C + E)	$15.5M		$16.2M

Case study: Surplus metrics

	Amount	Ratio to Surplus
Surplus as of 12/31/18	$25M	
O/S Losses as of 12/31/18	32M	1.3
2018 Contributions	25M	1.0
SIR	0.5M	50

Caveat

- Factors in this presentation are based on industry data and professional judgment
- Your entity's results may be different
- This presentation provides an approach for back of the napkin estimates

Mujtaba Datoo, ACAS, MAAA, FCA
Actuarial Practice Leader
Aon Global Risk Consulting
Phone: 949-608-6332 | Fax: 949-608-6475
email: mujtaba.datoo@aon.com

THE *Art* OF RISK

parma
public agency risk management association

46th Conference & Expo

NEW THIS YEAR – Surveys on the App

Find the App, Click on Events, Click on Browse by Day, Click on the Specific Session, Click on Rate Event. See Below for Screen Shots.