

# Decoupling Selected Ultimate from Deterministic Methods

May 10, 2023



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# Timothy J Pratt

Director, Insurance Consulting and Technology at WTW  
Regional P&C Reserving Proposition Leader

Tim has over 35 years of experience working in various insurance industries. He currently specializes in Property and Casualty reserving and his experience ranges over multiple countries.

Tim is passionate about Reserving for unpaid claims, developing and managing small and large reserving processes by starting with solid foundations and augmenting as required. His aim is to understand the claim settlement process, arriving quickly at stable estimates and generating actionable management information.

Tim is a Fellow of the Institute of Actuaries of Australia (FIAA) and a Fellow of the Casualty Actuarial Society (FCAS).



# Quarterly Reserve Meeting Excess & Umbrella

nothing happens ... every quarter  
IBNR reduction of \$2m each quarter

... until ...

something happened

*reported Claim of \$20m*



# Management Information

*How many of us have had this conversation?*

A large claim has just been reported

*How much IBNR is there for this claim?*




# ASOP 43 – Unpaid Claim Estimates

## Actuarial Central Estimate

An estimate that represents an expected value over the range of reasonably possible outcomes.

- The actuarial central estimate represents an expected value over the range of reasonably possible outcomes. Such range of reasonably possible outcomes may not include all conceivable outcomes, as, for example, it would not include conceivable extreme events where the contribution of such events to an expected value is not reliably estimable.

Actuarial	Central	Estimate
It is ours	Implies other types of estimates (range)	it is wrong, it will change



**ACTUARIAL STANDARDS BOARD**

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**Actuarial Standard  
of Practice  
No. 43**

**Property/Casualty Unpaid Claim Estimates**



# Periodic Reserve Reviews

*What is the aim with a Reserve Review?*

- Generate 'good' answers
- Provide insight
  - What is happening
  - What is likely to happen
- Balance Responsiveness and Stability
  - Isolate signal from noise
- How do we do that?
  - Use multiple methods
  - Use multiple measures (paid, reported)



# Testing a Reserving Method

## How to Test Method?

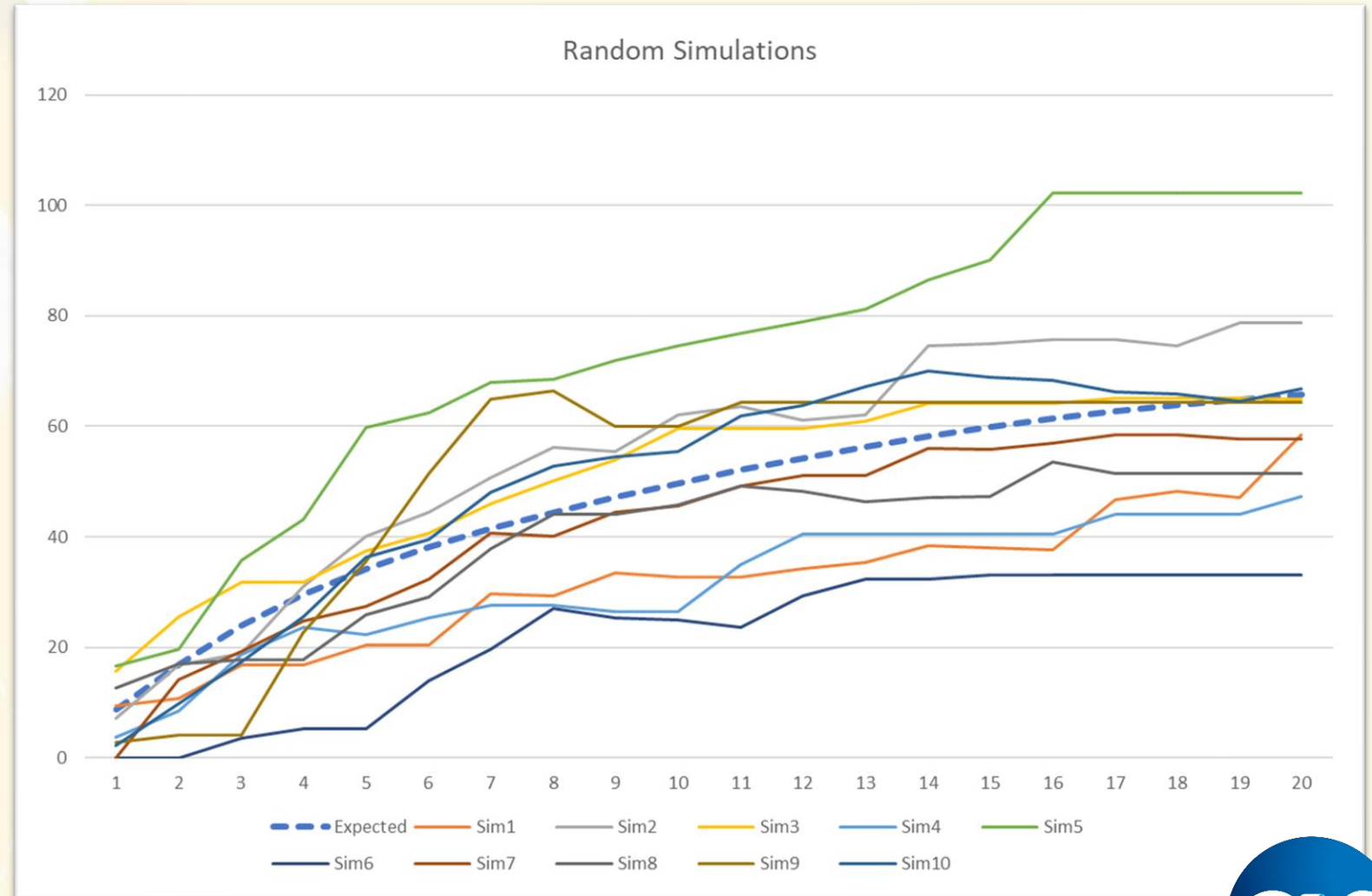
- Simulate claim situations

## Trying for Excess / Umbrella

- Periods of little activity
- Large changes
- Wide range of results

## Expected Pattern

- Average of the 30k simulations at each development period ... divided by the final loss result



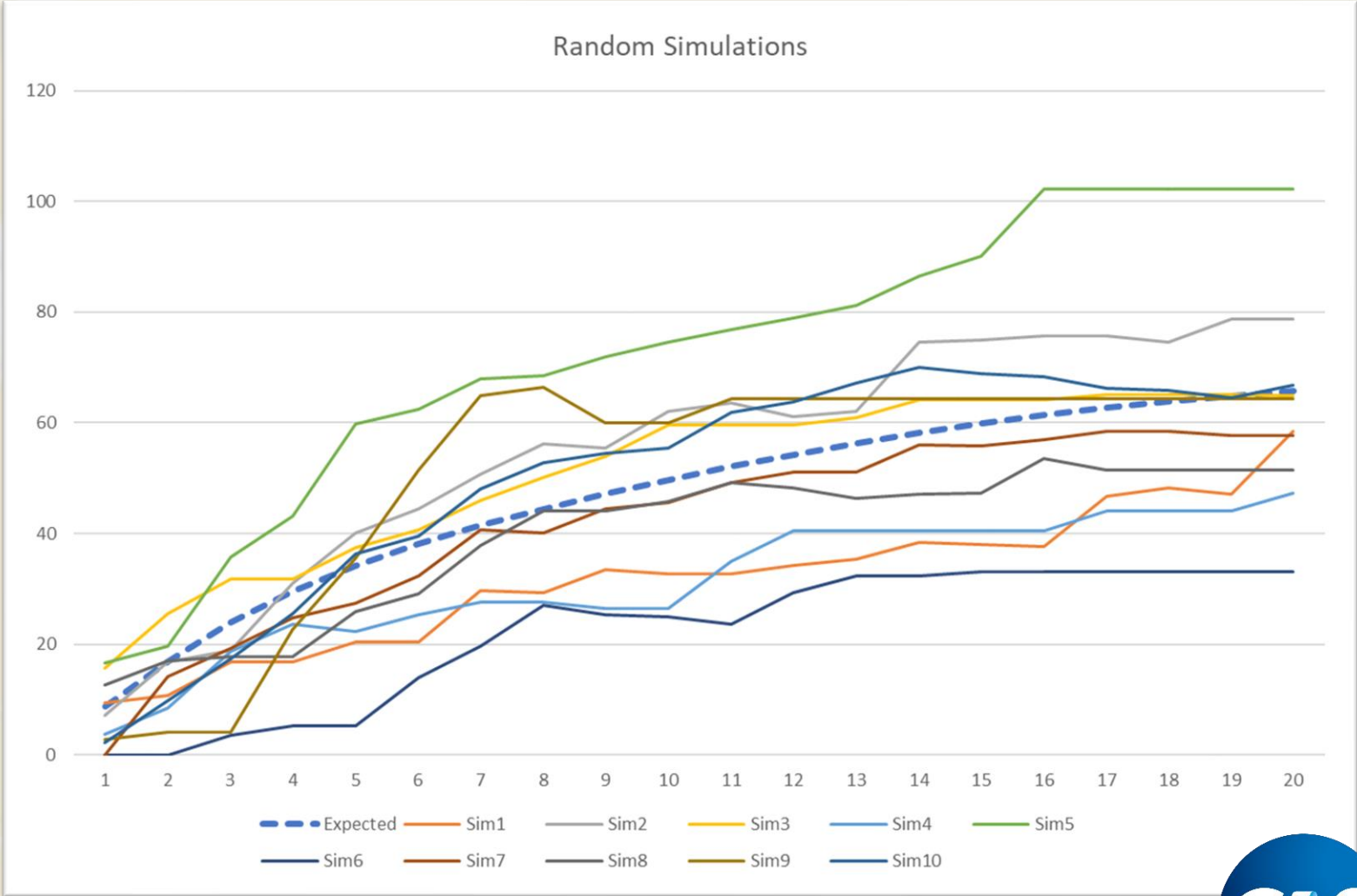


Included for info only, not part of presentation

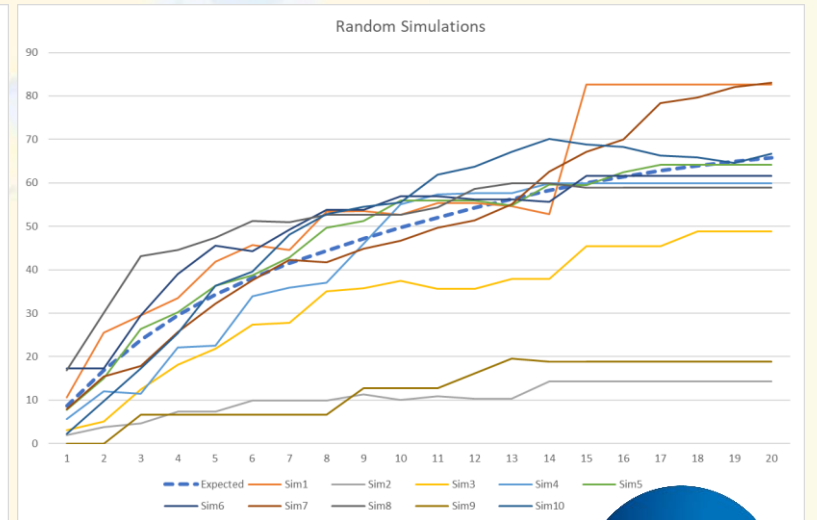
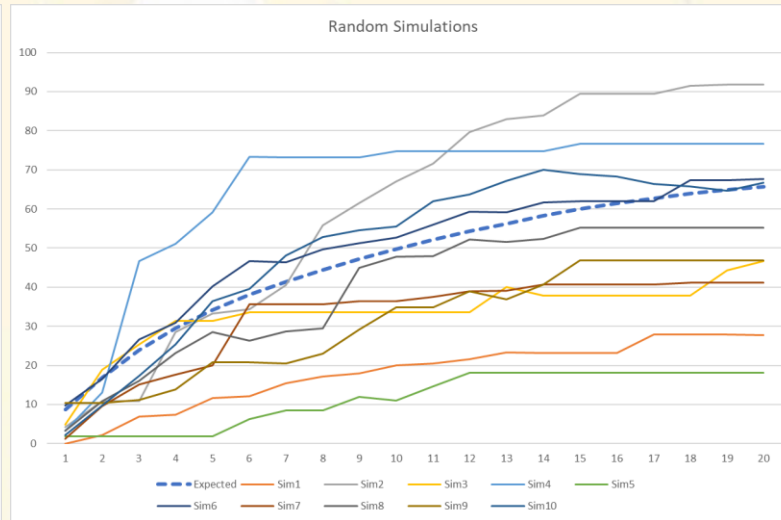
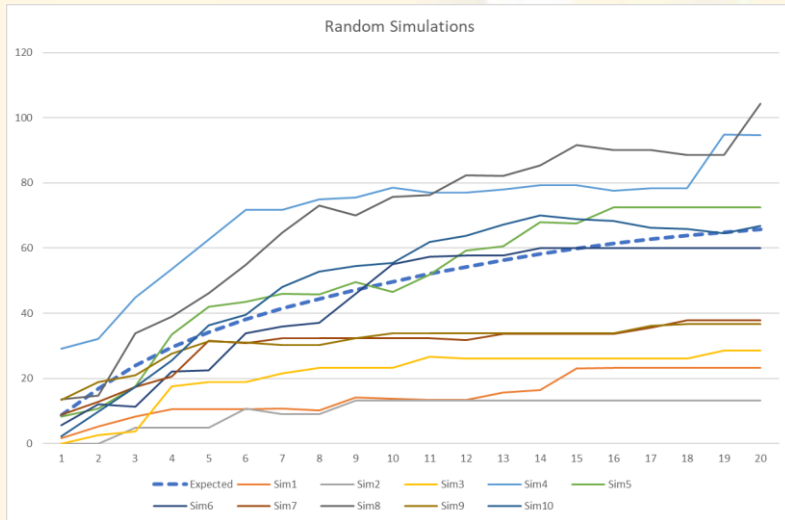
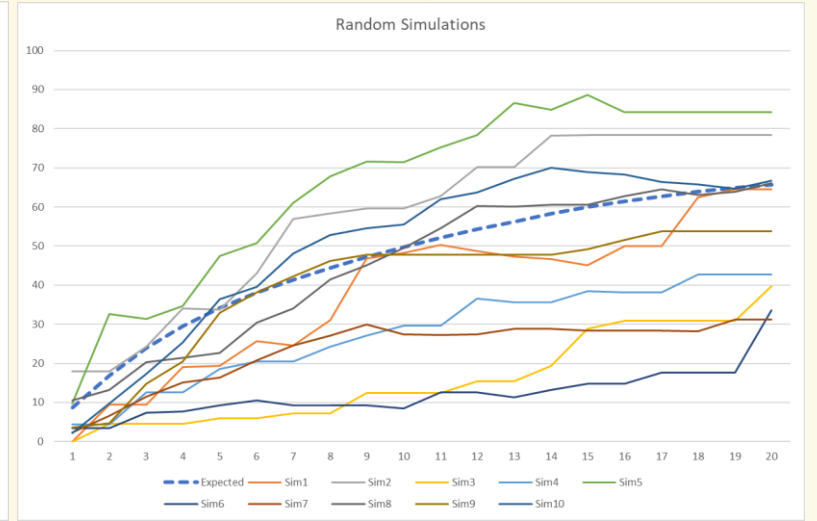
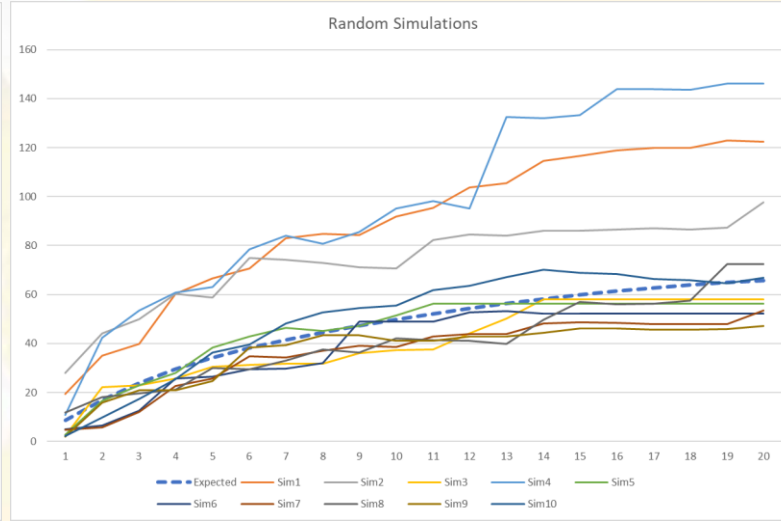
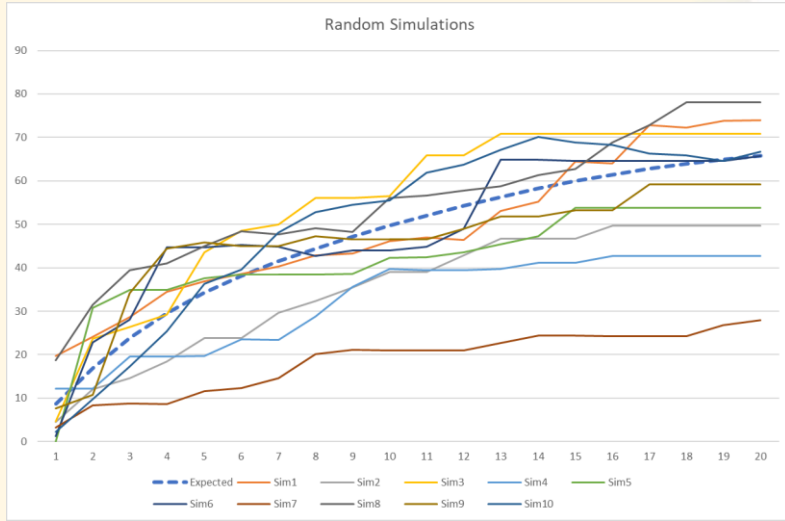
# Simulation Details

## Simulation Approach

- Number of losses (Poisson, mean 6)
- No Report Delay
- Size of Loss (LogNormal [16.25, 0.6])
- Number of estimate movements (Poisson, mean 8)
- Probability of Case Estimate movement 45% per period
- Size of movement is simulated loss divided by number of simulated movements times random value from -50% (ie reduction) to 150% of movement



# Collection of Random Simulations



# Periodic Reserve Reviews

*What is the aim with a Reserve Review?*

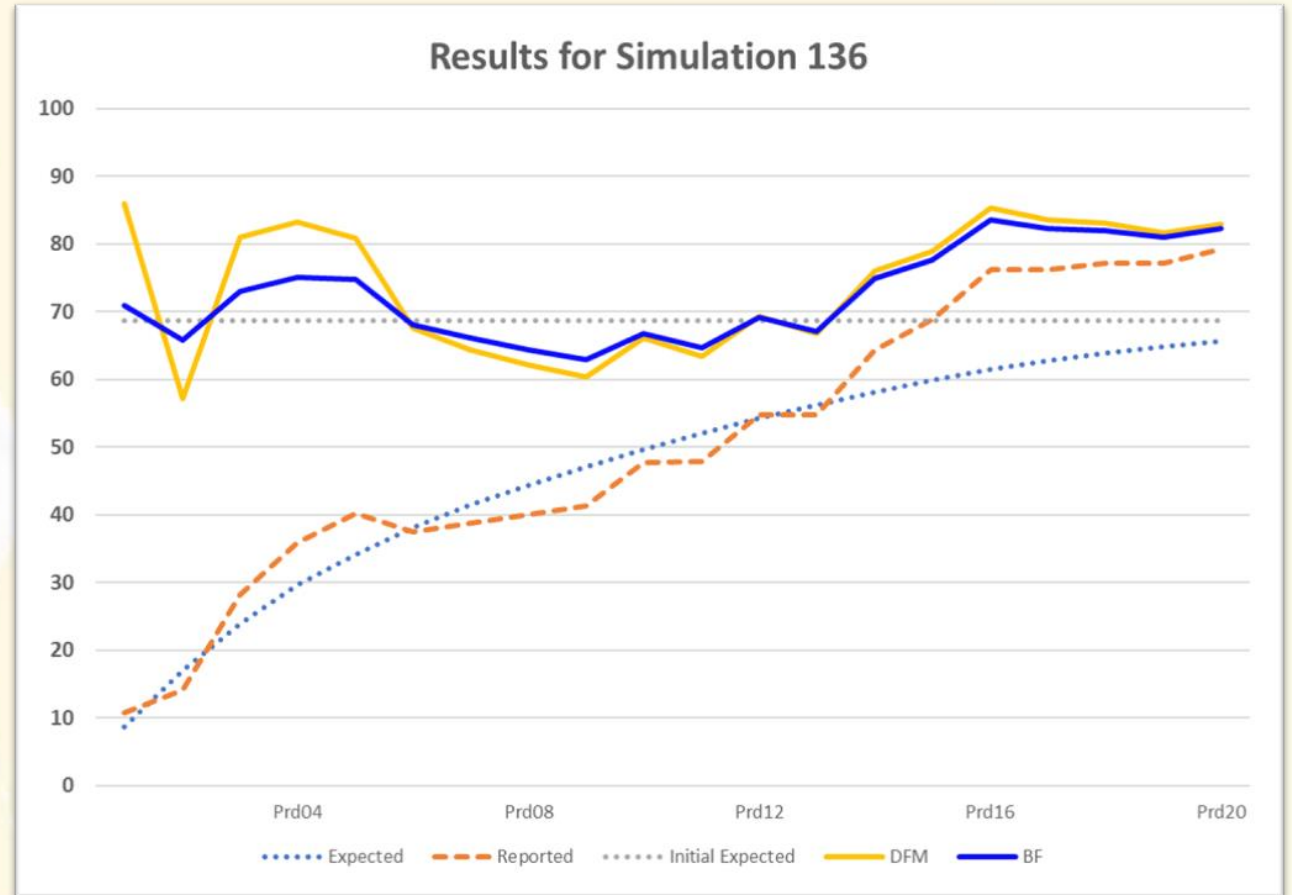
- Generate 'good' answers
- Provide insight
  - What is happening
  - What is likely to happen
- Balance Responsiveness and Stability
  - Isolate signal from noise
- How do we do that?
  - Use multiple methods
  - Use multiple measures (paid, reported)



# Chart Explanation

Balance of talk illustrates various aspects using this chart

Here is an intro what this chart contains



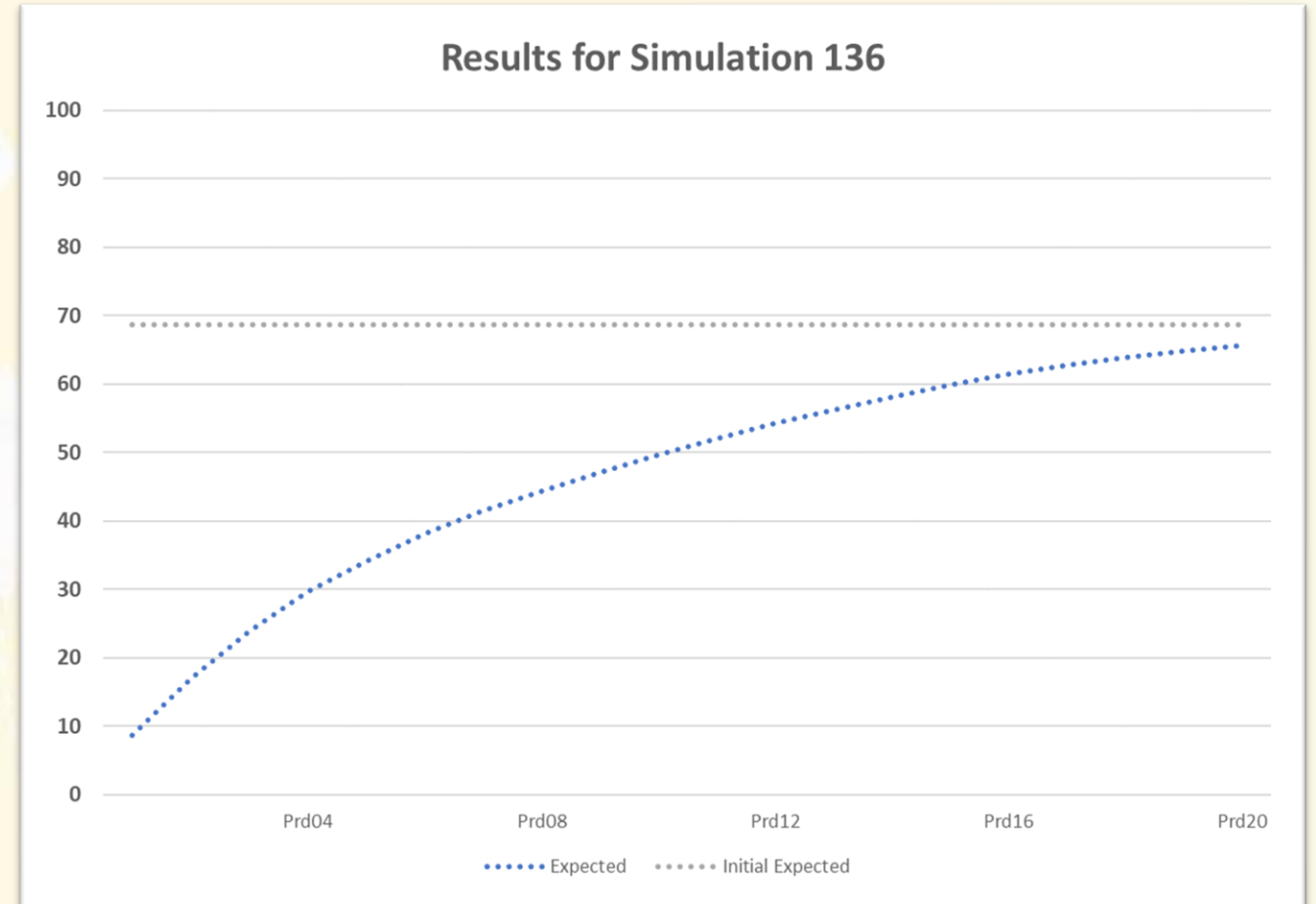
# Chart Explanation

Dotted blue line is reporting pattern

Dotted grey line is initial expected (\$68m)

20 Development Periods

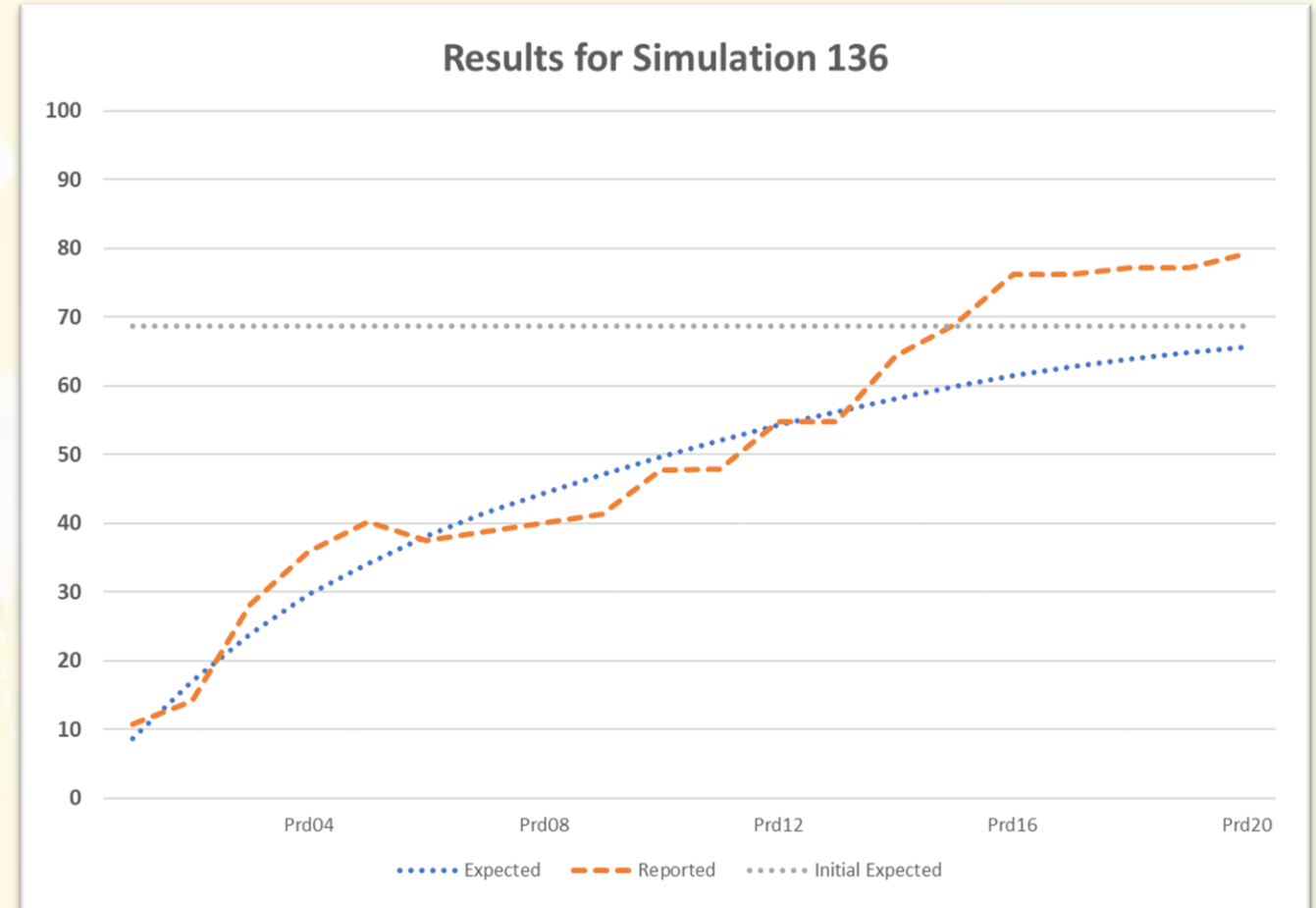
Range is \$0m to \$100m



# Chart Explanation

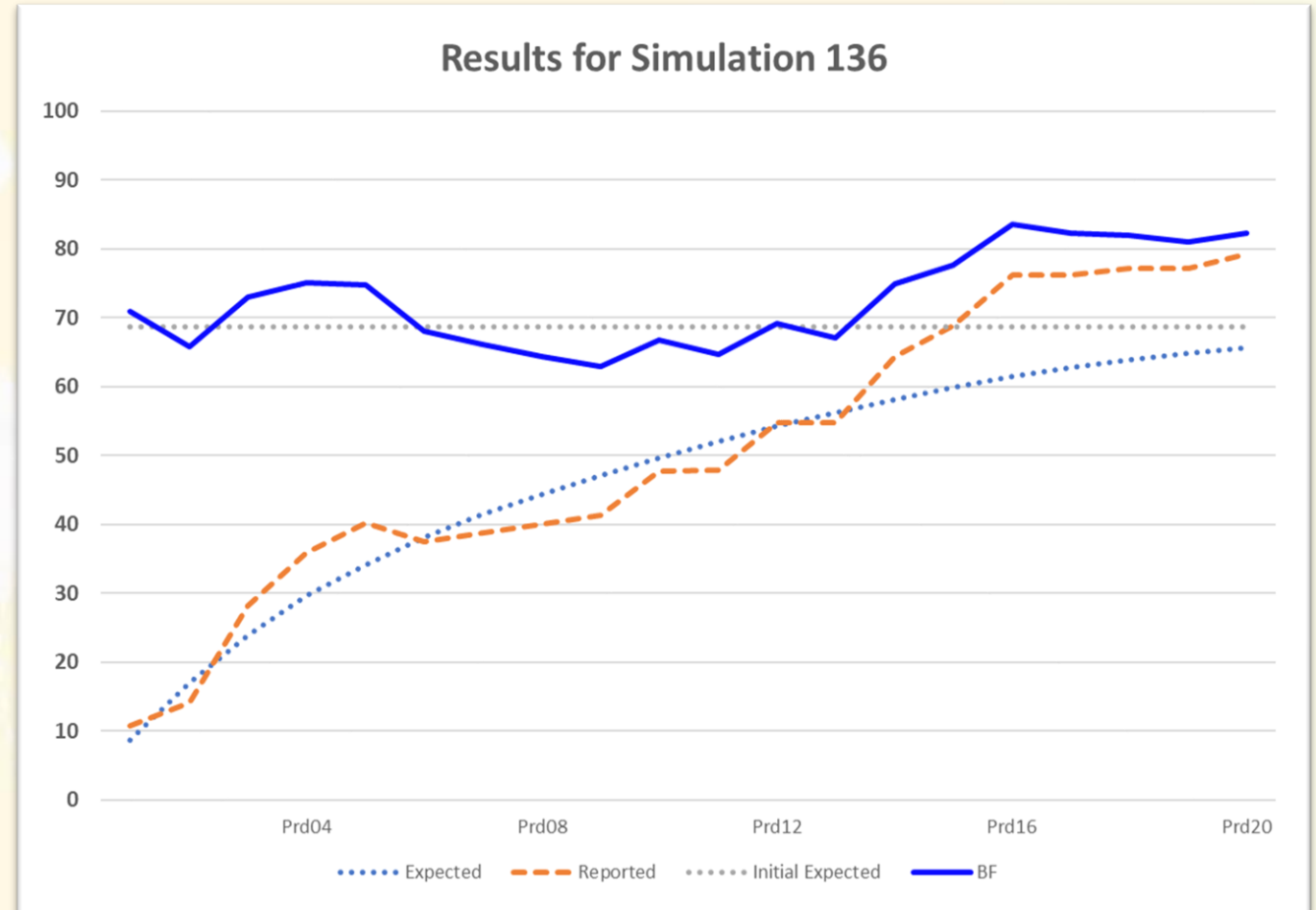
Dashed orange line is reported losses from one simulation

In this case, simulation #136



# Chart Explanation

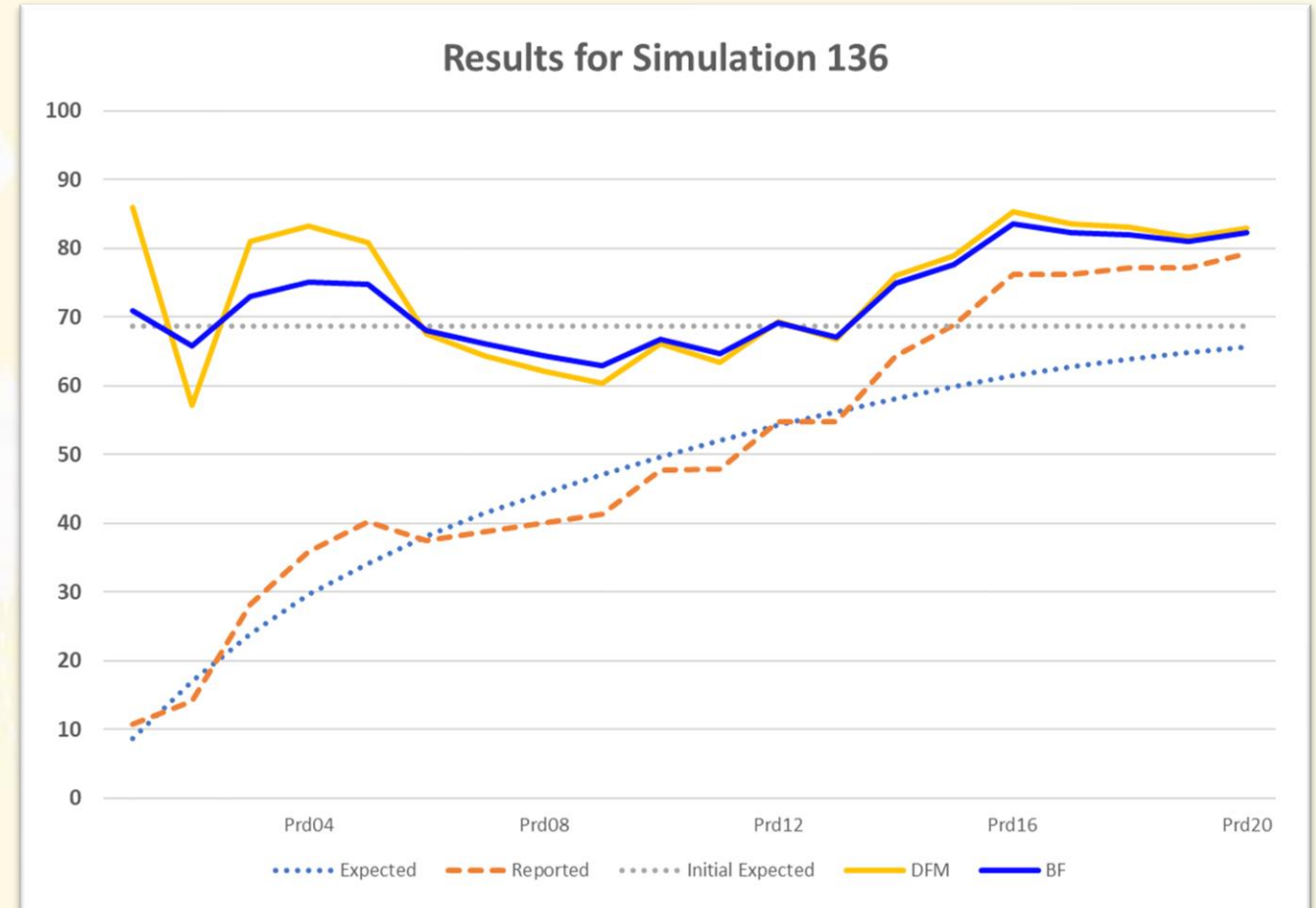
Solid blue line is ultimate at each development period generated by the Bornhuetter Ferguson (BF) method



# Chart Explanation

Solid yellow line is ultimate at each development period generated by the Development Factor Method (DFM)

Or, Chain Ladder (if you prefer)





# Quarterly Reserve Meeting Excess & Umbrella

nothing happens ... every quarter  
IBNR reduction of \$2m each quarter

... until ...

something happened

*reported Claim of \$20m*



# Quarterly Reserve Meeting – Excess & Umbrella

## BF Method

In some ways, a non-responsive method

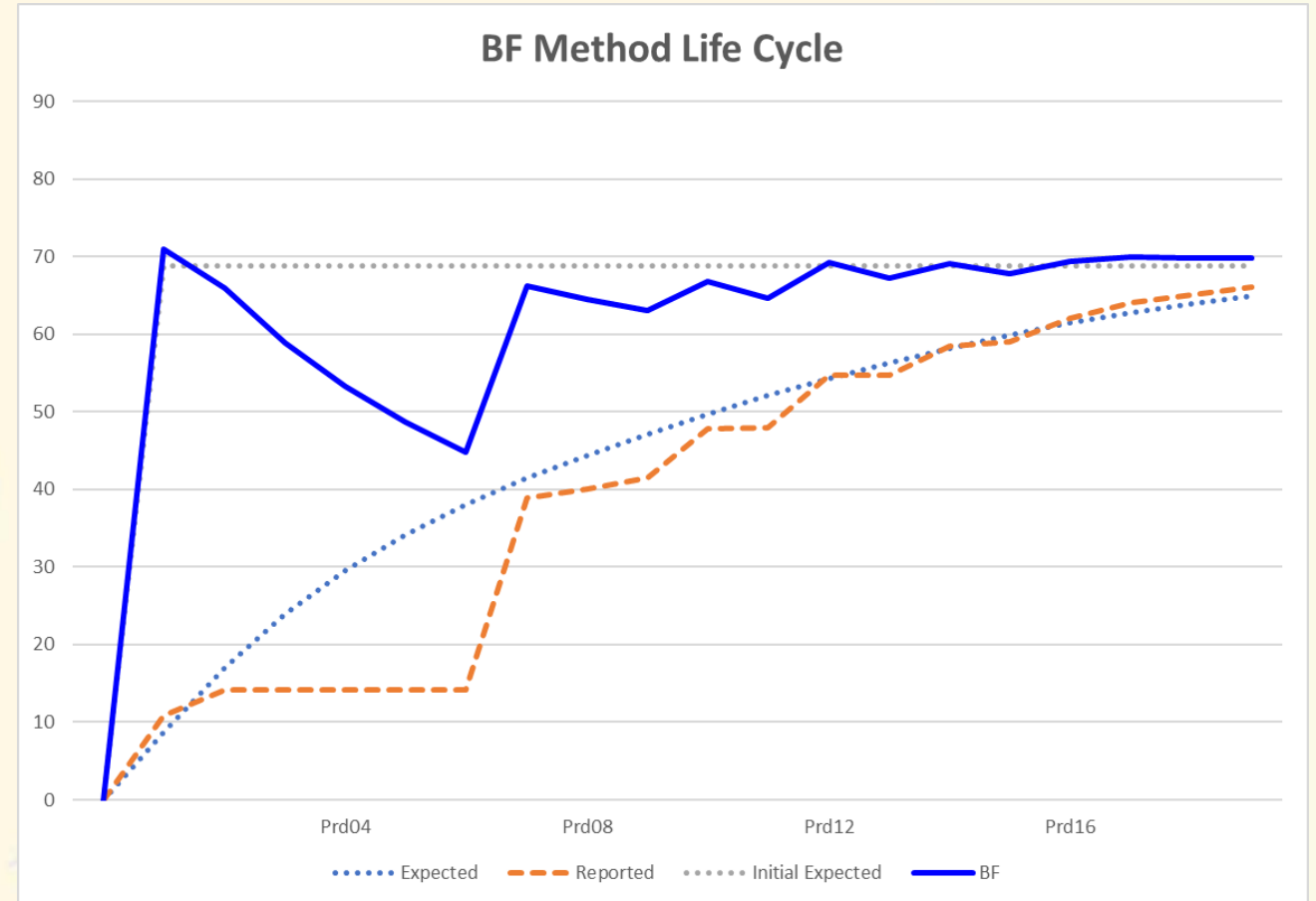
- IBNR at each future period is known

In some ways, a very responsive method

- 100% of the actual (over expected) is reflected in the ultimate

No actual activity → in continuous decline in ultimate

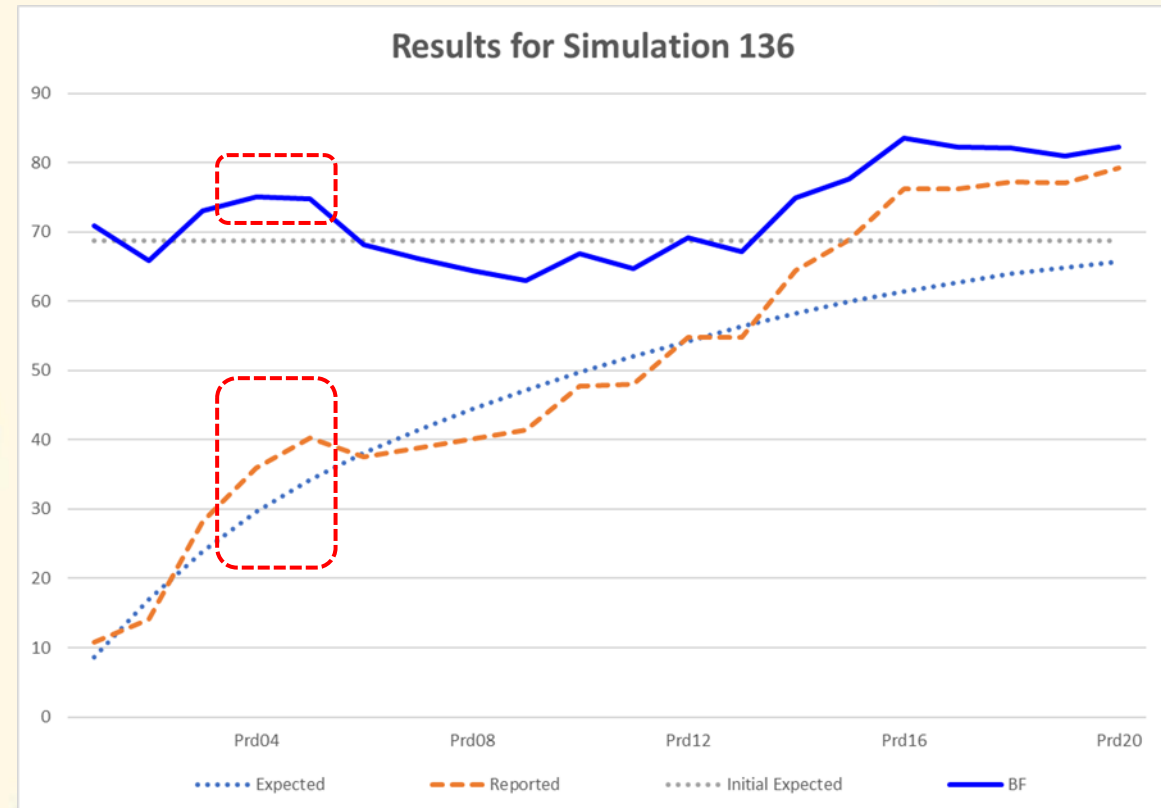
- No ability to smooth
- No ability to pool



# BF Review

## Simulation 136 ... Development Period 4

- The expected reported ... 4.3m
- The actual reported ... 4.6m
- Change in the BF IBNR ... -4.3m (expected)
- Actual v Expected ... -0.3m
- Change in the BF Ultimate ... -0.3m



# BF Scorecard

Responsiveness v Stability

## Simulation 136

### Responsiveness ... Grade A

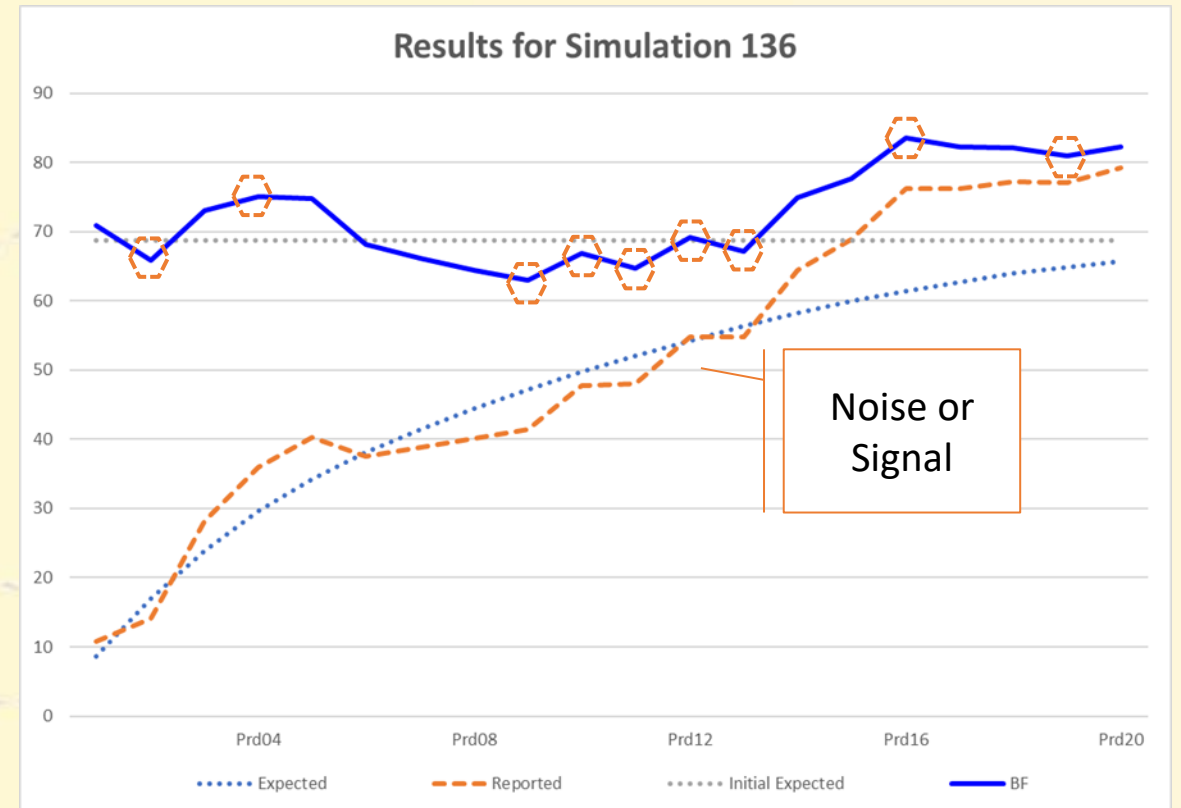
- You can't argue that the BF Method is not responsive
- It does provide information about how a year is doing
- Is it above expected?
- Is it below expected?

### Stable ... Grade D (or worse?)

- The BF changes value each and every development period
- The BF changes direction 9 times

### Can you imagine the meetings in the middle ...

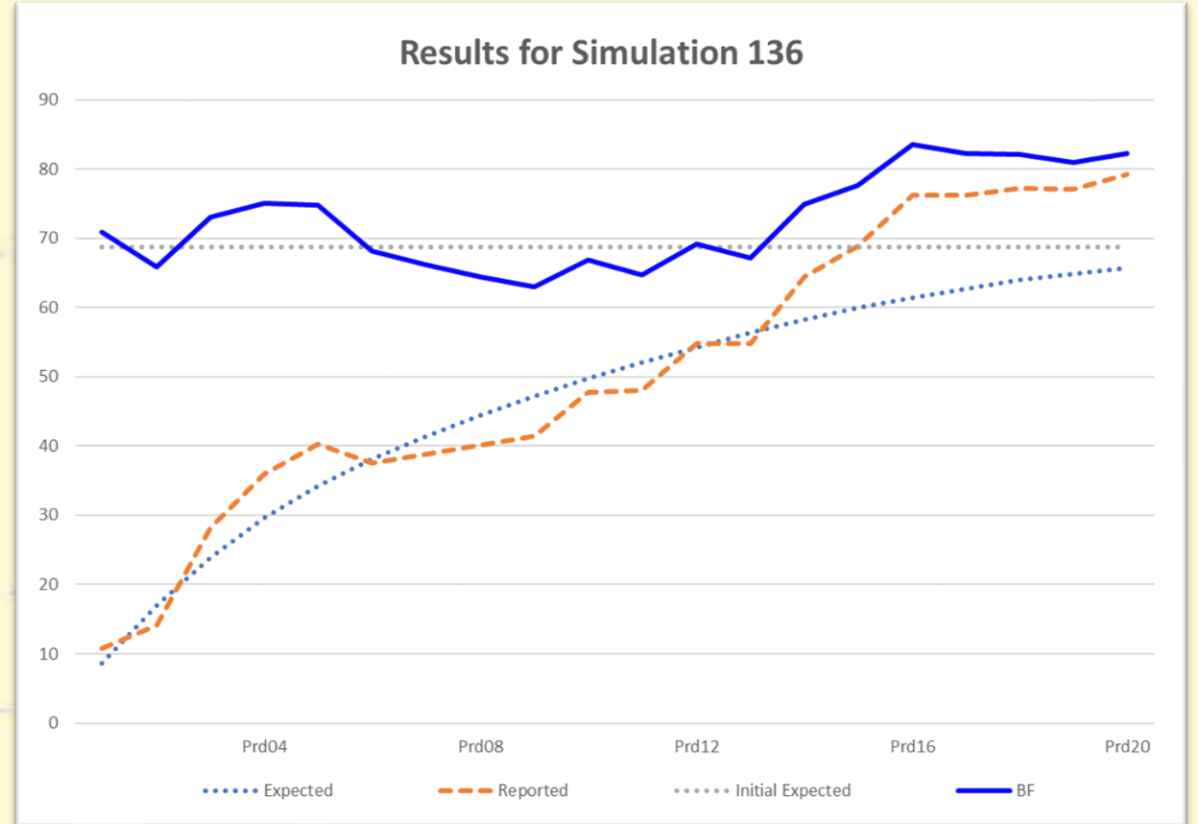
- Results are slight increase
- No, slight decrease
- Belay that, slight increase
- Sigh



# Check Back with our Aim

## Actuarial Central Estimate

- An estimate that represents an expected value over the range of reasonably possible outcomes
  - The actuarial central estimate represents an expected value over the range of reasonably possible outcomes. Such range of reasonably possible outcomes may not include all conceivable outcomes



# Review of Random Simulations

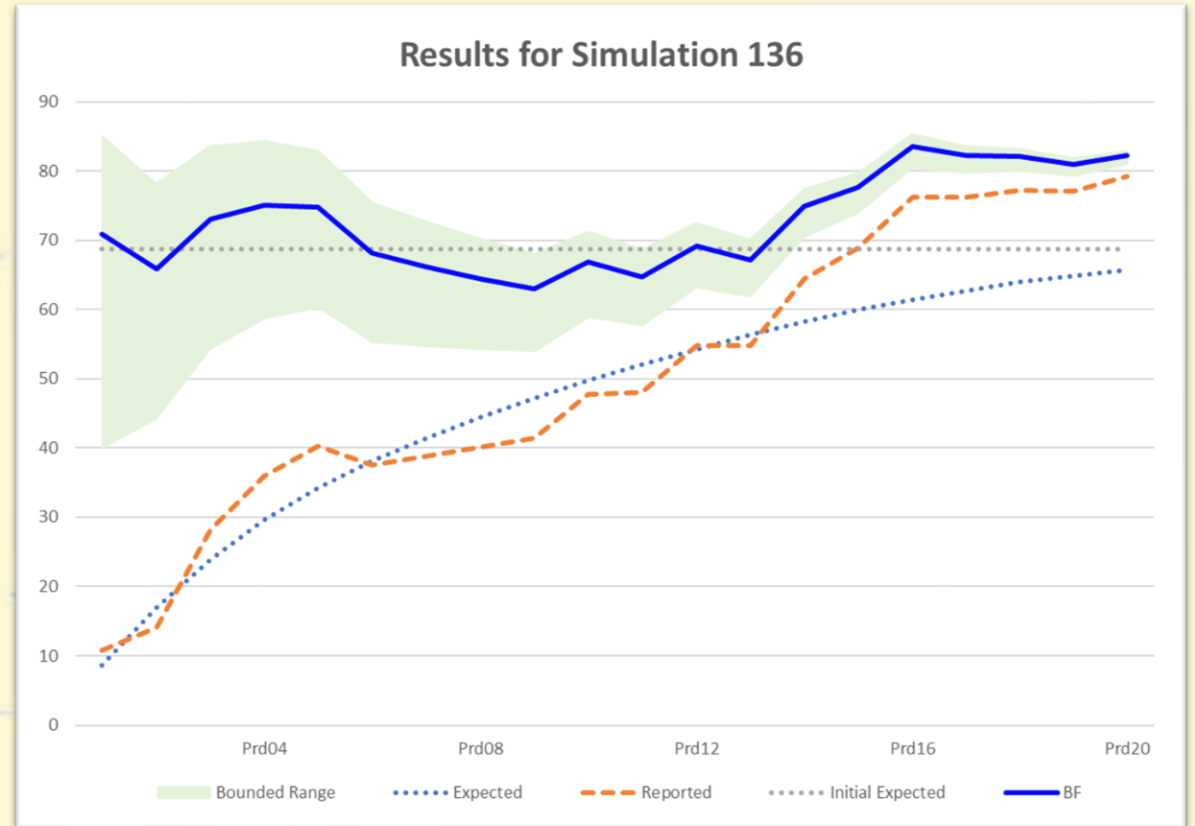
- Best Estimate, high estimate, low estimate

## Actuarial Central Estimate

- An estimate that represents an expected value over the range of reasonably possible outcomes
  - The actuarial central estimate represents an **expected value over the range of reasonably possible outcomes**. Such range of reasonably possible outcomes may not include all conceivable outcomes

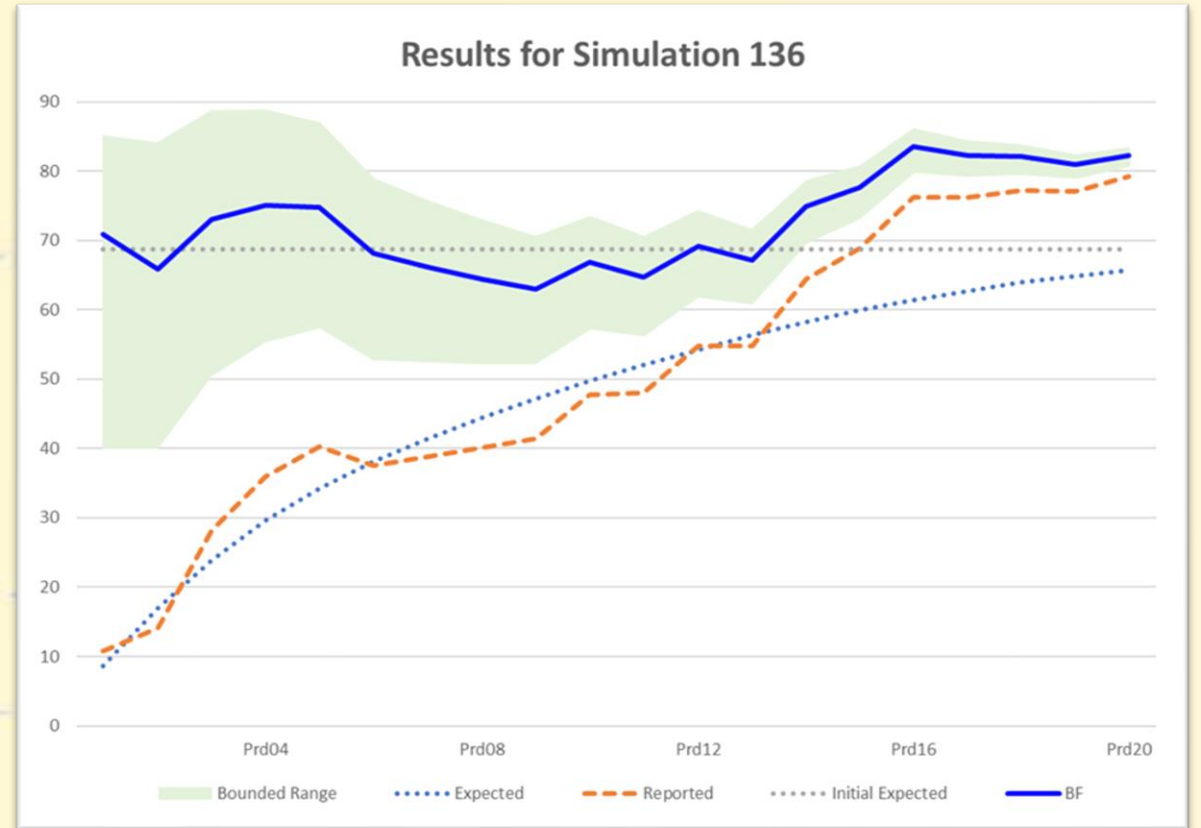
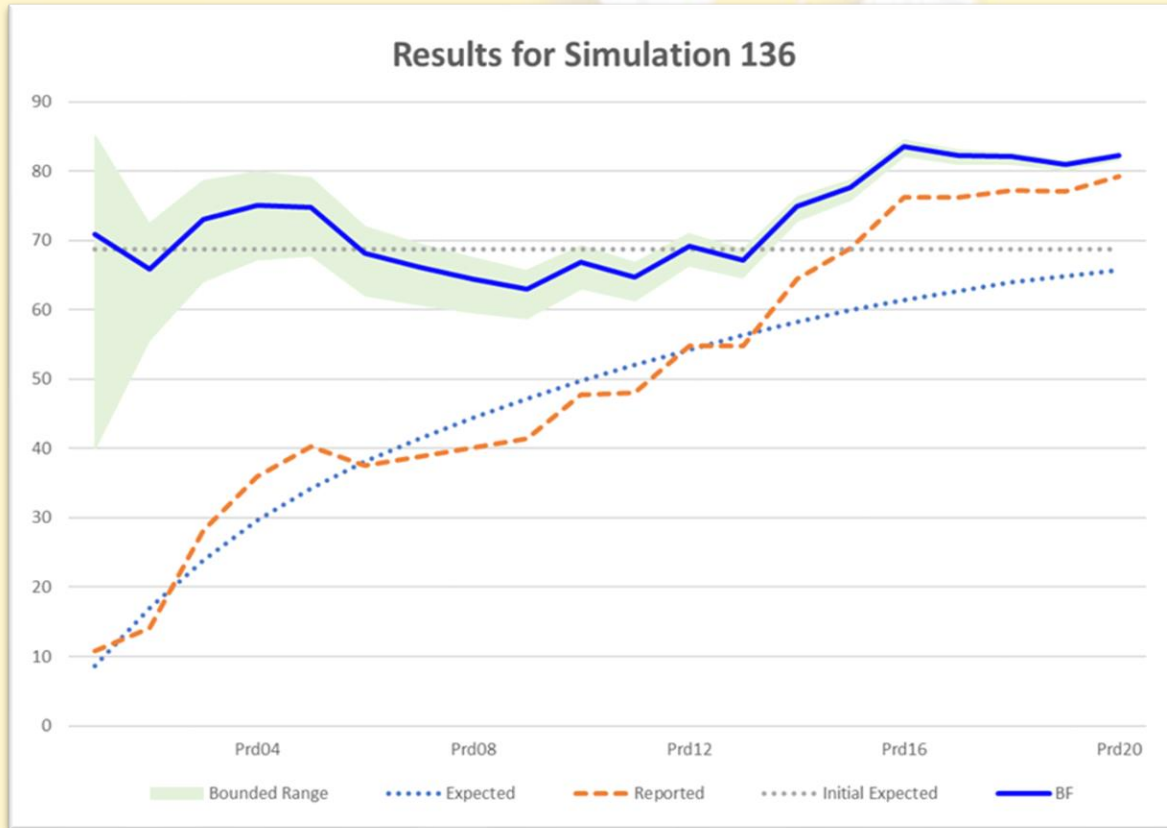
## Bounded Method

- Start with developing an upper and lower boundary
- Here I have adjusted the IELR in the BF
  - Lower uses \$40m
  - Upper uses \$85m
- Could also offset the pattern
  - Slightly slower
  - Slightly faster



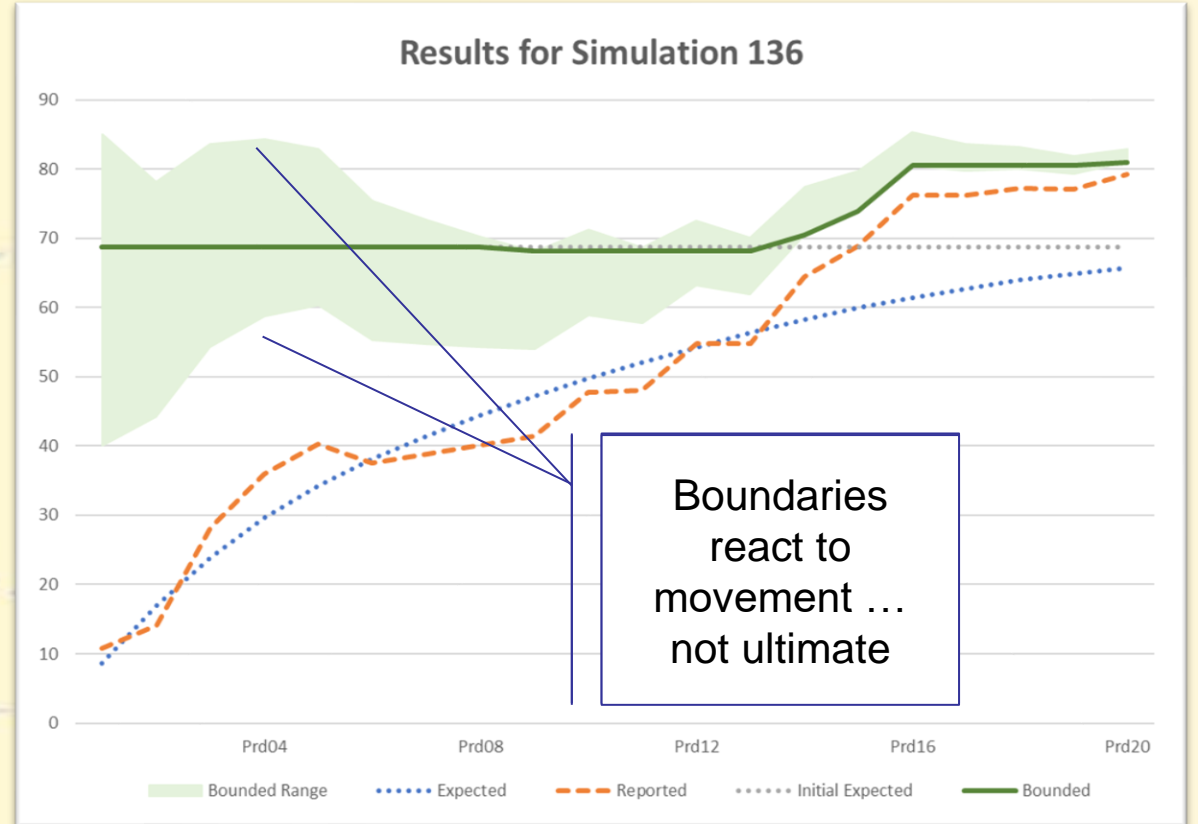
# Boundary Options ... fat / thin

- Bounded Method Options



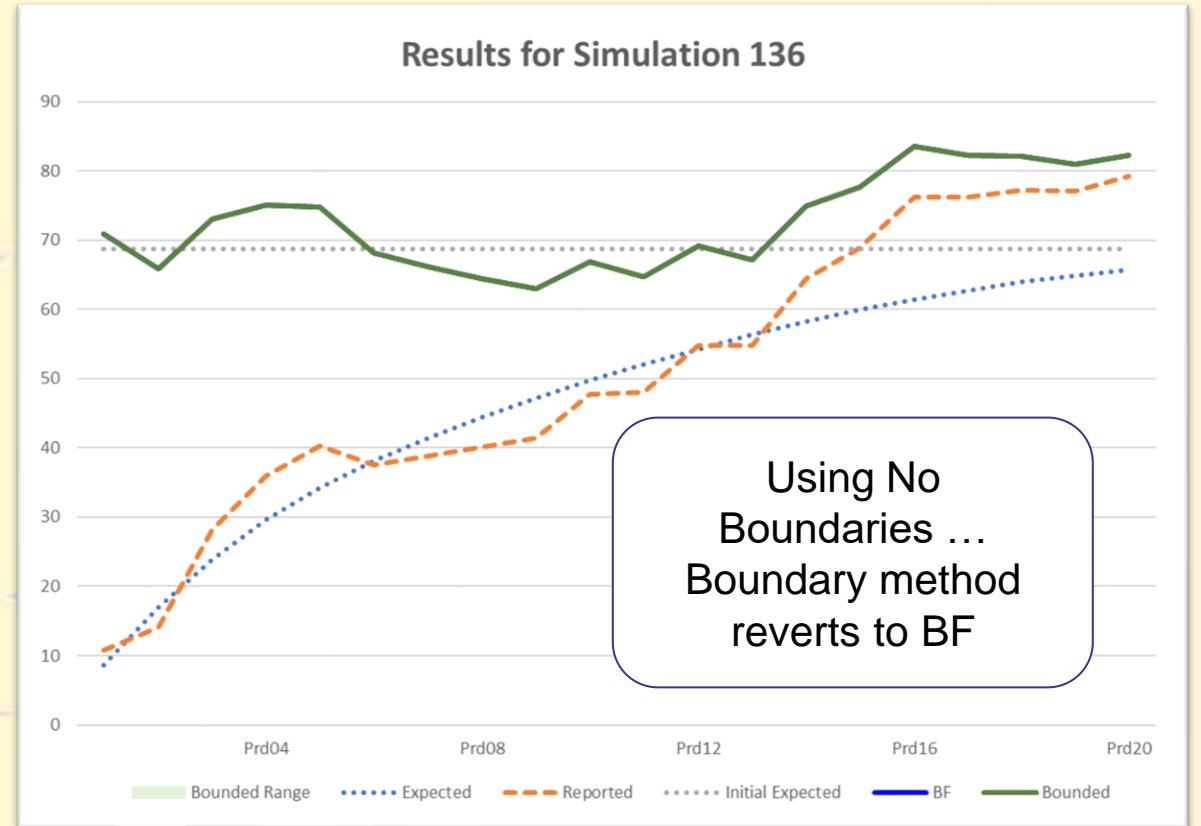
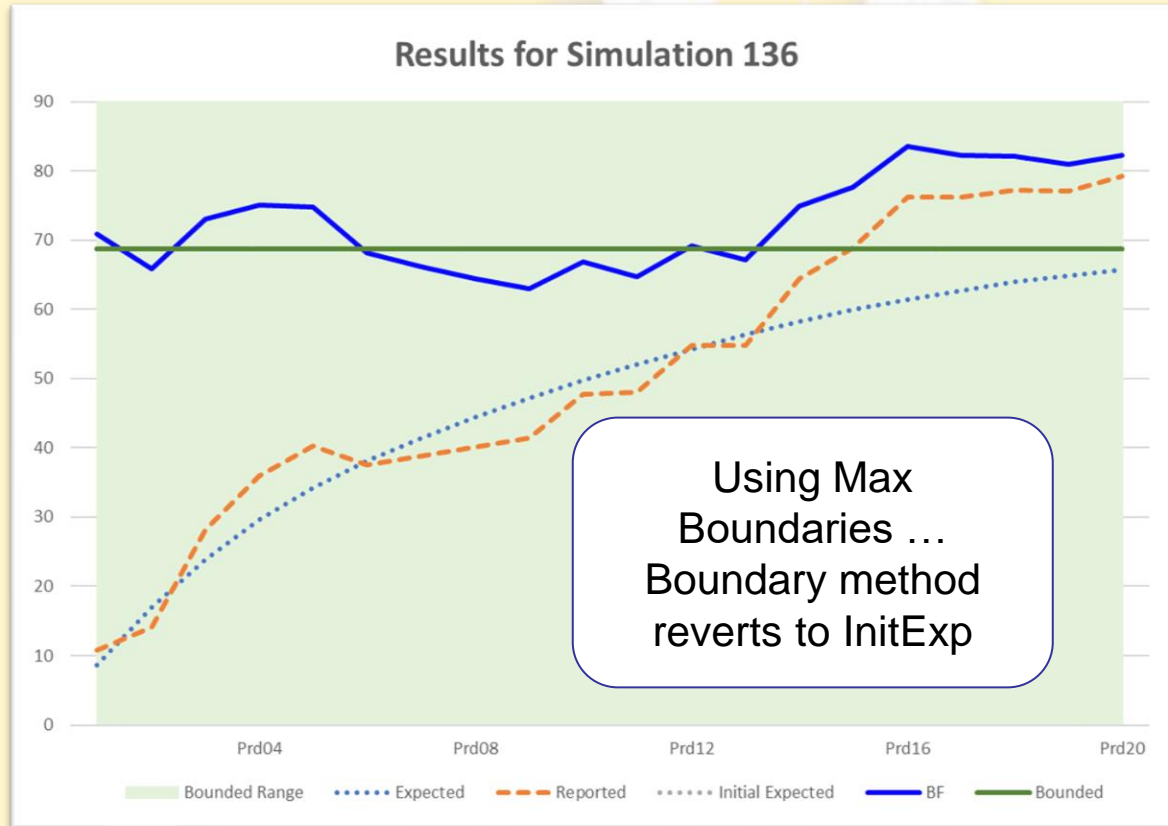
# Review of Random Simulations

- Bounded Method
- Basic Direction
  - Once you have your starting position
  - And defined your boundary conditions
- Current Estimate is Prior Estimate unless impacted by boundary conditions





# Boundary Method ... At the Extremes

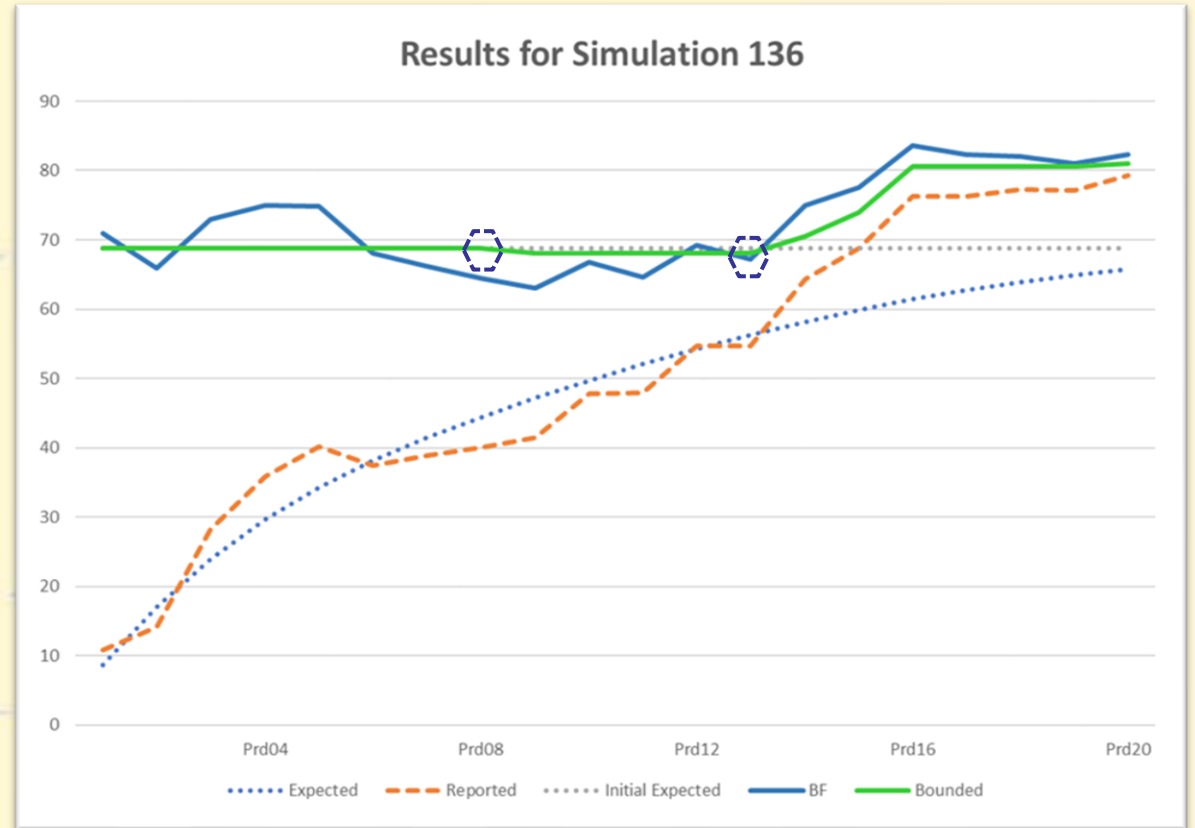


# Bounded Scorecard

- Responsiveness v Stability

## Simulation 136

- Responsiveness ... Grade C
  - I wouldn't call this method 'responsive'
- Stable ... Grade A (or worse?)
  - Marking here is a little harsh
  - First 'ding' is when it moves from FLAT to DOWN
- Other Issues
  - The Bounded method will follow the upper or lower boundary at the extremes

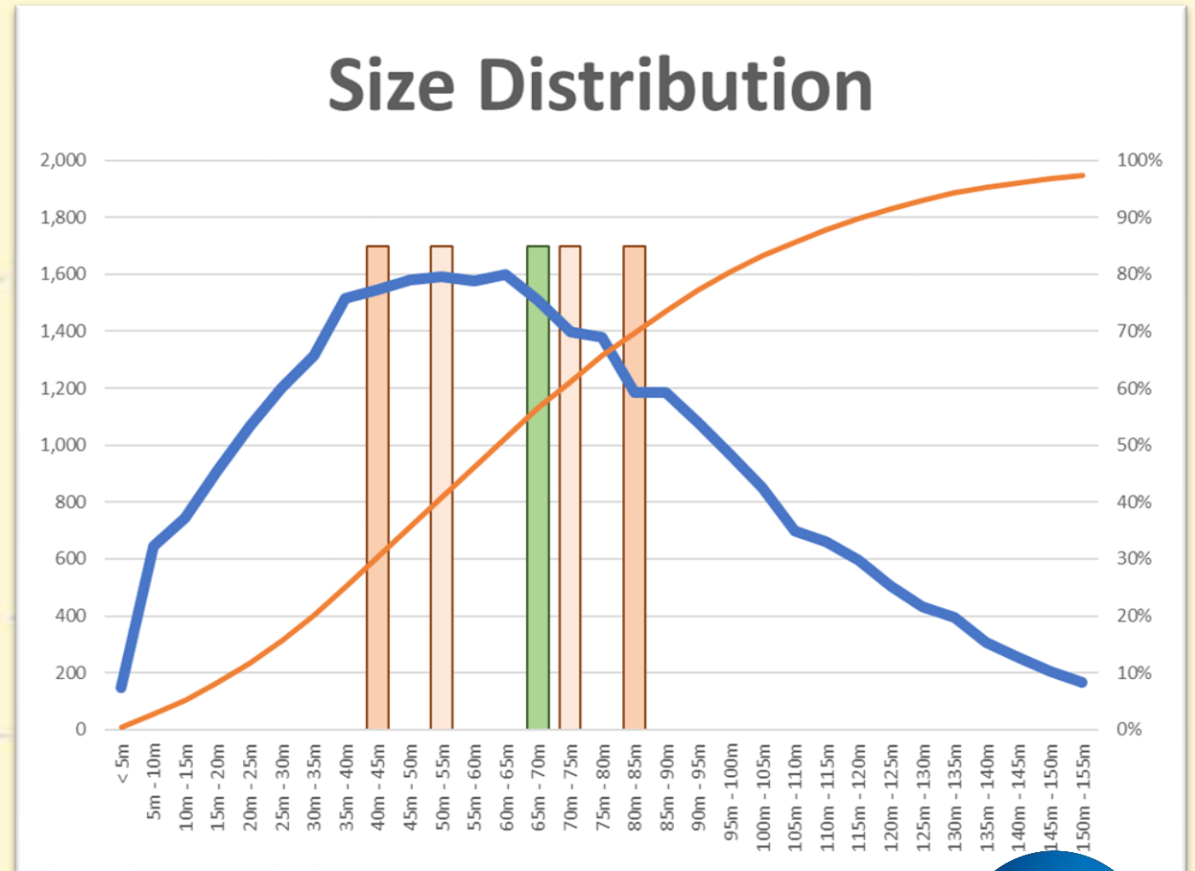


# Size Distribution

30k Simulations

- Average (green)
  - \$68m
- 40% - 60% percentile (light brown)
  - \$55m to \$75m
- 30% - 70% percentile (darker brown)
  - \$40m to \$85m

Within +/-	Count	Percentage
0.25%	115	0.4%
0.50%	206	0.7%
0.75%	318	1.1%
1%	407	1.4%
2%	801	2.7%
3%	1,211	4.0%
5%	2,033	6.8%
10%	4,046	13.5%

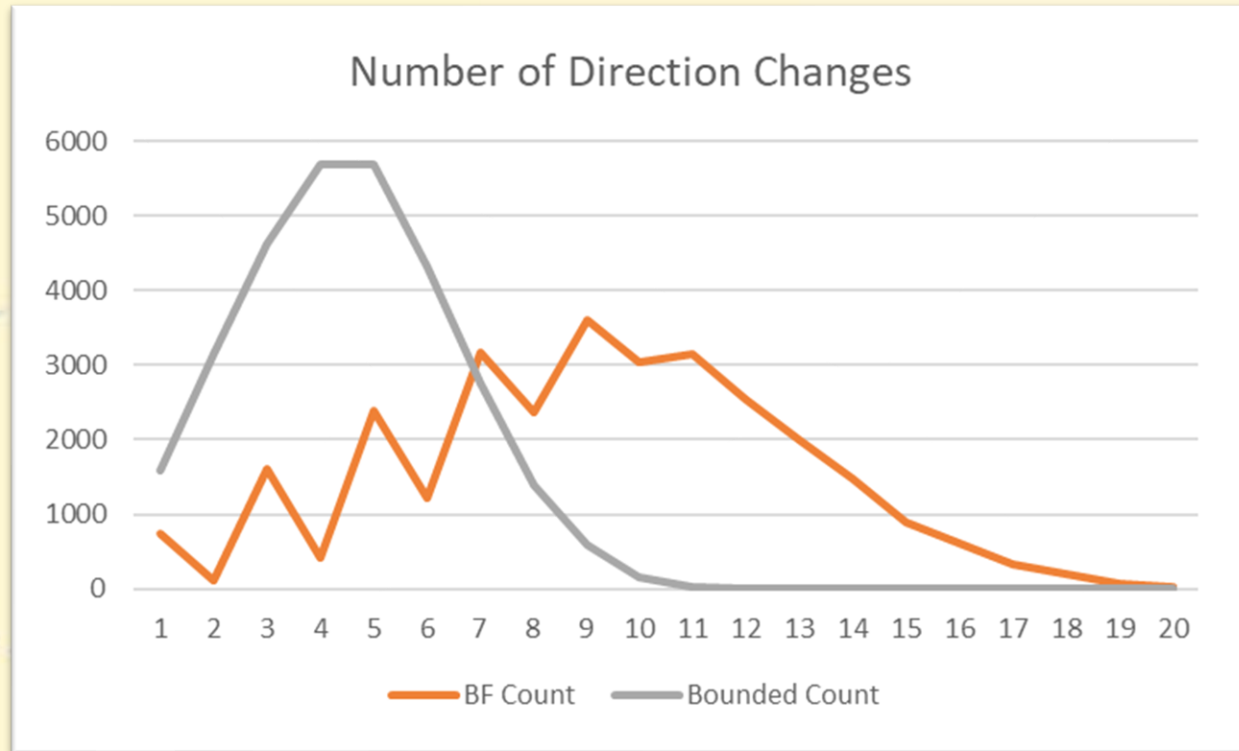


# Method Scorecard

- Responsiveness v Stability

## 30k Simulations

- Histogram of the number of times a method changed direction
- BF Method Histogram (orange)
  - Unknown why there is a slight propensity for early odd numbers
  - Could be due to my simulation approach (wanting periods where nothing was reported)
- Bounded Method Histogram (grey)

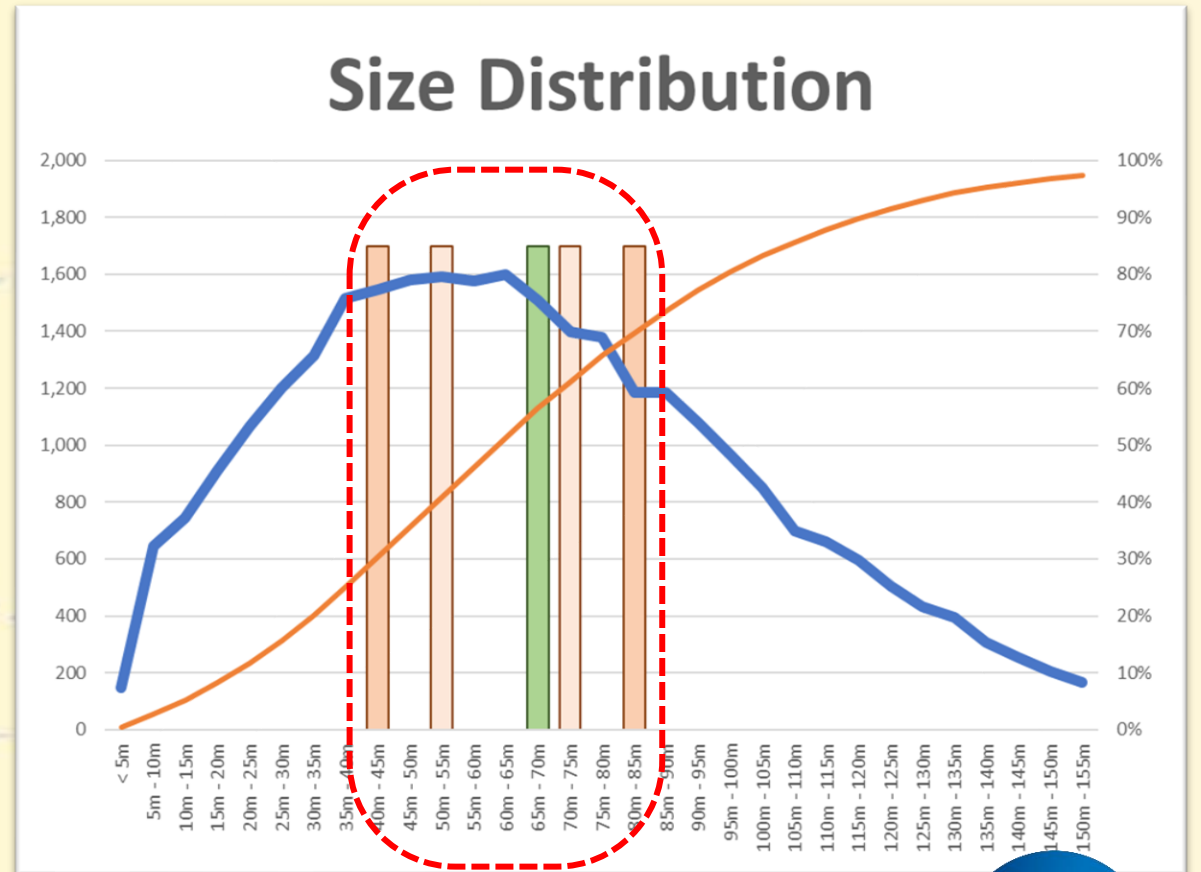


# Method Scorecard

- Responsiveness v Stability

## 30k Simulations

- 30% of simulations are below \$40m
  - No smoothing method required ... having a great year
- 30% of simulations are above \$85m
  - No smoothing method required ... having a horrible year
- 40% of simulations between \$40m and \$85m
- Average (green)
  - Responsiveness in these situations is less important
  - Stability in these situations is more important

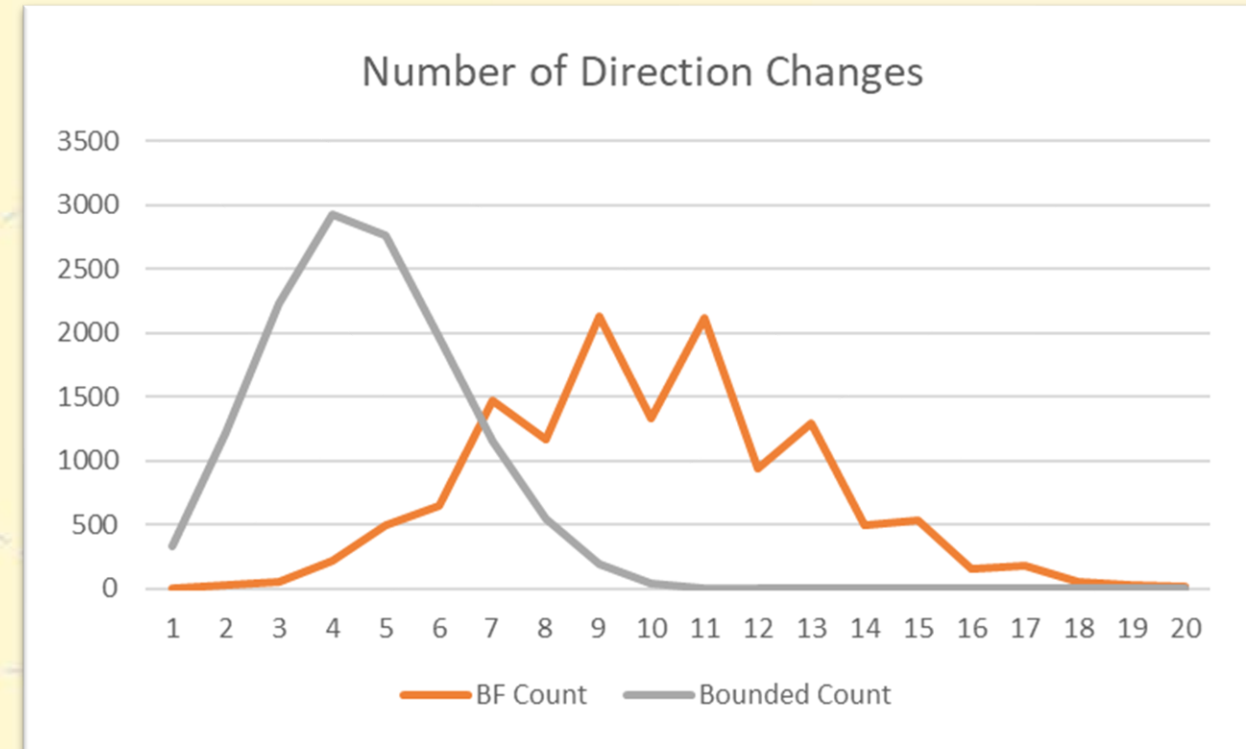
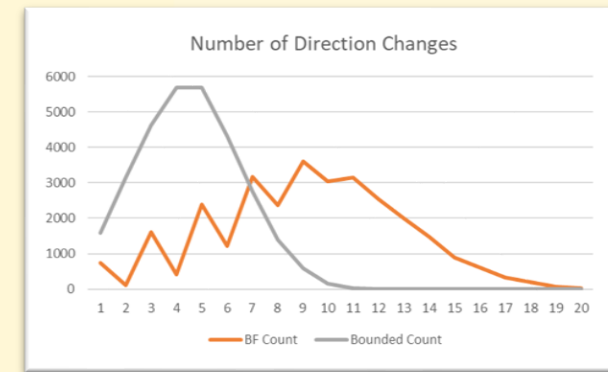


# Method Scorecard

- Responsiveness v Stability

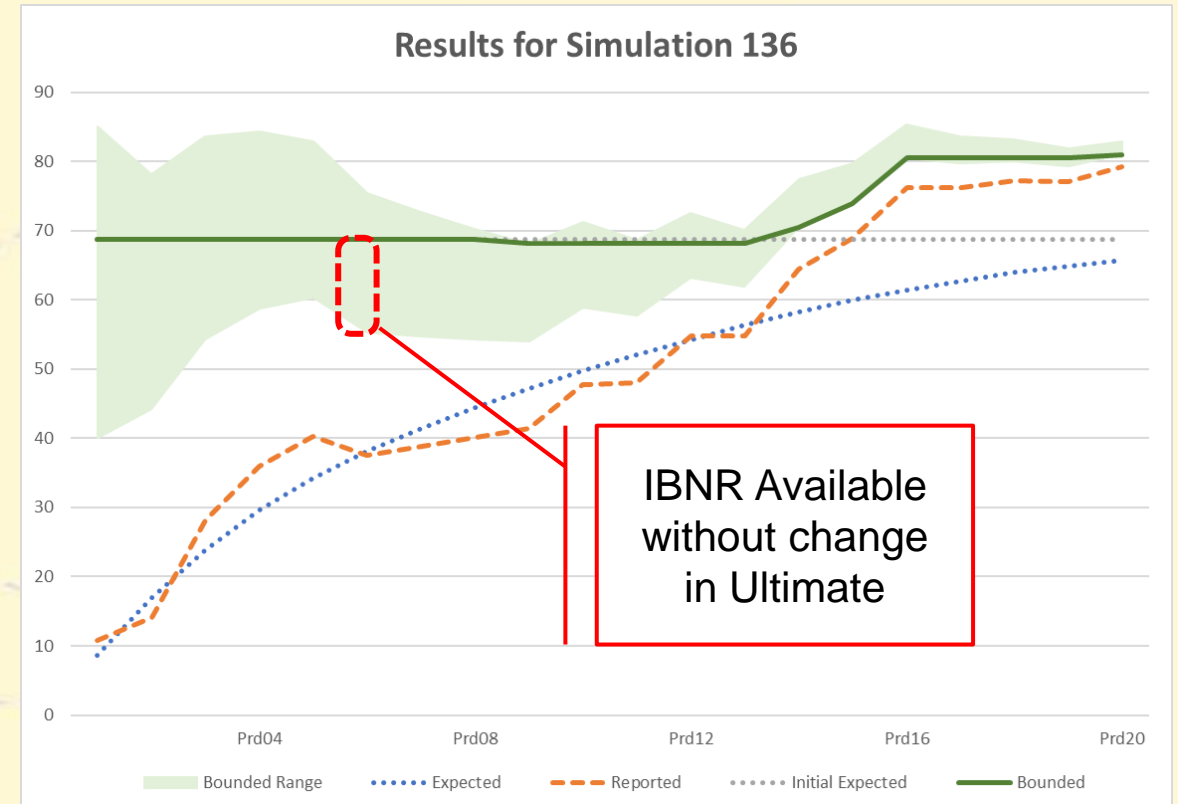
30k Simulations

- Histogram of the number of times a method changed direction
- BF Method Histogram (orange)
- Bounded Method Histogram (grey)



# Management Information

- Bounded Method
- A BF Method throws off the IBNR based on the pattern
- A Bounded Method will release IBNR down to the lower boundary
- This is information that you can publish to your management



# Next Steps?

Test in real world with actual loss data

How does this work across accident years

How does this work across lines of business







Decoupling Selected  
Ultimate from  
Deterministic Methods