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Practical Considerations in Claims Inflation Estimation

Erin Bargate
Cian Creedon (Supreme Wizard)
Shane Lenney

Marcus Schofield
Richard Stock

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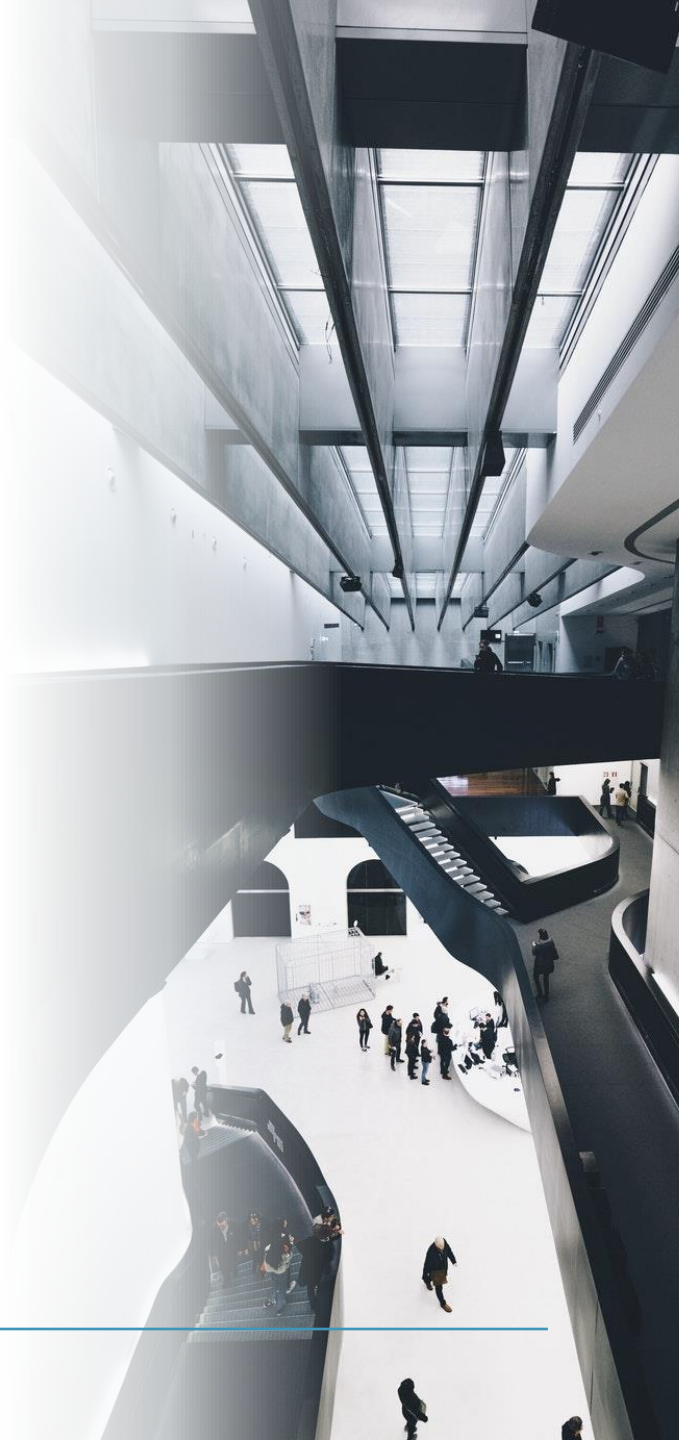
Introduction

Agenda

- **Introduction to the Inflation Working Party**
- **Study of inflation estimation methods**
  - Data used in estimation research
  - Inflation estimation scenarios
  - Individual and aggregate claims methods
  - Evaluation of methods
  - Ancillary considerations
  - Indices
  - Applications



Introduction to The Working Party

To comprehensively explore and produce pragmatic guidance on the challenges posed by claims' inflation, across all areas of actuarial involvement in general insurance

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Data, Methods and Scenarios

Estimation Data

Stochastic claims' generation via VBA

10 years per simulation with mean 50 claims per year

10 simulations run – each represents an individual insurer's data

Pareto severity with fixed seed for reproducability

Development pattern applied to create triangles

User specified economic, social and shock inflation applied to incremental development

Scenarios

Scenario A

- Constant, stable inflation
- 4% for all years

Scenario B

- Emerging social inflation
- Scenario A with social inflation of 2% in years 6-10
- Total = 4% in years 1-5, 6% in years 6-10

Scenario C

- Sudden shock inflation
- Scenario B with additional shock of 6% in year 9 and 4% in year 10
- Total = 4% in years 1-4, 6% in years 5-8, 12% in year 9, 10% in year 10

Scenarios D1 and D2

- Non-inflationary frequency trends
- Starting point same as Scenario C
- D1 = 5% decreasing mean frequency
- D2 = 5% increasing mean frequency

Scenario E

- Not revealed to analysts
- Constant economic inflation of 5.5%
- Social inflation of 1% in years 1-4, 2% in years 5-8, 3% in years 9 and 10
- First inflation shock at 3% in year 1, 4% in year 2 and 2% in year 3
- Secondary inflation shock of 2% in year 9 and 8% in year 10

Individual vs Aggregate Claims Methods

Individual

- Large severity trend
- Large frequency trend
- Trend in burning cost to a theoretical layer

Aggregate

- Inflation adjusted chain ladder (IACL)
- Separation method
- Calendar year development ratio (CYDR) 12-60 method

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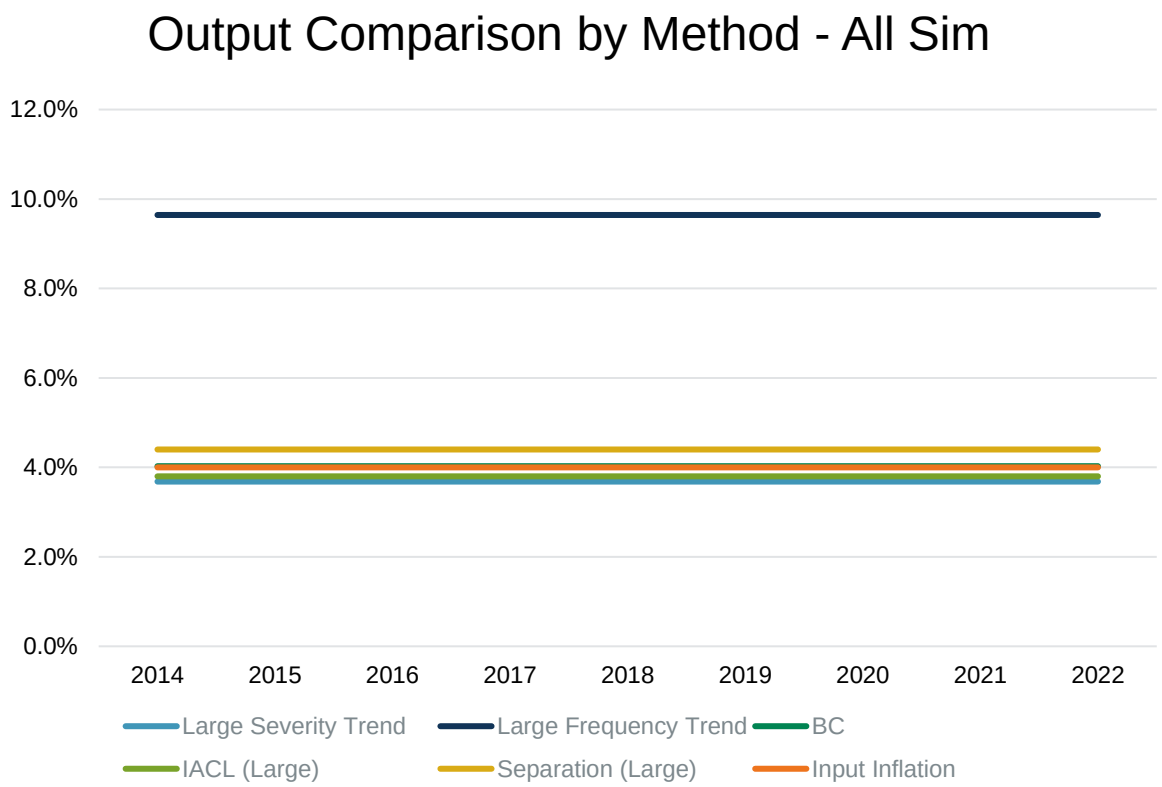
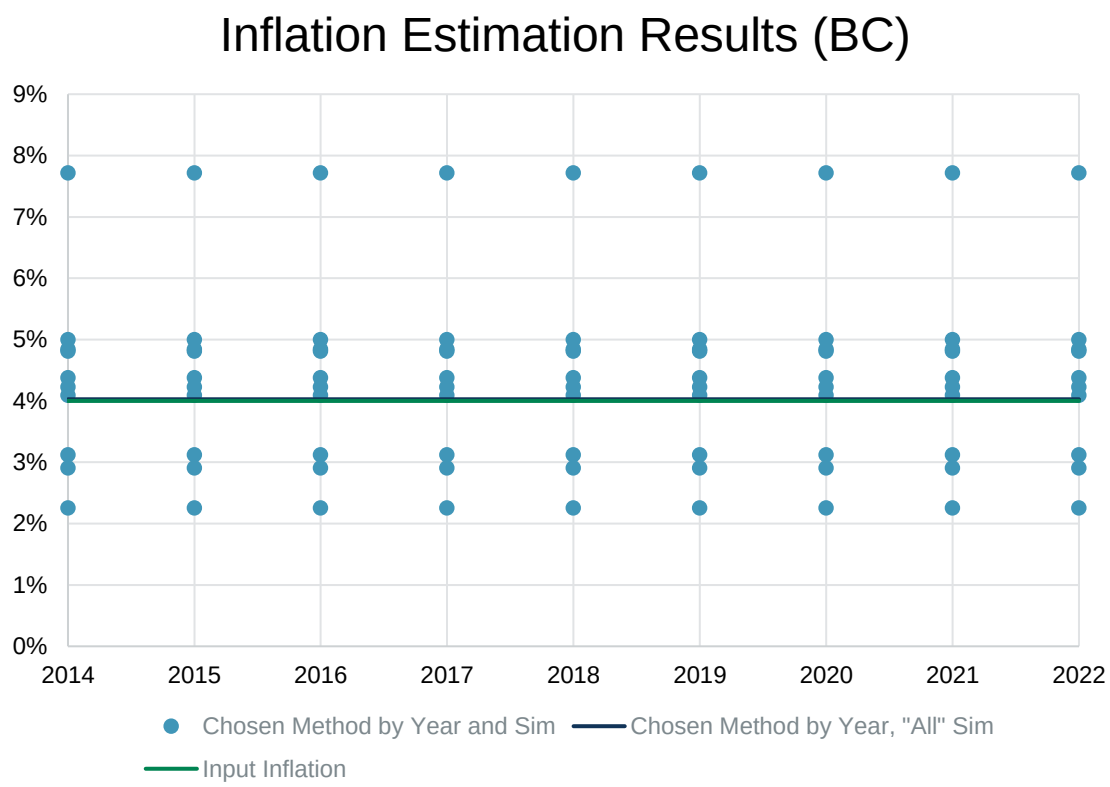
Evaluation of Methods

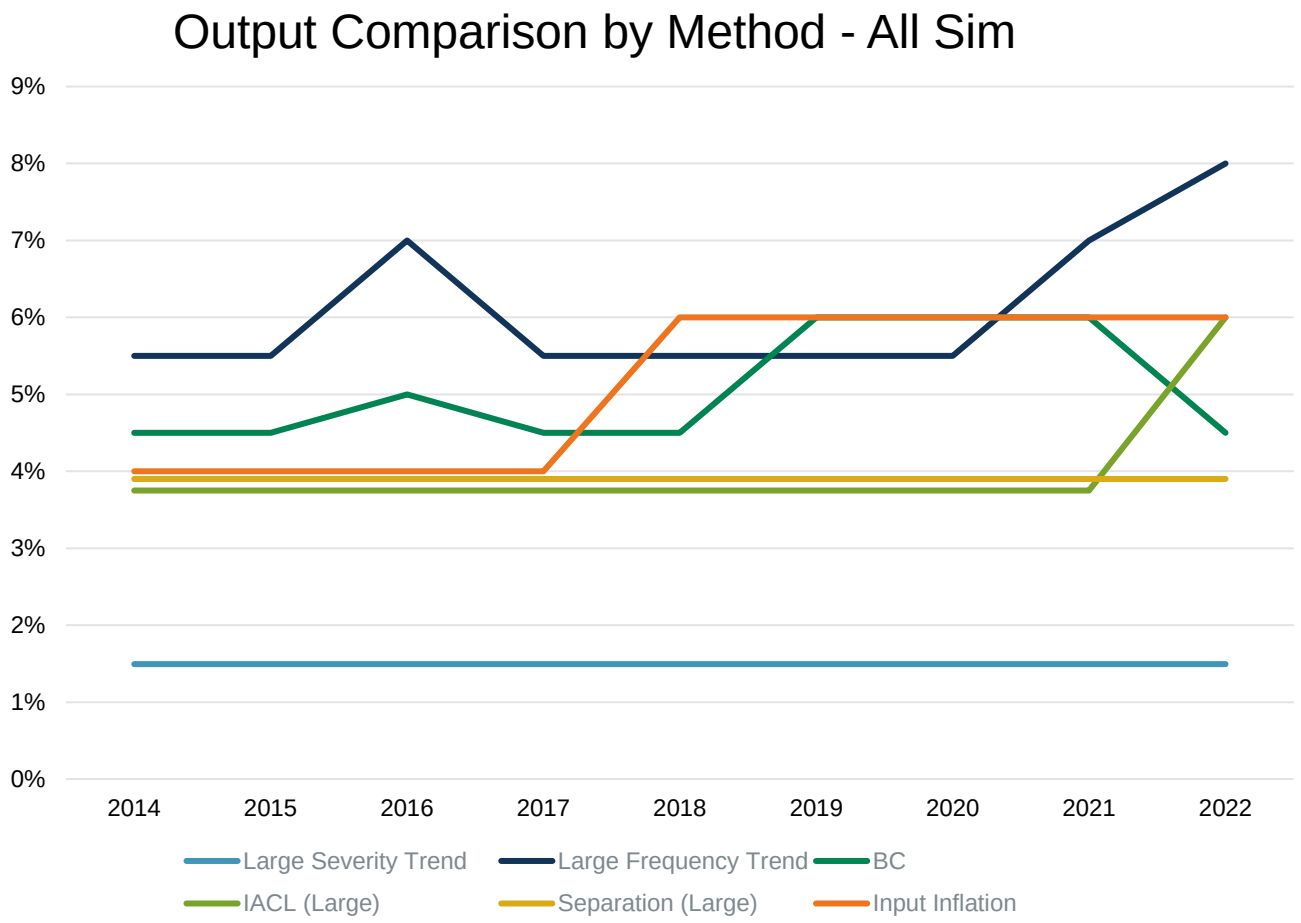
Scenario A

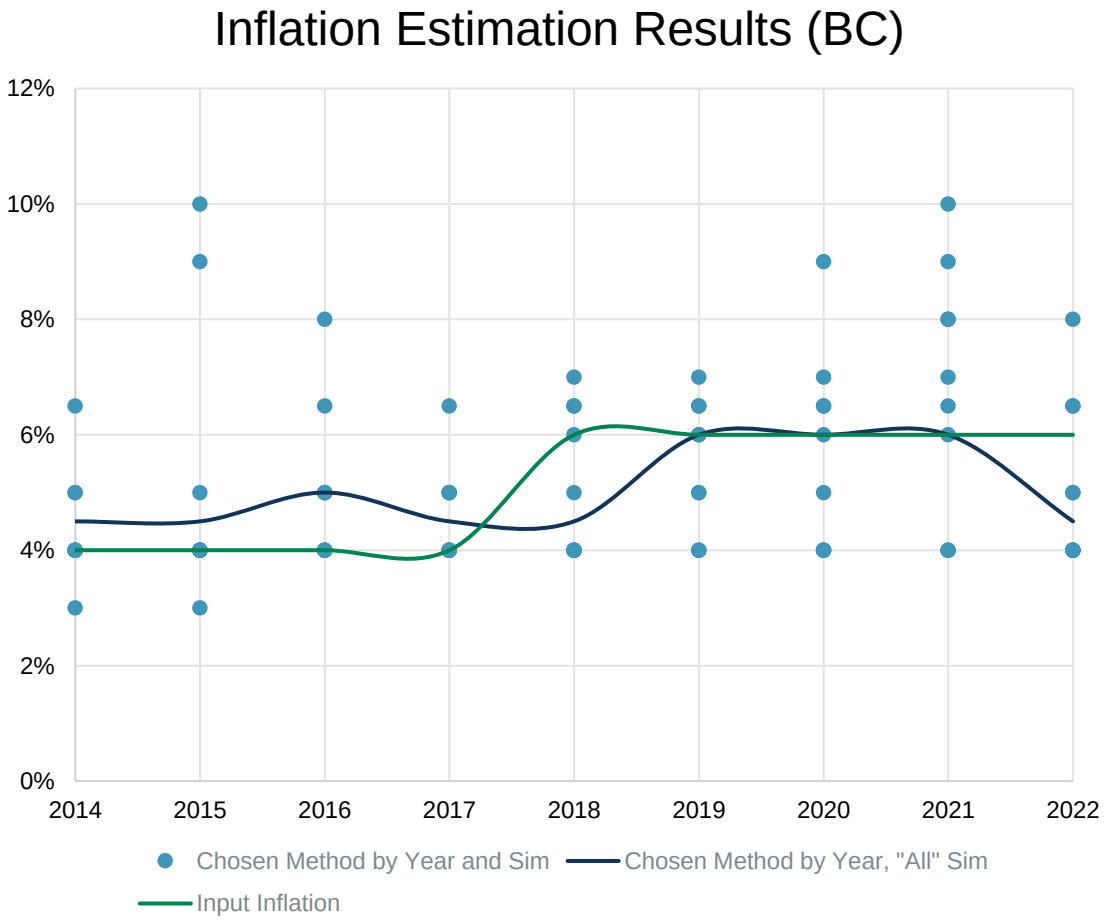




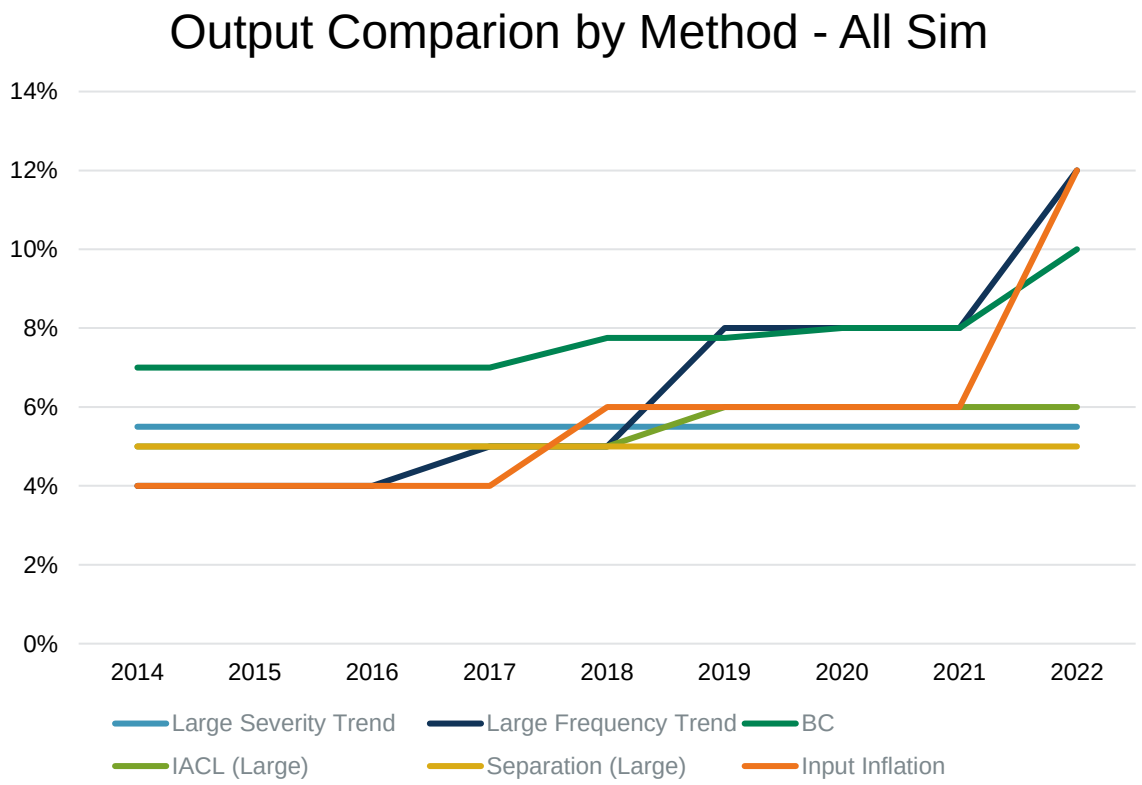
- All methods perform reasonably well, although frequency trend an outlier in over-estimating.

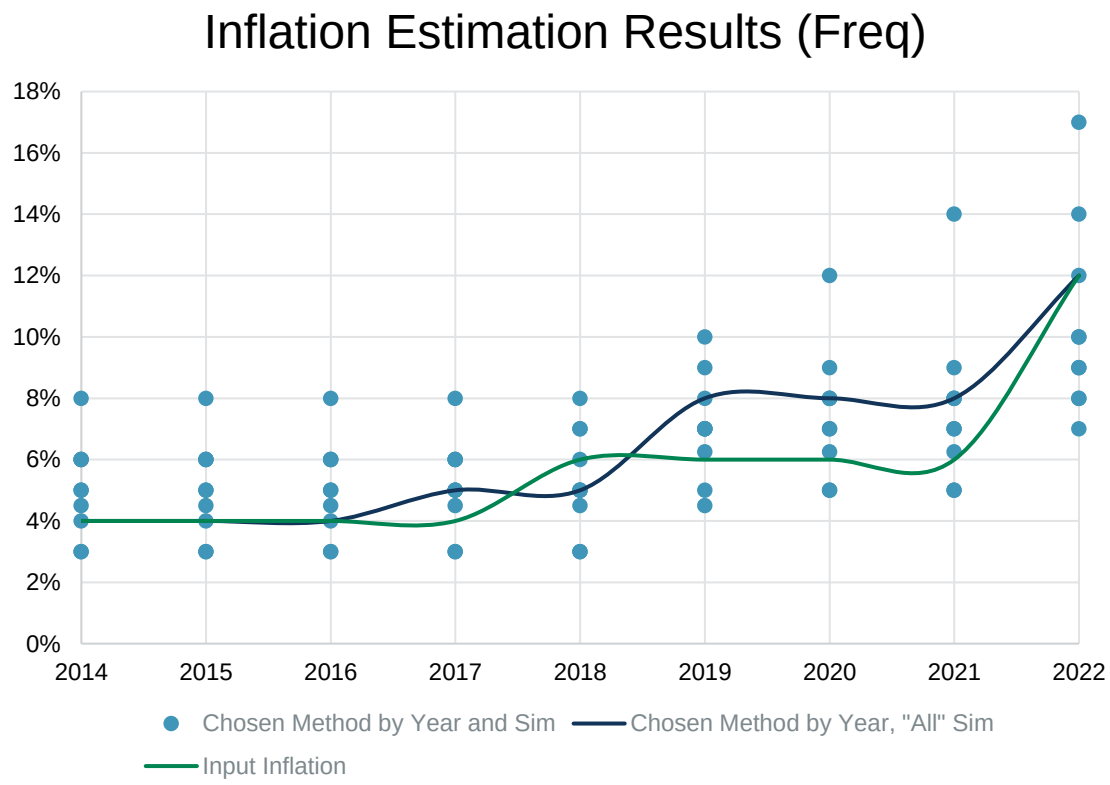
Scenario B


Output Comparison by Method - All Sim
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
Large Severity Trend
Large Frequency Trend
BC
IACL (Large)
Separation (Large)
Input Inflation


Inflation Estimation Results (BC)
12%
10%
8%
6%
4%
2%
0%
2014
2015
2016
2017
2018
2019
2020
2021
2022
Chosen Method by Year and Sim
Chosen Method by Year, "All" Sim
Input Inflation

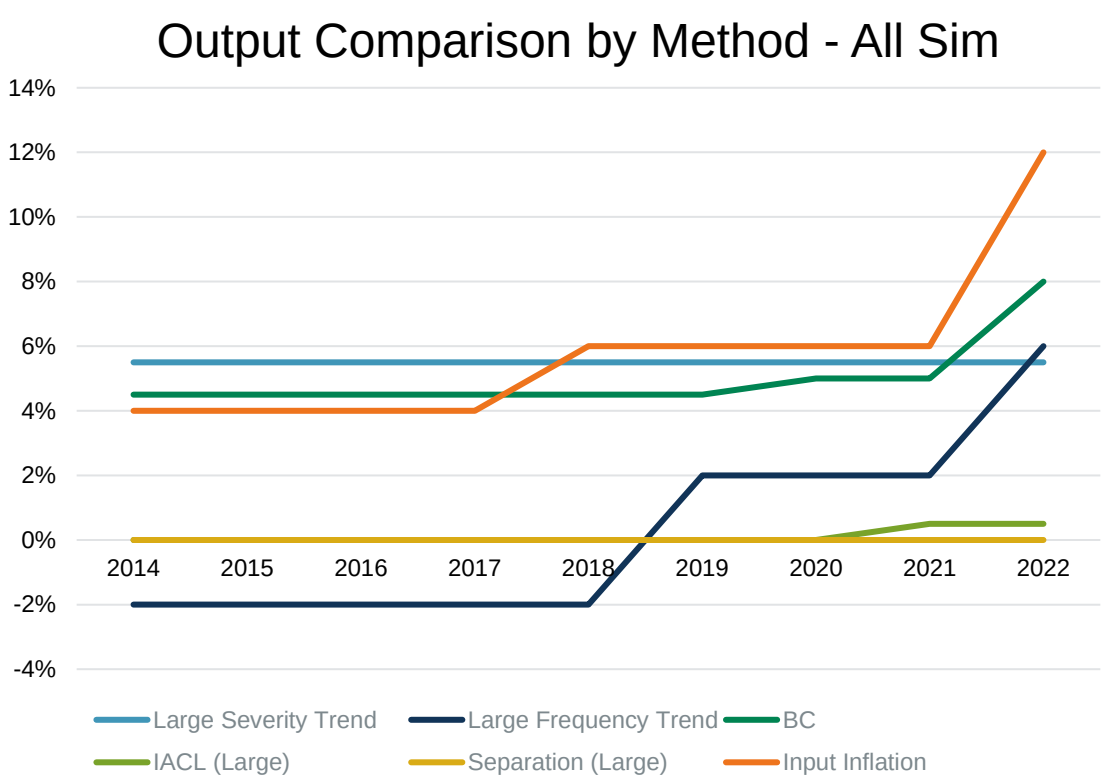
Scenario C

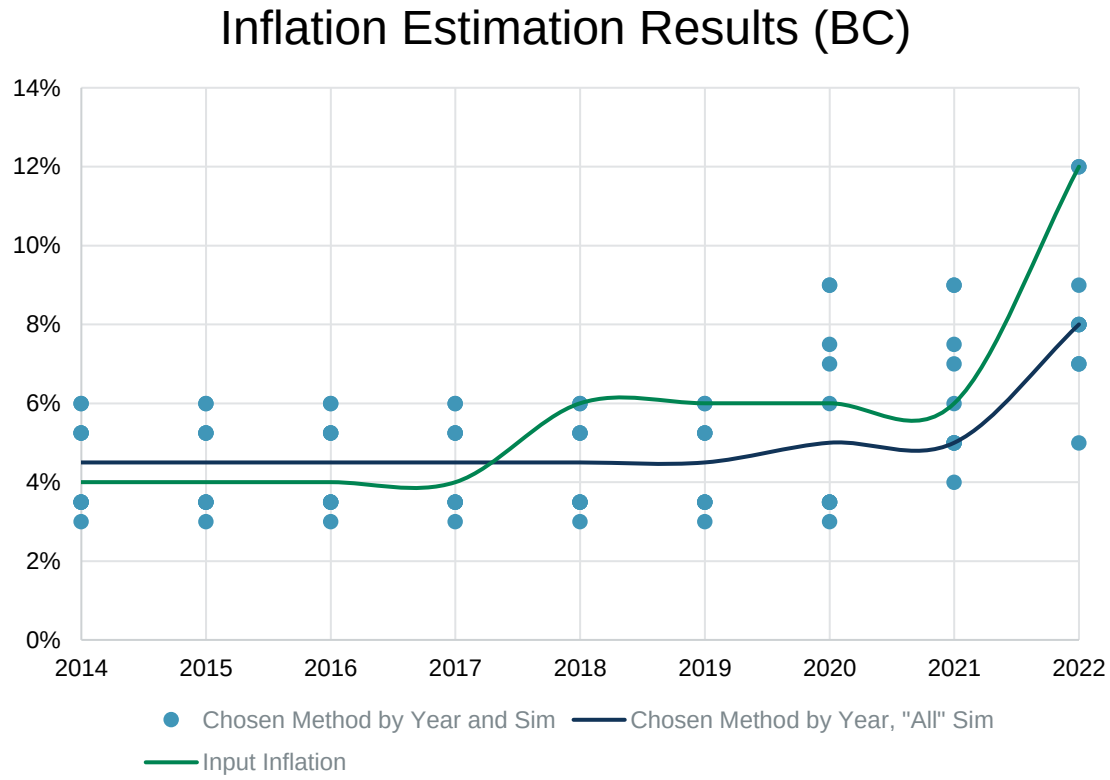




- Frequency trend found to be most responsive with regards changing inflation in period.

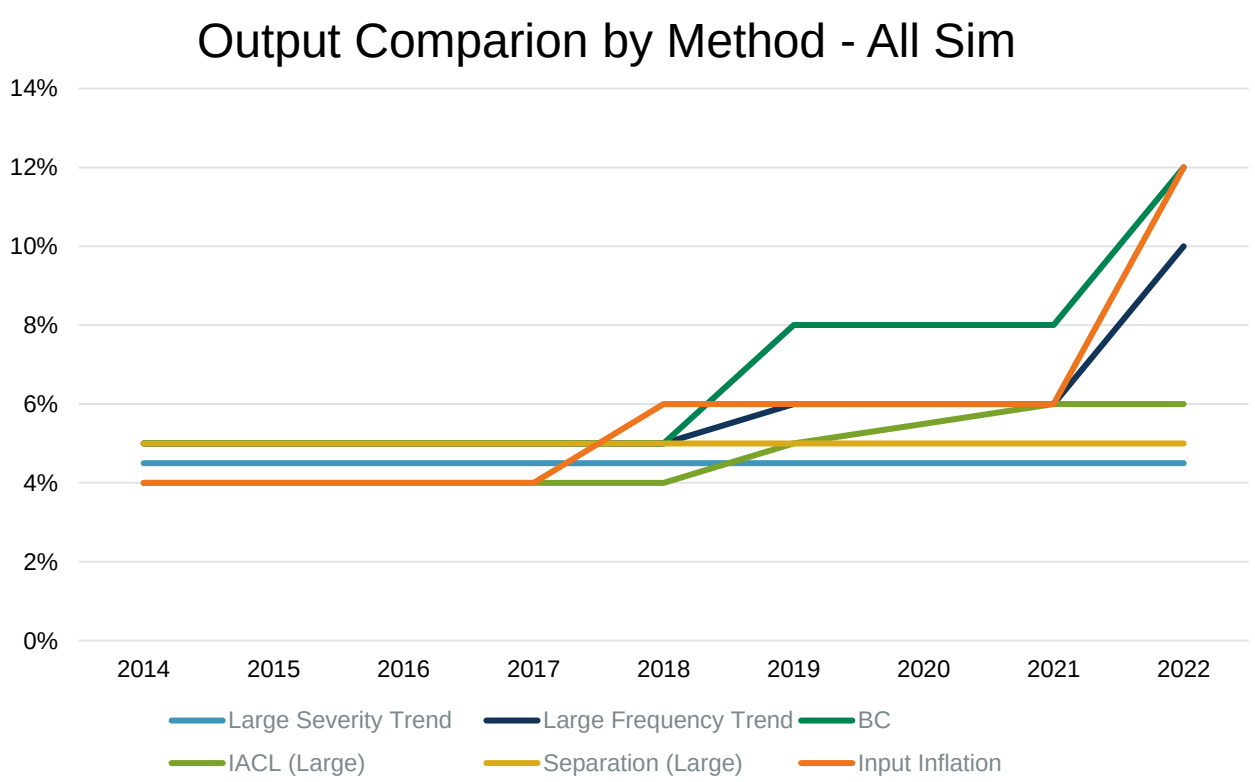
Scenario D1

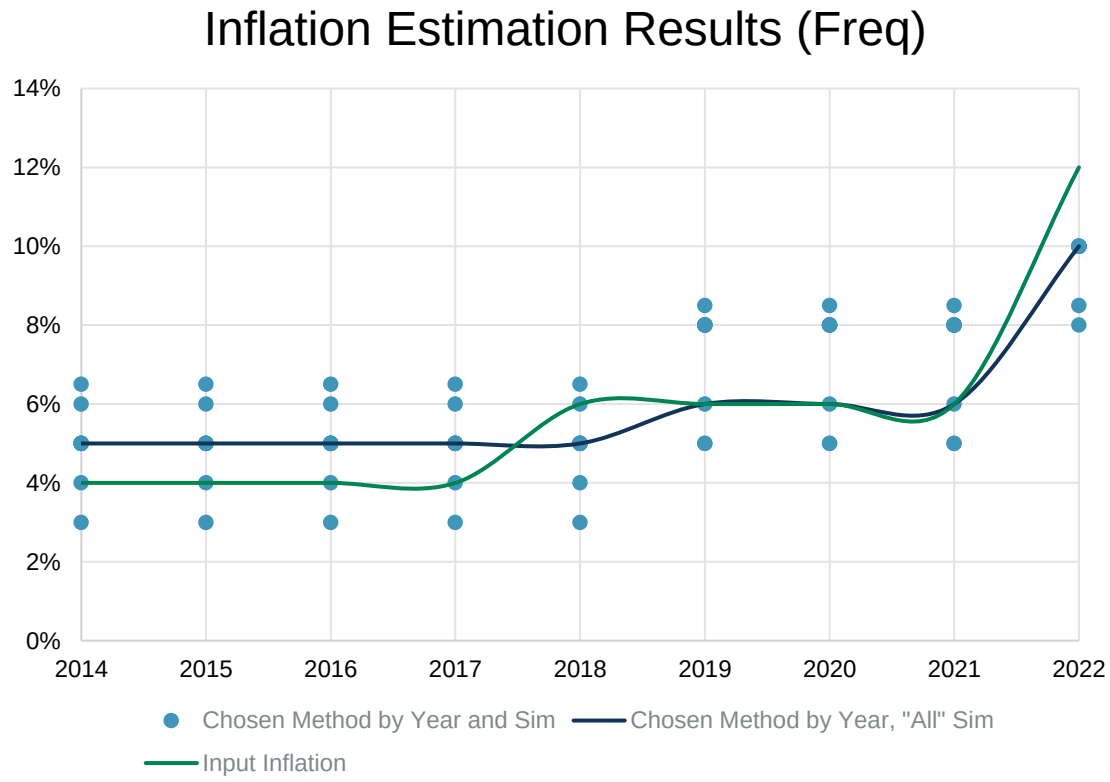




- Aggregate and frequency methods were poor at distinguishing frequency trend from claim cost (severity) inflation.

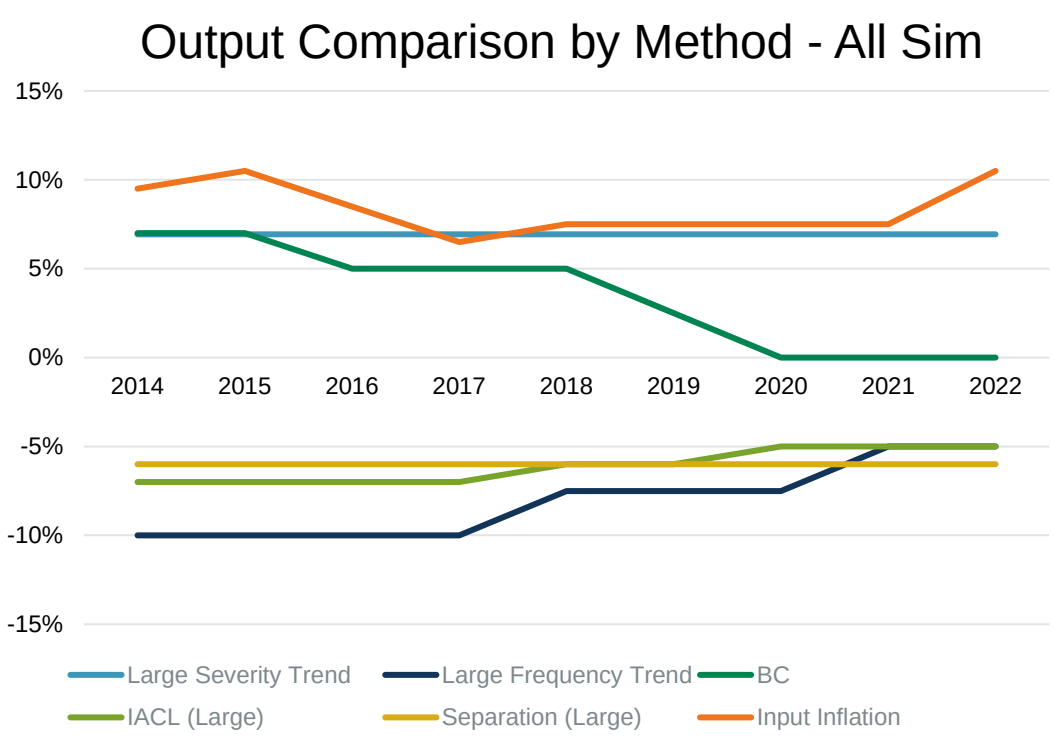
Scenario D2

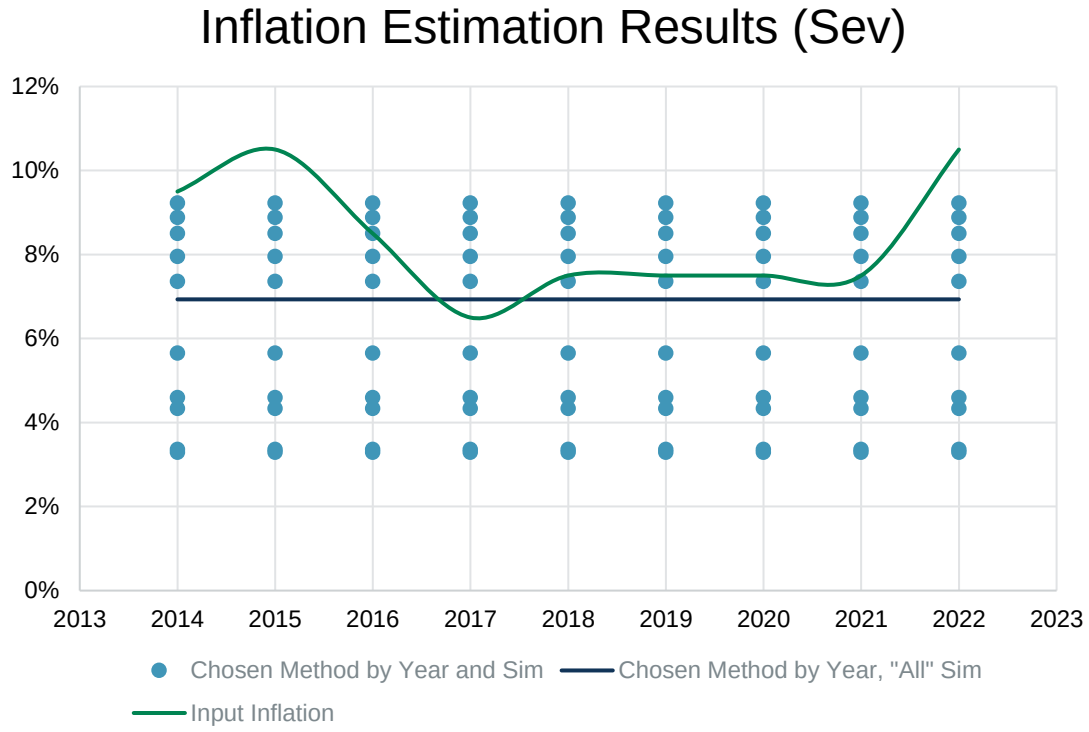




- Reasonably consistent performance across all methods and more robust at dealing with rising vs. falling frequency.
- Frequency trend method best performer.

Scenario E





- Broad range to be expected, given varying, unknown parameters.
- BC overcompensates for decreasing inflation.
- Severity trend, perhaps unsurprisingly, most adept at picking out long-run claim cost trend.

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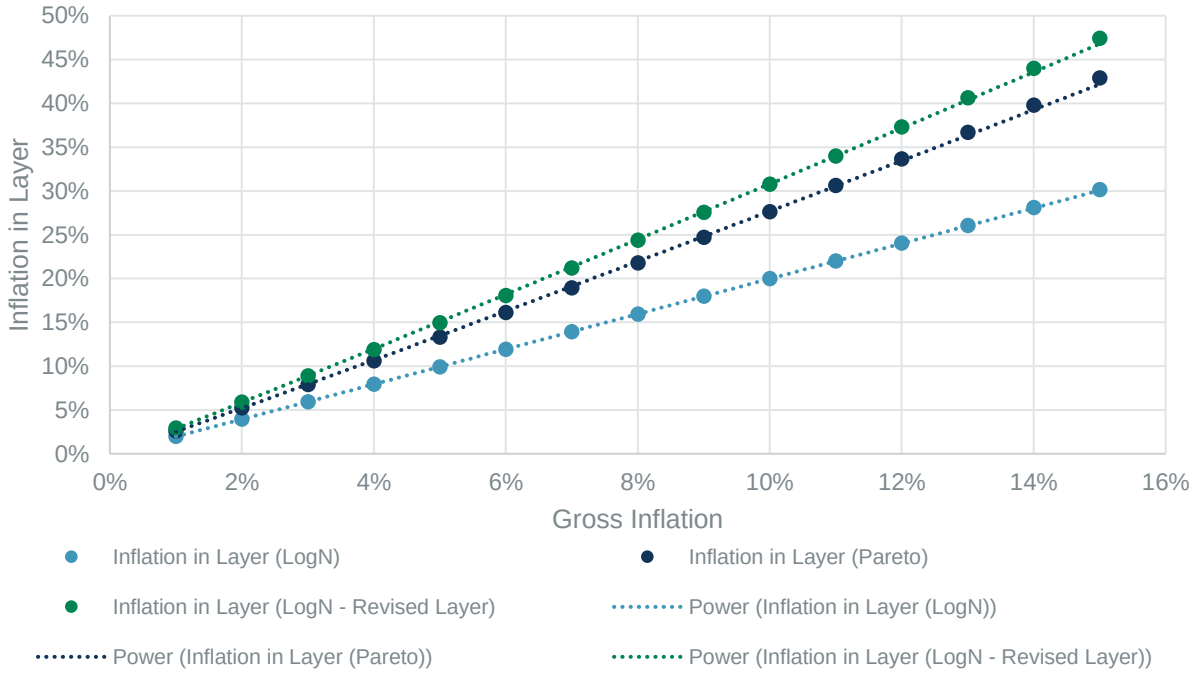
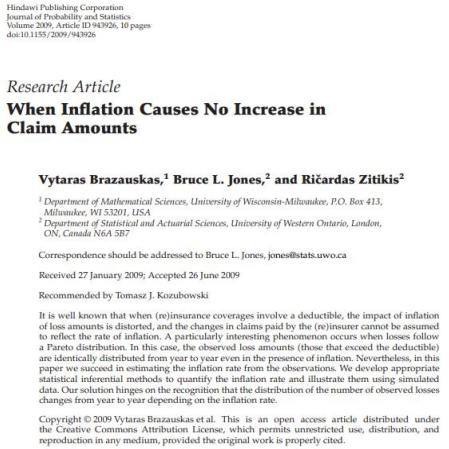
Ancillary Considerations

FGU vs. Geared Inflation

- Casts doubt on BC method:
  - Need to know severity distribution to convert from geared to FGU inflation…
  - …but don't know severity distribution unless we trend the FGU losses!
- Neat Pareto rule, but severity often not Pareto and gearing effect can vary significantly with distribution (even for same mean, CV) and layer.
- Equally, if claims are Pareto, may observe nil severity trend xs threshold as increased severity offset by increased frequency of claims pushed above threshold!





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Research Article

When Inflation Causes No Increase in Claim Amounts

Vytaras Brazauskas,[1] Bruce L. Jones,[2] and Ričardas Zitikis[2]

[1] *Department of Mathematical Sciences, University of Wisconsin-Milwaukee, P.O. Box 413, Milwaukee, WI 53201, USA*
[2] *Department of Statistical and Actuarial Sciences, University of Western Ontario, London, ON, Canada N6A 5B7*

Correspondence should be addressed to Bruce L. Jones, jones@stats.uwo.ca

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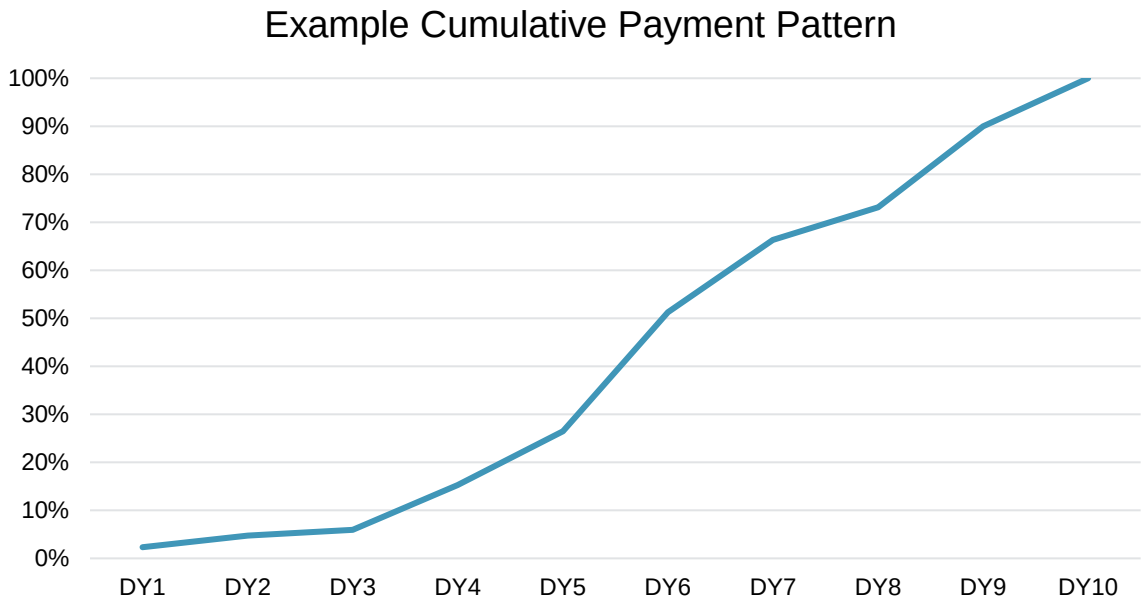
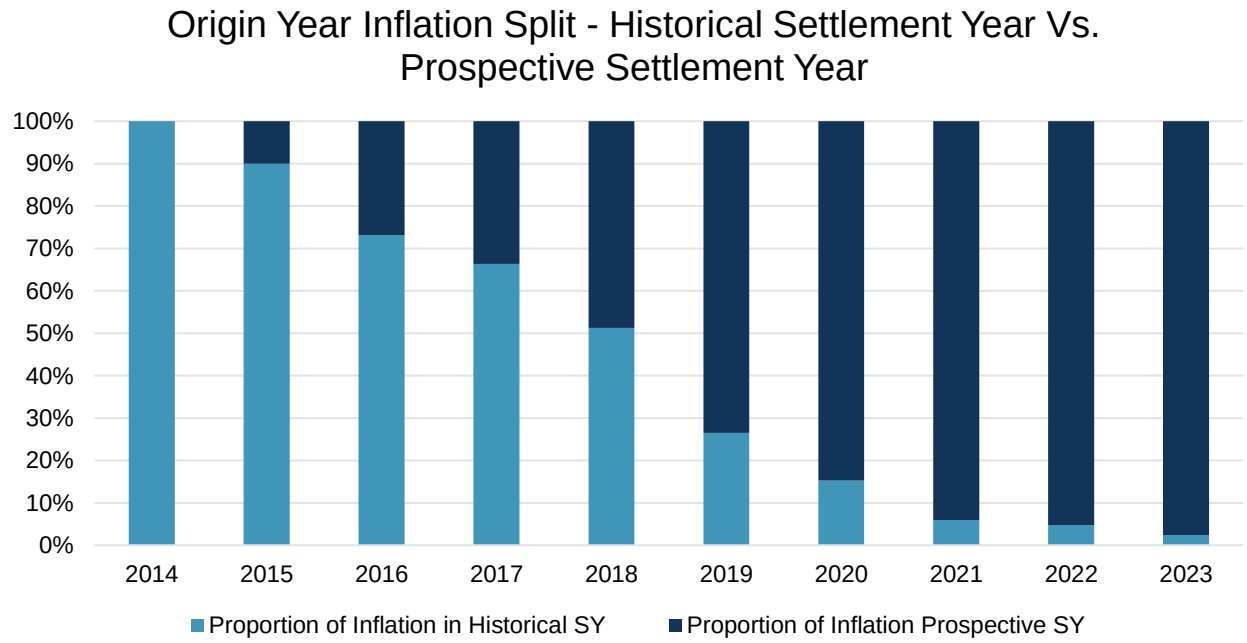
Recommended by Tomasz J. Kozubowski

It is well known that when (re)insurance coverages involve a deductible, the impact of inflation of loss amounts is distorted, and the changes in claims paid by the (re)insurer cannot be assumed to reflect the rate of inflation. A particularly interesting phenomenon occurs when losses follow a Pareto distribution. In this case, the observed loss amounts (those that exceed the deductible) are identically distributed from year to year even in the presence of inflation. Nevertheless, in this paper we succeed in estimating the inflation rate from the observations. We develop appropriate statistical inferential methods to quantify the inflation rate and illustrate them using simulated data. Our solution hinges on the recognition that the distribution of the number of observed losses changes from year to year depending on the inflation rate.

Settlements Vs. Origin Year Inflation

- ‘Cleaner’ to estimate inflation using settled claims.
- Indices effectively measure settlement year inflation.
- *But* need to *apply* inflation on origin year (AY or UWY) basis.
- Hence need estimates of *future* inflation.





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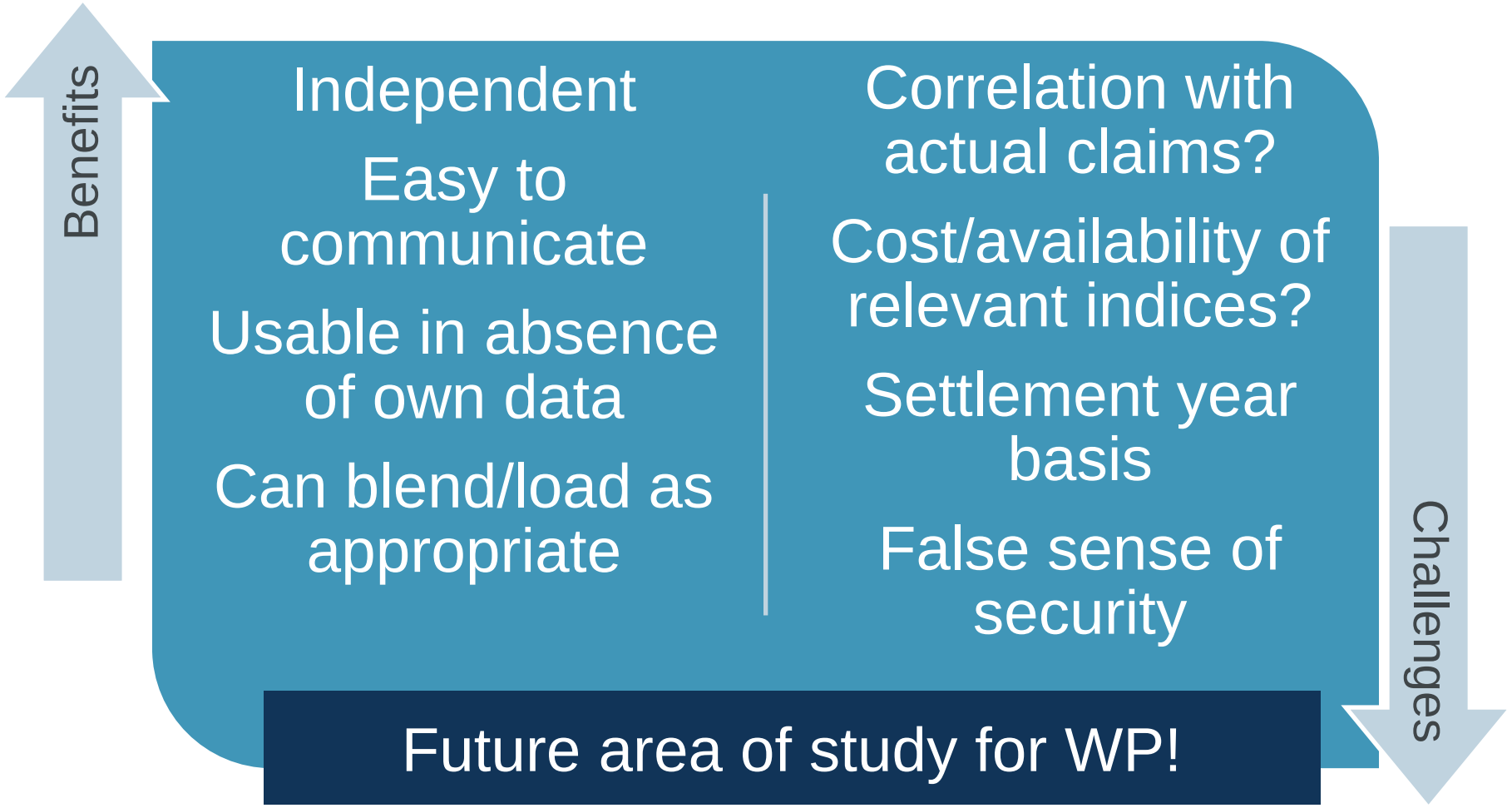
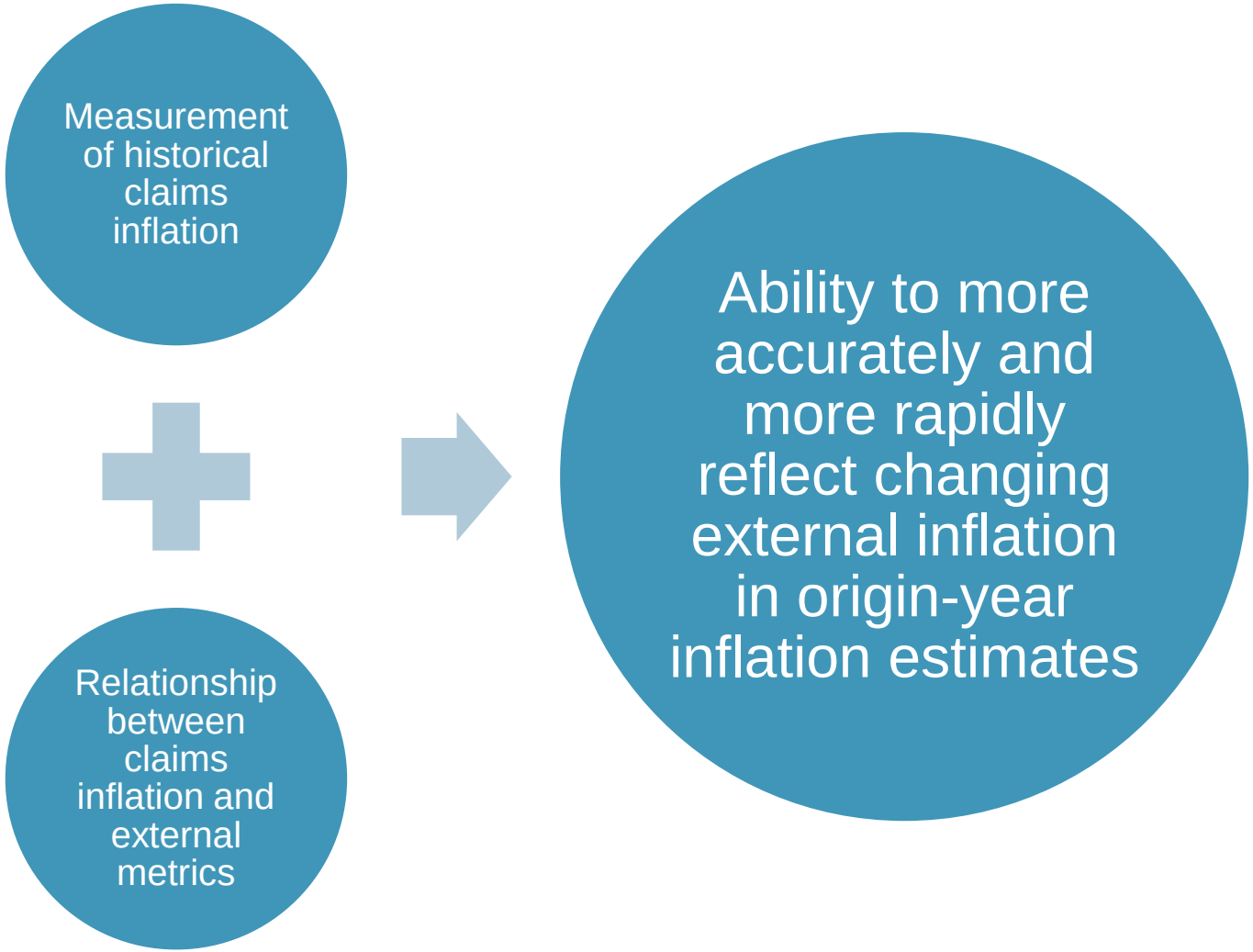
External Indices

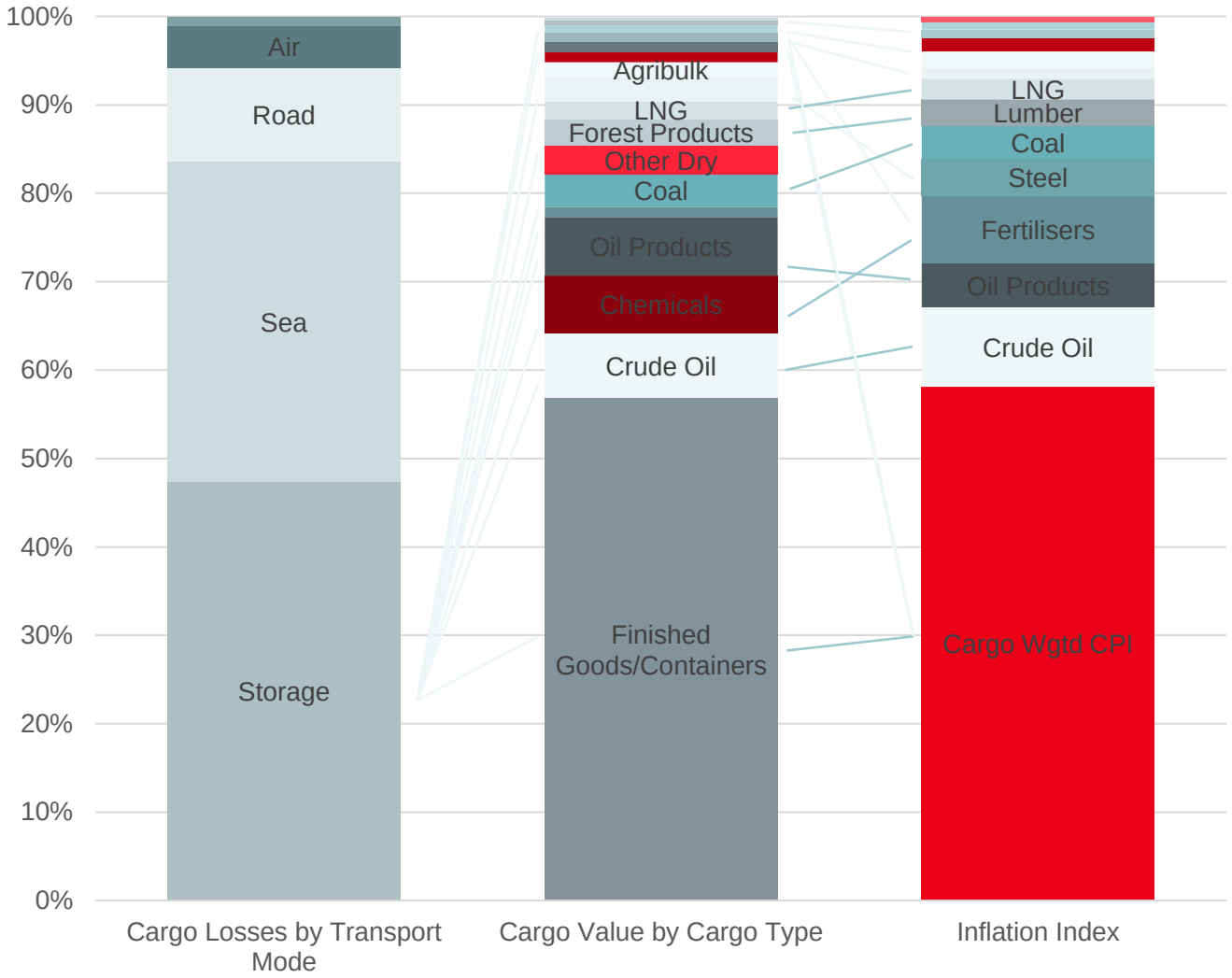
Using External Indices

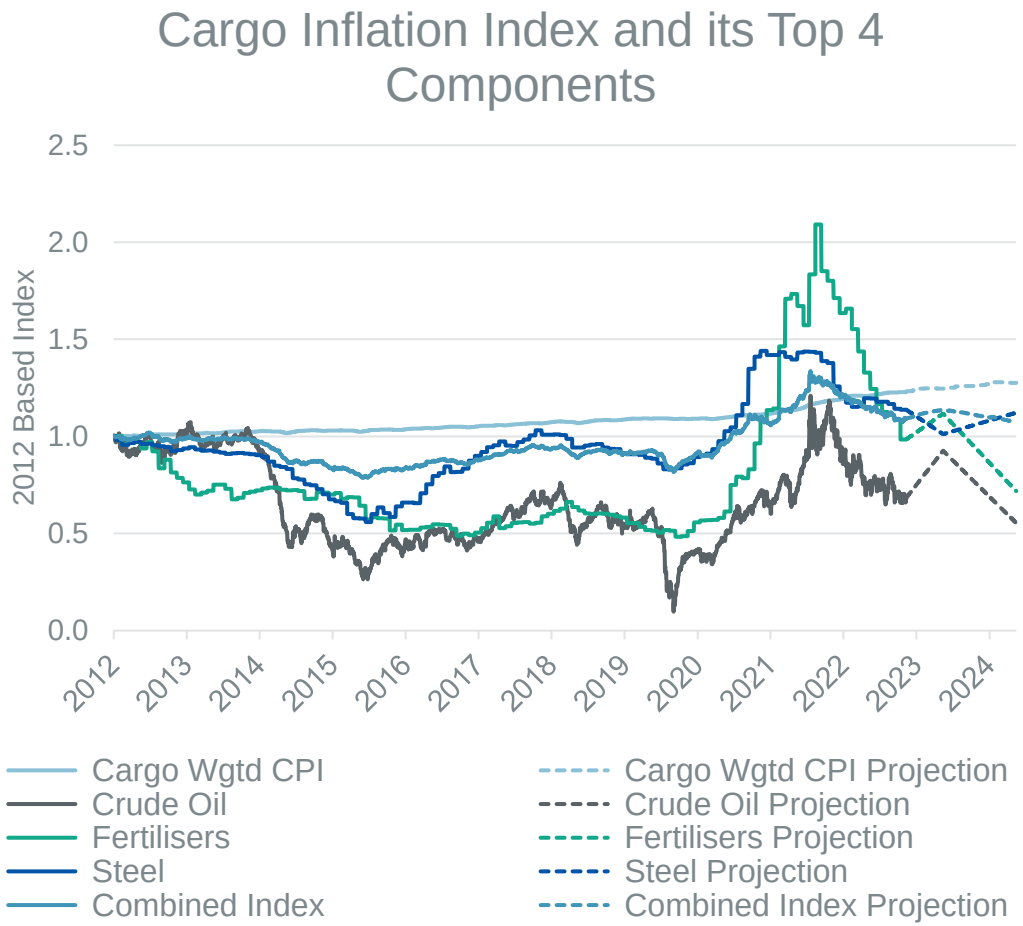


Why indices matter

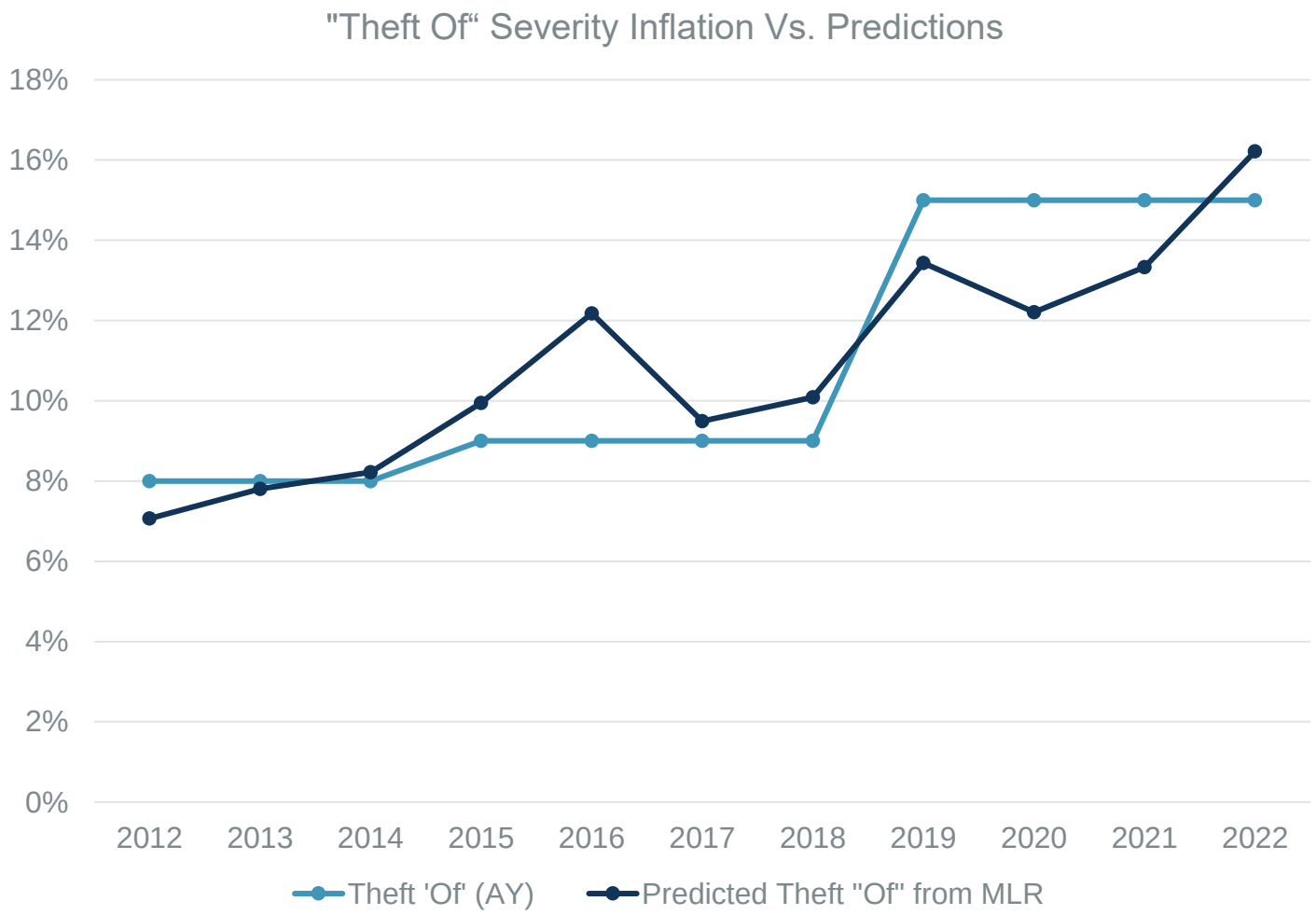


First Principles Approach



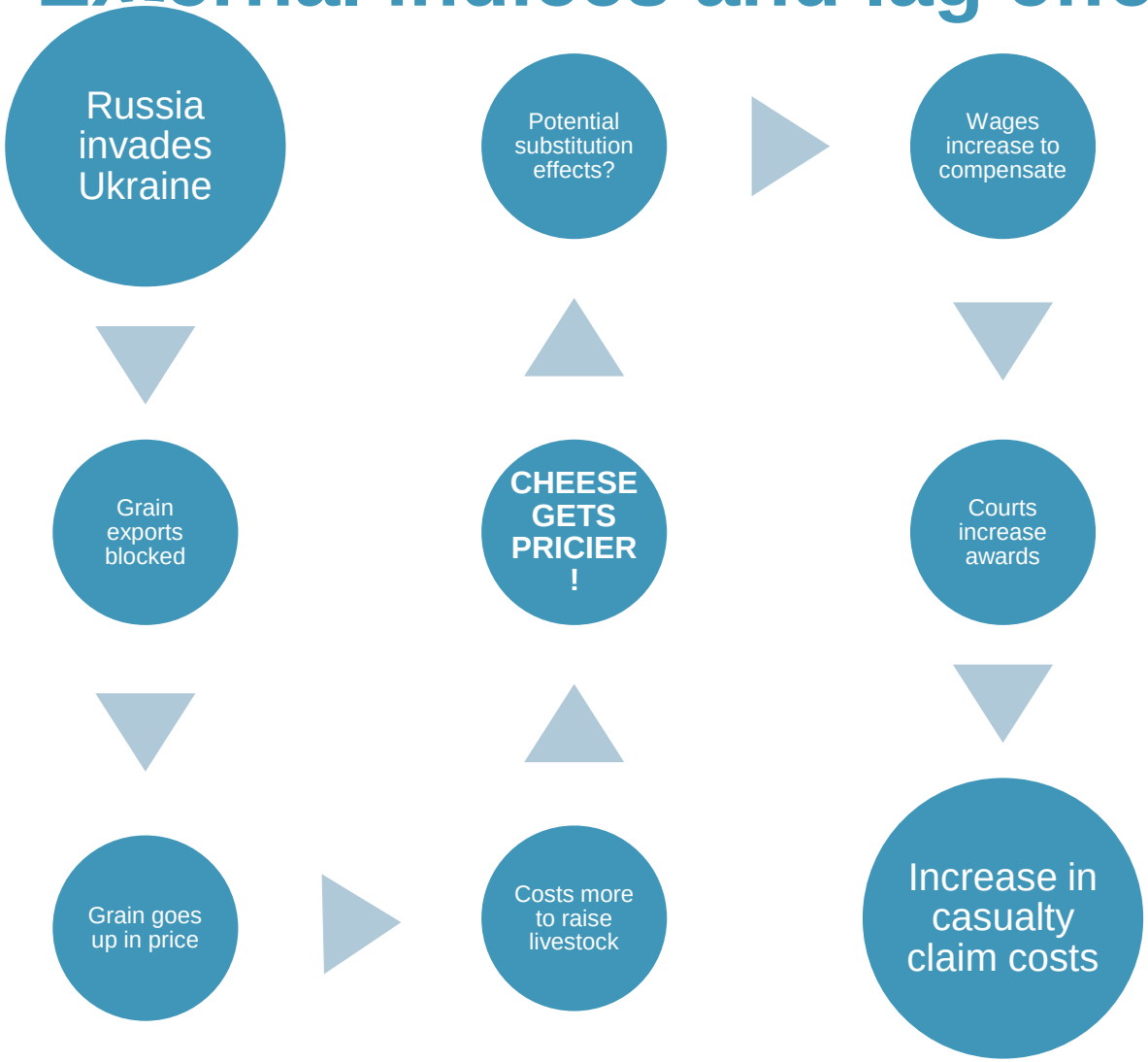


Fitting Approach – Initial Experiments



- Estimated vehicle theft claim severity inflation from data provided (kindly) by ABI
- Obtained UK CPI and PPI breakdown and first assessed correlation of components against fitted claims' inflation.
- Metal production inputs, earnings and tobacco (!) found to be heavily correlated.
- Accordingly, applied multi-linear regression model of these indices against estimated inflation.
- Surprisingly successful fit!

External indices and lag effects – working theory



- Shocks will take time to work their way through the economy.
- This effect will vary class to class.
- Even after we map UWY/AY claims inflation to calendar years, inflation in payments may not temporally correspond with economic inflation.
- Accordingly, ought to test fitting indices against lagged inflation.
- As a corollary, inflation spikes may also distort payment patterns.

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Applying Inflation – Why this matters

On-levelling

Exposure inflation, claims inflation, rate change and RARC

GIRO 2022 Extract

Simplified examples (assuming no frequency trend or other external factors):

- Property: Exposure measure: Insured Value
- Client A has 1 factory to insure
- Year N: The insured value is estimated at $100m.
- To price the risk, a rate is applied to insured value: 0.1%
- Premium in N = $100m * 0.1% = $100k
- Year N+1: The insured value is re-estimated at $110m
- To price the risk, the same rate is applied : 0.1%
- Premium in N+1 = $110m * 0.1% = $110k
- From N to N+1:
- Premium (Exposure trend) : increase by $10k (+10%)
- Rate change : 0%
- Loss trend : 0% (assuming declared insured value captures perfectly claims inflation)
- Expected impact on loss ratio : 0%

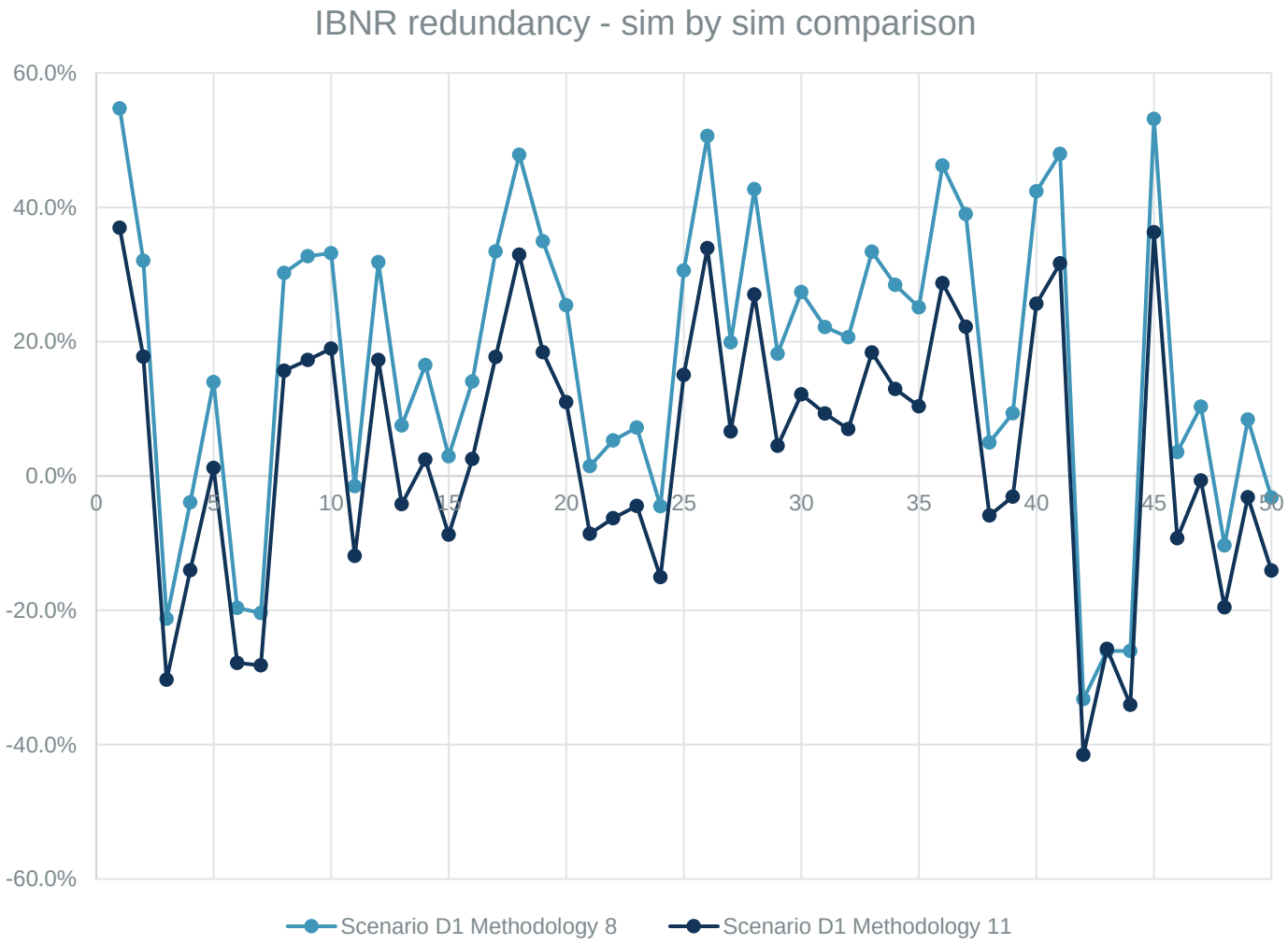
- Motor: Exposure measure: number of vehicles
- Client A has 1,000 vehicles to insure
- Year N: Premium per vehicle is estimated at $100
- Premium in N = 1,000 * $100= $100k
- Year N+1: Due to increase in repair cost, premium per vehicle is revised up to $110. Number of vehicles is unchanged.
- Premium in N+1 = 1,000 * $110= $110k
- From N to N+1:
- Premium : increase by $10k (+10%)
- Rate change : 10% (increase of the premium per unit of exposure)
- Loss trend : 10%
- Expected impact on loss ratio : 0%

- Trite, but: claims are claims and exposure is exposure.
- On-level claims with “best” view of inflation, regardless what client says, as we need to see distributional and not just LR impact!
- On-level exposures for exposure inflation and rate change (not RARC), making additional allowance for client inflation assumption if needed (and we can get it).

- **At very least, be mindful of any short-comings in your on-levelling!**

Reserving

If we know inflation is volatile, what method(s) get most accurate reserves?



- Loaded BF priors
- IACL
- Cashflow uplift
- Explicit management load

- **This was the focus of our 2024 research. Paper to follow!**

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Closing Remarks

Closing Remarks

“Unfortunately, claims inflation is notoriously difficult to measure with any degree of certainty”

- Various methods require considerable care and judgement
- Large dataset required to separate the effects of inflation from random variability or process error
- Generally, individual claims methods performed better than aggregate claims methods but may be time-consuming
- BC method impactful, but of dubious use, given gearing considerations
- Settlement vs. origin year inflation challenges
- How best to gauge sensitivity of claims inflation to economic metrics, so as to react rapidly?

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  - Greg Taylor of UNSW;
  - Dave Clark of Munich Re; and
  - Kate Bible of Aon.

Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

The views expressed in this presentation are those of the presenters.

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Appendices