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Economic Inflation and Impact on Reserving (C4)

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Agenda

- Economic Inflation
- Economic/Claim Inflation Impact on Different Classes
- Estimation of Claim Inflation –
  - Bottom-up Analysis
  - Top-down Analysis
- Reserving Methods to Reflect Claim Inflation
- Further Consideration in Setting Assumptions
- Claims Diagnostics to Monitor Inflation and Update Assumption

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Inflation Crisis Around the World

More than 90 countries have seen protests against rising fuel and food costs

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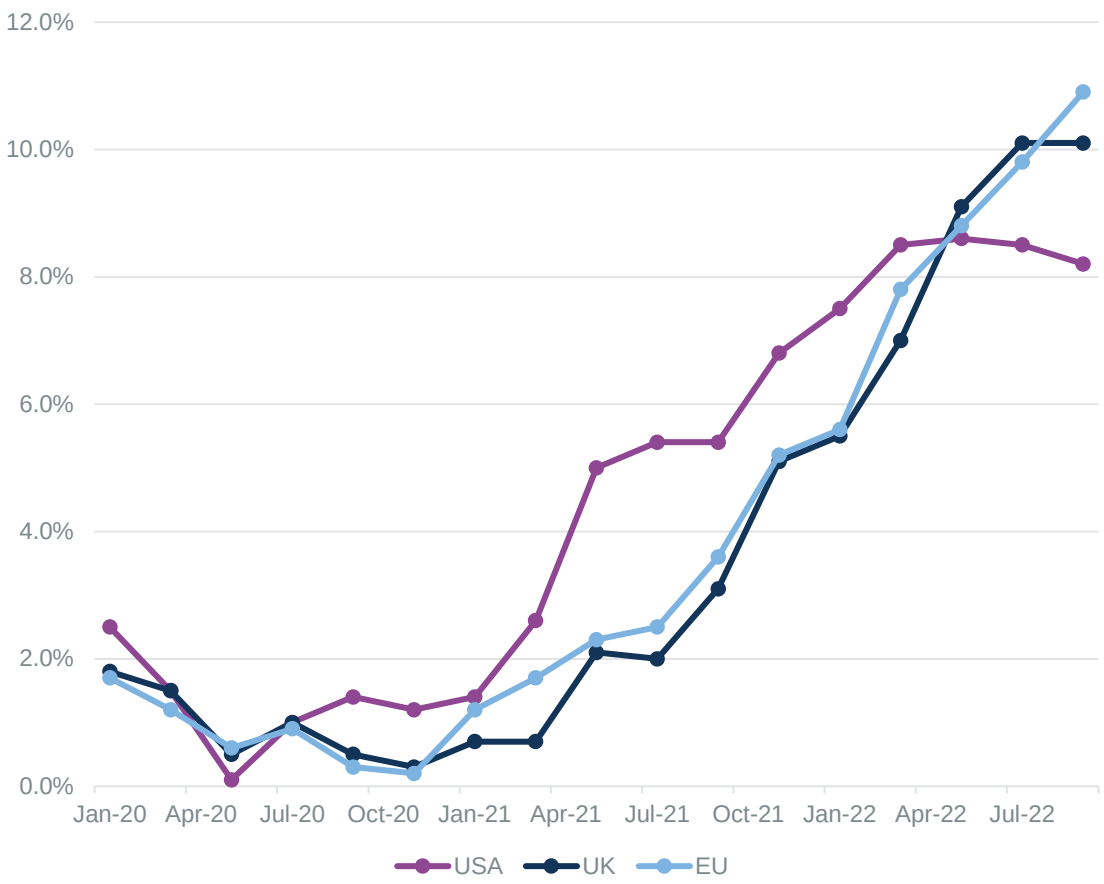
Economic Inflation - CPI Comparison Since Jan'2020



- As of September 2022, the inflation rate in the European Union was 10.9 percent, with prices rising fastest in Estonia, which had an inflation rate of 24.1 percent
- As per BoE inflation is expected to fall sharply in the UK from middle of 2023.
- In the US core Personal Consumption Expenditure (PCE) inflation (excluding Food and Fuel) is expected to come down to the Fed's 2 percent medium-term target by late 2023.

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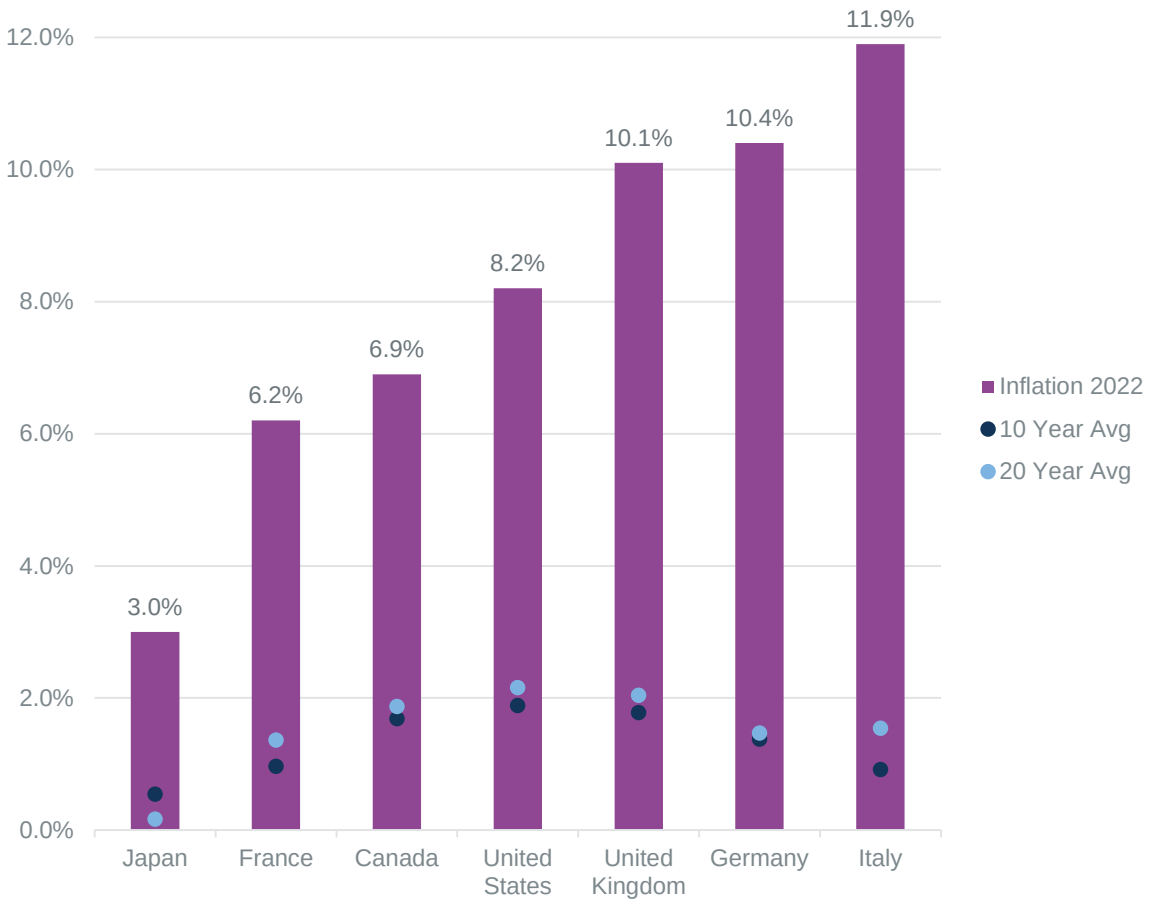
Economic Inflation - CPI Comparison G7



- All major economies are seeing a materially higher level of economic inflation (measured by CPI) in 2022 than the average over the last 10 to 20 years
- The principle of the history being a good guide to the future is therefore broken when narrowly looking at economic inflation
- Economic inflation compounded with other factors, including those listed below, brings a huge challenge to the accuracy and interpretation of actuarial analysis:
  - Indirect COVID 20/21
  - Interest rate volatility
  - Exchange rate volatility
  - Economic Growth volatility
  - Supply Chain delays
  - Russia/Ukraine
  - Non-economic inflation

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Inflation in Insurance Context

- **Economic Inflation** : changes in claims costs as captured through published economic indices relevant to a (re)insurer's mix of business. Typically, this is inflation in the cost of a basket of selected goods and services or average wage costs, which are captured in price and wage indices (such as RPI, CPI and ASHE in the UK, which are produced by ONS).

- **Claims Inflation** : is the change in the expected claims cost level of a like for like policy in an economy over time. In this context "like for like" means constraint by policy wording.

- **Excess Inflation** : changes in claims costs beyond what is captured in economic indices, including factors which are specific to a (re)insurers' business and including social inflation. Typically, this is inflation associated with resources specific to the nature of the claims costs of the (re)insurer (beyond that captured in generic inflation indices); or emerging risk from new materials, medicines and technologies; changes in the legal environment; evolving social attitudes towards claiming; and political developments.

- **Social Inflation** : is a subset of excess inflation, which more narrowly pertains to claims inflation as a result of societal trends. This includes rising costs of claims resulting from increased litigation, broader definitions of liability (excluding those caused by changes in policy terms and conditions), more plaintiff-friendly legal decisions, larger compensatory jury awards and social movements.

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Economic / Claims Inflation Impact
Short & Long Tail

Short Tail Lines

- Driving Claim Inflation:
  - Cost of labor and materials
  - Supply chain disruptions

- Is inflation in the data?
  - Seen instances where shortages of materials and labor result in increased claim costs?
  - Factors mitigating further case development:
    - Many contracts specify coverage of costs at time of damage, not at time of repair.

Long Tail Lines

- Property Damage Liability Claims
  - Reflect current inflated cost of damages

- Other Long Tail Claims
  - Less correlated with economic inflation (negotiated settlements),
  - Other factors drive claim costs (e.g., Social Inflation in Bodily Injury)

- Legal and vendor expense
  - Will experience pressure from wage inflation

- Expect impacts will bleed in slower, after prolong period of high economic inflation.

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How to Estimate Claims Inflation
- Bottom up
- Top Down

Bottom-up Analysis

Analysis by Geography, Class of Business and Heads of Damage

Heads of Damages - **Property**

- Main Coverages
  - Property Damage
  - Building and Contents
  - Business Interruption
- Method
  - Inspection of prior year loss ratio
  - Monitor industry construction cost trends
  - Monitor insured value trends

Heads of Damages - **Motor**

- Main Coverages
  - Bodily Injury
  - Physical Damage
  - Medical Payment
  - Legal Cost
- Method
  - Inspection of prior year loss ratio
  - Frequency & Severity trends in external data
  - Compare to internal Experience

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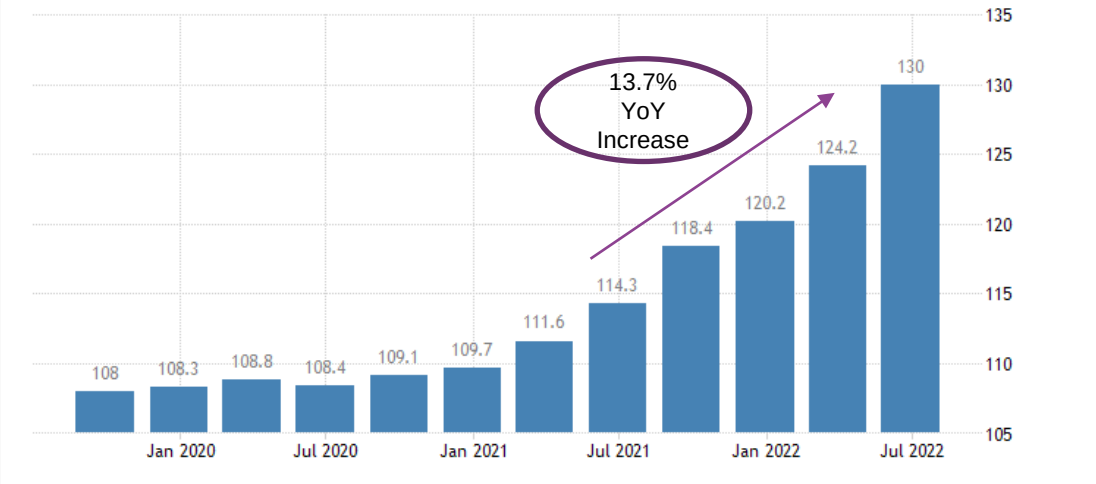
Property - Market Construction Cost Indices

European Union - Construction cost index



Source: https://tradingeconomics.com/

US - Construction cost index

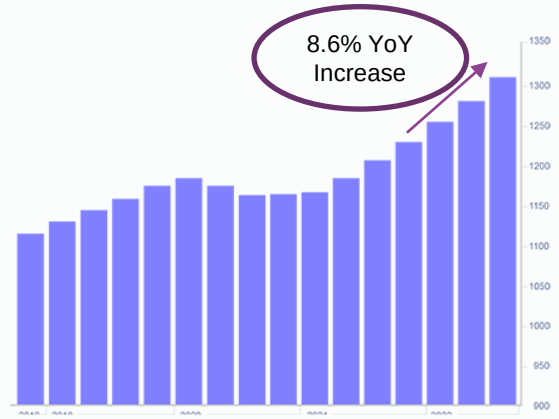
Cost Index

Turner's Third Quarter Building Cost Index: Wages are Increasing for Skilled Labor in the Construction Industry

Third Quarter 2022 Turner Building Cost Index—which measures costs in the non-residential building construction market in the United States—had increased to the value of 1311. This represents a 2.18% quarterly increase from the Second Quarter 2022 and an 8.62% yearly increase from the Third Quarter 2021.

"A focused and strategic approach to procurement that engages contractors, designers, suppliers, manufacturers, and clients reduces the risk of price escalation and produces the most competitive results for our clients."

Attilio Rivetti
Vice President



Quarter	Index	% Change
3rd Quarter 2022	1311	2.18
2nd Quarter 2022	1283	2.23
1st Quarter 2022	1255	2.03
4th Quarter 2021	1230	1.91

Source: https://www.turnerconstruction.com/

UK- Construction cost index – ONS

As at Sept, YoY increase in UK is 10.1% for all constructions, including new work and repair & maintenance

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Estimate Property Severity Inflation

- Scenario
  - 50% US and 50% UK exposed
  - 70% Property Damage and 30% Business Interruption

		US	UK	Total Business Mix
		50%	50%	
Property Damage (CoC – slide 11)	70%	8.6%	10.1%	9.4%
BI (CPI – slide 5)	30%	8.2%	10.1%	9.2%
	Total Geography Mix	8.5%	10.1%	**9.3%**

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Loss Trend

Loss Trend reflects anticipated inflationary impacts on losses over and above those impacting the exposure measure along with changes in anticipated loss frequency. This can be expressed as:

Loss Trend = (1+Frequency Trend) x (1+ InflLoss)/(1+ InflExp)-1

InflLoss is the inflationary impact on loss severity

InflExp is the inflationary impact on exposure measure

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Motor – Types of Inflation

- Physical Damage (PD)
  - Auto Repair Cost Inflation (including wage inflation)
  - Costs for Used Vehicles
- Liability/Injury
  - Medical Inflation
  - Legal Cost, Court Award Inflation & Wage Inflation
  - Social Inflation Impact on Severity & Frequency - e.g. more legal claim?
- Other Factors to Consider
  - Frequency Trend – negative?
  - Out of Court Settlement – favourable?

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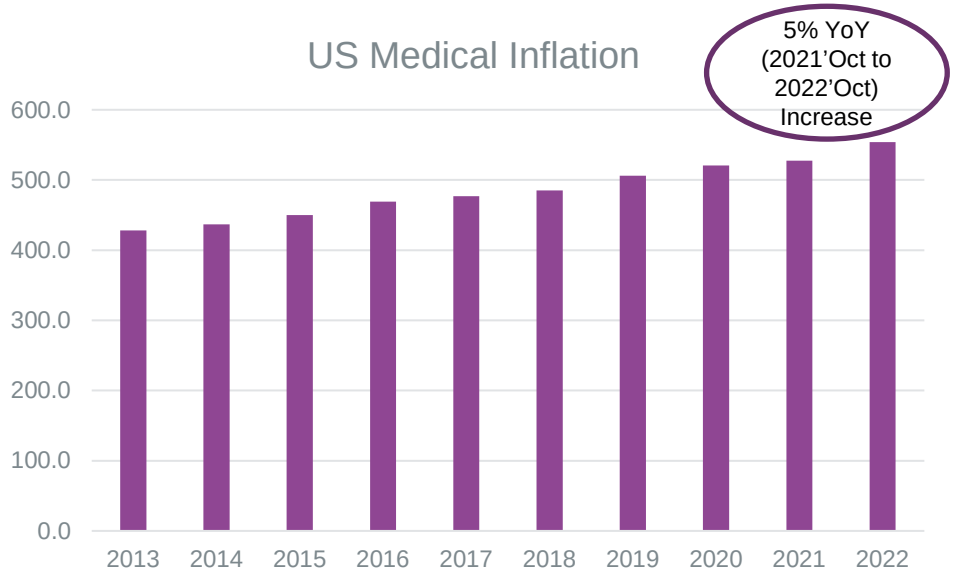
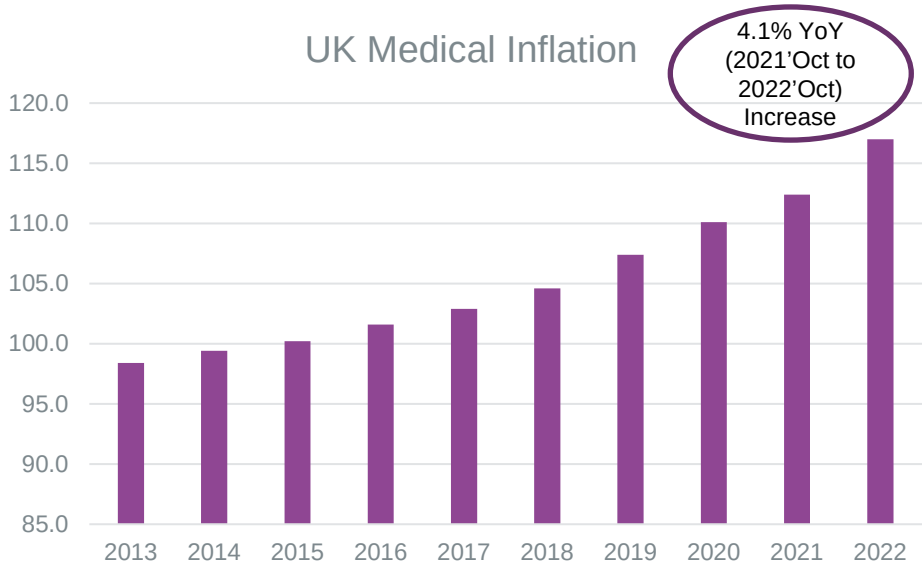
Medical Inflation



Source: Bureau of Labor Statistics Data (bls.gov)



Source: https://www.ons.gov.uk/

- 5-year average for US before 2022 is about 2.4%
- 5-year average for UK before 2022 is about 2.0%

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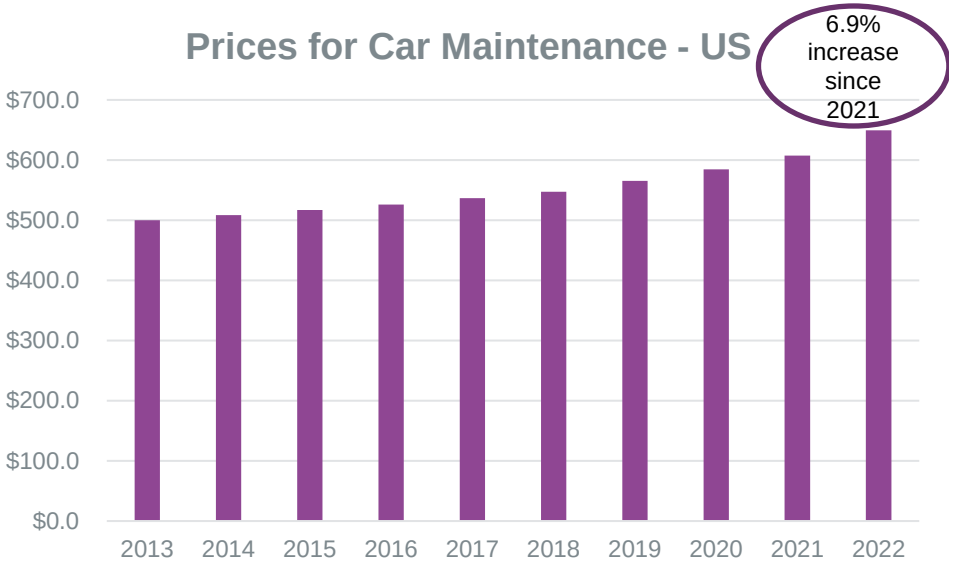
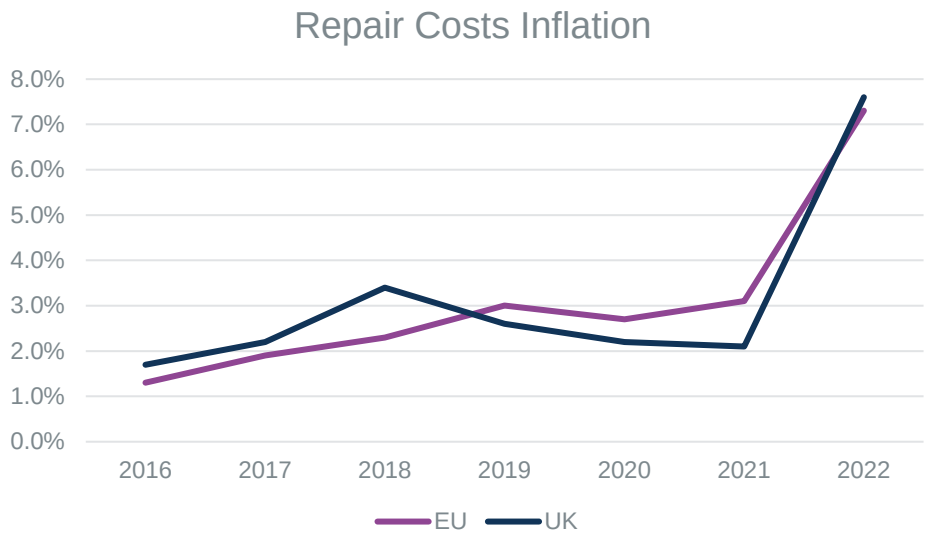
Auto Repair Cost Inflation



Source: https://www.officialdata.org/



Source: https://www.ons.gov.uk/
https://ec.europa.eu/

- US - Car maintenance experienced an average inflation rate of 2.95% per year. Compared to the overall inflation rate of 2.53% during this same period, inflation for car maintenance was higher.
- UK & EU – Repair Cost inflation in both EU and UK is above 7% compared to 3% and 2% in 2021 respectively.

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Estimate Trend for Auto Physical Damage

- Severity: 7% assumed based on Auto Repair Cost index
- Frequency: -2% assumed based on internal/external study
- Exposure: 0%
- Rates: 8%

Loss Trend = (1+Frequency Trend) x (1+ InflLoss)/(1+ InflExp)-1

= 5%

A 60% loss ratio in 2021 would be around 58.3% for 2022 based on 5% loss trend and 8% rates achieved.

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Inflation linked Exposure and Rates

The exposure measure will impact both the level of Loss trend and Rate change: An exposure measure that does not capture well the increase cost of the risk will (in an inflationary environment) generates high-Rate change, offset by high loss trend

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%

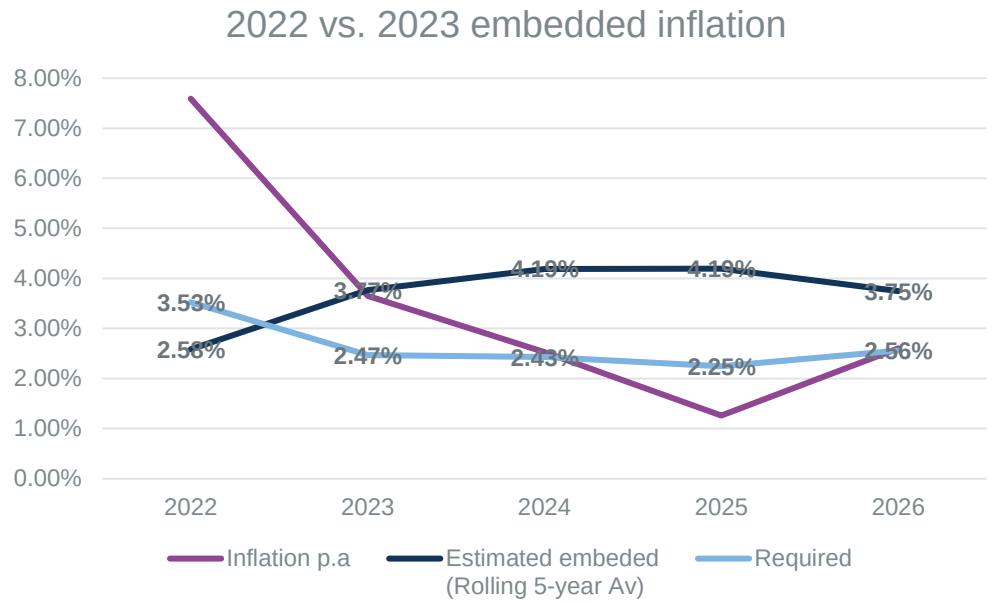
- Motor: Exposure measure: number of vehicles
- Client A has 1,000 vehicles to insure
- Year N: Premium per vehicle is estimated at $100
- Premium in N = 1,000 * $100= $100k
- Year N+1: Due to increase in repair cost, premium per vehicle is revised up to $110. Number of vehicles is unchanged.
- Premium 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%

Prior Year Top-down Reserving Analysis (1 of 2)

Additional Inflation Reserving Load

General Approach

1. **Top-down** deterministic analysis to estimate the impact of relatively higher current/future inflation vs. previous
2. Add a **reserve load** given level of inflation embedded in the reserving assumptions, notably **chain ladder,** being too 'low'
3. Reserve load calculated using cash flow model and applies **additional inflation** factor to future cashflows
4. Additional inflation factor can be calculated as:
    1. **Base Additional Inflation; Relative level** of historical CPI to current/future CPI
    2. To what extent prior year reserve movements are expected to or have been **correlated** to historical changes in economic inflation
    3. Any mitigating factors / **dampening**, such as certainty in case reserves, either due to agreed settlements/assessed costs/fixed costs/losses at limits & outwards reinsurance, frequency impacts, line of business specific loss trends
    4. Alternatively there can be **gearing impacts** present
    5. Any **lag** required between the timing of inflation in the cash flows vs. CPI index
    6. Risk groups are selected at **highest** reasonable level



Additional Inflation @ t =

Base Additional Inflation @ (t + lag) X

Mitigating / Dampening Factors X

Gearing Impacts X

Note: Numbers in chart are for illustration purposes only

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Prior Year Top-down Reserving Analysis (2 of 2)

Additional Inflation Reserving Load

GENERAL CONSIDERATIONS

1. Correlation of economic inflation to other types of inflation e.g. social inflation
2. Double counting & granularity

Additional Infl' Load	Additional Economic	Top Down
Chain Ladder	Historic Claims	Reserve Class
Loss Ratio	Expected Claims	Planning Line

3. Correlation of movements in historical vs. future economic inflation to movements in future to prior year reserves difficult to statistically prove; e.g. hidden by social inflation trends or indirect COVID
4. Approach may work better for larger organisations and 'noisy' data (e.g. some commercial lines)
5. Allocation from high level risk groups to more detailed granularity required

DISCUSSION ON USING CPI

1. CPI as a measure has a large amount of publicly historical data AND projections; many other indices may only have historical data
2. Estimating future inflation on indices other than CPI will likely require a significant level of expert judgment
3. We are trying to capture the general impact of additional economic inflation
4. Actual drivers of claims cost will differ to CPI, although may be relatable to components of CPI; and possibly correlated to changes in CPI.
5. Using CPI gives a link to other areas such as investments & assets.

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Methods to Reflect Inflation in Reserving

- Monetary load based on Top-down view
- IELR uplift bases on Bottom-up view
- Inflation adjusted Chain-Ladder method

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Further Consideration in Setting up Inflation Assumptions

- INFLATION EMBEDDED IN **EXPOSURE USED IN PRICING** CALCULATION OF PREMIUM **vs CLAIM LOSS** COST INFLATION
  - Exposure measure as proxy for risk
    - For lines of business where individual loss cost is closely aligned to the individual exposure measure (e.g. Sum Insured defines the payable loss amount) severity trend could be very small or zero
    - Where exposure measure is less predictive and loss cost may be subject to different inflationary pressures, then severity trend can be material. An example of this is where Turnover is used as an exposure measure. This may be relatively predictive in respect of prevalent frequency trend but does not always provide a good proxy for severity trend which is driven by other factors such as Judicial Inflation.
  - Reserving and Pricing assumptions on claim duration
    - At the time of Reserving and Pricing a defined settlement/cashflow pattern is assumed.
    - If payments end up being made materially more slowly than the timing assumed, those payment may accumulate more inflation, which increases the overall loss cost
  - Future inflation
    - At the time of Reserving and Pricing a long-term view of inflation is assumed.
    - If there are changes in the economy or other influences which mean future inflation is materially different to the long-term view, this can have a material impact on outcomes, especially for long tailed lines of business

- **SENSITIVE LINES OF BUSINESS**
  - Long tailed lines of business. Longer-tailed lines of business in general will likely see greater divergence between exposure variation and loss inflation due to timing of settlements
  - Less predictive exposure measure
  - Severity trend is largely positive, but frequency trend can be negative or positive (e.g. safety improvements improving loss frequency over time)
  - Frequency change is driven by market activity and influences as well as judicial decisions (e.g. Changes to safety rules/thresholds)

- FEEDBACK LOOP AND **USE OF EXPERTS** – Underwriting, Pricing, Claims, Reserving and Capital modelling

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Claims Diagnostics

- Incurred Link Ratios

AY/Dev Qtr	9-15	15-21	21-27	27-33	33-39	39-45	45-51	51-57	57-63	63-69
2017	3.952	1.666	1.214	1.055	0.990	1.008	1.007	1.000	1.000	1.000
2018	2.104	1.664	1.197	1.037	0.999	1.055	0.980	1.000		
2019	2.821	1.894	1.205	0.966	1.003	0.980				
2020	3.972	1.399	1.324	1.097						
2021	4.161	2.367								

- Case Reserves per Open Claim

Case Reserves per Open Claim ($000)

AY/Dev Qtr	9	21	33	45	57	69
2017	48	58	44	22	23	35
2018	17	48	76	64	135	
2019	29	61	71	119		
2020	45	85	148			
2021	25	154				
2022	81					

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Claims Diagnostics

- Average cost per Claim/ Frequency-Severity comparison by AY
- Paid-to-Incurred Ratio – Similar to Case Reserves per Open Claims
- Large Loss Experience – AvE

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 presenter.

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Resources

- https://www.statista.com/statistics/225698/monthly-inflation-rate-in-eu-countries/
- Worlddata: The world in numbers
- https://www.bls.gov/
- https://www.ons.gov.uk/
- https://www.imf.org/en/News/Articles/2022/07/11/CF-US-Economy-Inflation-Challenge
- Cost Index | Turner Construction Company

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Thank you

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