

A hand holding a silver pen points to a line graph on a grid background. The graph shows several lines in blue and red, with one blue line showing a prominent peak and subsequent decline. The background is slightly blurred, focusing attention on the graph and the hand.

Claims Inflation

An emerging risk for non-life insurers

**A presentation at IFoA Reserving Seminar
by Dr. Tobias Heinrich, Heike Klappach**

25 June 2014

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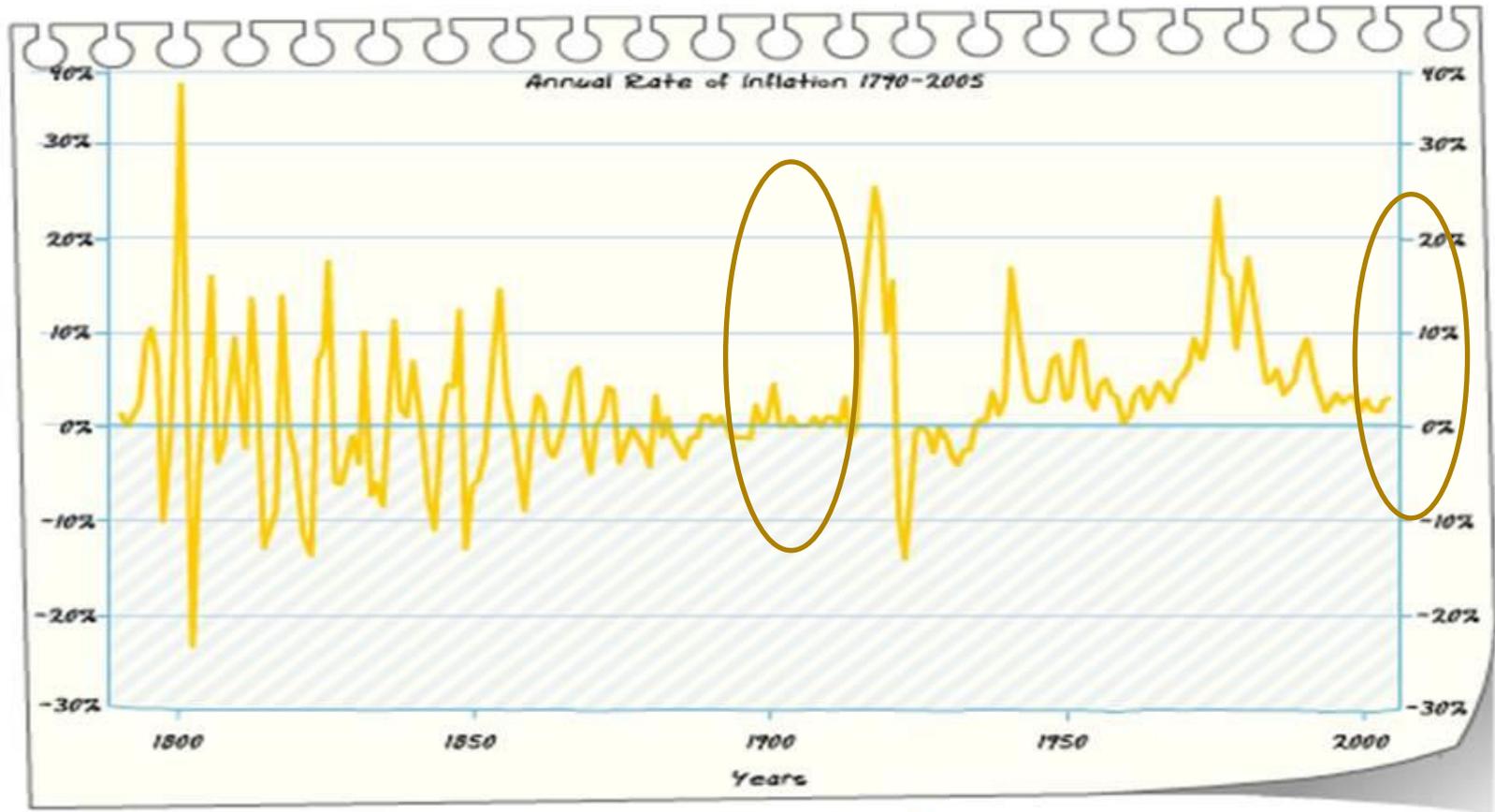


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Why do we worry about inflation if it is so low?

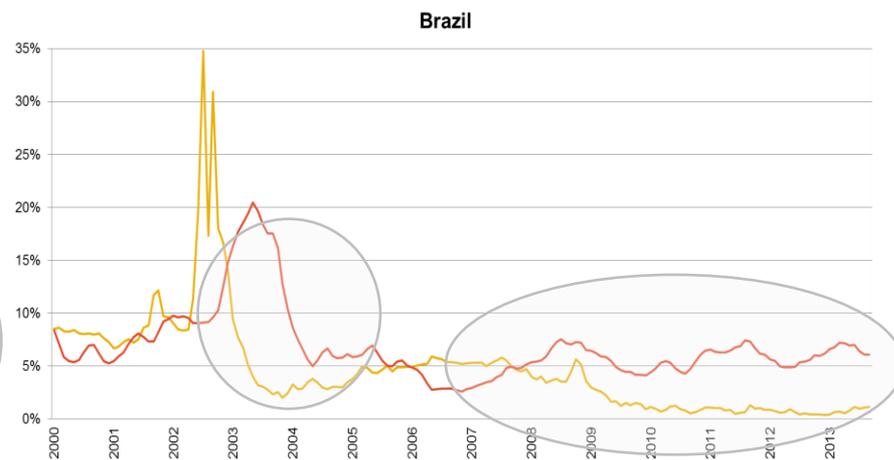
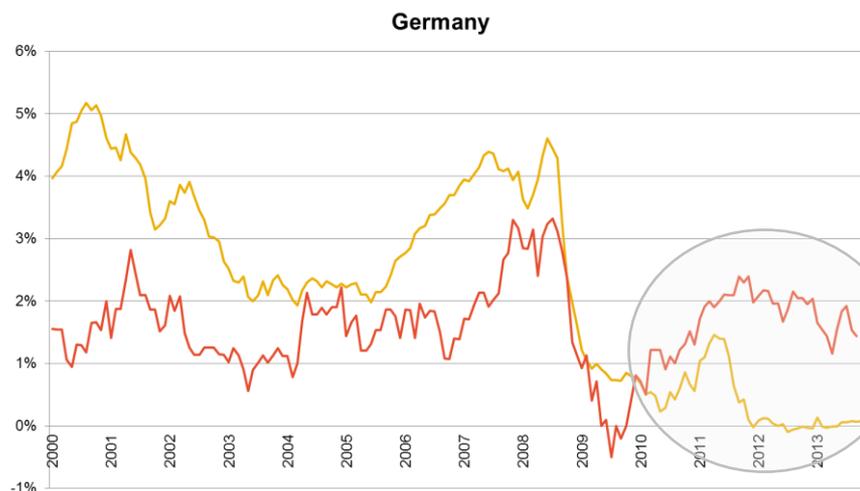
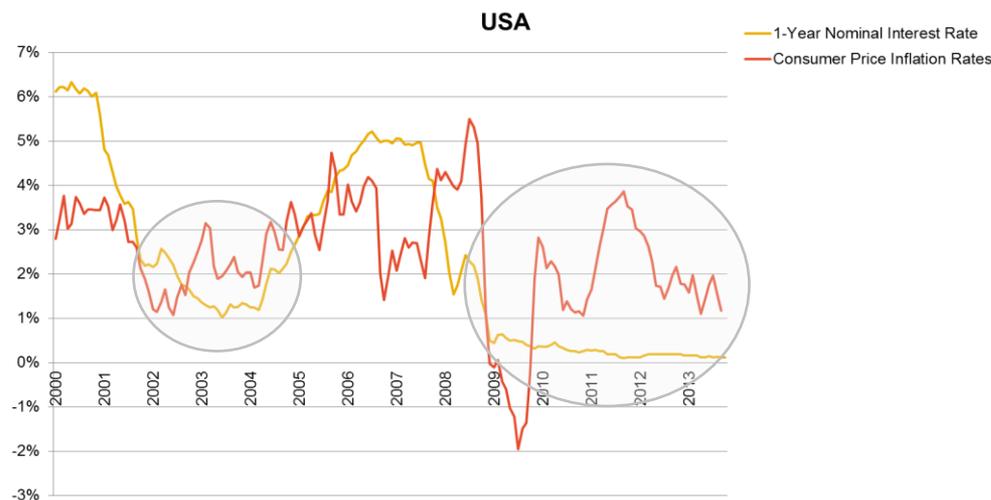
UK Inflation 1790-2005



Source: Bank of England

How did price inflation and interest behave in the past?

Looking at the liability side standalone, insurers have a major problem if the time value of money, measured by real interest rates, is less than the nominal value. This is the case if inflation rates (e.g. CPI) are higher than nominal interest rates.



Source: USA: U.S. Department of Labor: Bureau of Labor Statistics, Federal Reserve; Germany: Statistisches Bundesamt, Bundesbank; Brazil: Bloomberg

How does inflation impact non-life insurance liabilities?



If you know which parts of your business are impacted by inflation and how, you can manage risks from macroeconomic changes more effectively.

Why should you care?



Market challenges

Retroactive Reinsurance



In today's difficult investment environment, opportunities that offer sufficient security as well as promising returns are scarce – or non-existent. Low investment returns coupled with claims inflation threaten to undermine profitability, especially in long-tail business.

- » Incorporate inflation as an explicit risk factor
 - By explicit consideration of inflation, its economic impact on the overall balance sheet can be gauged



In Standard & Poor's Ratings Services' view, the UK non-life insurance industry is facing a number of significant regulatory developments at a vulnerable time

- » legal changes in April 2013 will seek to counter rampant claims inflation in motor bodily injury lines;

Are you ready?

Understanding the issue

Basic premise of insurance:

- Accept a fixed payment today
- In exchange for a contingent promise to pay an uncertain amount in future

Insurance risk:

- Contingency whether a claim event occurs
- Uncertainty – nominal amount of claim at today's prices & at fixed FX rates

Financial risk

- Inflationary level of claim at actual time of payment
- Level of claim in foreign currency

Insurance can be seen as including an implicit, contingent inflation (and FX) hedge

Uncomfortable questions

Current practice: Implicit projection of claims inflation already included in historical claims data.

But what if ...

- ... actual future claims inflation deviates materially past levels?
- ... the current economic environment with inflation rates far above nominal interest rates persists for another few years in most of the Eurozone?
- ... the beginnings of a European recovery lead to an upturn in economic activity which impacts claims frequency trends?
- ... costs of medical care and the utilization of medical services changes substantially?
- ... claims farming and changing social attitudes increase litigiousness further?
- ... Central bankers overreact to the threat of devaluation?
- ... actions by Central banks to combat unemployment leads to a sharp rise in inflation in some of the developed economies?
- ... South American countries experience further periods of economic and political turbulence: how will the effects of hyper-inflation and currency devaluation interact with your liabilities?
- ... a geopolitical event leads to an oil related shock, causing a spike in inflation?

Who in your organisation could assess the impact of these scenarios?

Common misperceptions



If there even is such a thing as claims inflation, it will emerge over a very long time. There is little need to worry now.



Claims inflation can have both immediate and long term effects

Even if future inflation is difficult to predict, it affects your balance sheet today. Under-reserving may lead to under-pricing, resulting in a P&L hit over time.

The risk is not necessarily the absolute level of claims inflation



I thought in Western Europe the danger currently was deflation. Are we not in an unusually low inflation environment?



Even if that were true. Real interest rates are negative in many Western European countries, so that even a low level of superimposed inflation will make it impossible to earn money on your reserves.



We already understand and manage claims inflation.



What does that mean? Are both BS and P&L protected? Do you take active measures to reduce the effect on claims costs? Have you adapted your reinsurance strategy and looked closely at product design and policy terms?

Inflation is a complex problem. Do not limit your options unnecessarily

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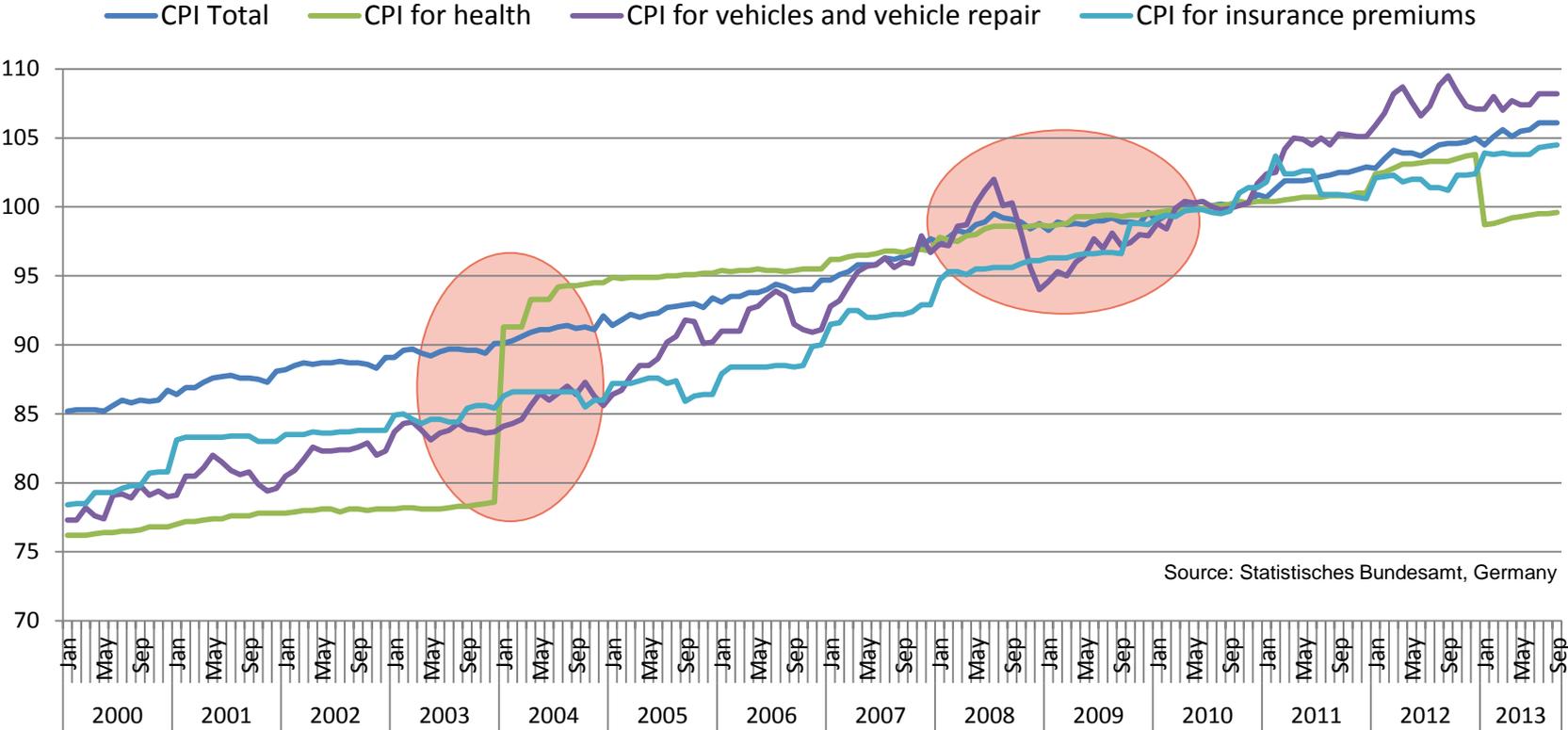
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Possible Claim Cost Drivers per Segment

German Consumer Price Inflation: Comparing different baskets



Source: Statistisches Bundesamt, Germany

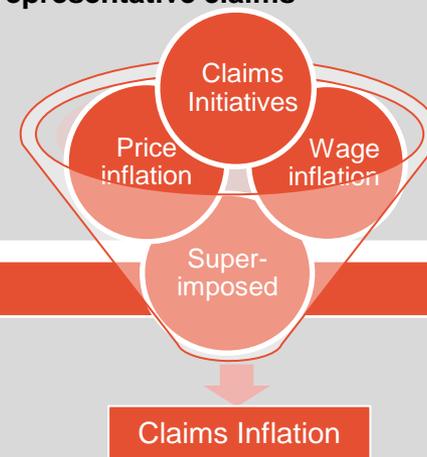
Claims costs are partially driven by price changes that are quantified by publicly available indices. These include regulatory changes that affect consumer spending, and do not include quality improvements of goods and services.

What is claims inflation in a portfolio?

Economic perspective

- Claims inflation = **Change in average price** of goods or services related to a specific **basket of representative claims**
- Due to **change in price level and/or change in utilisation**
- **Some explicit cost drivers:**
 - Medical cost and cost of care
 - Labor costs
 - Loss of income
 - Energy costs
 - Construction costs
 - Legal costs

→ **Official price and wage inflation drive elements of claims inflation**



Claims inflation versus economic inflation

- **Some implicit claim cost drivers:**
 - Litigiousness
 - Economic conditions
 - Legislative changes
 - Social factors

- **Additional technical claim cost drivers:**
 - Length of claim settlement
 - Legal obligations for insurers to incorporate inflation in their calculations (e.g. Ogden Tables in UK, Tribunal Tables in Italy)

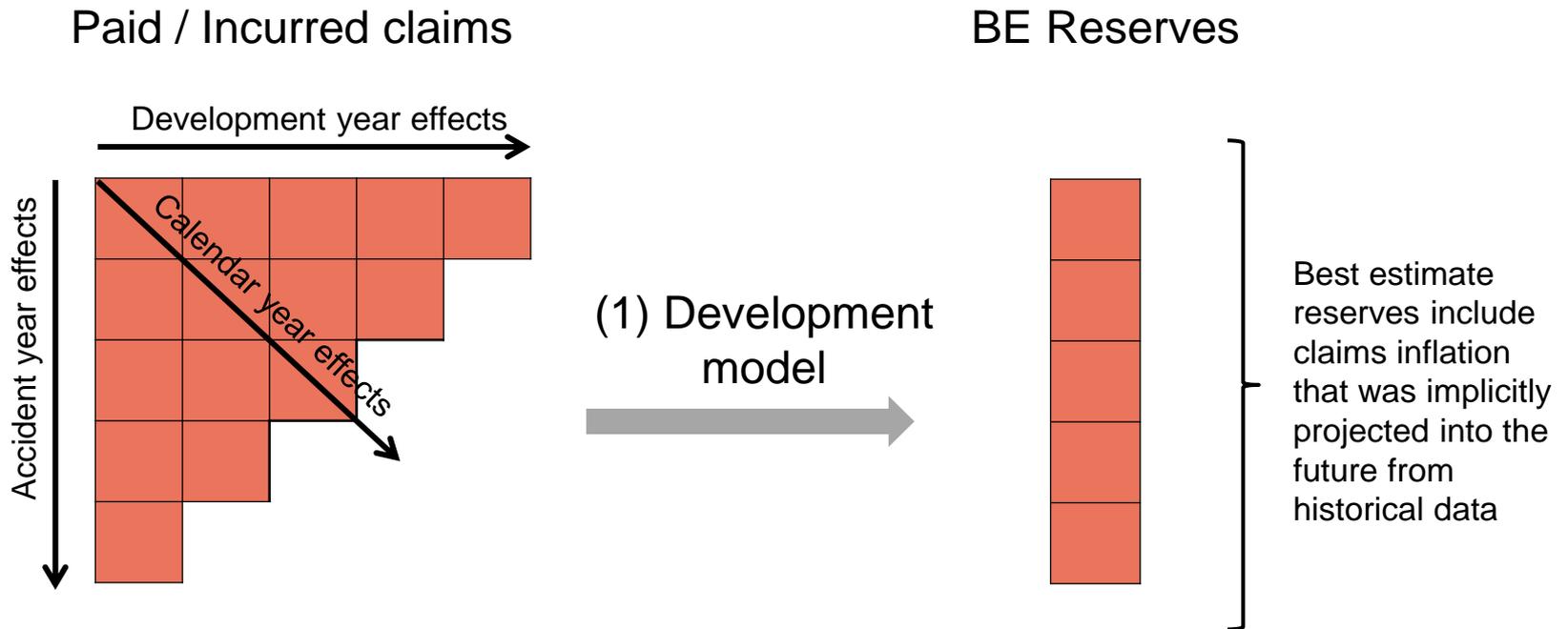
- Additive spread between claims inflation and price & wage inflation is called “**superimposed inflation**” (can be pos or neg)
- These effects of changes in utilisation and quality improvements are explicitly excluded in official inflation indices
 - If dependence b/w claims inflation and official inflation indices is small, then expert judgment on superimposed inflation is needed

Claims reserving perspective

- Claims inflation = **Change in per claim costs** in a specific portfolio
- Due to **change in severity and/or change in frequency**
- Affects the development factors alongside the diagonals (i.e. in **calendar year direction**)
- Might lead to under- or over-estimated claims reserves

Adequacy of Reserves

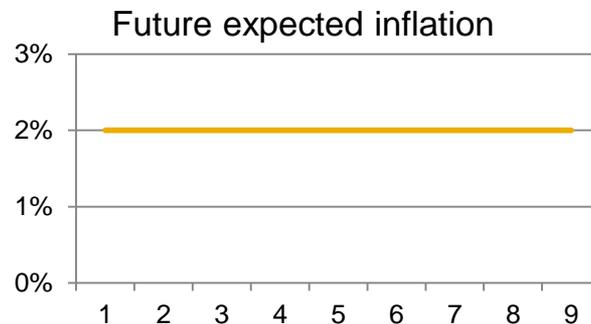
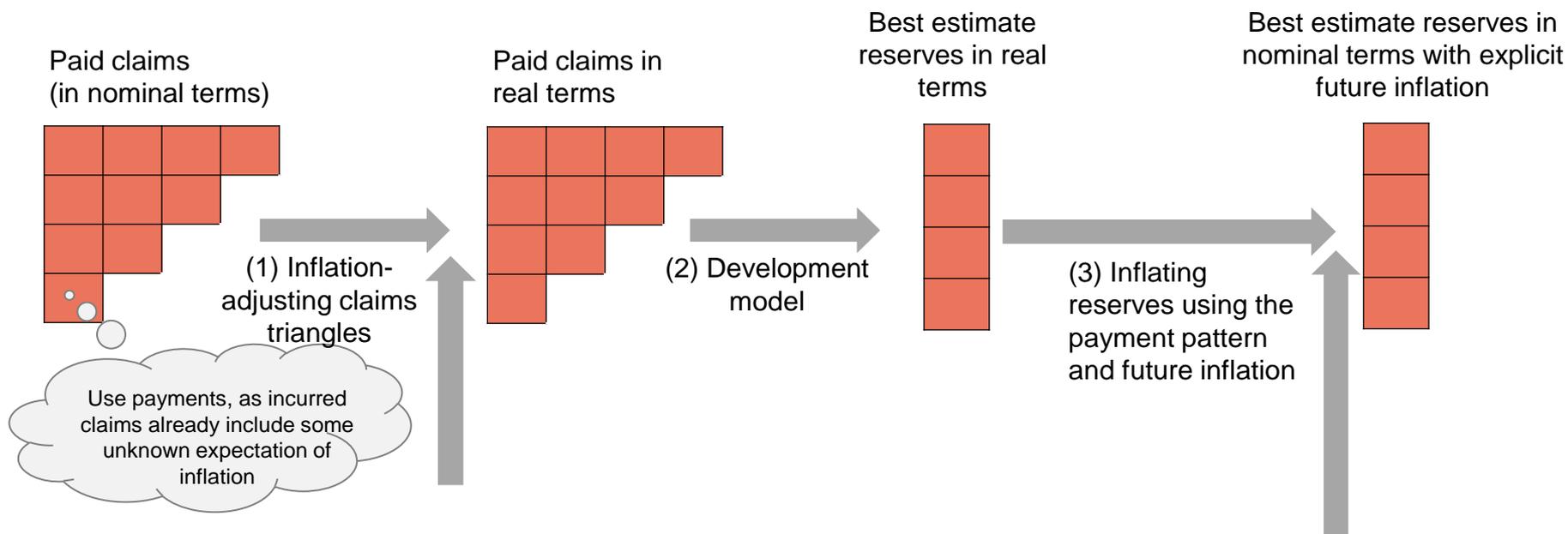
Status Quo: Accounting for claims inflation implicitly



This approach is easy and might be sufficient in calm market environments. However, it is inadequate if future claims inflation deviates materially from past levels! It doesn't facilitate the business to react appropriately to changes in the market environment.

Adequacy of Reserves

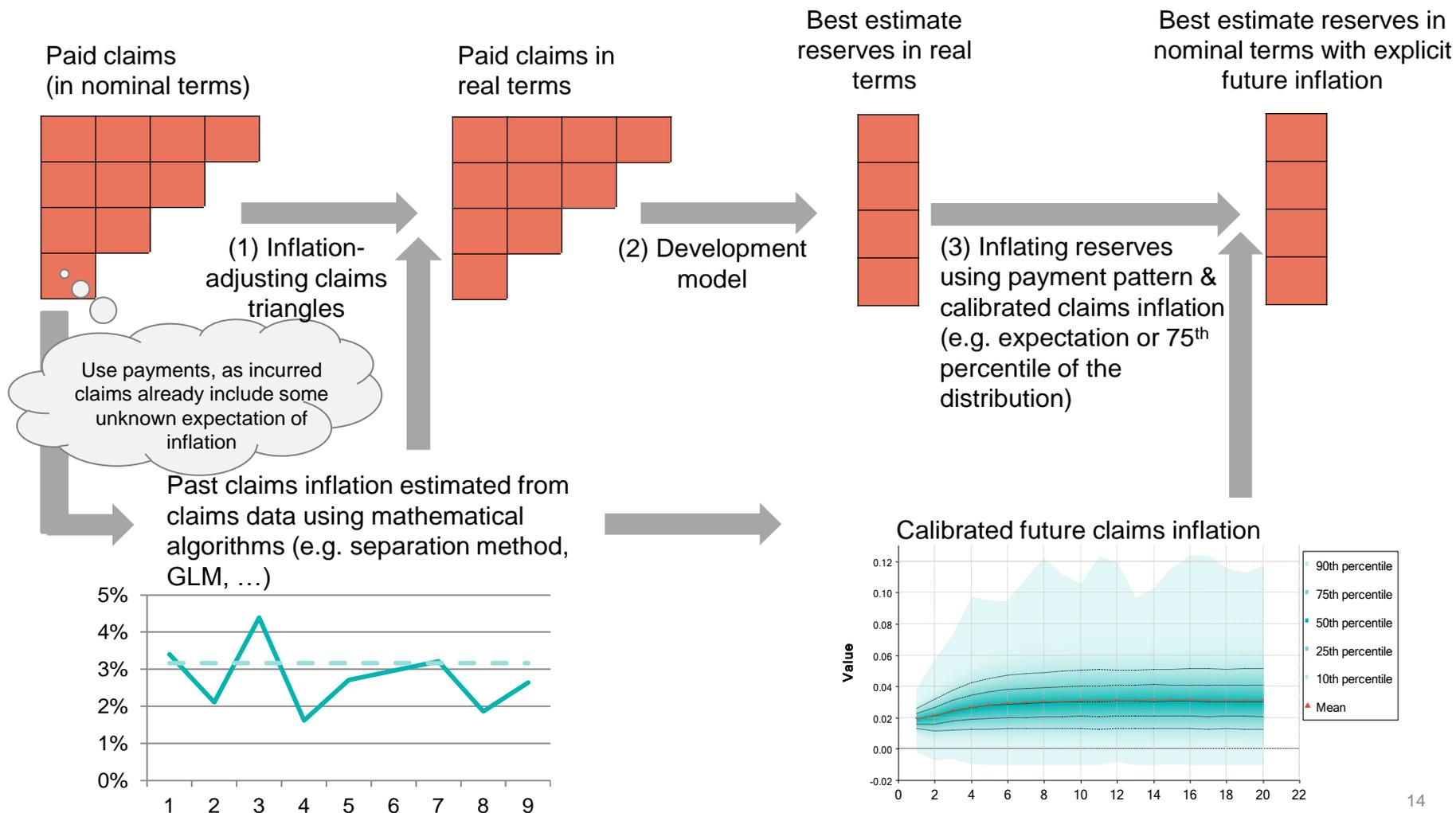
Status Quo: Accounting for price or wage inflation explicitly



Adequacy of Reserves

Improved methodology: Accounting for claims inflation explicitly

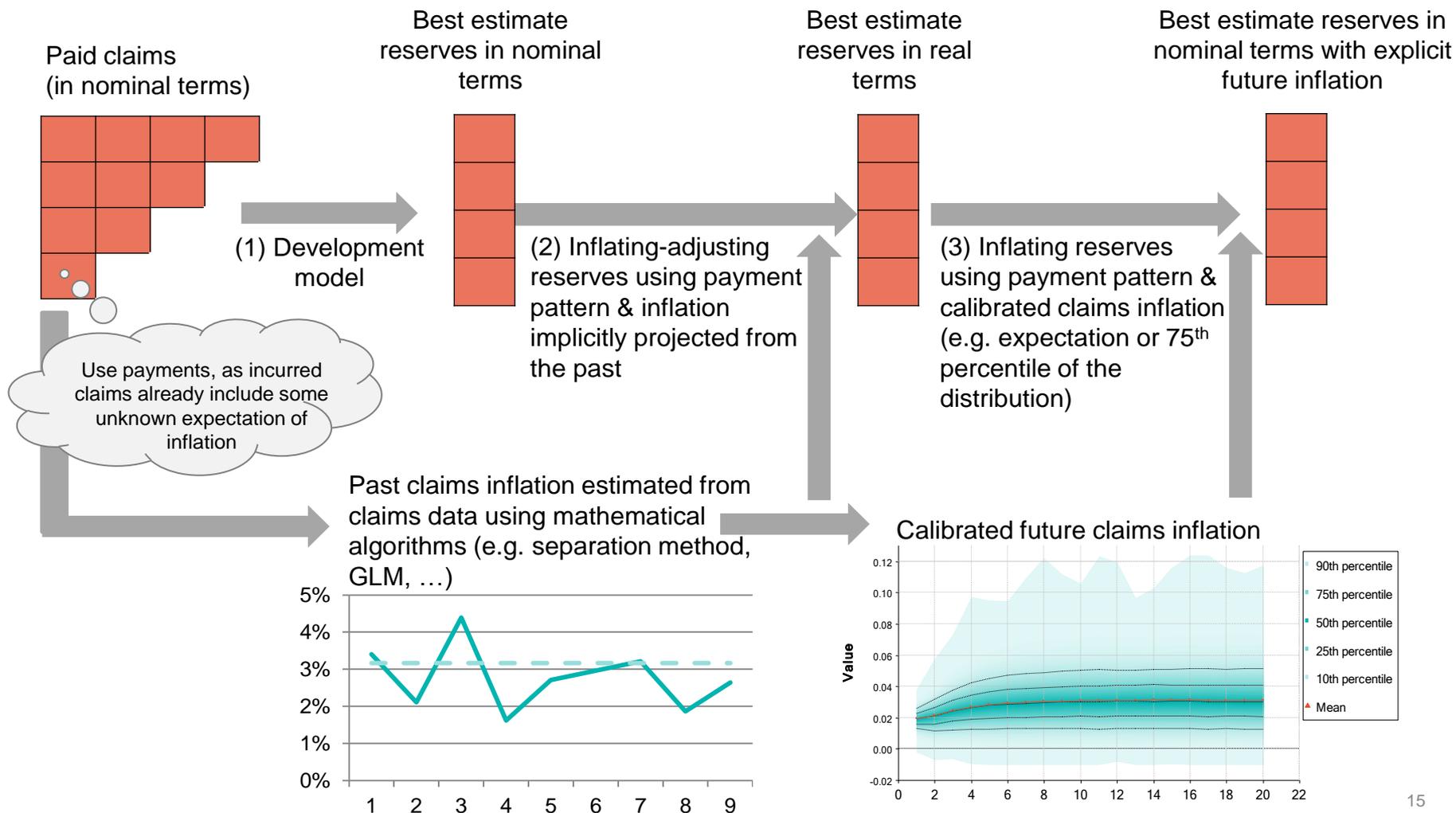
Example 1: Projections on adjusted triangles



Adequacy of Reserves

Improved methodology: Accounting for claims inflation explicitly

Example 2: Projections on un-adjusted triangles



How to Derive Claims Inflation

Per segment (and claim type):

Claims Inflation Calibration

- Link claims inflation to price and wage inflation
- Example method:
 - Derive historical claims inflation using mathematical algorithms (e.g. separation method)
 - Fit regression model on historical data with the following possible independent variables:
 - Price Inflation, Wage Inflation
 - Autoregressive component

Independent Variables for Regression Analysis	Regression Coefficients	P Value
CPI <input type="checkbox"/>	i: 1 1.4570	i: 1 0.0000
WI <input checked="" type="checkbox"/>	i: 2 0.0063	i: 2 0.1327
Previous Year <input type="checkbox"/>	Standard Error 0.0035	
Constant <input checked="" type="checkbox"/>		

Stochastic Future Calendar Period Claims Inflation

- Model future claims inflation
- Based on future inflation indices from ESG (price inflation, wage inflation, medical cost inflation)
- Based on fitted regression coefficients
- Based on expert judgment for the additional super-imposed Normal random element
- Interdependence in ESG thus leads to link between claims inflation and overall economy (GDP, interest rate development, etc.)

Claims Inflation Series	Price Inflation Factor	Wage Inflation Factor	Super-Imposed Inflation Mean	Super-Imposed Inflation CoV	Min Claims Inflation	Max Claims Inflation
Price driven claims inflation	86.30%	12.00%	-0.50%	25.00%	-1.00%	8.00%
Wage driven claims inflation	0.00%	145.70%	0.63%	25.00%	0.00%	10.00%
Social driven claims inflation	20.00%	20.00%	4.00%	25.00%	0.00%	10.00%

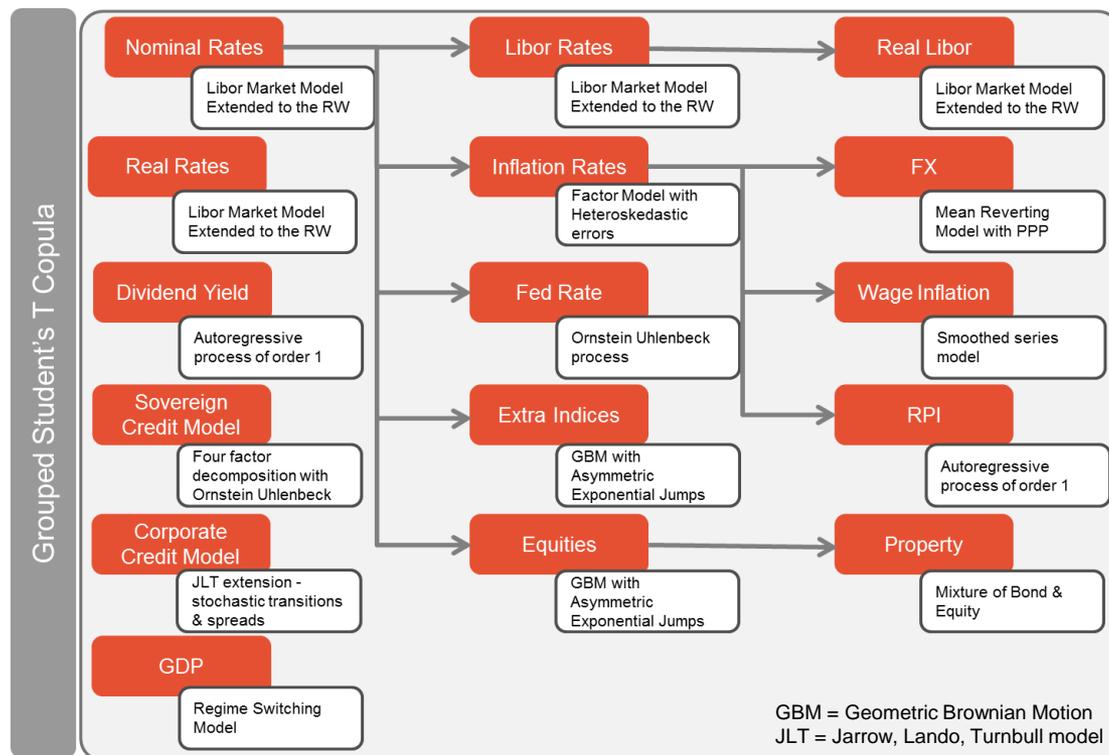
- Can also do stress tests, e.g.: What if superimposed inflation for segment X is 1% higher than assumed?

ESG

Possibly negative superimposed inflation due to technical innovations and efficiency, which aren't captured in official inflation indices

Modelling claims inflation based on ESG inflation projections

ESG Model Architecture



Inflation Models

Price Inflation

The price inflation (CPI) model is an autoregressive model of order 1. It captures the strong historical link between cash rates and inflation and the heavy tails of the historical distribution of inflation rates for most economies. The model allows projecting succeeding periods of 'normal' and 'extreme' inflation which is a good representation of historical patterns.

Wage Inflation

Wage inflation is modelled as a mean-reverting process that reverts to the smoothed level of price inflation, adjusted by a spread. The rationale behind this model is that wage inflation depends on price inflation, on one hand, and on the past values of itself, on the other.

Medical Care Inflation

Medical care price inflation (MCPI) is closely linked to the overall consumer price inflation. To better capture this link, we model MCPI rate as a spread on top of CPI. The MCPI spread process has a long memory. To capture this feature of the data, we model it as a second-order autoregression.

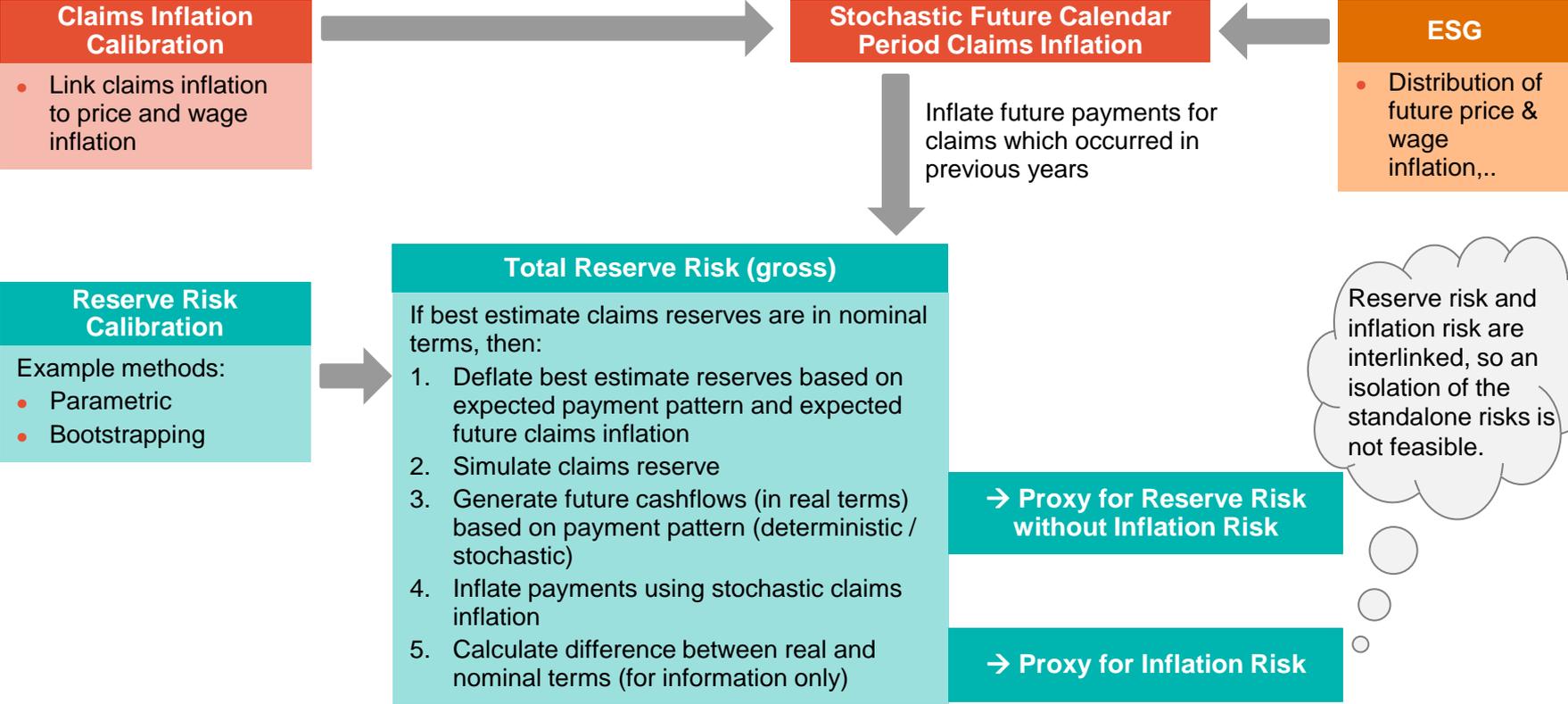
Dependencies in the ESG

The dependences between projected values of economic variables are created in 2 ways:

- An explicit formulaic link (e.g. projected inflation is a function of the projected interest rate) → "cascade approach"
- A link between the projected simulation scenarios of the economic variables (e.g. a negative equity return shock could be linked to a positive shock on credit spreads). This link is governed by a grouped Student's *t*-copula.

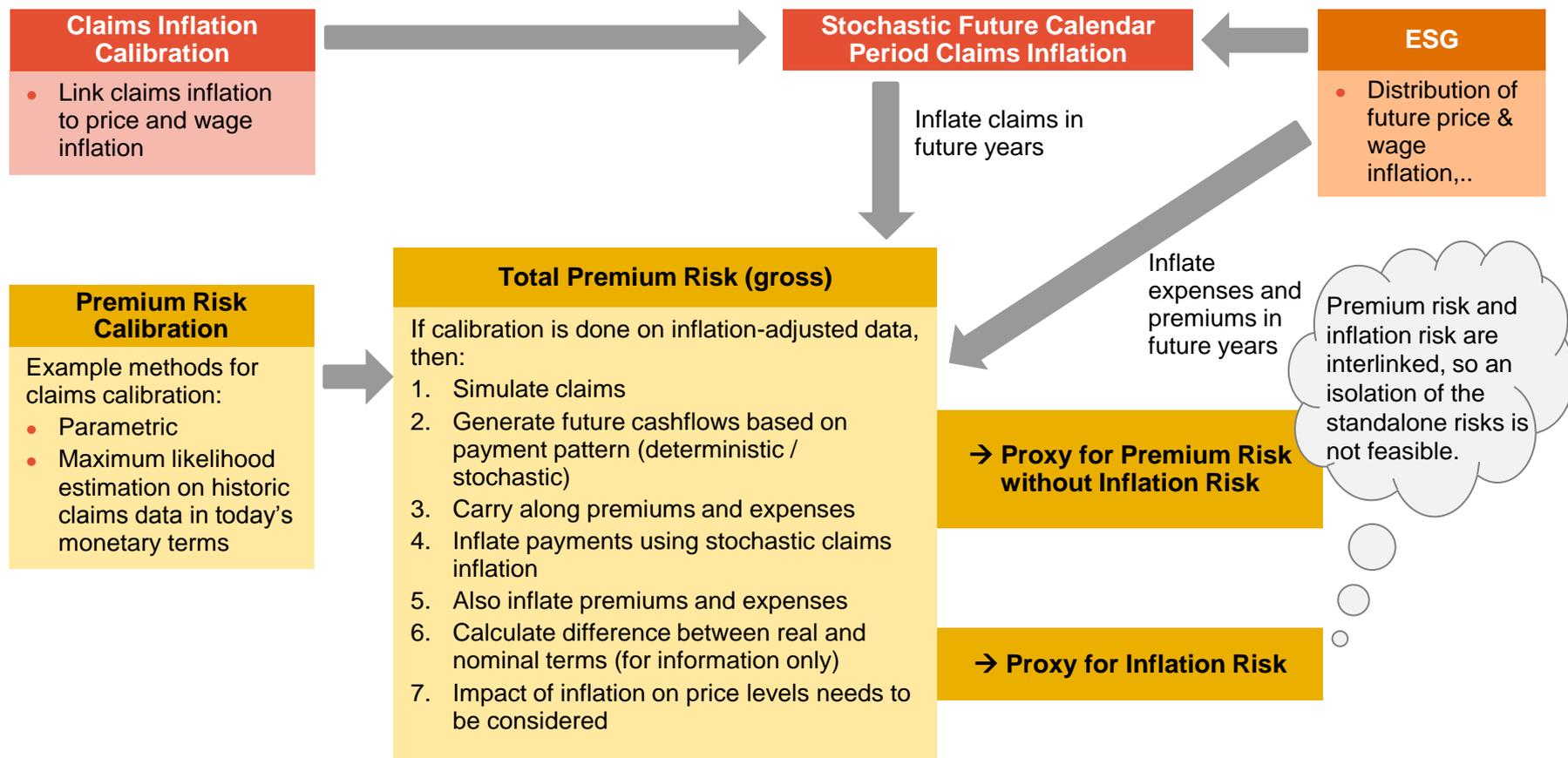
Reserve Risk: Accounting for Inflation in an Internal Model

Per segment (and claim type):

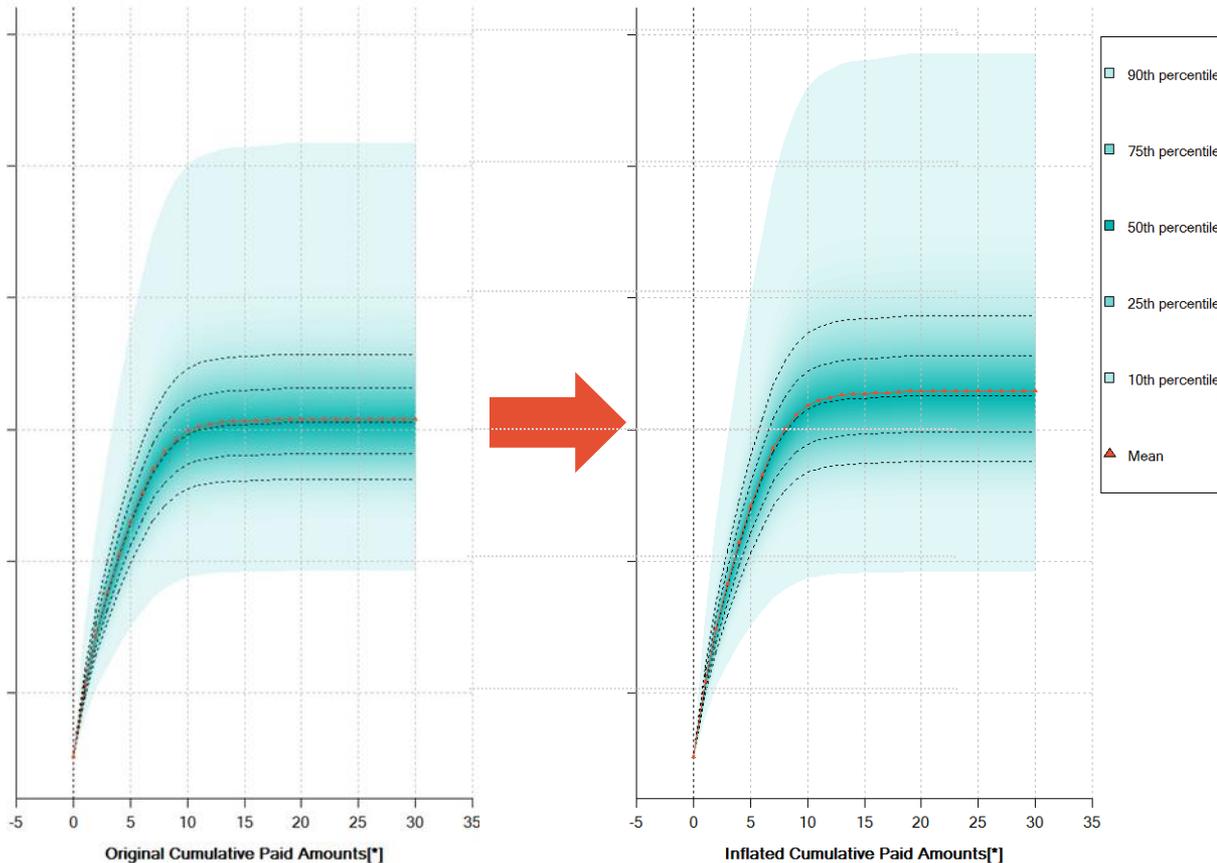


Premium Risk: Accounting for Inflation in an Internal Model

Per segment (and claim type):



The Result: implicit (left) vs explicit (right) allowance for claims inflation



A stochastic approach can answer the following questions:

- How does inflation contribute to reserve risk?
- Will interest compensate for inflation assuming some dependency?
- How does inflation as a joint driver reduce the diversification between segments in one economy?
- How does inflation affect the group aggregation over more than one economy?
- ...

An explicit allowance for claims inflation can affect the mean of the future cash flows and result in an increase of volatility

Data and mathematical methods need to be enriched with expert judgment

External changes:

- Legislative changes resulting in an increase or decrease of legal expenses
- New medical diagnostic guidelines
- Jury decisions and court interpretations
- Increase in structured annuities
- Introduction of inflation target by Central Bank
- Change in FX rate policy
- Change in local/global economic/geopolitical environment

Internal aspects:

- Portfolio cleansing last year
- Change in business strategy
- Changes in the Claims department
- New claims handling software
- Internal reserving practice: Claims inflation is only accounted for implicitly, or inflation is accounted for explicitly



Insurance market specifics:

- MTPL claims get regulated by the insurer independent of fault of driver
- Claims get regulated with specific tables that include assumptions on inflation
- Market cycle

Superimposed inflation and claims culture:

- Court cases & legislative changes
- Increased litigiousness sparked by simplified court rules
- Changes in the medical condition of claimants
- Changes in the public attitudes
- Climate change
- Improved risk management (e.g. fire safety, car security, rules for alcohol consumption in vehicles, ...)
- Increase in awareness on accessibility of compensation through, e.g., social networks
- Strong lobbying from victim associations

Example dashboard used as monitoring and reporting tool

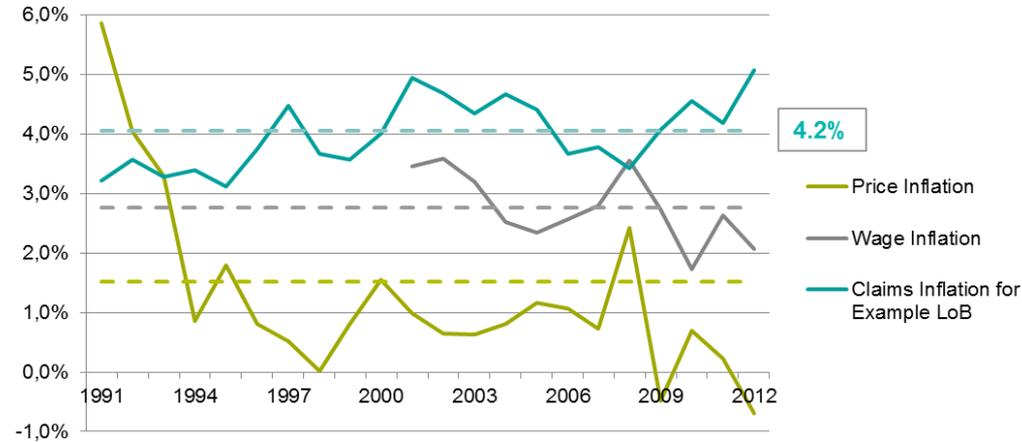
Methods deployed

- **Mathematical algorithms** applied to historical claims data (e.g. separation method, General Linear Models)
- Analysis of official **historical economic inflation** and their dependencies to the estimated claims inflation
- Taking into account **other calendar year effects** (see previous slide)
- **Expert judgement**

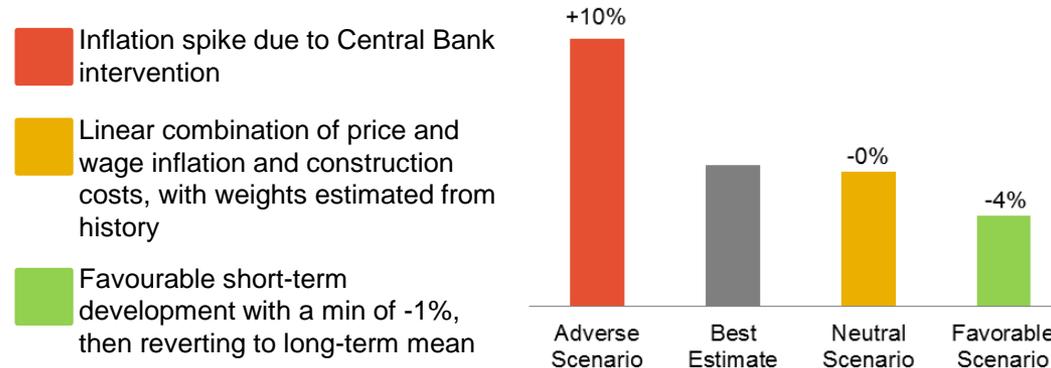
Methods deployed

- **Regression** based on projections in economic scenario generators and calibrated on history
- Taking account of **planned legal and governmental changes**
- **Stressing superimposed inflation**

Estimation of “how much” inflation is already implicitly included in the cash flow projections



Evaluation of the impact of claims inflation scenarios on case reserves



Conclusion

We deduce a claims inflation rate of **4.2%** to be implicitly included in the best estimate outstandings.

Conclusion

Claims reserves are underestimated by **10%** in an adverse scenario.

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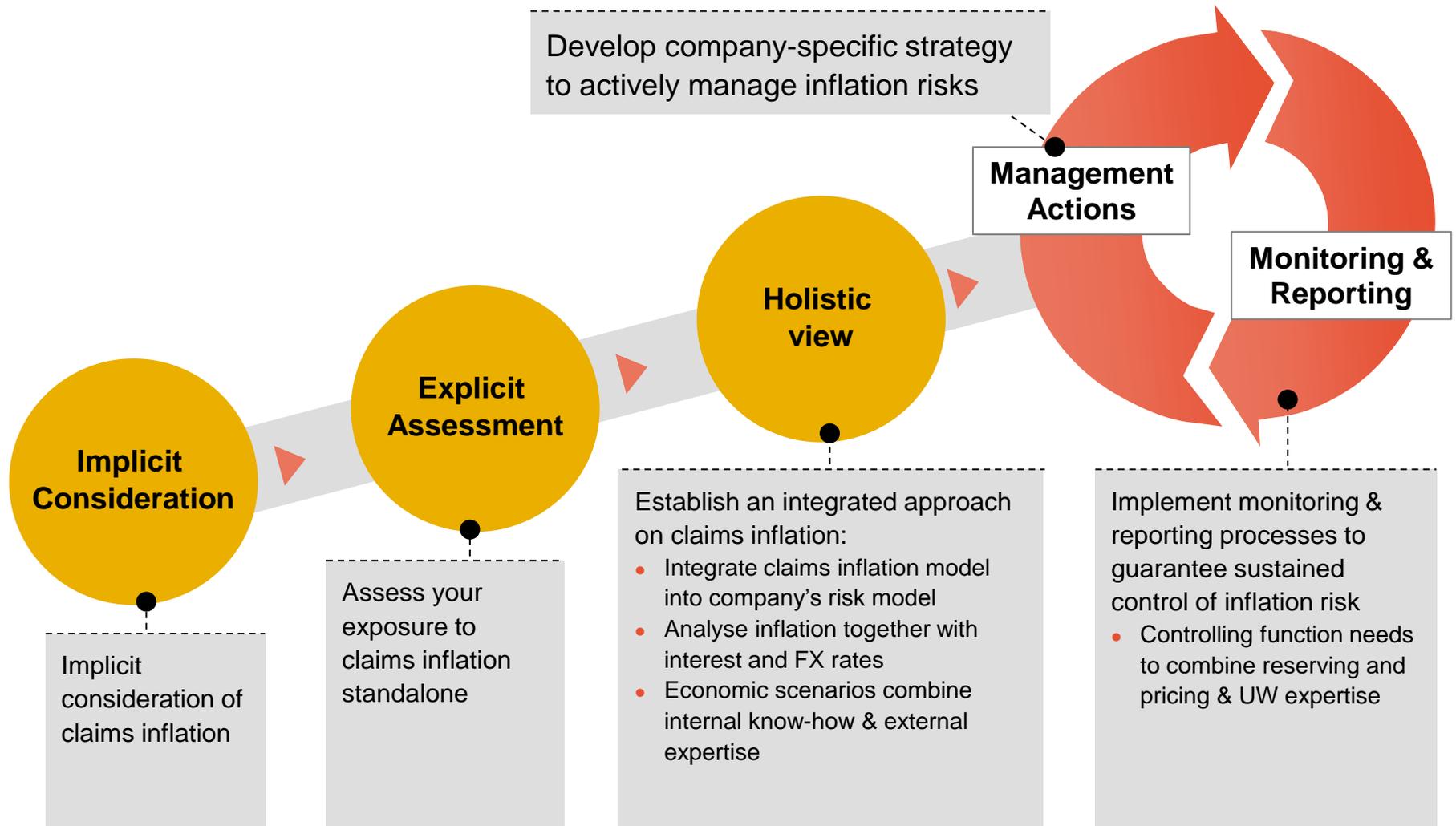
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Inflation Roadmap



Toolkit for mitigating, reducing or transferring inflation risk

Within the Company

Claims management

- Bodily injury: include inflation scenarios in the assessment of annuity versus lump sums
- Motor: cost control through own garage networks
- Specialty teams for reactive measures (e.g. medical teams for keeping large claims at bay)
- Improve fraud detection capabilities
- Improve wreck management

Underwriting of new business and product design

- Shorter contract terms, increasing claims made policies and sunset clauses to reduce IBNR claims
- Indexation of limits and deductibles
- Specialty teams for detailed risk assessments before and performance monitoring after contract conclusion (e.g. for property insurance)

Portfolio management

- Reduce underwriting where inflation risk together with pressure on premiums is high, e.g. liability insurance for midwives

Diversification

- Diversify claims inflation across regions that are not significantly correlated and across lines of businesses

Within the company (continued)

Pricing

- Adjust premiums to reflect expected inflation developments, in order to avoid vicious cycle of underpricing and underreserving, while still ensuring competitiveness
- Possible reference: target combined loss ratio for pre-defined inflation scenarios is not achieved

Reinsurance

Reinsurance optimisation

- Investigate excess of loss casualty covers as a very cost efficient inflation hedge
- Use index clauses and align the choice of index clause with the firm's strategy and expectation

Capital markets

Securitisation

- Sell **insurance linked securities** to securitise insurance risk, including inflation risk (e.g. AXA's motor portfolio, Swiss Re's credit portfolio)

Asset Allocation

- Investing in **inflation-linked** bonds with floors
- Investing in **inflation derivatives**
- Investing in real assets e.g. property, commodities or government bonds

Holistic view on inflation risk

Looking at and hedging risks individually can be counterproductive.

A holistic view requires considering a time dimension (beyond one year) as well as dependencies to all other material risks (FX, interest, credit, ..).

Transferring inflation risk to another economic instrument usually results in increased exposure in another risk type (e.g. counterparty risk).

Look at the interaction of (claims) inflation on both sides of the balance sheet.

Transferring inflation risk to capital markets still requires a continuous monitoring: Inflation effects on your assets appear immediately through the corrected market value, while inflation effects on your liabilities only appear in your BS if reserves are adjusted.

While change in CPI might be hedged, the excess of CPI to claims inflation will remain in BS. A comprehensive view on superimposed inflation is essential for asset and liability side.

Have a firm-wide expectation on future inflation and use that consistently in all your models and all business decisions.

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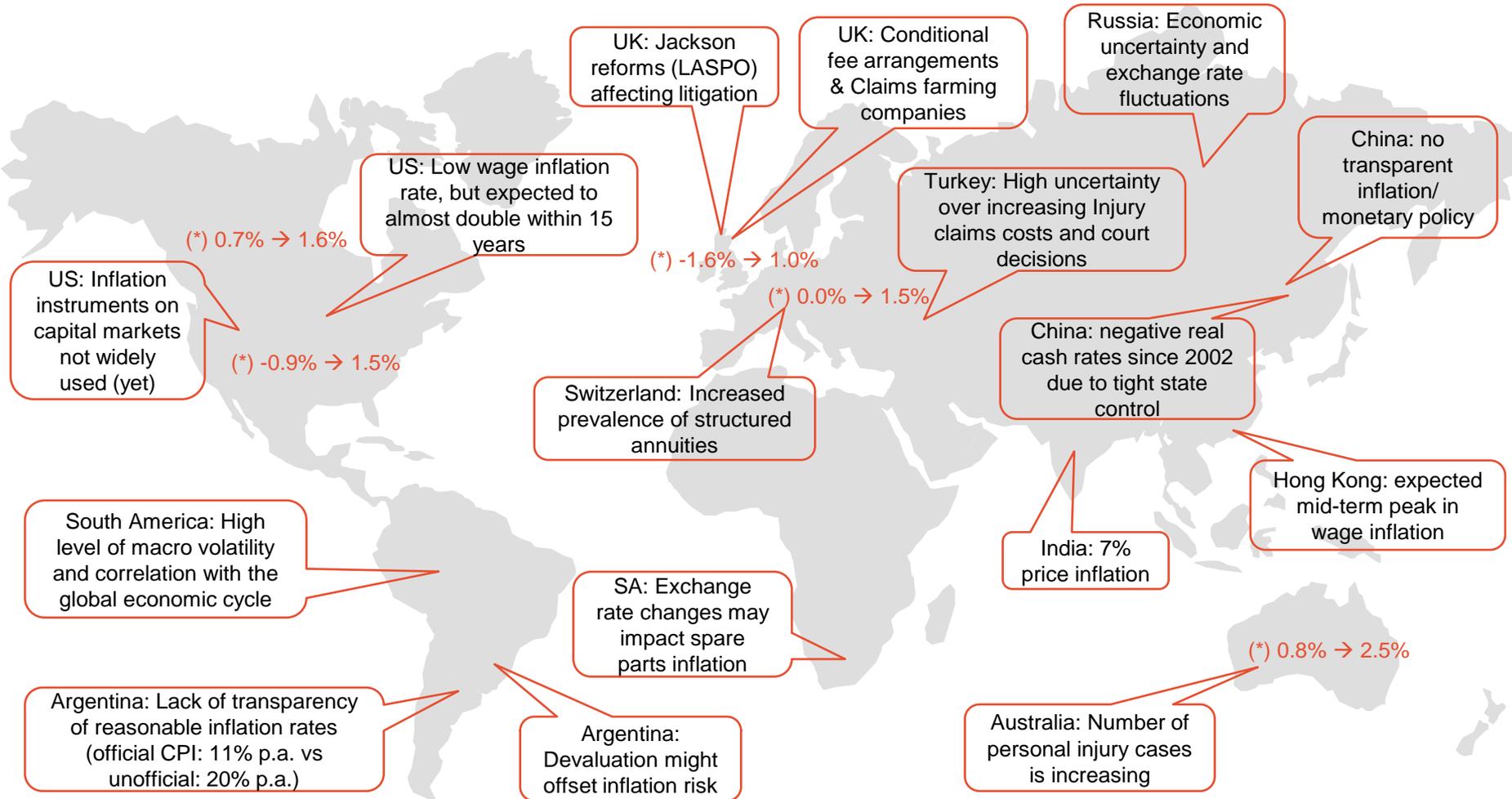
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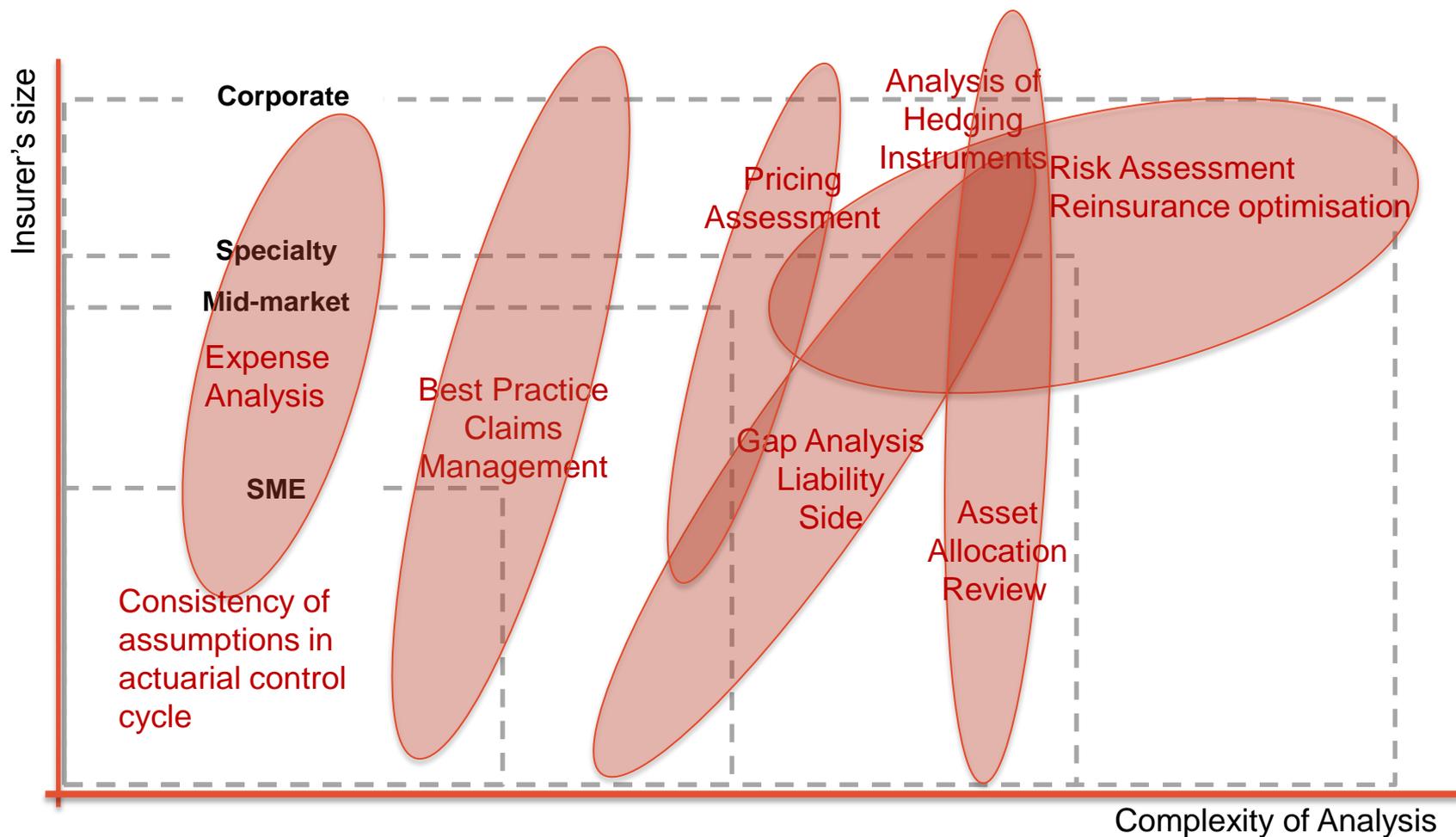


Markets that are worth a closer look



(*) Company view on real cash rates as at end 2014 and long-term

What type of analysis would be helpful?



TOWERS WATSON

