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Cost inflation modelling for Best Estimate Liabilities: a perspective on modelling choices

Inflation has reached record highs in 2022 – with the average price level in the Netherlands rising 11.6% in July compared to a year before, raising concerns of a wage-price spiral[1]. In the UK inflation is expected to reach almost 19% in 2023[2]. While the increase in inflation is generally expected to stabilize in the coming years[3], increasing inflation has a direct impact on the insurer's balance sheet. Both assets and liabilities can be sensitive to inflation and create additional unwanted balance sheet volatility. Since cost inflation is embedded within insurance liability expense cashflows, future expense inflation needs to be projected. The projection of cost inflation, particularly price inflation and wage inflation, is complicated by the limited data available to make such projections. In practice, various methodologies exist to model Best Estimate cost inflation – each presenting their own strengths and weaknesses. Moreover, each approach has a different impact on both the Solvency II ratio ('stock') and capital generation ('flow') as well as balance sheet volatility. Additionally, for insurance companies with an Internal Model, there is also a dependency on how cost inflation is modelled. Given the current elevated levels of inflation, insurers may wish to reassess whether their current method of modelling cost inflation is appropriate. Two key questions to consider, which ultimately impact risk management, include:

1. **What (practical) modelling options are available to model cost inflation risk?**
2. **What are the strengths and weaknesses of each of these methodologies?**

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TYPES OF INFLATION EMBEDDED IN INSURANCE LIABILITIES

In general, there are two types of liability cash flows sensitive to inflation risk:

1. **Expense cash flows**: An increase in inflation levels will result in higher expenses to service insurance businesses. For example, personnel expenses increase due to the increase of service level contracts within a certain time period following a rise in inflation. Such expense increases may, however, be offset in the insurance premiums.

2. **Claim cash flows**: In some cases, future claims from insurance contracts may be inflation dependent. For example, many collective pension contracts include the contractual adjustment of claims based on the inflation index.

The remainder of this paper will focus primarily on expense cash flows and how to model cost inflation.

WHAT DRIVES COST INFLATION AND WHAT DATA IS AVAILABLE

In order to effectively model expense inflation, it is important to first understand and identify the most suitable drivers related to operating expenses. Drivers of cost inflation can generally be classified into two types of related expense drivers:

1. Full-Time Equivalent (FTE) related expenses (such as wage inflation); and
2. Non-FTE related expenses (such as price inflation).

Wage inflation rates are determined by the Collective Labor Agreements (CLAs) between employers and trade unions. However, historical CLA data is typically limited as the wage inflation is determined on an annual basis and may have a limited history. Moreover, the indication of the future wage inflation is only available upon the duration of the CLA, which is typically maximally three years. This makes it challenging to forecast wage inflation as only realized inflation is provided.

Price inflation is determined by the Dutch Consumer Price Index (CPI) or the Dutch Harmonized Index of Consumer Prices (HICP) which may be sourced from CBS or Eurostat. Again, both the CPI and HICP only indicate realized inflation. These historical inflation rates are, however, available for a longer historical period and are published at a higher frequency – specifically, monthly year-on-year data.

An alternative option would be to derive the implied inflation term-structure (i.e. the expected inflation rate) based on inflation-linked derivatives related to the HICP excluding Tobacco (HICPxT) index.

HOW TO MODEL COST INFLATION

Various methodologies to model expense inflation are available and range from data-driven approaches to approaches that are based on applying management expectations or expert judgments, each presenting their own strengths, weaknesses and impact on risk management. Those that are more reliant on data are subject to greater volatility but can provide hedging opportunities for inflation risk; while those that are more reliant on expert judgement yield more stable projections that can be aligned with the business plan, at the expense of additional requirements. Moreover, each approach has a unique impact on the Solvency II ratio and capital generation.

Three potential approaches to model expense inflation, and their corresponding advantages and disadvantages, are described below.

1. Data driven approach without portfolio specifics

The inflation term structure can be estimated based on break-even inflation data obtained from the European HICPxT inflation swaps. This subsequently results in basis risk due to the difference between the European and Dutch inflation rates, as well as the difference between implied and realized inflation rates.

Advantages	Disadvantages
■ The data driven-nature of this approach in order to determine the dynamics of future inflation, and the resulting reduced reliance on expert judgement, make such a method simple and transparent. ■ When applicable, this method can also be aligned with the corresponding assumptions regarding the unconditional inflation provided in the liabilities – which is good to hedge given that there is no basis risk in modelled liabilities versus inflation-linked swaps.	■ Due to the incorporation of only price inflation data, this approach may not fully capture wage-price inflation dynamics and, ultimately, the expense inflation development. ■ Since the inflation curve changes on a daily basis, the resulting projections may be particularly volatile. ■ Such a method can also make setting and achieving business plan expense targets (i.e. steering) relatively more difficult.

2. Data driven approach with portfolio specifics:

This methodology builds on the data driven approach while incorporating the dynamics between wage-price inflation. In this case, the first approach is adjusted by applying either e.g.:

- Linear regression (α*HICPxT + β); or
- Time series analysis model to forecast inflation, such as an AR(1)-model.

Other methodologies are possible as well.

Advantages	Disadvantages
■ This method can better capture the inflation development expected in expense than the first approach, due to the incorporation of wage-price inflation dynamics.	■ The resulting projections may still be particularly volatile due to the frequent changing of the implied inflation curve. ■ Expert judgement is necessary to ultimately link the expected inflation rate to the realized inflation rate.

3. Management expectation / Expert judgement

Expectations by management or expert judgements can be used to model expense inflation, typically on the relatively short-term. Approaches may include but are not limited to:

- The inflation rate prescribed by the CLA may be applied on the very short term (maximally up to 3 years);
- The business plan forecast for the first period (usually maximally 3-5 years); or
- Using a flat assumption of the inflation rate based on the expectations of management.

Advantages	Disadvantages
■ Results in more stable projections that are less sensitive to inflation shocks, making it more practical for setting business plan targets. ■ Results therefore align with the business plan forecast and are less volatile over the short-term.	■ The combination with other methodologies is still required, particularly for the longer term. ■ The reliance on expert judgement also has the consequence that additional requirements on documentation and analysis are required.

In practice, various methodologies can ultimately be combined to model expense inflation. For example, expert judgement combined with the data driven approach can be combined to obtain the inflation term-structure over the mid-term.

CONCLUSION

The steep (and unexpected) rise in interest rates is likely to remain elevated in the short-term – resulting in potentially material impacts for insurers whose liabilities face correspondingly significant increases. The severity of the impact on liabilities is largely dependent on the choice of modelling approach for inflation and the assumptions thereof. Those relying on data-driven methods will experience the harshest impact of the current economic scenario, while those that base inflation on management expectations can maintain relatively low inflation assumptions but will be required to adequately justify why this would hold in such a high inflation environment. ■

1 – https://fd.nl/economie/1446585/inflatie-juli-piekt-op-11-6-dalende-trend-doorbroken-kyh2caYiscgE
2 – https://fd.nl/economie/1449309/citigroup-inflatie-verenigd-koninkrijk-volgend-jaar-naar-bijna-19-kyh2caYiscgE
3 – Inflation forecasts (europa.eu)