

# Effects of Shifts in Inflation on the Work of General Insurance Actuaries in Australia

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Presented to the Actuaries Institute 2024 All-Actuaries Summit 1-3 May 2024

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## Abstract

In 2022 economic inflation increased to levels not seen in Australia for the last 25 years.

In this paper the authors address the effects of this shift in inflation on the work of general insurance actuaries in Australia, and examine the theory and evidence of its impact on:

- Claims;
- Premiums;
- Insurance margin;
- Investment returns; and
- Capital.

Earlier work on inflation and its effects on general insurance in Australia by other Australian actuaries is discussed and acknowledged and used as a foundation. Comparisons with experience and thinking overseas are reflected upon.

The final section of the report contains a discussion of the difficulties encountered in recent years in forecasting inflation and what this means for the uncertainty in forecasts in future.

The purpose of this paper is to generate a discussion at the Summit of the techniques available to the actuary for addressing risks associated with inflation, especially changing inflation and superimposed inflation.

Keywords: Economic inflation, superimposed inflation

## 1. Introduction

### Background

Inflation is a type of systematic degradation of data quality – consistently and increasingly making information less relevant to decision making - with the passing of time. As the "profession trained to put data to good use" actuaries cannot – and as a rule do not - ignore inflation<sup>1</sup>.

More specifically the rate of inflation is a financial phenomenon: the rate at which the purchasing power of money reduces as prices for a given unit of goods or services expressed in money terms increase. The rate of inflation is the rate at which money becomes worth less.

General insurers are purchasers of goods and services, directly or indirectly (by settling claims). Therefore, they are exposed to the risk that inflation will escalate their liabilities, sometimes at an unexpectedly rapid rate. As we have seen in recent years, forecasting the rate of inflation, even over short periods, can be very difficult. Even though many professionals from various fields have a strong interest in doing it well and they devote a lot of time and resources to it, their efforts are often to little avail.

Many economic and finance professionals are essentially trying to forecast the rate of change or shift in the rate of inflation, in search of a turning point - they are trying to forecast the second derivative of the prices of goods and services.

Despite awareness of inflation on the part of actuaries, in 2010 De Ravin and Fowlds presented their paper "Inflation Risk in General Insurance" and observed that there had been relatively few papers over the preceding 25 years which had explored this topic. In hindsight, their paper was well-timed -

- there had been a long period where inflation was low and constant (benign), which arguably could have contributed to some complacency within the actuarial community;
- there was growing concern for the potential of sudden inflation spikes in the aftermath of global financial crisis (the risk that "the sleeping dragon" would soon awake); and
- APRA had made recent changes to the regulatory capital requirements for life and general insurers as they observed inflation is one of the key risks faced by insurers, and that the regulatory capital regime which operated at the time was not appropriately sensitive to that risk.<sup>2</sup>

The authors of this paper are not aware of any papers since 2010 which have as comprehensively considered the effects of shifts in inflation in Australia on the work of general insurance actuaries, although there have been several significant studies which have considered aspects of it (i.e. superimposed inflation).

As this paper intends to explore the impact of inflation on the work of general insurance actuaries in Australia, it is useful to recall the historical connection between the two. 'Meaningful' involvement of actuaries in general insurance in Australia did not commence

<sup>&</sup>lt;sup>1</sup> David Whittle Presidential address 2024

<sup>&</sup>lt;sup>2</sup> Technical Paper: Review of capital standards for general insurers and life insurers - asset risk capital charge" July 2010 Actuaries Institute

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until the mid-1970s, when Australia—along with many other countries—experienced a sustained period of high (double-digit) inflation. There was no general insurance training or guidance in Australia at the time. In 1977 Greg Taylor wrote a paper 'Separation of inflation and other effects from the distribution of non-life insurance claim delays'. Through the late 1970s and early to mid-1980s, the involvement of actuaries in general insurance grew quite significantly - albeit from a small base) – and it is estimated that there were around 25 Fellows working in the area in 1985.

The growth of the actuarial profession grew from the development of improved reserving methods, which were partly the result of the challenges arising from high inflation. Therefore, it could be (arguably!) concluded that high inflation hastened the establishment of the general insurance actuarial profession in Australia.

Despite the fear of an inflation spike in 2010, the inflation dragon stayed sleeping in Australia until 2022. As shown in the chart below, the levels of price inflation experienced in Australia in 2022 has not been experienced since the late 1980s (over 35 years ago). Given that there were only 25 Fellows working in general insurance in 1985, it might be reasonable to conclude the recent inflation levels experienced in Australia is not just "beyond the working memory" of most general insurance actuaries, but beyond their lived actuarial experience.





Source: Australia Bureau of Statistics. Series ID A2325850V

The following chart shows the annual price inflation in the US and UK compared with Australia, since 2010. This shows that Australia was not alone in experiencing unprecedented levels of price inflation in 2022.





Source: Australian Bureau of Statistics. Series ID A2325846C Office for National Statistics, Harmonised Index of Consumer Prices (HICP) from Eurostat US Bureau of Labor Statistics, US HICP

The increase in inflation prompted the authors to revisit the work of De Ravin and Fowlds and to consider the implications of inflation risk on the work of general insurance actuaries in Australia.

So how did general insurers respond to the waking dragon?

In October 2022, the Prudential Regulatory Authority in the UK wrote to Chief Actuaries – having conducted a thematic review across the general insurance sector focussing on the effect of claims inflation on general insurance claims. They shared their findings and observations for good practice to assist in the preparation for year-end reserving, capital, and business planning for 2023.

In Australia, general insurers responded by increasing premiums. The reporting of the relationship between inflation and the increases in insurance premiums in Australian newspapers began in June 2023, and hasn't slowed. This following figure appeared in an article "How to save on insurance as Australian firms hike premiums by up to 20%" by Jonathon Barrett from The Guardian newspaper on 25 June 2023.

#### Figure 1.3: Insurance premium increases and claims inflation



Premium increases and inflation. Photograph: Insurance Australia Group

This paper will attempt to explore the link between price inflation and claims inflation, reserving, pricing, profitability, and capital, as relevant to the practice of general insurance actuaries within Australia. The intention of this paper is to prompt a discussion at the summit to capture some of the experiences of general insurance practitioners in Australia over the last 2 years – to better equip actuaries in future – perhaps in another 35 years – who might face a similar challenge.

### Contents of this paper

Section 2 of this paper - Defining Inflation – contains a discussion of subtle issues with the current Australian definition and comparisons with the definitions used in the UK and US. Section 3 Effects in general insurance – reflects on the theory of the impact of a

sharp increase on claims, premiums, profitability, investments and capital. An effort is made to analyse evidence of these effects based on recent industry data. Section 4 - Effects in general insurance models – focusses on valuation models in use in Australia. Section 5 - Forecasting inflation – contains a summary of view from relevant Australian actuarial literature, as well as economic and investment sources.

Appendix 1 recalls, as a cautionary tale, the experience of superannuation actuaries in the 1970s who had to deal with shifting rates of inflation. Appendix 2 contains data relating to Section 3.

## 2. Definitions

General insurance actuaries in Australia normally consider inflation as consisting of two separate components, which they call:

- economic inflation (usually wage or price inflation); and
- superimposed inflation.

Economic inflation is inflation as understood by other professionals in economics and finance, politicians, the media, and the general public.

Superimposed inflation (often referred to as SII) is a concept used by general insurance actuaries and refers to the excess rate of inflation of insurance payments or claims over and above economic or widely understood inflation<sup>3</sup>. There is no clearly agreed definition of SII in Australia and there are various factors that contribute to this excess rate of inflation.

#### Economic inflation

The effects of inflation are commonly estimated using a standard index such as the Consumer Price Index (or a combination of CPI subgroups considered appropriate to the class of business) or Average Weekly Earnings. The factors driving economic inflation are the subject of debate among economists and other finance professionals. It has been widely acknowledged that it is difficult to forecast over both long and short term periods.

#### Superimposed inflation

The underlying factors causing superimposed inflation vary by type of payment and from time to time. They include shifts in legislation and regulation, as well as in social norms and the behaviour of claimants. The observed rates of superimposed inflation also depend on the model used in the data analysis. It has been widely considered by general insurance actuaries that superimposed inflation is more difficult to forecast over both long and short term periods than economic inflation, which has been considered to be relatively low and stable over the three decades preceding 2022.

The following chart shows how the definition of inflation by general insurance actuaries in Australia compares with that of their counterparts in the US and UK.

<sup>&</sup>lt;sup>3</sup> "Superimposed inflation is the tendency for payments to increase at a higher rate than economic inflation. It can appear in the form of **more claims**, longer periods of payment, changes in legislation and/or judicial precedents." - "Actuarial Practice of General Insurance" by David Hart, Bob Buchanan, Bruce Howe (1996 version) Chapter 15: Run off Techniques Actuaries Institute



Figure 2.1: Similarities in definition of inflation (in general insurance actuarial practice) in Australia compared to US and UK

This chart suggests that although there are both conceptual and definitional differences, *the building block approach of defining total inflation as economic inflation plus some excess item appears to be widely accepted* among general insurance actuaries. This has the added benefit of general insurance actuaries being able to utilise the specialist knowledge of other professionals regarding what we refer to as economic inflation in the forecast of future total inflation.

However, there are subtle issues with this definition -

- 1. Lack of definition of the term "superimposed inflation" in Australia
- 2. Differences between international definitions
- 3. Common actuarial practice

#### Lack of clear definition of superimposed inflation in Australia

In 2001 superimposed inflation was described as "ubiquitous"<sup>4</sup> – existing or being everywhere - in Australia. And in 2007 it was described as "deeply embedded in the regulatory, actuarial, and accounting regimes in Australia"<sup>5</sup>. However, in 2007, the Superimposed Inflation Working party acknowledged a lack of consistent definition. They grouped the different definitions in common practice as either:

- Claim cost escalation above "normal" inflation; or
- Claim cost escalation above that which is allowed for in the actuarial models.

Subsequent papers (Gould and Atsu (2011) and Hayden and Lane (2014)) concluded that the definition of superimposed inflation depends on its use.

Given there is no consistently adopted definition of superimposed inflation in Australia, it would seem necessary for an actuary using the term to provide a clear and explicit definition with every use.

### **Common actuarial practice**

The definition of superimposed inflation in the general insurance actuarial textbook (see note below)<sup>6</sup>, as provided at the start of this section of this paper, considers the impact of inflation on claim costs in total. This definition will hereafter be referred to as the "theoretical definition". However, In Australia, payment per claim methods are more widely used in claim valuations than claim development methods and so the inclusion of the effect of claim frequency in the theoretical definition is inconsistent with the practical usage.

There is ambiguity in the two definitions identified in the section above, but it's possible that the individual definitions contained within Pearson and Beynon should probably be more clearly described as:

- Claims size escalation above economic inflation; or
- Claim size escalation above that which is allowed for in the actuarial models.

These definitions will hereafter be referred to as the "practical definitions", and these both appear to exclude the impact of inflation on claim frequency. The differences between the practical definitions and the theoretical definition prompts the following questions -

1. Is the impact of inflation (both economic and superimposed) on claim frequency material? And should it be ignored?

In Pearson & Beynon's example of superimposed inflation in the NSW CTP scheme in the 1990s, they showed claim frequency increased by 25%. They conclude that "while superimposed inflation was present in claims at both the low and higher severity levels, the lower severity claims experienced higher superimposed inflation and higher claim frequency increases". This demonstrates that *the analysis and monitoring of* 

<sup>&</sup>lt;sup>4</sup> "The Role of Modelling Long Tail Classes of Business Risk in Managing Capital", Atkins, Geoff presented at the Aon Re Conference (2001)

<sup>&</sup>lt;sup>5</sup> Pearson and Beynon – with references to GPS 310, PS3000 and AASB1023

<sup>&</sup>lt;sup>6</sup> There is no definition of superimposed inflation given in the current version of any of the three Australian GI Fellowship course materials – although it is discussed in several sections. Actuaries Institute

*superimposed inflation is not only relevant to average claim costs, but also claim frequency*. They also found that the higher general damages amounts for less serious claims appeared to have led to an increase in claim frequency, suggesting a link between the analysis of average payments and claim frequency.

2. Is it ok to measure inflation in claim frequency separately from measuring inflation in average claim size?

The separation of the measurement of the impact of inflation on frequency and severity is supported by Sheaf et al - "total claims inflation is clearly the combination of the trends in frequency and severity, but very different factors drive the trends in these two elements. Consequently, it is only by looking at them in isolation from one another that the actuary can fully understand what is going on". Gould and Atsu observed that "changes which drive claim frequency (such as legislative changes applying to accidents from a given date) will be accident period effects, while changes which drive average claim size (such as environmental changes) will be payment period effects". The conclusion from both of these studies is that monitoring and measuring the impact of inflation on frequency and severity, separately, is preferable for understanding the cause of the inflation, but also for appropriately allowing for its potential future impact on frequency and severity.

Sheaf et al identify the drivers of inflation and state whether they impact claim frequency, claim size (or severity) or aggregate (total) claim costs. The following chart is based on information in contained in that paper.

#### Figure 2.2: Drivers of inflation – (based on Sheaf et al)

#### **Claim frequency**

- •Compensation culture
- •Conditional fee arrangements
- Claim management companies
- •Advertising by solicitors/claim management companies
- Stricter definition of liability
- Economic conditions
- Traffic density
- Road safety
- Population growth
- Number of physicians
- Safety education
- Merger/takeover activity
- Risk management initiatives

#### Claim size or severity

- Retail price inflation
- Wage inflation
- The courts act
- NHS recoveries
- Judicial inflation
- Inflation of legal costs
- Increasing number of heads of damage
- Medical advances
- Interest rates
- Large claims
- Contributory negligence on employers liability claims
- Claims handling procedures

Although Sheaf et al find separate measurement of frequency and severity preferable, they also acknowledge that total claims escalation is more appropriate for applications to business planning or in deriving Bornheutter-Ferguson prior loss estimates. Thus, monitoring and measuring the impact of inflation on aggregate claim costs - frequency and severity, in total - can also have useful applications.

Aggregate claim costs

Changing weather patterns

Legislative changes
Tort reform
Court decisions

Car design
Demographics
Changes in deductibles
Changes in policy terms
Underwriting decisions

In summary, in Australia we have:

- No consistent definition of superimposed inflation in practice; and
- A different definition of superimposed inflation in theory and practice.

#### International definition differences

The UK and the US differ from Australia in both having specific definitions of inflation. However, the definitions are not the same.

The 2022 CAS paper in the US defines social inflation as "all ways in which insurers' claims costs rise over and above general economic inflation, including shifts in societal preferences over who is best placed to absorb risk." They acknowledge the similarity to superimposed inflation - "actuaries in some quarters, particularly outside the United States, have referred to similar phenomena as superimposed inflation." However, in their update in 2023, they clarify that they define "social inflation can also drive increases in claim frequency but state that "such an exploration is beyond the scope of this paper. We continue to use excessive inflation in the size of claims as our definition of social inflation."

Lloyds insurance in the UK measure claims inflation on a like for like basis<sup>7</sup> which excludes changes in exposure, policy wording and level of coverage.

The following chart depicts the differences in definition between the UK, US and Australia's theoretical definition and concludes that *although the UK definition of inflation is theoretically superior, the US definition is the easiest of the three to measure and of more practical use.* 

<sup>&</sup>lt;sup>7</sup> "We define claims inflation as the change in claims cost of a like for like policy over time. Claims cost is considered as all costs in relation to the payment and settlement of a (re)insurance claim. This includes loss adjustment expenses directly associated with the claim, such as claims handling. Like for like means having consistent policy wording, exposure and level of coverage, such that the change in claims cost is considered after normalizing for changes in policy terms and other differences in the policy. Our definition of claims inflation covers changes in claims cost due to trends which affect the number (frequency) and/or size (severity) of claims. Claims inflation is the sum of economic inflation and excess inflation." Lloyds definition taken from "Claims Inflation – what are Lloyds doing" presentation given at GIRO 2022

Figure 2.3: Differences in definition of inflation (in general insurance actuarial practice) in the US and UK, compared to the theoretical definition in Australia.



## **3. Effects in general insurance**

"Forces that influence claims costs generally affect all existing unpaid liabilities rather than just future claims. Anything driving up claims costs thus has a leveraged effect on solvency, annual profit and required premium rates"

"We expect high claims inflation to affect every general insurance firm, although the nature of the impact will vary depending upon the firm's business model and risk profile. The impact of a persistent spike in claims inflation may result in a material deterioration of solvency coverage for some firms unless mitigating actions are taken."

(UK Prudential Regulatory Authority, 2023)<sup>1</sup>

It is generally presupposed that an increase in inflation will have a negative impact on general insurers, although this is not a universal assumption. At least one article challenges this assumption - although the "immediate impact of inflation on non-life (property & casualty and health) insurers' earnings is negative … macroeconomic shocks such as unexpected inflation challenge insurers' role in society, but they also offer opportunities"<sup>6</sup> when insurers can demonstrate their value proposition and/or redesign products to meet changing customer expectations.

Notwithstanding this potential upside to increases in inflation for general insurers, the remainder of this section will focus on the negative effects to general insurers. The negative effects will be divided into five aspects of the general insurers business:

- 1. Claims
- 2. Premiums
- 3. Insurance margin
- 4. Investments
- 5. Capital and solvency.

The sections of this report relating to each of these aspects will discuss the theory and then examine empirical evidence within Australia. The evidence will be backwards looking, particularly focussed on the last 5 years, to capture the increase in economic inflation – no effort will be made in this section to consider potential scenarios of future levels of economic inflation, and their impact on each of the five aspects.

There are common challenges to empirical evidence supporting the theoretical impacts, including:

- i. High inflation is not the only external impact on outcomes for general insurers in the last few years;
- ii. Outcomes can be altered by actions undertaken by the insurers themselves in response to anticipated and/or experienced high inflation; and

<sup>&</sup>lt;sup>8</sup> Schanz & Treccani /The Geneva Association (2023) "The return of inflation: what it means for insurance – summary" Actuaries Institute

iii. The impact of high inflation can be shared by the linkages between each of the 5 areas.

Figure 3.1: Influences other than inflation which challenge empirical studies of the effect of inflation



Having established a potential or experienced inflationary impact on the cost of claims, the insurer may choose to increase premiums (pass the cost to the consumer), reduce insurance margin (wear the cost) or some combination of the two. If the insurers are unaware of the (extent of the) inflationary impact, then the margin would be reduced. However, the insurers may also consciously choose not to pass the increased cost to the consumer to avoid loss of customers (to competitors, or from the insurance market entirely), or the risk of government intervention such as price controls.

Insurers (mostly) respond appropriately to anticipated and/or experienced changes in inflation by:

- offering more affordable, low-cost products with an increased focus on risk and loss prevention;
- maintaining their drive to improve operational cost efficiency and overall productivity, i.e. output per employee. Digitalisation is one obvious route to achieve this objective in areas such as distribution (the biggest non-claims cost block), marketing and customer service;
- countering rising claims costs (by accelerating claims automation and straight-through processing as well as expanding (or building) partner and supplier networks in order to negotiate fixed prices for a longer period of time.)<sup>9</sup>

To the extent that there is a significant time lag between economic inflation and the impact on general insurers, the empirical evidence in this section may also be understated.

### Claims

#### Theory

*Claims inflation is linked to, and exceeds, the level of economic inflation.* While the claims and expense inflation are correlated with the economic inflation, there are also certain differences. Accordingly, it is important to consider the insurance specific characteristics of the inflation to get to the claims and expense inflation. Claims and expense inflation are mainly driven by the price of goods and services in connection with the settlement of potential insured claims. Claims inflation is significantly affected by increases in, for example, the prices of materials or repair work, but also by wage increases (e.g., for loss adjusters), the costs of medical care due to medical advancements, which are particularly relevant for personal injuries, and changes in judicial decisions.

Masterson (1968) defines a Claims Cost Index, and by comparing it to the consumer price index (CPI), shows that insurance claims costs generally exceed the overall economic inflation rate. He shows that this increase was especially notable for medical and workers' compensation insurance.

"when claim costs are related to prices at the time of settlement, incurred losses may rise faster than the inflation rate at the time policies are sold"

By comparing the historical annual growth of incurred claims to the inflation rate, Swiss Re (2010) shows that insurance claims have grown well above the inflation rate in some countries such as United States, Canada, UK, Germany, France, Italy, and Japan, during the period between 1960 and 2008. *Certain classes of general insurance business are more closely linked to economic inflation than others. Claims inflation in* 

<sup>9</sup> Schanz & Treccani /The Geneva Association (2023) "The return of inflation: what it means for insurance – summary" Actuaries Institute Level 2, 50 Carrington Street, Sydney NSW 2000

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# different classes of general insurance business may lead, lag or coincide with economic inflation.

"An interesting question is also if claims and expenses inflation leads, lags or coincides with general inflation. There are lines of business like the homeowner's insurance or damage claims in the motor third party liability business where claims inflation has been tending to lead general inflation. There might be other lines of business where claims inflation coincides more with the general inflation. Residential liability business might be an example. For long-tail lines of business such as personal injury claims in motor third party liability, which are particularly driven by wage increases, claims inflation might also lag to some extent general inflation as wage increases oftentimes lag the general inflation. Overall, when the real trend of claims growth surpasses the estimates assumed when policies were first issued, insurers may face reserve deficiencies. For long-tail lines of business, where claims may need years to settle, unanticipated surges in inflation that were not accounted for in the pricing of insurance contracts, may lead to a situation of under-reserving. The potential extent of under reserving particularly depends on the degree to which the future inflation assumptions of the undertakings correspond to the actual realised inflation. Too optimistic inflation assumptions might lead to a higher amount of under-reserved technical provisions in a scenario where inflation is stickier than undertakings might have assumed in their best estimate calculations."<sup>10</sup>

#### Empirical evidence

The following chart is based on information contained in Appendix 2 to this report. It is too early to be able to tell whether average claim sizes in the 2022 accident year have been impacted by inflation. More frequent and timely information would allow us to analyse the impact of changes in economic inflation on claim costs at an industry level.



#### Figure 3.2: Average cost per claim by accident year

Source: see Appendix 2

<sup>&</sup>lt;sup>10</sup> European Insurance and Occupational Pensions Authority (2023) "Impact of inflation on the insurance sector" Actuaries Institute

Notwithstanding the issues around delayed and infrequent data, the conclusions which can be drawn from this empirical evidence is flawed as:

- Gross ultimate cost includes costs relating to reported and unreported claims (pure IBNR), so the numerator includes claims costs relating to claims not included in the denominator. The average claim size will be incorrect, and an analysis of the trend over time makes an assumption that the average claim sizes of unreported claims will be impacted similarly, by economic inflation, to the average claims of reported claims.
- Use of the gross ultimate cost already includes actuarial assumptions about future levels of inflation or inflation. To the extent that actuaries do not respond immediately and correctly to changes in the level of economic and superimposed inflation, this analysis will not represent the impact of inflation on average claim sizes.

### **Premiums**

#### Theory

"The main underwriting response is to reprice insurance risks that exhibit elevated claims costs. The need and scope for doing so depend on the competitive environment in the relevant insurance markets, insurers' assumptions concerning central banks' ability to tame inflation within a reasonable period of time and the degree of public policy and regulatory constraints and interventions."<sup>11</sup>

Insurance premium increases for householders (and insurance affordability) is often reported on in the press. One article examined the influence of inflation and found "rising insurance premiums have been among the fastest rising costs for households, growing in the double digits, even as the Reserve Bank has looked to kneecap inflation"<sup>12</sup>. The article contained a comparison of CPI in total to that of CPI for insurance only (reproduced in the chart below) and warned customers would not accept price rises several times above wage growth for much longer.

Figure 3.3: Annual change in CPI and insurance indices

<sup>&</sup>lt;sup>11</sup> "The return of inflation: what it means for insurance – summary" (2023) Schanz & Treccani /The Geneva Association

<sup>&</sup>lt;sup>12</sup> "Soaring insurance costs open gate to affordability crisis" by Millie Muroi, SMH (Business), Saturday January 27 2024 Actuaries Institute

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Source: Reproduction of chart contained in SMH article using data from Australian Bureau of Statistics. Series ID: A3602833C and A2325846C

The article acknowledged that premium increases were driven by more than CPI inflation, explaining that motor insurance premium increases were driven by car prices which are still significantly higher compared to pre-COVID, leading to higher replacement values and sums insured, as well as increased motor claims inflation. The article also discussed cost drivers other than inflation in Australia, including reinsurance and natural disasters.

To suggest that increases in premium income reflects increases in prices ignores the following additional impacts:

- the potential impact of stagflation on reduced demand;
- increases in premium income as a result of higher exposure

#### Empirical evidence

Analysis of gross earned premium by class of business compared with CPI shows that there is some evidence in recent years that changes in gross earned premium is correlated to economic inflation for some classes of business.

Travel appeared to have the strongest evidence of correlation. However, clearly gross earned premium in this class of business was influenced heavily by the re-opening of borders to travel and it would be more likely to conclude that the evidence of correlation is purely co-incidental.

Figure 3.4: Changes in premium and CPI for Travel



Source: Australian Bureau of Statistics. Series ID: A2325846C

APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

Changes in premium for domestic motor vehicle business also appeared to be correlated to inflation. However, this relationship appeared to have a lag.

#### Figure 3.5: Changes in premium and CPI for Domestic Motor Vehicle



Source: Australian Bureau of Statistics. Series ID: A2325846C

APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

The results are shown in the following table.

# Table 3.1: Empirical evidence for correlation between premiums and inflation by class of business

Class of business	Evidence that changes in GEP are linked to economic inflation
Commercial motor vehicle Compulsory third party (CTP) motor vehicle Domestic motor vehicle Employers' liability Fire and industrial special risks	Correlated Correlated Correlated – with a lag Correlated Correlated
Houseowners and householders Non-proportional reinsurance Professional indemnity Proportional reinsurance Public and product liability Travel	Correlated No evidence No evidence No evidence Correlated – strongest evidence (although likely to be purely coincidental)
Other	No evidence

### **Gross insurance margin**

#### Theory

For the non-life business, inflation has a direct negative impact on profitability via rising claims costs. Regarding the historical evidence, D'Arcy (1982) analysed the statutory underwriting profits and the investment returns for property-liability insurers between 1929 and 1981, along with the annual changes in CPI. He concluded that these two components of the insurers' operating results are negatively correlated with the inflation rate. Similarly, Swiss Re (2010) analysed the relationship between 1951 and 2008. The analysis provided some evidence of inflation driving up insurers' combined ratio and lowering their return on equity. However, this relationship was generally not statistically significant, which may be explained by other factors affecting insurers' results, such as catastrophe losses and/or capital gains on investments.

#### Empirical evidence

The only classes which showed any correlation between insurance margin and CPI were "Fire and Industrial Special Risks" and "Professional Indemnity" although the latter seemed to lead inflation by a year.



#### Figure 3.6: Underwriting result for Fire and ISR and CPI



APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

#### Figure 3.7: Underwriting result for Professional Indemnity and CPI



Source: Australian Bureau of Statistics. Series ID: A2325846C

APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

The impact of inflation on the underwriting result in the other classes was masked by the myriad of other experience drivers.

### Investments

#### Theory

The literature suggests that **general insurers' investment income is largely protected against inflation** due to the insurer's ability to:

- incorporate it into pricing ("by introducing investment income directly in the pricing calculation...insurers are, to a large extent, insulated against unanticipated changes in rates of inflation"<sup>13</sup>);
- duration match their assets and liabilities (so that inflation impacts on the assets are offset by corresponding liability impacts); and
- alter their investment strategy (although capital requirements for insurers regulated by APRA limit the ability of insurers to tilt the investment portfolio away from bonds and towards commodities, equities, and real estate).

<sup>&</sup>lt;sup>13</sup> Butsic, Robert (1981) "The effect of inflation of losses and premiums for property-liability insurers"

#### Empirical evidence

Investment income over the past year appears to have responded to changes in CPI (albeit with a lag), however this relationship does not appear to have held prior to the most recent year – the evidence for a relationship is therefore rather weak.



#### Figure 3.8: Investment income and changes in CPI

Source: Australian Bureau of Statistics. Series ID: A2325846C

APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

## Capital

#### Theory

A short-term sharp increase in inflation is expected to have a negative impact on the capital requirements of general insurers due to the increase in the cost of claims themselves (which would increase their PCR) and also the activities needed to service the claims.

If the higher levels of inflation were to continue, general insurers would be able to benefit from higher nominal reinvestment yields, however general insurers are unlikely to benefit from this offset if inflation increases are short-lived.

#### Empirical evidence

There is no evidence that an increase in CPI has reduced insurers' excess capital. In fact, there is more empirical evidence to support the proposition that insurers' excess capital has increased in line with inflation.

#### Figure 3.9: Excess capital and changes in CPI



APRA Quarterly General Insurance Performance Database - December 2002 to June 2022 (issued 24 August 2022)

## 4. Effects in GI models

Modelling is a fundamental skill of all general insurance actuaries and there is a wide variety of types and uses. This section of the paper will focus narrowly on one type of general insurance model – the claim valuation model – and the impact of inflation.

One of the biggest differences in typical claim valuation modelling between Australia and the UK and US is an explicit allowance for inflation. The reasons for this difference have been suggested to include "regulatory requirements, norms around reserving methodologies and data availability"<sup>14</sup>. Pearson and Beynon suggest the infamy of inflation-adjusted reserving techniques in Australia may be due to the use of average payment reserving as opposed to the prevalence of chain ladder reserving techniques more commonly used in the US and Europe.

In 1974, a seminar on issues in general insurance was held in Norwich (a seminar which would become an annual event and be renamed to GIRO), Clarke demonstrated the effects of a large and volatile rate of inflation on the paid development method.<sup>15</sup> In 1977, Taylor noted Clarke's findings and presented the average cost per claim method (building on Verbeek's "separation method" which modelled claim counts) where the claims cost of a particular development year is proportional to some index which relates to the year of payment rather than the year of origin which he noted would be "particularly useful when claims cost is dominated by high rates of inflation").

Australian general insurance actuaries have continued to adopt payment per claim methods with an explicit inflation adjustment, whilst these methods are no longer widely used in the UK.<sup>16</sup> *The use of explicit inflation adjustment techniques in Australia meant that actuaries in Australia were better positioned than their UK counterparts when inflation shifted significantly in 2022.* 

As shown in the chart on page 6 of this paper, the UK did not experience an inflation spike earlier than Australia, but in October of 2022, the prudential regulator in the UK proactively contacted general insurance actuaries, in response to the increase in inflation, with several recommendations. One of their suggestions was that "firms may wish to consider re-introducing them" (explicit inflation adjustment techniques) "into the suite of analysis performed". The reasons for reintroducing the methods was that they can "help capture inflationary trends" enabling "better monitoring, benchmarking and actual versus expected analysis to be performed". Despite this strong recommendation for explicit inflation adjustment techniques from the Regulatory Authority, it appears that most general insurance actuaries in the UK did not change their claim valuation methodologies. Rather, it was observed that "the recent paradigm shift to a higher inflationary environment is driving more of an adaptation of<sup>17</sup> existing methodologies rather than fundamental changes in modelling approaches."<sup>18</sup>

<sup>18</sup> "Inflation adaptation: how reserving actuaries are changing tack" Dyna-Mo published 20/1/23 www.dyna-mo.com/news-and-events/inflation-adaptation-how-reserving-actuaries-are-changing-tack/ Actuaries Institute

<sup>&</sup>lt;sup>14</sup> dyna-mo (20/1/23) "Inflation adaptation: how reserving actuaries are changing tack"

<sup>&</sup>lt;sup>15</sup> Clarke, T.G. (1974) "An actuary looks at claims provisions in general insurance".

<sup>&</sup>lt;sup>16</sup> "Inflation-adjusted reserving techniques are no longer widely used" Letter from UK PRA: Insights from PRA thematic review of general insurance reserving and capital modelling (2022)

<sup>&</sup>lt;sup>17</sup> They conclude the "drivers of superimposed Inflation over the two periods are different and are picked up to a different extent by the respective models". It is likely that changes in economic inflation would also be picked up to a different extent by the respective models.

Although Australian general insurance actuaries appear to have been better placed than their European counterparts when inflation increased in 2022, the adoption of payment per claim techniques does not magically solve the difficulties of modelling claims liabilities with rapidly changing inflation, and uncertainty about future inflation.

Firstly, there are a variety of different payment per claim techniques in use in Australia and as reported by Pearson and Beynon, and the way that they respond to inflation changes can vary. The table below taken from the Pearson & Beynon report shows three of the payment per claim models in used (within one report, at two different points in time – the 2000/01 report and the 2006/07 report):

- Payment per claim incurred;
- Payment per claim finalised; and
- Payment per claim handled.

Table 4.1: Estimates of superimposed inflation based on different payment per claimmodels taken from PwC's Premium Rates Committee Report for WA workers compensation(taken from Pearson & Beynon paper).

Model	Estimate of SI Inflation p.a.			
	2000/01 report 2006/07 report			
PPCI	14.1%	2.7%		
PPCF	11.5%	4.3%		
PPCH	11.0%	3.9%		

Secondly, the measure of inflation used in the payment per claim method may not be sensitive to the level of economic inflation. For example, the measure of economic inflation used in the WA workers compensation above is based on wage inflation rather than price inflation.

Table 4.2: Claim escalation factors taken from Scyne Advisory's Premium Rates Con	nmittee
Report for WA workers' compensation (2024/25)	

Year to 30	Claim escalation factors (based on	CPI (Perth)
June	wages)	
2020	3.41%	
2021	2.34%	1.6%
2022	3.52%	6.0%
2023	5.45%	6.2%

In September 2022, the Reserve Bank of Australia observed that "headline inflation is at multi-decade highs in most advanced economies, reflecting a confluence of factors. Wages growth has also increased, but not to the same extent."<sup>19</sup> Relying solely on wage inflation as an indicator of economic inflation within claims data may not reflect the level of economic or superimposed inflation within the claims portfolio – or within segments of the claim portfolio which may be more sensitive to price inflation.

Thirdly, when inflation is changing rapidly, and particularly when it is high, there is often increased uncertainty about the level of future inflation. The next section of this paper will deal with forecasting inflation.

www.rba.gov.au/publications/bulletin/2022/sep/wage-price-dynamics-in-a-high-inflation-environment-the-internationalevidence.html

<sup>&</sup>lt;sup>19</sup> "Wage-price dynamics in a high-inflation environment: the international evidence" by Suthaharan, Neyavan and Bleakley, Joanna (15 September 2022) published in the RBA Bulletin – September 2022 www.rba.gov.au/publications/bulletin/2022/sep/wage-price-dynamics-in-a-high-inflation-environment-the-international-

## **5.** Forecasting inflation

Over the last forty-seven years various Australian actuarial authors have discussed the need for and the difficulty of forecasting inflation (either economic or superimposed or both). Observations that can be made on each of these papers together with the practical implications for dealing with the effects of inflation on general insurance today, are set out below. We then go on to review some very recent papers from economists on the difficulties that they have observed during the recent acceleration in economic inflation.

#### Summary of views from various Australian actuarial authors

"Separation of inflation and other effects from the distribution of non-life insurance claim delays" (1977) G.C. Taylor

Taylor opens with the statement - "In recent years, as a result of more concentrated research together with the ravages wrought upon some insurers by inflation, the fundamental significance of the so-called run-off triangle in the calculation of provisions for outstanding claims has been increasingly recognised" indicating that a rapid and/or significant shift in inflation was regarded as a serious problem for the management of insurers.

He proposed a separation method to deal with what he referred to as exogenous influences on claim amounts - by deriving exogeneity factors specific to each combination of year of claim and year of payment- with inflation being one of the main exogenous factors affecting claim size, varying mainly by the period between claim and payment.

The paper, written in 1977 followed a period in which the annual rate of increase in the Australian Consumer Price index (CPI) had accelerated from a rate that had been regarded as less problematic.

#### Table 5.1: Inflation rates in Australia 1961- 1976 (source RBA table g01)

Year ending	Annual rate
	of CPI
	increase
Dec-1961	0.0
Dec-1962	0.0
Dec-1963	1.3
Dec-1964	3.8
Dec-1965	3.7
Dec-1966	2.4
Dec-1967	3.4
Dec-1968	2.2
Dec-1969	3.3
Dec-1970	5.3
Dec-1971	7.0
Dec-1972	4.7
Dec-1973	<mark>12.5</mark>
Dec-1974	<mark>16.7</mark>
Dec-1975	<mark>14.3</mark>
Dec-1976	<mark>14.3</mark>

The rapid increase followed what seemed like a long period of low inflation. This may have given rise to a tendency for actuaries to assume that low rates of inflation would continue.

The rise in inflation was more severe and more prolonged than the recent experience (from 2022 to the date that this paper is published).

A longer term and broader picture of inflation cycles can be seen from the data for the period 1945 to 2023 shown in Table 5.2 – changing the focus provides a different perspective. That is, like today, general insurance actuaries in the 1970s needed to look 20 years into the past, to find similar levels of inflation.

	Annual		Annual		Annual		Annual
	rate of		rate of		rate of		rate of
Year	CPI	Year	CPI	Year	CPI	Year	СРІ
ending	Increase	ending	Increase	ending	Increase	ending	Increase
Dec-1945	0.3	Dec-1966	2.4	Dec-1987	7.2	Dec-2008	3.7
Dec-1946	2.4	Dec-1967	3.4	Dec-1988	7.6	Dec-2009	2.1
Dec-1947	5.6	Dec-1968	2.2	Dec-1989	7.8	Dec-2010	2.8
Dec-1948	10.3	Dec-1969	3.3	Dec-1990	6.9	Dec-2011	3.0
Dec-1949	7.9	Dec-1970	5.3	Dec-1991	1.5	Dec-2012	2.2
Dec-1950	12.2	Dec-1971	7.0	Dec-1992	0.3	Dec-2013	2.7
Dec-1951	23.9	Dec-1972	4.7	Dec-1993	1.8	Dec-2014	1.7
Dec-1952	10.5	Dec-1973	12.5	Dec-1994	2.6	Dec-2015	1.7
Dec-1953	1.6	Dec-1974	16.7	Dec-1995	5.1	Dec-2016	1.5
Dec-1954	1.6	Dec-1975	14.3	Dec-1996	1.5	Dec-2017	1.9
Dec-1955	3.1	Dec-1976	14.3	Dec-1997	-0.3	Dec-2018	1.8
Dec-1956	6.0	Dec-1977	9.4	Dec-1998	1.5	Dec-2019	1.8
Dec-1957	1.4	Dec-1978	7.6	Dec-1999	1.9	Dec-2020	0.9
Dec-1958	1.4	Dec-1979	10.2	Dec-2000	5.8	Dec-2021	3.5
Dec-1959	2.7	Dec-1980	9.2	Dec-2001	3.1	Dec-2022	7.8
Dec-1960	4.0	Dec-1981	11.0	Dec-2002	2.9	Dec-2023	4.1
Dec-1961	0.0	Dec-1982	11.3	Dec-2003	2.4		
Dec-1962	0.0	Dec-1983	8.6	Dec-2004	2.5		
Dec-1963	1.3	Dec-1984	2.5	Dec-2005	2.8		
Dec-1964	3.8	Dec-1985	8.3	Dec-2006	3.3		
Dec-1965	3.7	Dec-1986	9.6	Dec-2007	2.9		

#### Table 5.2: Inflation rates in Australia 1945- 2023 (source RBA table g01)

Practical implications for dealing with the effects of inflation on general insurance today are:

- Actuaries need to resist the behavioural bias that leads to a tendency to forecast the future of a variable such as inflation based on short, or even medium, term historical experience;
- Actuaries need to take a longer term and broader view of inflation patterns;
- Inflation looks like it is difficult to forecast and is probably influenced by factors which are difficult to incorporate into quantitative models, such as shifts in fiscal and monetary policy, that in turn are influenced by qualitative factors such as geopolitics and supply disruptions such as war and pestilence (pandemics).

"Superimposed inflation – Accident Compensation Landscape in 2007" (2007) Pearson, E and Beynon, C

Thirty years later, after economic inflation had reduced and appeared to have stabilised at a low level, Estelle Pearson and Chas Beynon focussed, in their paper, on what was regarded as the more difficult forecasting problem – that of superimposed inflation.

Pearson and Beynon concluded that:

- superimposed inflation did exist;
- while it was then at a low rate, there was ample evidence from past experience that the rate of SII could reach high levels and have potentially severe financial consequences;
- the causes of SII are varied and involve complex behavioural, social, legal and legislative processes.
- while an effective way of dealing with SII was (and is) to change the benefits being insured, this may have unintended consequences.

Therefore, we conclude that:

- a sound method of dealing with SII is needed
- forecasting SII has some of the same difficulties as forecasting economic inflation: and
- if forecasting is difficult then an alternative such as scenario analysis may be useful.

Practical implications for dealing with the effects of inflation on general insurance today are:

- It may still be useful to attempt to forecast SII and economic inflation separately and then apply the forecasts together in an overall model.
- The observed difficulties in forecasting both types of inflation are an argument in favour of applying scenario analysis in which multiple factors are simultaneously varied to develop a range of scenarios.
- Apart from the difficulty of developing alternative assumptions of various factors in the forecasts of both SII and economic inflation, there is the additional challenge of ascribing a probability to each of the scenarios that are developed.
- Nonetheless, a multiple scenario approach is worth considering, perhaps with the added refinement of a stochastic modelling approach to considering the probability of outcomes from various scenarios.
- Actuaries by virtue of their actuarial education and training are at least as capable and well suited to this type of work as are any other professionals engaged in forecasting (such as economists and management consultants).

#### "Inflation Risk in General Insurance" (2010) De Ravin, John and Fowlds, Mike

In their very comprehensive paper and presentation to the 17<sup>th</sup> General Insurance Seminar, De Ravin and Fowlds drew several conclusions that still seem relevant today:

- the Wilkie model does not actually work as it does not allow shifts to new levels of long term inflation, but rather sticks at the one level for all periods, and does not allow for "breakouts" which clearly happen in practice;
- numerous macroeconomic models have been proposed to describe the movement in macroeconomic variables such as price and wage inflation, short and long term bond yields, equity and property prices and yields. However, it is difficult to find a simple model which satisfies standard statistical tests;
- superimposed inflation tends to occur in bouts and for complex causes.
- pricing is normally performed using a best estimate of future index (economic) and superimposed inflation. The pricing process requires significant judgment of hard-to-estimate quantities particularly future rates of superimposed inflation.

- a variety of asset classes have been proposed as hedges against inflation but some (such as equities and property) that may be tolerable long run hedges are not suitable in the short term.
- the traditional investment approach that 'matches' the liabilities using nominal bonds of similar duration to the liabilities leaves the insurer exposed to inflation risk.

In addition, in their work on reserving they illustrated the benefit of using multiple scenarios with different patterns to derive a range of potential outcomes that would inform the decision to be made about the appropriate level of reserves.

Practical implications for dealing with the effects of inflation on general insurance today:

- the use of multiple scenario analysis in forecasting both economic and superimposed inflation can be extended beyond the application to reserve calculations, to pricing.
- It can also be used in asset liability management and investment strategy.

#### "Challenge Inflation Opportunity" (2017) Miller, Hugh and Evans, Ash

In their paper to the Injury and Disability Schemes Seminar 12 – 14 November 2017, written in a period of persistent low (economic) inflation, wages growth and yields on credit-risk-free bonds, Miller and Evans made observations that still seem relevant today:

- then current common approaches to inflation forecasting included:
- Historical rates Looking at average inflation rates (since the introduction of government inflation targeting in 1993) gives a plausible basis for the future. These sometimes took different forms; for example, a 'fixed-gap' approach using the historical gap between inflation and discount rate, whereas fixed inflation uses historical inflation levels directly.
- Formula-based approaches These were extensions of using historical rates that recognised patterns in past inflation and applied these to future conditions.
- Economic forecasters produced detailed forecasts quarterly, which had widespread use among actuaries.
- using a fixed gap between discounting and inflation is not supported by evidence: correlation between these series is far from perfect and such approaches in situations where market-consistent inflation is required were not recommended;
- the market for index-linked bonds had deepened so a market-based estimate of future inflation was possible;
- a market-based inflation forecast of inflation could be used for pricing longer-tailed insurances where stability of premium is a material consideration.
- it can be a legitimate way to determine liability using a market-based "gap", as opposed to other approaches which are heavily reliant on convenient assumptions.
- CPI (economic) inflation can be estimated from indexed-linked bonds consistent with how nominal discount rates are estimated from the yield curve.
- nominal and index-linked bonds can contain information to the same date. For most applications, professional forecasts of inflation do not contain the up-to-date information contained in the nominated yield curve. Consequently, there is less observed volatility in the gap if index-linked bonds were used.
- where insurance schemes inflate cash flows that follow consumer spending trends, a yield fitting approach like the one illustrated in their paper was recommended.
- constructing a CPI forecast from market instruments is exclusively consistent with IFRS17 and a professional obligation.
- projecting AWE inflation has proven more difficult to forecast because:
- while CPI is explicitly targeted (by monetary authorities) there is no corresponding target for AWE inflation

- wage growth was usually viewed as CPI plus a premium equalling productivity growth. However, even this is a simplification, as it was distorted by factors like the level of income going to wages (as opposed to profits), or the changing number of hours worked.
- there are cyclical runs of above-average and below-average wage growth such as during the mining boom years of 2003 to 2011, which were then counterbalanced by below average growth post 2013.
- AWE inflation assumptions are harder, but it best to tie them to CPI in some way, given their strong correlation and the ability to estimate CPI expectations directly from the market.
- recommended options were:
- do not use a complex forecast of real wage growth for valuations where the role of superimposed inflation is important, it may be more direct to estimate higher superimposed inflation as a loading on CPI, rather than AWE.
- consider combining a long-run assumption with short-run trends using a simple time series analysis to produce AWE projection curves. They will typically start at current levels and revert over some period to the long-term (observed) difference over CPI.

#### Practical implications for dealing with the effects of inflation on general insurance today:

• make more use of bond market based estimates of future inflation where there is a deep enough market in inflation linked government bond (mainly the USA, UK and to a lesser extent Australia) as the base case for forecasts of economic inflation.

#### Summary of views from various economic and investment market sources

"Phillips Curve Inflation Forecasts" (2007) Stock, James H and Watson, Mark

Stock and Watson open their paper with the statement: "Inflation is hard to forecast. There is now considerable evidence that Phillips curve forecasts do not improve upon good univariate benchmark models."

This work is cited because it was a review of the efficacy of many forecasts of inflation by economists who were using a widely accepted model of how the rate of inflation and the rate of unemployment in an economy were linked. The Phillips curve model is based on an hypothesis that when unemployment is at or below the non-accelerating inflation rate of unemployment (NAIRU) then the rate of inflation will accelerate. The extensive review of many forecasts using this model by Stock and Watson in 2007 suggested that the addition of the unemployment rate into a macro economic model added little to the capacity of the models to predict inflation.

This has some relevance to the situation experienced since 2022, when it was observed that:

- initially in 2022 inflation in the USA and many other countries accelerated due to supply chain disruptions, caused first by the COVID pandemic, and then exacerbated by the war in Ukraine;
- this caused a rapid increase in inflation in goods prices;
- then in 2023 inflation spread to services prices, as wages increased in labour markets where unemployment was at historically low levels.

This suggests that there may be some use for Phillips Curve analysis where unemployment below the NAIRU level causes higher inflation to persist. There are however widespread reservations among professional economists about whether the addition of such analysis to macroeconomic models assists in inflation forecasting, for the reasons set out in the Stock and Watson analysis in 2007. "Forecasting Inflation" (2021) Sablik, Tim

This paper was written in late 2021, at the start of the recent surge in inflation. This was before the accelerating impacts of the war in Ukraine ramped up inflation.

Sablik notes at the outset that:

"In recent months, inflation has climbed to levels not seen in a generation. The Fed's preferred measure of inflation, the Personal Consumption Expenditures (PCE) price index, increased to 4.4 percent in September 2021 compared to the same month the previous year. The last time the index reached such heights, George H.W. Bush was president, and Alan Greenspan was just finishing his first term as chair of the Fed's Board of Governors."

He notes, almost approvingly that:

"Maintaining price stability is one half of the Fed's dual mandate, so Fed officials have been watching this spike in inflation closely. According to the monetary policy framework adopted by the Fed last year, it judges inflation that averages 2 percent over time to be consistent with its price stability mandate. While inflation measures in recent months have come in above that 2 percent threshold, that hasn't been entirely unexpected nor unwelcome. Prices fell last year as the pandemic rippled through the global economy. Some of the current surge in prices is actually "reflation" as the economy ramps back up after months of lock- downs, and the Fed's new framework was designed to allow periods of higher inflation following periods when inflation is below target."

Therefore at the time (before the situation worsened in 2022) there was a sense that the spike (as small as it was) may have been part of a longer term reversion to a mean rate of inflation.

Sablik also goes on to acknowledge that:

"But Fed officials have also admitted that inflation has proven more lasting than they initially anticipated. As the economy has reopened, consumer demand has outpaced supply for some goods and services. Lingering supply chain disruptions have led to product shortages and price increases that are more than just a return to pre-pandemic trends. The challenge facing Fed policy- makers now is trying to predict whether inflation will remain elevated in the absence of monetary policy intervention or gradually return to levels consistent with the Fed's target once the shocks from the pandemic fade."

He then goes on to discuss the difficulty of forecasting inflation and determining the relative importance of monetary policy decisions (which are easy to observe) versus shifts in expectations (which can also be observed but are difficult to predict as they are a social phenomenon).

In conclusion, Sablik cites Reis, a leading macroeconomist at the London School of Economics, who says:

"In the end, it is policy that pins down inflation, not expectations. A credible central bank uses monetary policy to make expectations that differ from its target unsustainable, ensuring that expectations and actual inflation are ultimately the same."

On this view, the social driver of economic inflation, is influenced by monetary policy, which in itself is uncertain in its effects which are often experienced with a lag.

In this regard, forecasting economic inflation, looks as difficult as forecasting superimposed inflation, which has important social drivers.

#### "Commentary on Bank of England Monetary Policy Committee Inflation Forecasts"

(2024) Bernanke, Ben

The Bank of England, the central bank of the United Kingdom of Great Britain and Northern Ireland, is undergoing a review of its inflation forecasting processes led by Ben Bernanke, former Chairman of the Federal Reserve Board, the central bank of the United States of America. The Bernanke review has been underway since the middle of 2023 and is due to report on or about 12 April 2024, after the submission deadline for this paper. The review was commissioned by the governing board of the Bank of England following severe criticism of its failure to forecast the sharp rise in inflation in 2022 and 2023.

David Milliken of Reuters, a leading financial news service, wrote on 11 March 2024: "When the Bank of England's chief economist was asked to explain why its forecasting models had failed to anticipate runaway inflation, he sought to manage expectations. "All economic models are wrong, but some are useful," Huw Pill concluded in a letter to lawmakers last June that laid out the limitations of prediction methods.

Britain's central bank was nonetheless unable to escape the censure of economic experts in parliament who judged its **"inadequate" projection models** and a narrow outlook had frustrated its efforts to rein in rampant inflation in the wake of the COVID pandemic and Russian invasion of Ukraine."<sup>20</sup>

There is a range of speculation among commentors about what Bernanke will recommend. By the time of the Actuaries Summit in early May we will know and we will comment on Bernanke's views in the presentation related to this paper. We include this as a current example of the difficulties of forecasting inflation, even for organisations that apply great resources to the task.

Appendix 3 sets out a commentary on the Bernanke review published in the LSE Business Review of the London School of Economics and Political Science, just prior to the deadline for this paper.

The article makes the following key points:

- it would be tempting to expect moderate rather than radical changes implemented in the BoE's (forecasting) models. This, however, is far from certain as radical changes will go a long way towards addressing the forecasting failures of the BoE in the recent past.
- 2. many believe that Ben Bernanke will suggest a new version of the Bank of England's Monetary Policy Report will provide forecasts of inflation and GDP growth based on interest rate dot plots (similar to those produced by the Federal Open Market Committee in the USA). The idea is that Monetary Policy Committee (MPC) members will anonymously provide their future forecasts of interest rates. These forecasts will enter as inputs to provide inflation and GDP forecasts of the UK economy up to three years into the future.
- 3. moving to this Fed-style dot plot rather than conditioning (i.e. basing) forecasts on market expectations of interest rates is worth pursuing because financial markets have historically been mistaken about the Bank's policy rate. In fact, figure 5.1, which plots the market expectations of UK interest rates two years ahead together with the actual policy interest rate, shows that financial markets have over-

<sup>&</sup>lt;sup>20</sup> https://www.reuters.com/markets/europe/bank-england-forecasts-dock-bernanke-verdict-looms-2024-03-11 Actuaries Institute

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predicted the Bank's policy rate by an average of 1.07 percentage points per annum between late 2006 and early 2022. Since early 2022, however, financial markets have under-predicted the Bank's policy rate by an average of 3.28 (!) percentage points a year, which, to some extent, flags the challenges of the ongoing geopolitical risk.



Figure 5.1. Market expectations of BoE's policy rate and actual policy rate

## 6. Conclusion

### **Summary of Findings**

The findings in this paper are as follows:

- High inflation hastened the establishment of the general insurance actuarial profession in Australia.
- The recent economic inflation levels experienced in Australia have not been seen for over 35 years and are not just "beyond the working memory" of most general insurance actuaries, but beyond their lived actuarial experience.
- Australia is not alone in experiencing unprecedented levels of economic inflation over the last two years.
- The building block approach of defining total inflation as economic inflation plus some balancing item appears to be universally accepted.
- Although the UK definition of inflation (on a like for like policy basis) is theoretically superior to both the US and Australian definitions, the US definition (increases in claim size) is the easiest of the three to measure and of more practical use.
- Given there is no consistently adopted definition of superimposed inflation in Australia, it would seem necessary for an actuary using that term to provide a clear and explicit definition with every use.
- The analysis and monitoring of inflation is not only relevant to average claim costs, but also claim frequency. A discussion of inflation should include observations of its impact on both.
- Monitoring and measuring the impact of inflation on frequency and severity, separately, is not only preferable for understanding the cause of the inflation, but also for appropriately allowing for its potential future impact on frequency and severity. However, monitoring and measuring the impact of inflation on aggregate claim costs frequency and severity, in total can also have useful applications.
- The effect of inflation on general insurers can be summarised as:
  - Claims inflation is linked to, and exceeds, the level of economic inflation.
  - Certain classes of general insurance business are more closely linked to economic inflation than others.
  - Claims inflation in different classes of general insurance business may lead, lag or coincide with economic inflation.
  - The main underwriting response is to reprice insurance risks that exhibit elevated claims costs.
  - o Inflation has a direct negative impact on profitability via rising claims costs.
  - General insurers' investment income is largely protected against inflation.
  - A short-term sharp increase in inflation is expected to have a negative impact on the capital requirements of general insurers.
- The use of explicit inflation adjustment techniques in Australia meant that actuaries in Australia were better positioned than their UK counterparts when inflation shifted significantly in 2022.
- Actuaries need to take a longer term and broader view of inflation patterns, and make more use of bond market based estimates of future inflation where there is a deep enough market in inflation linked government bond (mainly the USA, UK and to a lesser extent Australia) as the base case for forecasts of economic inflation.
- Forecasting SII has some of the same difficulties as forecasting economic inflation

   forecasting economic inflation, with its influences from monetary policy, looks as
   difficult as forecasting superimposed inflation, which has important social drivers.

• The observed difficulties in forecasting both types of inflation are an argument in favour of applying scenario analysis in which multiple factors are simultaneously varied to develop a range of scenarios.

### Areas for further research

The questions for today's actuaries include:

- Will central bank policy bring inflation back to the previous targets of 2% p.a. to 3% p.a.? If not, where will the economic inflation rate stabilise?
- Will the factors driving excess insurance inflation (superimposed inflation) continue to drive excess inflation no matter what happens to economic inflation?
- Will the fiscal deficits of many governments continue to add not just to economic inflation but also to superimposed inflation (e.g. via schemes such as the NDIS which can change the propensity to claim more broadly)?

### Acknowledgements

The authors would like to thank John De Ravin for his generosity in agreeing to peer review this paper, and for his kind and insightful suggestions.

## 7. References

### **Economic papers**

Title	Author	Year
Commentary on Bank of England Monetary Policy Committee Inflation Forecasts	Bernanke, Ben S	2024
Forecasting Inflation	Sablik, Tim	2021
Phillips Curve Inflation Forecasts	Stock, James H and Watson, Mark W	2007

### Australian actuarial papers

Title	Author	Year
Extreme events in inflation	Ahlgrim and D'arcy	2012
A Claim Pairing Approach to Measuring		
Superimposed Inflation – A NSW CTP Example	Cutter et al	2015
Measuring and Understanding Superimposed		
Inflation in CTP Schemes - What's in our toolkit?	Cutter, Karen	2009
Inflation Risk in General Insurance	De Ravin & Fowlds,	2010
Challenge, Inflation, Opportunity	Evans & Miller,	2017
Superimposed inflation - an elusive concept	Gould and Atsu	2011
Superimposed Inflation Study of impact on	Lane, Tim and Haden,	
premium rates	Rebecca	2014
Towards a better inflation forecast	Miller, Hugh	2010
	Mulquiney, P. and Miller,	
A topic of interest – how to extrapolate the yield	Н.,	2012
Superimposed inflation	Pearson and Beynon	2007
Superimposed Inflation, or, actuaries searching		
for Brigadoon	Pearson, Beens and Liu	2018
Separation of inflation and other effects from the		
distribution of non-life insurance claim delays	Taylor	1977

### International actuarial papers

Title	Author	Year
	Ball, Matthew and	
Some considerations with regard to inflation	Staudt, Andy	2011
	Brickman, Forster and	
Claims Inflation – Uses and Abuses"	Sheaf,	2005
The Effect of Inflation of Losses and Premiums for		
Property Liability Insurers	Butsic, Robert	1981
	European Insurance and	
	Occupational Pensions	
Impact of Inflation on the Insurance Sector	Authority	2023
	Lynch, Jim and Moore,	
Social Inflation and Loss Development	David	2022

Social Inflation and Loss Development - an update	Lynch, Jim and Moore, David	2023
Insights from PRA thematic review of general insurance reserving and capital modelling	Shah, Nylesh	2022
Claims inflation - what are Lloyds doing	Shah, Ajay et al	2022
Reserving for inflation - Lloyd's Guidance		2022

### **Appendix 1: A cautionary tale**

Today's general insurance actuaries are not the first to be caught out by a sharp shift in the rate of inflation. In the early 1970s most actuaries in Australia were practising in the area of superannuation and more specifically in the establishment and management of defined benefit superannuation plans for companies.

The retirement benefits being funded in the defined benefit plans were mainly lump sum benefits payable on retirement at age 65 and linked to final (or final average) salary at the time of retirement. The benefit liability accrued at a defined rate year by year. For example a typical plan would provide for a lump sum benefit of 15% of final salary at age 65 for each year of membership of the fund. Members often joined the funds at age 25 or below so that the benefits that were being funded were therefore of the order of six times final salary at age 65 and based on the salary at that point of time, which may be 40 years into the future. The liabilities of the defined benefit plans were therefore linked to the rate of salary inflation over long periods of time. The contributions to the fund to provide for these benefits were usually set at 5% of current salary for the members contribution, with the employers contributing whatever percentage of salary was needed in to meet the projected liability assuming that the contributions could be invested over long period of time at certain expected rates of return on investments.

In the early 1970s consumer price inflation was running at 2% p.a. and it was common to assume that salary inflation would average 4% per annum for a long period of time of up to 40 years.

Expected Investment returns on a mix of assets including listed equities, commercial property and fixed interest (mostly government bonds) was assumed would be of the order of 6% per annum over long periods of time.

The challenge of funding the retirement benefits was assisted by the fact that members who withdrew received a benefit of their accumulated contributions plus a low rate of interest with the non-vested employer contributions being reallocated to fund the benefits of remaining members. This gave rise to what was called a withdrawal surplus which was substantial.

This structure and set of assumptions typically gave rise to a recommended employer contribution rate of the order of 8% or 9% of salary, which would be reviewed every three years in the light of emerging experience.

In 1973 and 1974 inflation started to accelerate, due mainly to war in the Middle East in 1973 and reactions to it. The price of oil quadrupled in a year. This had the effect of increasing inflation in most developed countries as well as driving them into a recession due to their dependence on oil.

In the 1970s the labour markets were more regulated and trade unions were more dominant so that inflation in goods and services prices i.e. increases in the consumer price index, normally led to increases in wages and salaries.

In 1974 and 1975 the market prices of equities and properties fell by as much as 50% in response to the major recession which was underway. At the same time goods and services inflation rapidly accelerated to above 10% per annum while wage and salary inflation accelerated at a faster rate as an inflation uncertainty premium emerged in addition to the already higher rate of inflation.

All of this was completely unanticipated by the actuaries of the defined benefit funds. In the early 1970s the assumed excess of investment returns above salary inflation was mostly borne out by the experience. This together with the withdrawal surpluses led to most defined benefit superannuation plans having significant surpluses of assets over liabilities by 1972.

The normal triennial reviews of the finances of such funds from 1974 onwards started to reveal that the erstwhile surpluses had disappeared and had become major deficits as the value of the assets had plunged and the value of the liabilities had lifted to a new plateau which was 15% greater.

The response from the superannuation actuaries was threefold:

- 1. acknowledge the lower market price of the assets;
- change the long term assumptions from 6% p.a. investment returns and 4% p.a. salary increase to 7% p.a. investment returns and 6% p.a. salary increase, thus halving the margin that contributed to surpluses; and
- 3. institute a short term addition to the rate of salary increase to somewhere between 10% p.a. and 15% p.a. for a period of three years.

There was a resultant temporary sharp increase the recommended contribution rates for employers at a time when economic conditions (recession plus sharply higher inflation) were badly impacting their profitability and capacity to pay.

In the subsequent years 1976 through the 1980 asset prices in the equity markets recovered significantly and those in the property market also recovered to some degree. Bond market prices did not as bond yields did not go back to the pre 1973 levels. Nevertheless the assets of most of the defined benefit superannuation funds recovered significantly, reducing the deficits of the funds.

The higher employer contributions contributed further to the reduction of the deficits and by 1980 the finances of most of the plans had been restored to surplus. The long term actuarial assumptions about salary inflation and investment returns had however changed and did not go back to the levels seen before 1973.

In 1980 the equity market peaked. The oil price had accelerated again in 1979 due to trouble in the Middle East. In 1981 there was another recession, but not as bad as 1974-75. Inflation was still high by today's standards.

The period 1973 to 1983 was stressful for actuaries who were trying to guide and manage the finances of defined benefit funds.

In 1983 to 1985 negotiations led to the establishment of today's dominant defined contribution funds, where the members rather than the employers bear the investment risk. Defined benefit funds are now a much smaller part of the landscape. Actuarial practice has moved to other pastures such as general insurance.

From 1980 onwards the world central banks attempted to seriously reduce the rate of inflation, mainly by raising short term interest rates. Eventually, in the early 1990s they started to succeed. Inflation was lower than it had been in the 1970s and 1980s. Following the GFC induced recession it moved even lower. Central banks were cutting interest rates to raise bath GDP growth and keep inflation above zero.

A sense of stability and calm, at least about the rate of economic inflation, came to prevail.

Then in the period since 2020 the world's economies have seen disease induced economic lock downs and supply disruptions, a major war in Europe and more supply disruptions, war in the Middle East (again) and supply disruptions, and with it all an unanticipated rapid increase in (economic) inflation.

Add to this the effects of climate change on insurance claims frequency and size, and social change on propensity to claim, and we can see factors contributing to accelerated superimposed inflation.

General insurance actuaries of today can look back at the experience of the superannuation actuaries in the 1970s and 1980s and find some comfort that problems of accelerating inflation can be solved. History does not repeat but it can rhyme.

# Appendix 2: Claim development data

Accident year 2014 2015 2016 2017 2018 2019	22 24 26 28 27	35 39 41	18 20	44				
year 2014 2015 2016 2017 2018 2019	22 24 26 28 27	35 39 41	18 20	44				
2014 2015 2016 2017 2018 2019	22 24 26 28 27	35 39 41	18 20	44				
2015 2016 2017 2018 2019	24 26 28 27	39 41	20		799	1,905	100	295
2016 2017 2018 2019	26 28 27	41		70	1,086	2,118	134	32:
2017 2018 2019	28 27		21	40	899	2,089	134	320
2018 2019	27	43	23	37	946	2,168	136	353
2019		44	24	38	837	2,160	124	379
	26	40	24	38	832	2,165	120	365
2020	21	35	21	36	975	1,882	124	328
2021	22	33	20	37	840	1,921	100	333
2022	16	25	17	32	966	1,944	100	32:
	Travel	Marine	Aviation	Consumer Credit	Other accident	Other	Total	
Accident				U				
vear								
2014	185	18	1	29	152	446	3,218	
2015	222	24	1	32	120	539	3,812	
2016	207	24	1	32	109	667	3,570	
2017	224	23	1	32	92	763	3,733	
2018	261	22	1	34	90	833	3,633	
2019	274	20	1	41	92	946	3,610	
2020	194	20	1	49	99	1,093	3,422	
2021	47	25	1	45	102	1,287	3,305	
2022	106	24	1	33	74	1,364	3,421	
Source: <u>Genera</u>	al insurance clai	ms development sta	tistics December 2	022				

	СТР	PL	PI	EL	House- holders	Domestic motor	Fire & ISR	Commercial Motor
Accident								
year								
2014	2,210	1,158	1,035	1,131	2,956	4,786	1,838	1,315
2015	2,269	1,271	1,070	1,731	5,038	5,591	3,056	1,509
2016	2,634	1,379	1,757	1,201	4,052	5,674	2,868	1,540
2017	2,736	1,553	1,585	1,186	5,187	6,151	3,078	1,656
2018	2,587	1,609	1,584	1,335	4,109	6,379	2,861	1,762
2019	2,665	1,573	1,726	1,384	5,990	7,002	2,992	1,769
2020	2,548	1,538	1,811	1,395	8,055	6,497	4,921	1,701
2021	2,721	1,691	2,126	1,515	6,544	6,643	3,382	1,762
2022	2,913	1,858	2,152	1,669	10,305	7,949	5,236	2,244
		-	2a	QE	2 (			
	Travel	Marine	Aviation	Consumer Credit	Other accident	Other	Total	
Accident								
year								
2014	353	250	79	69	352	344	16,429	
2015	404	279	78	72	409	398	21,535	
2016	393	303	66	76	647	467	21,105	
2017	356	378	96	69	573	496	23,132	
2018	448	292	85	57	396	567	22,226	
2019	519	265	74	56	408	589	25,101	
2020	382	298	37	54	466	1,085	28,466	
2021	86	349	50	27	453	831	26,384	
2022	313	472	71	19	576	865	34,326	
Courses	Caparal insurance clai	ms development st	tistics December	2022				
Bublished	20 July 2022	ing percropment at						

## Appendix 3: The Bernanke review of the Bank of England inflation forecasting process

The following article appeared in the LSE Business Review of the London School of Economics and Political Science, just prior to the deadline for this paper.<sup>21</sup>

Ben Bernanke, former chair of the US Federal Reserve Board (Fed), has carried a review of the Bank of England's (BoE) forecasting models. His recommendations are due this week. Central banks are quite conservative in the sense that they (generally) take policy decisions in measured and cautious steps. Think about raising interest rates by 25 basis points most of the time rather than pursuing interest rate increases of 50 or even 75 basis points. This is because big changes in interest rates introduce uncertainty both for businesses and consumers and therefore risk damaging economic growth by delaying investment and spending decisions. Consequently, it would be tempting to expect moderate rather than radical changes implemented in the BoE's (forecasting) models. This, however, is far from certain as radical changes will go a long way towards addressing the forecasting failures of the BoE in the recent past.

Many believe that Ben Bernanke will suggest a new version of the Bank of England's Monetary Policy Report which will provide forecasts of inflation and GDP growth based on Fed-style interest rate plots. The idea is that Monetary Policy Committee (MPC) members will anonymously provide their future forecasts of interest rates. These forecasts will enter as inputs to provide inflation and GDP forecasts of the UK economy up to three years into the future.

Moving to this Fed-style dot plot rather than conditioning forecasts on market expectations of interest rates is worth pursuing because financial markets have historically been mistaken about the Bank's policy rate. In fact, figure 1, which plots the market expectations of UK interest rates two years ahead together with the actual policy interest rate, shows that financial markets have over-predicted the Bank's policy rate by an average of 1.07 percentage points per annum between late 2006 and early 2022. Since early 2022, however, financial markets have under-predicted the Bank's policy rate by an average of 3.28 (!) percentage points a year, which, to some extent, flags the challenges of the ongoing geopolitical risk.

<sup>&</sup>lt;sup>21</sup> https://blogs.lse.ac.uk/businessreview/2024/04/09/what-ben-bernankes-review-might-change-in-the-bank-of-englands-forecasting-models/



Figure 1. Market expectations of BoE's policy rate and actual policy rate

Data sources: Market expectations of interest rate from successive BoE Monetary Policy Reports. Policy rate from the BoE.

Nevertheless, moving to a Fed-style dot plot framework is far from certain. MPC members are employed by the Bank of England to decide on interest rates today with the aim of hitting the 2 per cent CPI inflation target two to three years into the future. It is not their job to simultaneously decide on current interest rates and future interest rates. I sense that MPC members might feel uncomfortable adopting a Fed-style dot plot framework. If MPC members have already communicated this to Bernanke, I also sense he will not suggest a Fed-style plot! Why is that? It will be extremely embarrassing for the MPC and Bernanke if he suggests a Fed-style dot plot only for them to reject it!

So, if, and this is a big if, Bernanke does not suggest a Fed-style dot plot, what other suggestions can he make?

I will start with the observation that the fan charts, currently employed by the Bank's Monetary Policy Report, provide forecasts based on the mode (that is, the most likely outcome), average, and median forecast. The fan charts also offer a range of probability forecasts, such as the probability of inflation being too high or too low. Admittedly, this is too much information. Instead, I would like to see three main suggestions in Bernanke's review.

First, continue reporting the most likely inflation and GDP growth outcome (forecast) based on interest rates staying at their current level up to three years down the road. Consider this the "baseline" forecast which is easy to digest because it asks the following simple question: if the MPC members take no further interest rate action over the next two to three years, what is going to happen to inflation and GDP growth? In fact, this "baseline" forecast has historically been more valuable than the forecast based on market expectations of interest rates. Since 2006, the "baseline" forecast has under-estimated two-year ahead inflation by an annual average of 0.77 percentage points, whereas the forecast based on market expectations of interest rates has underestimated two-year ahead inflation by an annual average of 0.93 percentage points.

Second, the most likely inflation and GDP growth outcome (forecast) based on the average interest rate expectation of the nine MPC members two to three years down the road. Consider this as a "light version" of the Fed-style dot plot.

Third, I would like Bernanke's review to also focus on the use of money, the latter measuring liquidity in the economy. So far, the Bank of England appears to be ignoring "Divisia money". Divisia money is a powerful measure of liquidity that weights the components of money based on their likelihood of being spent. Notes and coins have a higher weight than money held in mutual funds, for example. The idea is that higher (lower) liquidity (money, that is) raises (lowers) inflation and GDP growth. In fact, Divisia money captures the effect of quantitative easing (QE), in which central banks have tried to stimulate their economies by "creating" money. My own research has shown that Divisia money is a powerful predictor of GDP growth and more so when GDP growth is either weak, or the economy is already in recession (the UK was been in recession during the second half of 2023). At the same time, Divisia money predicts UK inflation quite well. So, why ignore money **in** when it improves UK economic forecasts? At the end of the day, better forecasts will help the Bank's MPC members take better policy decisions now.

Last but not least, it has been argued that any central inflation forecast could be accompanied by a scenario of high inflation as well as a scenario of low inflation. This carries extra risks. If, for instance, MPC members believe that a high-inflation scenario is more likely than a low one, they would be tempted to overtighten policy now, therefore invalidating their central inflation forecast.