LLOYD'S

CLAIMS INFLATION

DISCUSSION DOCUMENT
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1 PURPOSE

This document aims to facilitate the discussion of the Claims Inflation Working Group at Lloyd's, a group which includes members of the Market and the Corporation. The group's purpose is to establish a common definition and framework for claims inflation.

It is not the aim of the Corporation to collect more claims inflation data from managing agents than is already asked for in the syndicate business forecast (SBF) return, but to work with them to provide guidance on how claims inflation can be defined and monitored.

2 INTRODUCTION

Claims inflation is a vital input to planning, pricing, capital setting and reserving [1]. However, one of the biggest challenges is to establish a consistent definition across different business functions [2].

In 2009 Lloyd's established the performance management data return (PMDR) setting out a consistent framework to monitor risk adjusted price movements from one year to the next, see www.lloyds.com/pmdr.

The success of PMDR is largely due to the fact that Lloyd's established an agreed definition and language for price monitoring across different entities, such as syndicates or classes of business.

Claims inflation is part of the PMDR framework, but only implicitly as part of the "other" category. This paper looks at how this can be broken down. It is hoped that a consistent understanding of this will support improved assessment and monitoring of claims inflation.

Lloyd's is currently not aiming to collect claims inflation numbers in the PMDR. It is however hoped that syndicates explicitly take claims inflation into account in their models and try to measure it as best practice, especially for long tail business. This could also help consistent analysis, benchmarking, tracking of market trends etc.

In reaching a definition on claims inflation the working group has tried to take into account current practices in the market, and challenges syndicates may face when assessing claims inflation such as resources and market specificities. However, the nature of these specificities means that it is unrealistic for an overview document to detail how to measure claims inflation in every instance; instead general principles are offered.

3 INFLATION

Before we discuss claims inflation it is helpful to review how economic inflation is defined and measured.

Inflation is defined as a sustained increase in the general price levels of goods and services in an economy over a period of time. Inflation is usually measured by monitoring the price for an average basket of goods and services over time.

4 CLAIMS INFLATION

How does 'ordinary' inflation relate to claims inflation? What is the basket of goods and services in the insurance context?

Insurers sell the promise to pay the insured an indemnity or benefit following a loss event caused by insured perils, subject to any limits, for an upfront received premium as agreed in the insurance policy. Therefore the products sold by an insurer are the future claim payments and the basket of goods and services is defined by the insurance contracts, the words that describe the policies and expected claims costs.

Like with ordinary inflation, where the cost of the basket is derived from the items bought, e.g. the number of loaves of bread bought during a given period, and cost level, here the price for one loaf of bread, we speak in the insurance context of frequency and severity of claims.

4.1 Definition

Claims inflation is the change in the **expected claims cost level**[1] of a like for like policy in an economy over time. In this context "like for like" means constraint by policy wording.

4.2 Measuring claims inflation

Claims inflation is measured by comparing the change in expected claims costs of insurance contracts over time.

As stated above, the basket of goods and services in the insurance context are the words of the policy that describe the indemnity or benefits, the deductible and limits, the insured risks or exposures and perils covered.

4.2.1 Challenges

Measuring economic inflation is reasonably straightforward, as long as the basket of goods and services don't change. However, more often than not the basket of goods and services is changing over time, as new products emerge and others become redundant. Similarly, insurance contracts change over time as clients request changes in their deductibles, include or exclude certain perils, or make changes to the underlying exposure, e.g. replace their Ford Focus with a Porsche 911. In all those cases we need to consider how those changes are taken into account allowing for a like-for-like comparison.

4.2.2 Normalising for changes in the basket

The principle of normalising changes in a basket is generic: one of the two baskets needs to be adjusted for the changes in the other, either to last year or this year. The direction of the adjustment will depend on the usage. For pricing we have to understand the impact of claims inflation on this year's policy, while for reserving the focus will be on understanding the impact of claims inflation on last year's policy. Claims inflation is in both cases the change in the expected claims cost from one year to the next. Typically it is either reviewed as a difference of amounts or more often as a percentage. In the latter case for the purpose of pricing we have

$$Claim\ Inflation\ (\%)_{Pricing} = \frac{Expected\ claims\ cost\ on\ this\ year's\ policy\ this\ year}{Expected\ claims\ cost\ on\ this\ year's\ policy\ last\ year} - 1$$

In either case one has to estimate the impact of changes in the insurance contract on the expected claims costs. As mentioned above, typical changes in the policy reflect changes in deductible, limits, breadth of cover (perils), exposure characteristics (Ford Focus to Porsche 911) and units of exposure (10 properties to 12 properties). All these changes reflect changes in the policy wording and therefore should be accounted for.

The remainder in the change of expected claims costs from one year to the next can then be attributed to claims inflation, largely driven by economic (e.g. CPI-type inflation) or social inflation (e.g. legal & regulatory changes, moral standards), but also changes in business process (e.g. speed of settlements or payments), resulting in some cases also in claims deflation.

Claims inflation therefore tries to estimate the impact of the overall environment, economic as well as social, on the expected claims costs over time. For a group of policies it will be the average emerging pattern of claims inflation.

Because this approach defines claims inflation as the residual after allowing for policy wording changes, claims inflation will be a characteristic of each policy's wording. Hence, a policy with tightly defined wording may have significantly different claims inflation than another policy on the same risk with loser wordings.

Therefore claims inflation can vary from product to product, and will depend on the level of granularity in which the product is defined; compare Example 3 and 4, see also Simpson's paradox[2]. As result the impact of claims inflation can be actively influenced by reviewing the products' policy wordings.

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[1] The total expected settlement costs of all claims associated with the policies. Expect claims cost means the true underlying mean of the population, which is often unobservable.

[2] It is a paradox in which a trend that appears in different groups of data disappears when these groups are combined.

5 CLAIMS INFLATION IN THE CONTEXT OF RENEWAL PRICING

For renewal business the risk adjusted rate change (or perhaps better risk adjusted price change) is defined as the difference in premium charged this year compared to the premium one would have charged last year for this year's policy. In order to normalise last year's policy to this year's policy Lloyd's asks as part of the Performance Management Data Return (PMDR) syndicates to provide a breakdown of the premium changes by the following components: changes due to deductible/limits, changes due to breadth of cover (perils) and other changes. Other changes include all other changes, such as changes in the exposure and claims inflation.

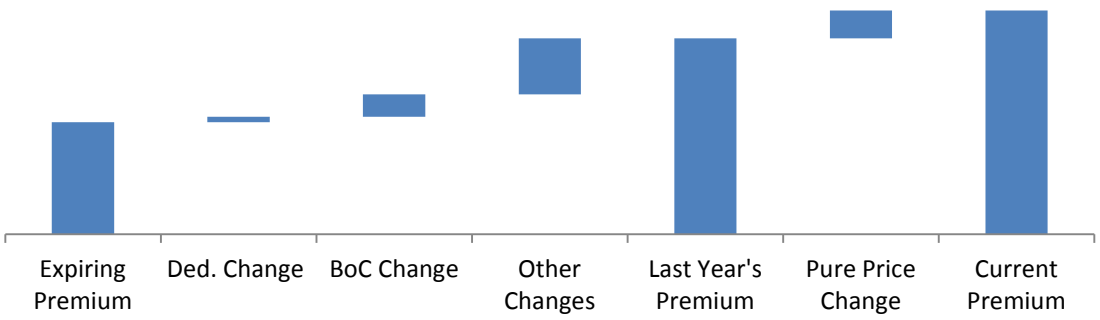


Figure 1: Illustrative example of price monitoring in PMDR.

Note, Lloyd's uses an additive model, whereby the changes of the first two adjustments (Ded./Limits & BoC) have to be reported on last year's exposure unit basis and allocated appropriately. It is assumed that the deductible and breadth of cover are explicitly included in the policy wording. Thus they are part of the terms and conditions and, by definition, are not responsible for claims inflation.

Similarly changes in claims due to changes in breadth of cover can only be isolated and properly defined by fixing all other factors. For example, a renewed policy which covers fire losses is not directly comparable to its pre-renewal counterpart if that covered only flood losses.

Changes in exposure units (e.g. from one property to ten properties) and characteristics (e.g. installation of sprinklers, or switching from a Ford Focus to Porsche 911) are captured in the "other" bucket. Claims inflation is included implicitly as part of the total in this bucket.

5.1 Breaking down "Other changes" to find Claims Inflation

As outlined above, claims inflation is captured implicitly as part of price changes in "Other" in PMDR. By breaking out the "Other" bucket into its components, namely the changes in premium income due to claims inflation, exposure characteristics and units we gain a more explicit view of the year on year price movements. Lloyd's is currently not proposing to collect this more granular level of information in the PMDR – we are only splitting "other changes" into better characterised underlying components to understand what it contains in theory, see Figure 1and compare to Figure 2. Arguably other factors such as increased administrative costs, e.g. to cope with increase regulations can be considered as well, but these have been omitted here for simplicity.

The following approach aims to make changes in the policy wordings explicit, so that changes in the expected claims cost from one year to the next can be attributed to either changes to the policy, the 'basket of words' or claims inflation. As mentioned above, the order in which those changes are accounted for matters. Although there is no 'right' or 'wrong' way for this order, a consistent approach is crucial to establish comparable results.

Table 1and Figure 2 present an approach of monitoring renewal price changes that makes the various changes on a policy more transparent and claims inflation an explicit assumption. Similar to the original PMDR framework, last year's and this year's actual premium are captured in columns A and J. Columns B to E monitor the impact of changes to the policy on last year's pricing basis and in last year's economic and social environment. Therefore the sum of columns A to E (= column F) gives the premium of this year's policy ('basket of words') last year. The impact of changes in premium due to changes in the economic and social environment on the expected claims cost from last year to this year is recorded in column G, e.g. consider by how much the premium would have needed to change to keep the loss ratios from A to F constant. Therefore column H provides us with the information as to how

much we would have charged for this year's policy in today's social and economic environment, but in last year's competitive environment and therefore the difference in columns J and H is the risk adjusted price change, while the ratio of G/F gives an estimate of claims inflation %.

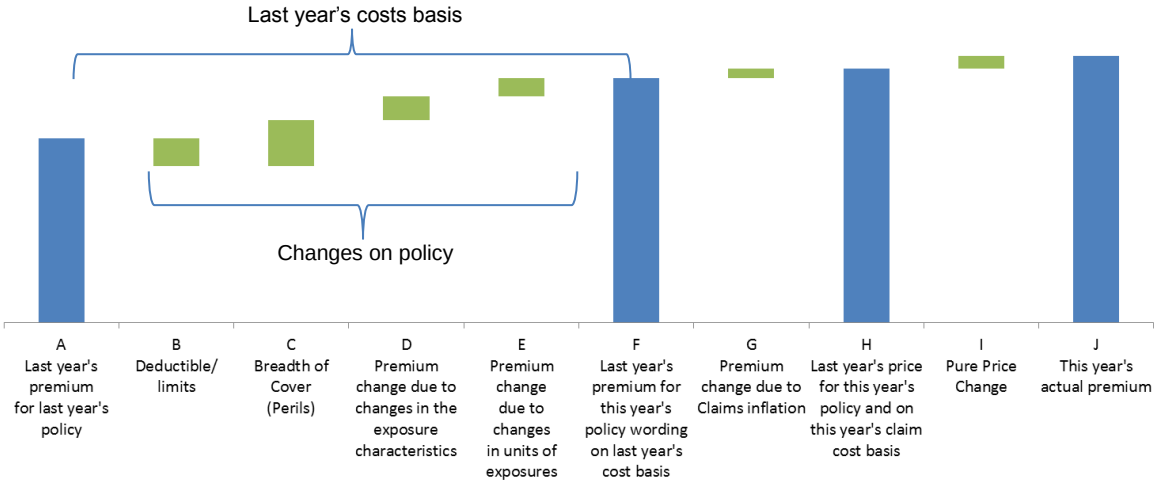


Figure 2: Illustrative example of price changes. Boxes in green/red explain changes in premium due to changes in the underlying cost structure.

Column	Description
A Last year's premium for last year's policy	Last year's premium for last year's policy, or in other words: the expiring premium
B Deductible/ limits	Changes in premium due to changes in deductible and/or limits on last year's pricing and exposure unit basis
C Breadth of Cover (Perils)	Changes in premium due to changes on breadth of cover (the perils covered, e.g. moving from fire and flood to fire only) on last year's pricing and exposure unit basis
D Premium change due to changes in the exposure characteristics	Change in premium due to changes in the underlying exposure characteristics as defined in changes in the policy, e.g. last year a Ford Focus was insured, this year a Porsche 911, but last year's quantum
E Premium change due to changes in units of exposures	Change in premium due to changes in extent of insured item exposure, e.g. insuring two vessels instead of one, or a house which has had an extension compared to one that hasn't, or an insured item which has changed in value for some other reason – based on last year's pricing basis, having taken into account the changes thus far.
F Last year's premium for this year's policy wording	This year's policy priced on in last year's competitive environment.
G Premium change due to Claims inflation	Impact of economic and social inflation, e.g. CPI related inflation, changes in laws, regulation, moral standards, etc.
H Last year's price for this year's policy and on this year's claim cost basis	The premium one would have charged last year for this year's T&C, exposure units and expected claims costs.
I Pure Price Change	The difference between the actual price achieved (J) and the price one would have achieved in last year's market, adjusted for changes the policy and changed claims costs (H).
J This year's actual premium	This year's actual price achieved.

Table 1: Breaking down year on year price changes

5.2 Examples

The examples in this section are purely illustrative, with the aim to demonstrate how changes can be categorised and captured. Examples 3 and 4 only differ slightly in the policy wording artificially to highlight that the composition of the 'basket of words' defines claims inflation. Similarly in the case of economic inflation of a basket of goods and services the level of granularity used to define the basket influences the measurement and outcome, e.g. monitoring price movements for a white shirt with double cuffs, breast pocket and wide collar will have less variance than for a generic white shirt.

5.2.1 Example 1

Last year's policy: Property insured with a total insurable value (TIV) of $500k against fire and flood.

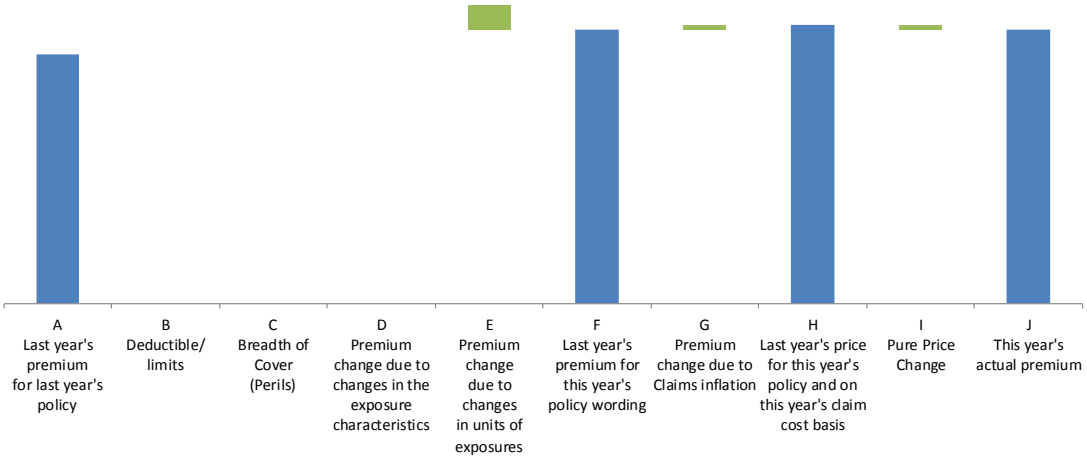
Rate charged 1%. Estimated expected claims costs 0.8% of the TIV and hence expected loss ratio of 80%.

This year's policy: Property insured with a TIV of $550k against fire and flood.

Rate charged 1%. Estimated expected claims cost to rise to 0.816% of the TIV, an increase by 2% compared to last year.

In this example only the TIV changed on the policy. Hence, we have to consider how much the change in the TIV would have changed last year's premium. Assuming that the rate charged is the same for $550k, we allocate $500 to column E. From the information we have been given above we assume that expected claims cost rise by 2%. Hence, if the premium increases by 2% as well, then the impact on profitability, or loss ratio, would be eliminated. Therefore $110 = $5500 * 2% are allocated to column G and claims inflation can be recalculated again as Column G / Column F.

A Last year's premium for last year's policy	B Deductible/ limits	C Breadth of Cover (Perils)	D Premium change due to changes in the exposure characteristics	E Premium change due to changes in units of exposures	F Last year's premium for this year's policy wording	G Premium change due to Claims inflation	H Last year's price for this year's policy and on this year's claim cost basis	I Pure Price Change	J This year's actual premium	RARC	Claims inflation
5,000	0	0	0	500	5,500	110	5,610	-110	5,500	-1.96%	2.00%



5.2.2 Example 2

Last year's policy: 10 year old vessel with a value of £10m insured against machinery breakdown.

Rate charged 1.5%, premium £150k. Estimated expected loss cost £110k. Hence, expected loss ratio was 73.3%.

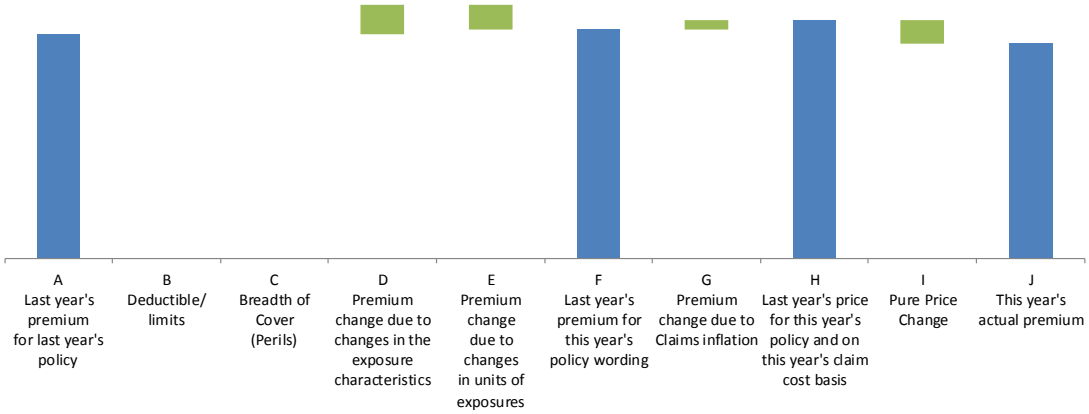
This year's policy: 11 year old vessel with a value of £9m insured against machinery breakdown.

Rate charged 1.6%, premium £144k. Estimated expected loss cost £120k. Hence, expected loss ratio is 83.3%.

Further we assume that in last year's competitive environment we would have been able to charge a rate of 1.7% for an 11 year old vessel and a value of £9m. In last year's claims environment the estimated expected loss cost was £115k for this year's policy. Hence, expected loss ratio was 75.2%.

In this example we note two changes on the insurance contract; the vessel's age changed from 10 to 11 year, while the value was reduced from £10m to £9m. Therefore we first have to consider the impact on last year's premium for an 11 year old vessel with a value of £9m. The first change reflects a change in the exposure characteristic (£10m*(1.7% - 1.5%) = £20k), while the second change describes an adjustment in the units of exposures ((£9m - £10m)*1.7% = -£17k). Therefore, before taking into account claims inflation the like-for-like premium would have been £153k). As the estimated expected claims cost increased from £115k to £120k, premium should have increased by £6,652=£153k*(£120k / £115k - 1) to £159,652 to maintain the same loss ratio of 75.2%, reflecting claims inflation of 4.35%. Therefore the pure price change, the impact change in the competitive environment is £144,000 - £159,652 = -15,652 and hence the RARC = -£5,652/£159,652 = -9.80%.

A Last year's premium for last year's policy	B Deductible/ limits	C Breadth of Cover (Perils)	D Premium change due to changes in the exposure characteristics	E Premium change due to changes in units of exposures	F Last year's premium for this year's policy wording	G Premium change due to Claims inflation	H Last year's price for this year's policy and on this year's claim cost basis	I Pure Price Change	J This year's actual premium	RARC	Claims Inflation
150,000	0	0	20,000	-17,000	153,000	6,652	159,652	-15,652	144,000	-9.80%	4.35%



5.2.3 Example 3 – Product with vague risk details

Last year's policy: A cargo policy insures the transit of 1m barrels of oil to and from any location in the world, with a £10m limit and £250,000 excess.

Last year's policy was priced at $1,462,000, based on an expected mix of 50% WTI, 50% Brent crude oil.

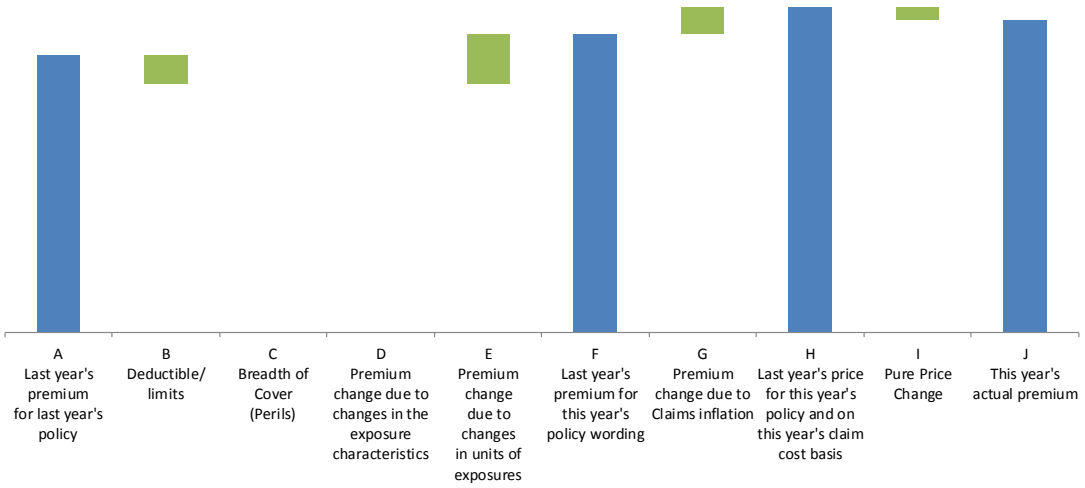
This year's policy: A cargo policy insures the transit of 1.2m barrels of oil to and from any location in the world, with a £10m limit and £500,000 excess.

The excess increase to $500,000 is assessed to cause a 10% reduction in claims. Due to economic inflation the price of a barrel of WTI crude oil has increased from US$95 to US$105 over the year and Brent crude oil has increased from $100 to $110, which is believed to be indicative for this year. The mix of crude oil is expected to change to 75% WTI, 25% Brent crude oil. The price achieved this year is $1,650,000.

The change in deductible is captured in column B as a 10% reduction in premium. The increase in quantity of barrels of oil by 20% is recorded in column E, after having considered the changed deductible.

In this example the change in the expected mix of barrels of crude oil and their prices is an implicit assumption not mentioned on the policy wording. Hence, the change in premium income due to claims inflation is estimated using the factor (75%*105 + 25%*110) / (50%*95+50%*100) - 1.

A Last year's premium for last year's policy	B Deductible/ limits	C Breadth of Cover (Perils)	D Premium change due to changes in the exposure characteristics	E Premium change due to changes in units of exposures	F Last year's premium for this year's policy wording	G Premium change due to Claims inflation	H Last year's price for this year's policy and on this year's claim cost basis	I Pure Price Change	J This year's actual premium	RARC	Claims Inflation
1,462,000	-146,200	0		263,160	1,578,960	141,702	1,720,662	-70,662	1,650,000	-4.11%	8.97%



5.2.4 Example 4 – Product with more risk details

Last year's policy: A cargo policy insures the transit of 1m barrels of oil, with an agreed mix of 50% WTI, 50% Brent crude oil, to and from any location in the world, with a £10m limit and £250,000 excess.

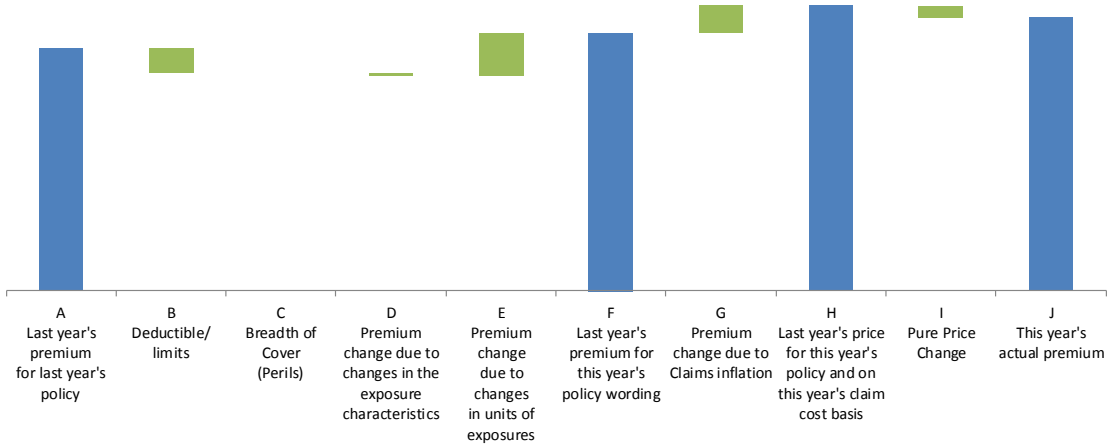
Last year's policy was priced at $1,462,000. The expected price for WTI was $95 and Brent $100.

This year's policy: A cargo policy insures the transit of 1.2m barrels of oil, 75% WTI, 25% Brent crude oil, to and from any location in the world, with a £10m limit and £500,000 excess.

The excess increase to $500,000 is assessed to cause a 10% reduction in claims. Due to economic inflation the price of a barrel of WTI crude oil has increased from US$95 to US$105 over the year and Brent crude oil has increased from $100 to $110, which is believed to be indicative for this year. The price achieved this year is $1,650,000.

Although this example is very similar to Example 3, here the change in the mix of crude oil is mentioned in the policy wordings and as a result the impact of this change in product is recorded in column D ((75%*95 + 25%*100)/(50%*95+50%*100) – 1) and only the impact of the increased oil price as claims inflation in column G ((75%*105+25%*110)/(75%*95+25%*100) – 1). Note, that the view on RARC has not changed (-4.1%), but the view on claims inflation increased from 8.97% to 10.39%. This example and the previous one underline that claims inflation is product specific.

A Last year's premium for last year's policy	B Deductible/ limits	C Breadth of Cover (Perils)	D Premium change due to changes in the exposure characteristics	E Premium change due to changes in units of exposures	F Last year's premium for this year's policy wording	G Premium change due to Claims inflation	H Last year's price for this year's policy and on this year's claim cost basis	I Pure Price Change	J This year's actual premium	RARC	Claims Inflation
1,462,000	-146,200	0	-16,869	259,786	1,558,717	161,945	1,720,662	-70,662	1,650,000	-4.11%	10.39%



5.2.5 Example 5 – Claims inflation captures the effect of time and not change in model

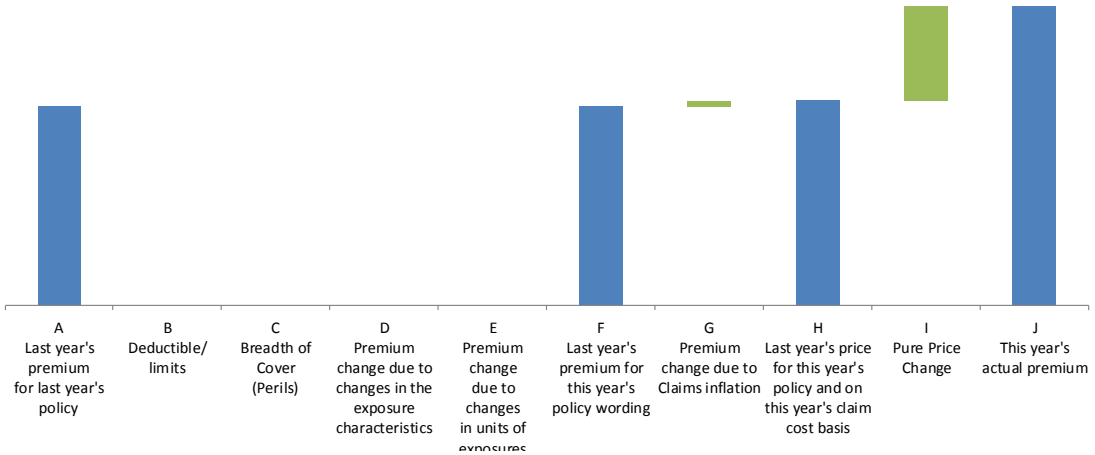
Last year's policy: A property policy insures a house with a sum insured of $1m against flood for a premium of $1,200.

The estimated expected loss cost was $1,000.

This year's policy: A property policy insures a house with a sum insured of $1m against flood for a premium of $1,800.

Over the year a survivor found out that the house is built on floodplain and that the expect loss cost is therefore $1,500. The expected rebuilding cost for a house is expected to increase by 3% from last year due to economic inflation. Note the floodplain is not an effect of time. It was there already last year, the insurance company was just not aware of it; hence it is not claims inflation. Instead the increase in premium will decrease the expected loss ratio and hence is a pure price increase. This example highlights that claims inflation is not model specific.

A Last year's premium for last year's policy	B Deductible/ limits	C Breadth of Cover (Perils)	D Premium change due to changes in the exposure characteristics	E Premium change due to changes in units of exposures	F Last year's premium for this year's policy wording	G Premium change due to Claims inflation	H Last year's price for this year's policy and on this year's claim cost basis	I Pure Price Change	J This year's actual premium	RARC	Claims Inflation
1,200	0	0	0	0	1,200	36	1,236	564	1,800	45.63%	3.00%



6 MONITORING CLAIMS INFLATION

6.1 Anticipated/unanticipated claims inflation

Unlike most other industries which know the impact of inflation on their production cost almost immediately and have to forecast price inflation at the future point of sale to understand the impact on profitability, the situation is reversed for insurers. Insurance companies get paid upfront for a product the will deliver in the future (paying claims) and hence have to forecast the production cost inflation, claims inflation, at the point of sale.

In the context of pricing the forecast of claims inflation can be called anticipated claims inflation. Hence, anticipated claims inflation is defined as the rate of claims inflation that was anticipated at the time of pricing the policy and so was provided for.

Unanticipated claims inflation is therefore the rate of inflation which was not allowed for when the policy was priced. It will only be possible to know this once the policy and its claims are fully settled. If it is statistically significant it can be used to update the assumptions made when forecasting claims inflation.

6.2 Methods

There are a number of methods to monitor and estimate claims inflation. The complexity of the method used is limited by the data available. In particular the data available to a follower in the reinsurance market is likely to be in less detail than a direct writer. It is also dictated by the class of business written. For example for a catastrophe class of business it is harder to establish trends in what is a highly volatile dataset.

A popular method to extract claims inflation is the so-called on-levelling of loss ratios over time, where ultimate loss ratios are adjusted for known risk adjusted rate changes (which should include anticipated inflation) and any remaining trend can be assumed to be unanticipated inflation. More sophisticated approaches try to extract changes in the trend of the calendar year direction of loss triangles, see Figure 3, using linear and generalised linear models [4], [5].

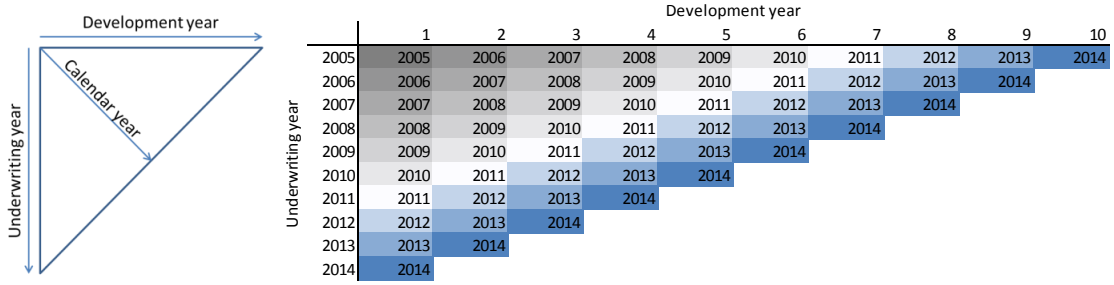


Figure 3: Different time trends in a run-off triangle.

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