

Inflation impact on non-life reserving

Romain NOBIS, ADDACTIS

About the speaker

- **Romain NOBIS**– *Manager, ADDACTIS*

Member of the Actuarial French Institute, Romain NOBIS is manager in ADDACTIS for 4 years on P&C regulatory. He was before actuary in SMACL Assurances during 8 years on P&C thematic. He has a great experience in reserving, modeling, internal models, Solvency 2, IFRS 17, reinsurance, data quality and as a project leader. He's a jury member for thesis of French actuaries student and provides teaching on reserving, internal models and IFRS 17.

Romain participates to the R&D of ADDACTIS on reserving, IFRS 17 and climatic.



-
- We know that succeeding through uncertainty, from risk assessment to strategic decisions, is a very long time consuming and challenging issue. **We are strongly committed to support you and take your business further.** Constantly innovating, challenging existing methods and ideas by creating the knowledge and solutions that make change possible.
 - Step by step, remaining agile and humble, we are women and men in action, conscious that insurance is more than ever a business in motion.

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Introduction

- **Objective of the webinar:** presentation of various **R&D techniques** associated with the treatment of **inflation** in non-life provision risk, with a particular focus on the following aspects:
 - **Adjustment for historical inflation:** market indices, portfolio indices
 - **Projecting future inflation:** regression model, rate model

SOMMAIRE

A decorative graphic featuring a city skyline with modern glass skyscrapers in the background. In the foreground, there are lush green trees and a row of solar panels. The graphic is partially enclosed by a dark blue rounded rectangle on the left and a blue rounded rectangle on the right, with a small teal circle to the right of the blue rectangle.

1. Context

2. State of the art

3. Adjustment for inflation using indices

4. Reserving with explicit inflation

1. Context

2022, a new era

Return of high inflation to which the market was no longer accustomed.

In Europe

Shock on energy prices (+40%) and food prices (+12%).

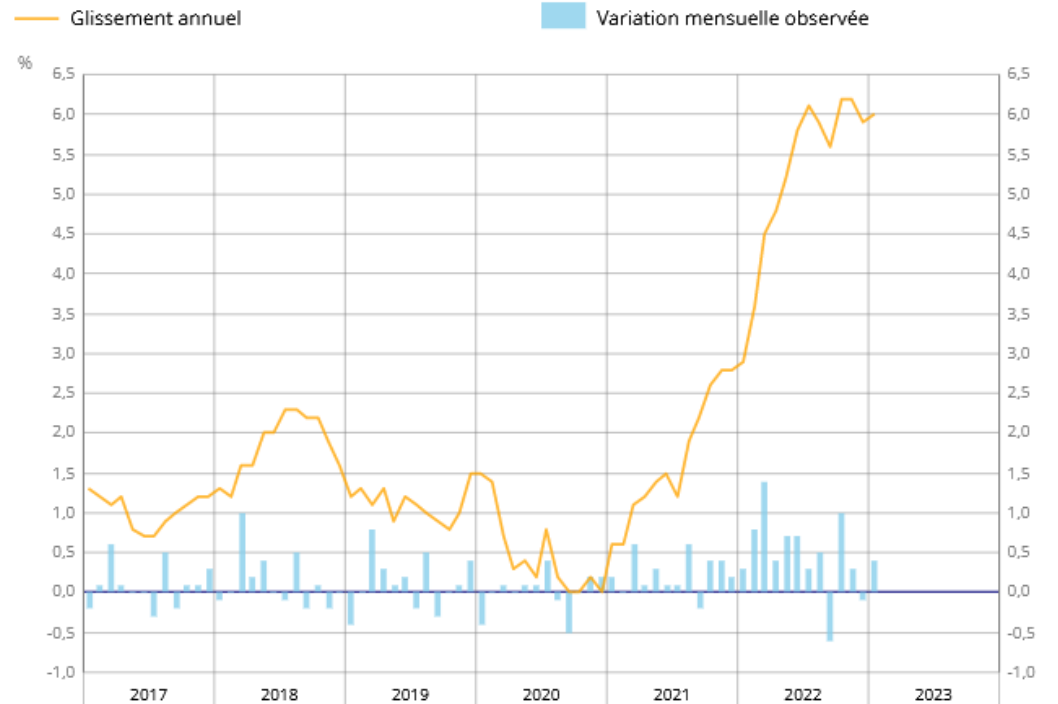
Within the OECD

8% general inflation and 6% in 2023.

In France

Indexes up by around 10% for glass breakage, industrial risks and FFB.

Évolutions de l'indice des prix à la consommation

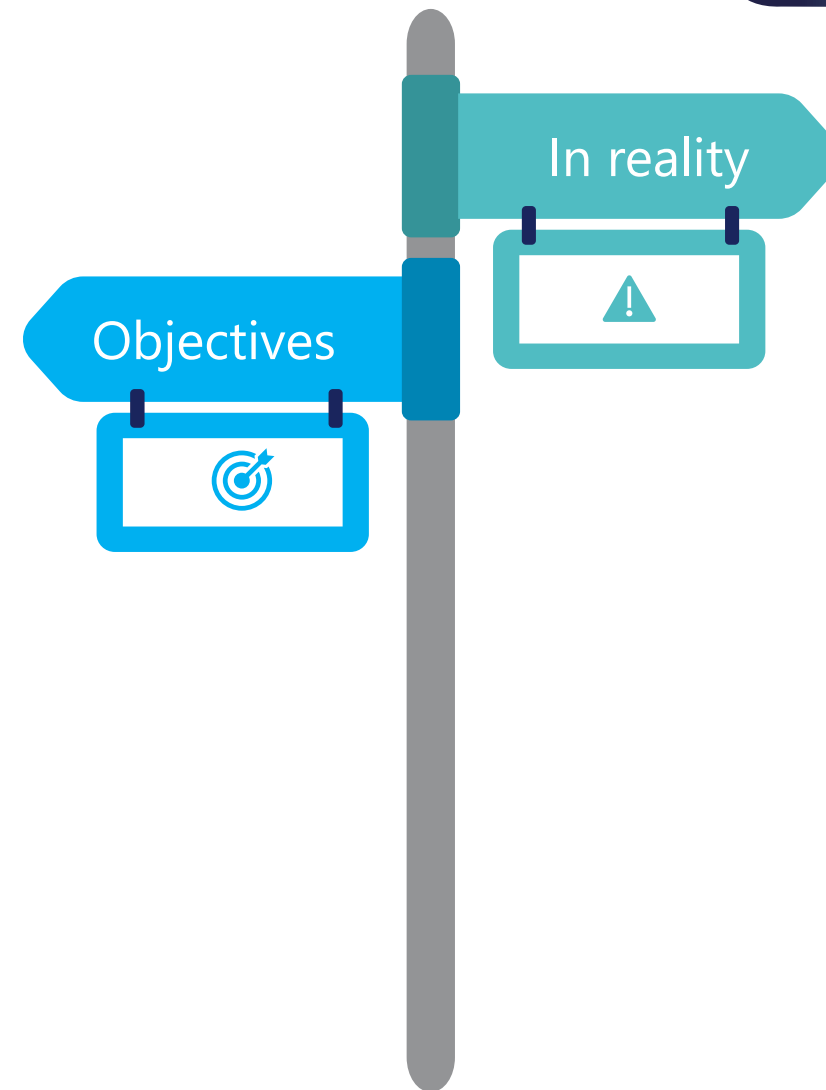
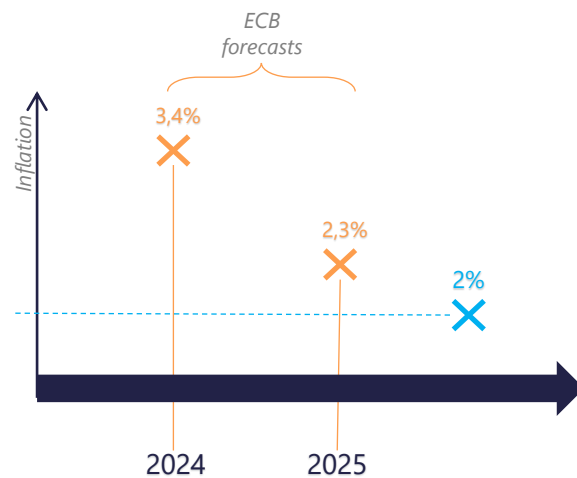


Source: INSEE

1. Context

What's next?

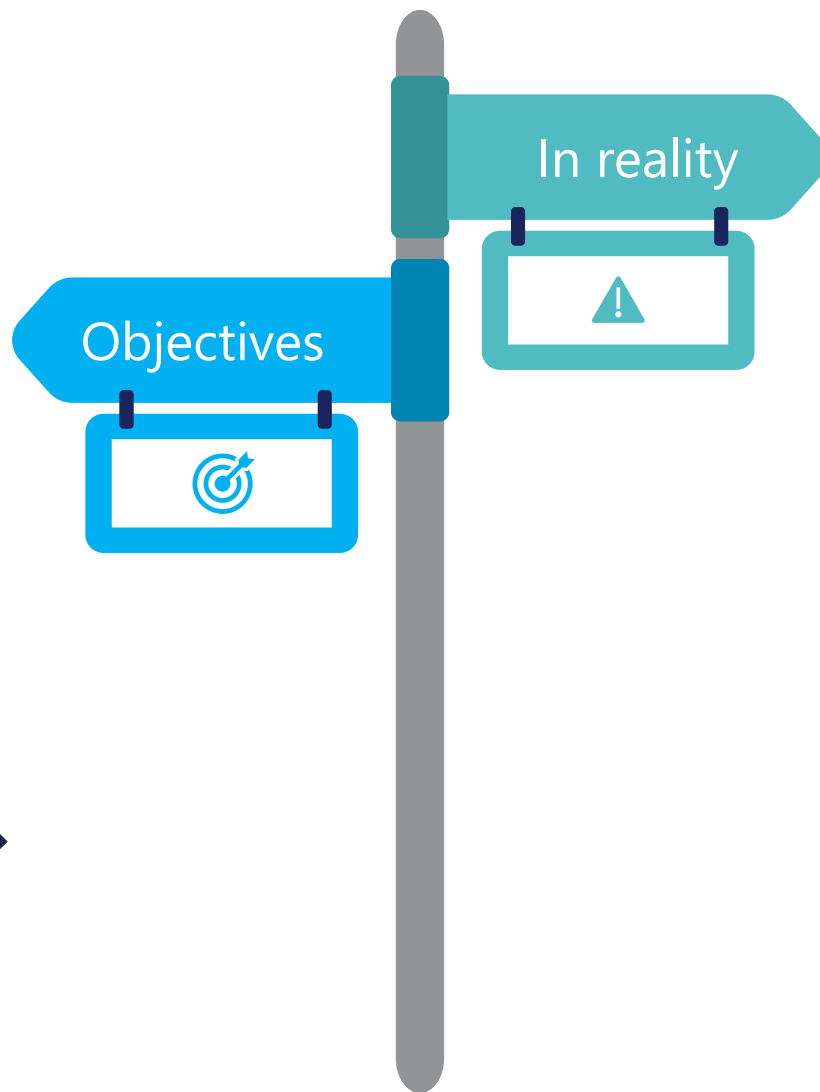
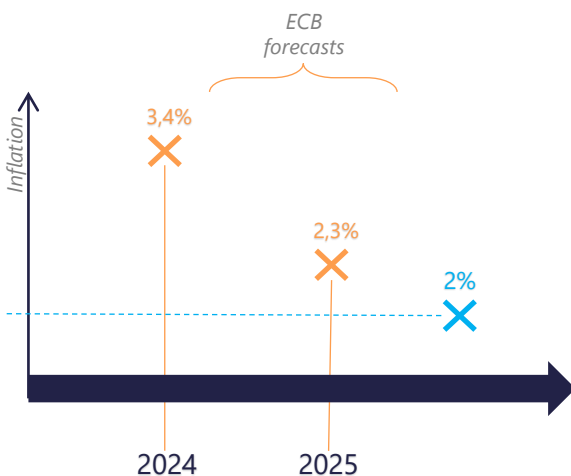
Central bank policy aimed at a return to 2% inflation within 2 or 3 years.



1. Context

What's next?

Central bank policy aimed at a return to 2% inflation within 2 or 3 years.



Policies to mitigate the impact of inflation on consumers could delay the end of the inflationary phase.

Not forgetting :



The energy transition

Energy costs, lower agricultural yields



Deglobalisation

Acceleration since the start of the pandemic



An ageing population

Reduction in available manpower.

SOMMAIRE



1. Background

2. State of the art

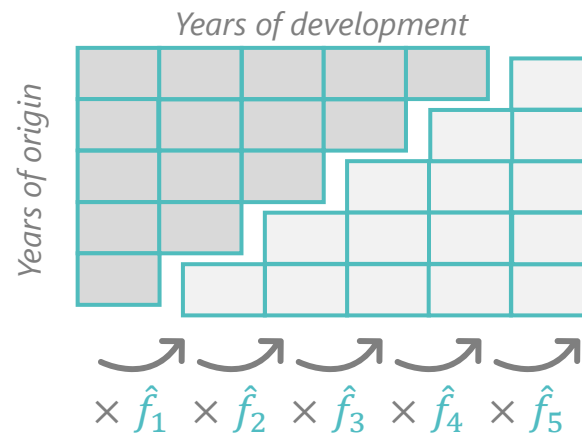
3. Adjustment for inflation using indices

4. Reserving with explicit inflation

2. State of the art

Reserving with implicit inflation

With a low and almost constant inflation over the last 20 years, it was widely assumed that **future inflation would remain similar to that of the past.**



- Traditional chain-ladder reserving methods should be systematically reprocessed.
- Past inflation is no longer comparable with future inflation.

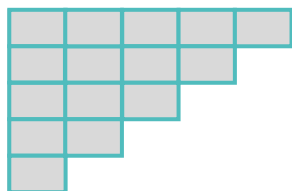
➡ **Reserving processes need to be adjusted.**

2. State of the art

Reserving with explicit inflation

Calculation of reserves

Initial load triangle



Payments in **current euros**
Reserves at constant euro



Constant euro
conversion of
Past payments

Deflated load triangle

Payments in constant euros
Reserves at constant euro



Ultimate
projection

Reserves at
constant euro



Conversion of
Future payments

Reserves at **current euro**



Reprocessing of historic inflation

Input:

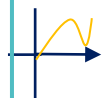
- ✓ Market indices
- ✓ Past payments

The method:

- ✓ Expert opinion
- ✓ Verbeek-Taylor model
- ✓ ...

Output :

- ✓ Market indices
- ✓ Portfolio indices



Reserving methods

- ✓ Chain Ladder, BF, ...
- ✓ Parametric models (ODP, GLM, etc.)
- ✓ Non-parametric models (Mack, etc.)

Projection of future inflation

Input:

- ✓ Market indices
- ✓ Portfolio indices

Method:

- ✓ Rate model
- ✓ Regression model
- ✓ ...

Output :

- ✓ Future inflation trajectories



SOMMAIRE



1. Background
2. State of the art
- 3. Adjustment for inflation using indices**
4. Reserving with explicit inflation

3. Adjustment for inflation using indices

Reprocessment of triangles using market inflation indices

... to use market information on goods or materials specific to the insurance products studied.

... to retain a Chain-Ladder method while validating the hypothesis that there is no diagonal effect.

The use of
indices
makes it
possible...

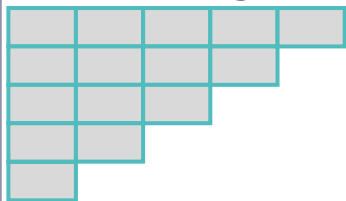
... project inflation (linear regressions, smoothing) and incorporate expert estimates.

3. Adjustment for inflation using indices

Reminder of the process

Calculating reserves

Initial load triangle



Payments in **current euros**
Reserves at constant euro



Constant euro
conversion of
Past payments

Deflated load triangle



Payments in constant euros
Reserves at constant euro



Ultimate
projection

Reserves at
constant euro



Conversion of
Future payments

Reserves at **current euro**



Reprocessing of historic inflation

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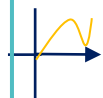
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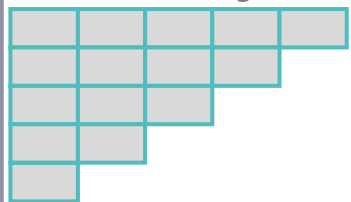


3. Adjustment for inflation using indices

Reminder of the process

Calculation of reserves

Initial load triangle



Payments in **current euros**
Reserves at constant euro



Constant euro
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Deflated load triangle



Payments in constant euros
Reserves at constant euro



Ultimate
projection

Reserves at constant euro



Conversion of
Future payments

Reserves at **current** euro



Reprocessing of historic inflation

Input:

- ✓ Market indices
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Method:

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- ✓ ...

Output :

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Projection of future inflation

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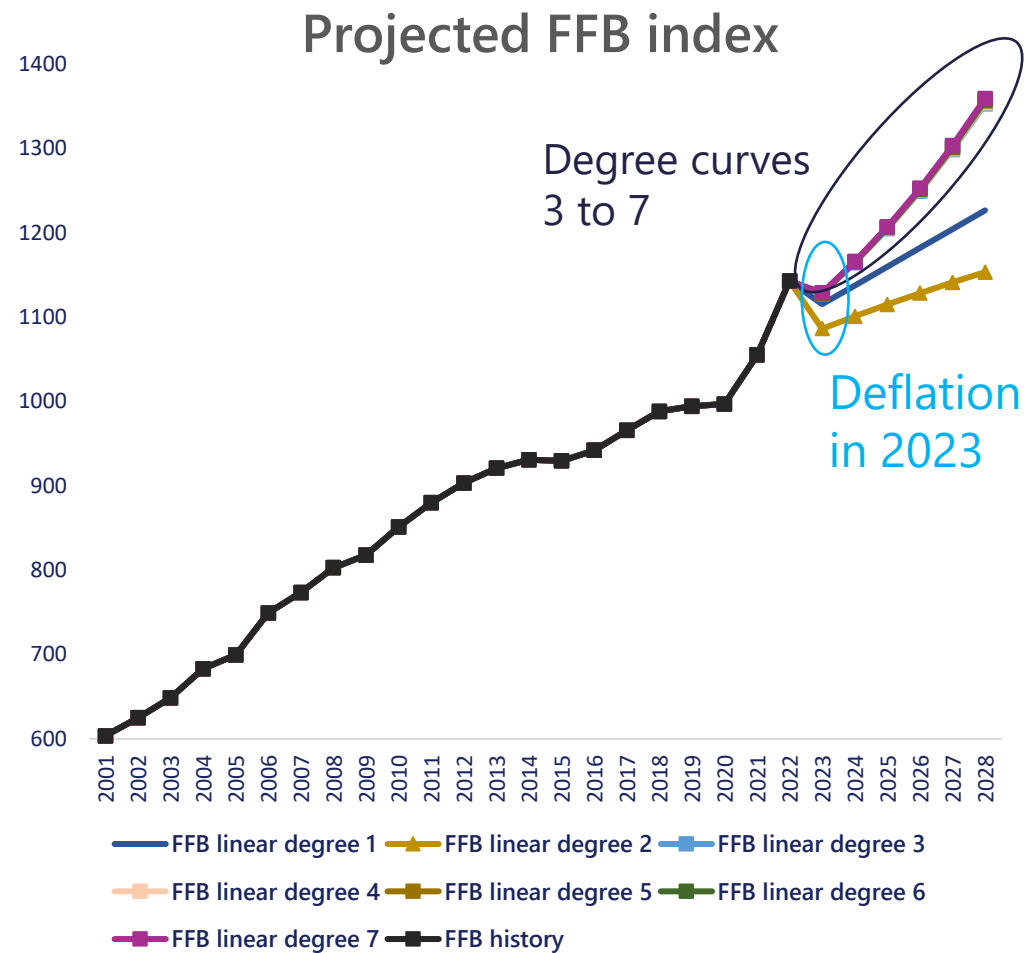
3. Adjustment for inflation using indices

Illustrations - FFB market index

Linear regression applied to the 21 points of the FFB index

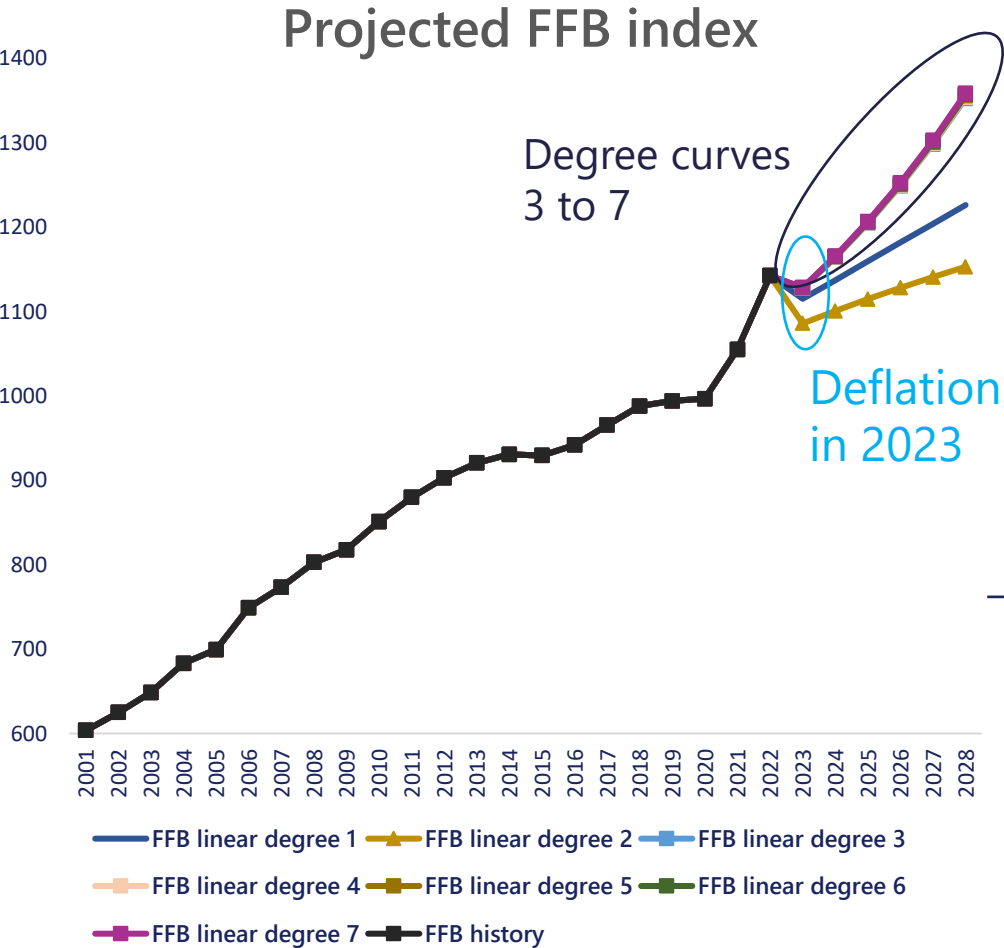
- **Stable** predictions **from degree 3**, no gains in accuracy beyond that
- Modelled deflation in year N+1

Degree of polynomial	R ²
1	96,94%
2	97,56%
3	98,26%
4	98,27%
5	98,27%
6	98,27%
7	98,28%
12	98,30%

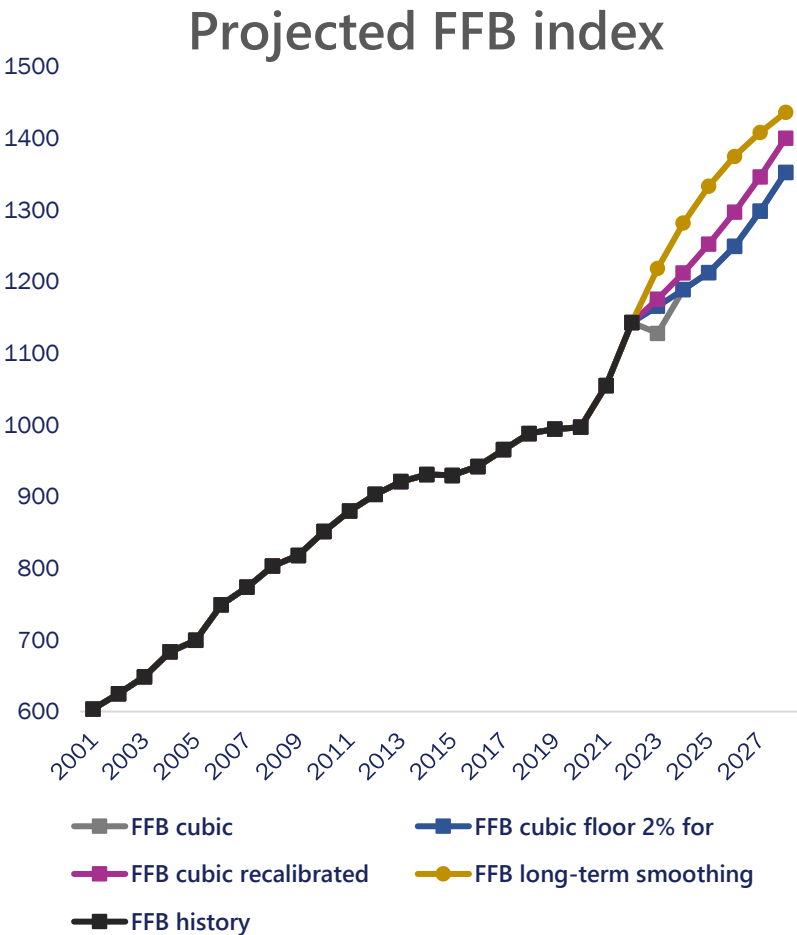


3. Adjustment for inflation using indices

Illustrations - FFB market index



Level 3 linear model, with a floor rate of 2%.

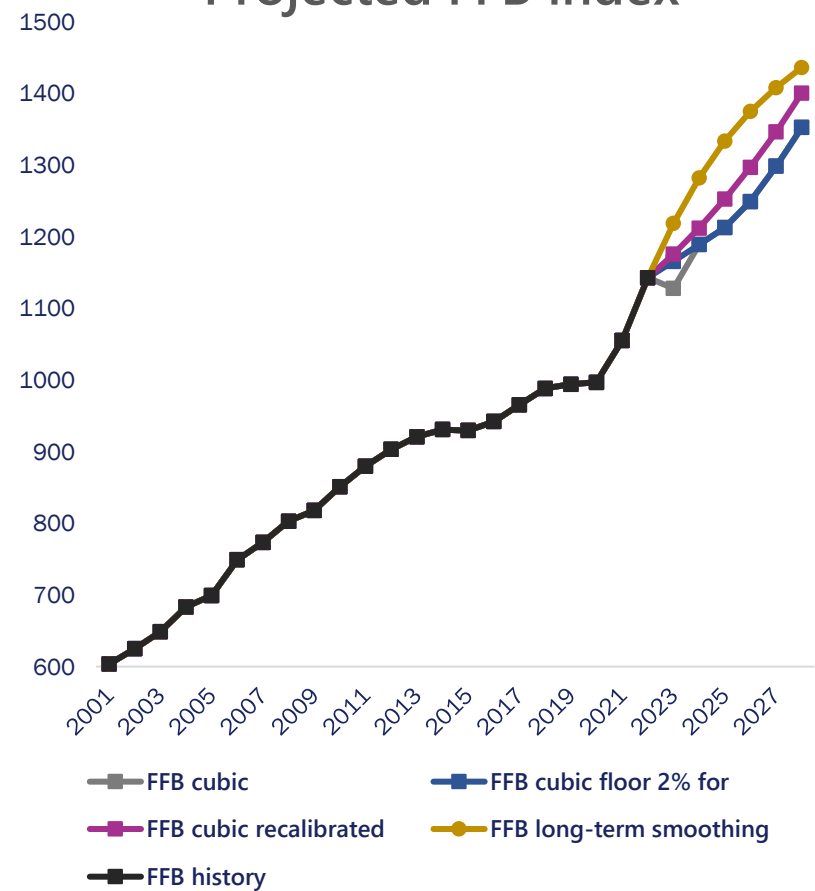


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Illustrations - FFB market index

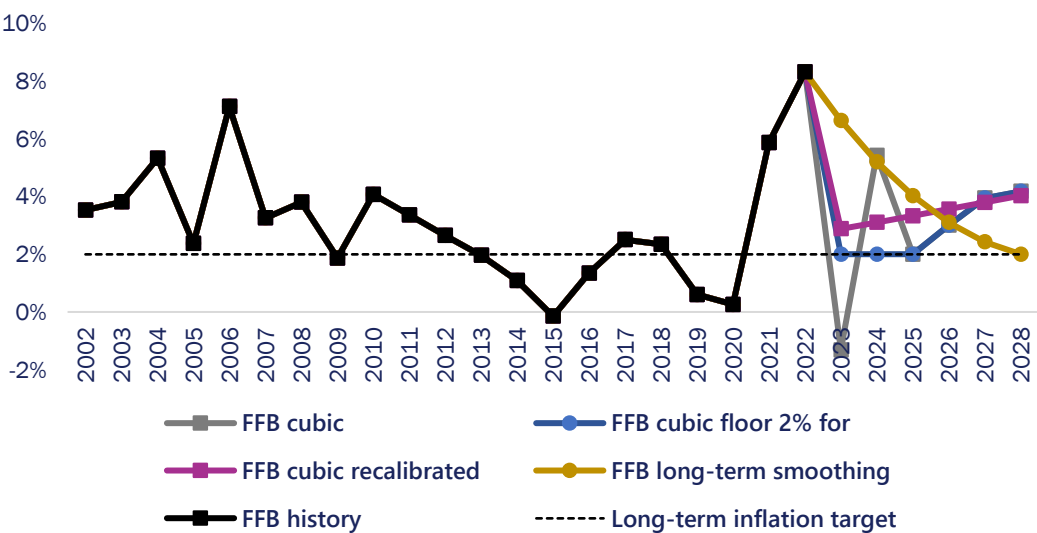
Level 3 linear model, with a floor rate of 2%.

Projected FFB index



The inflation rate is the rate of change between index n and index $n+1$.

Change in the FFB inflation rate

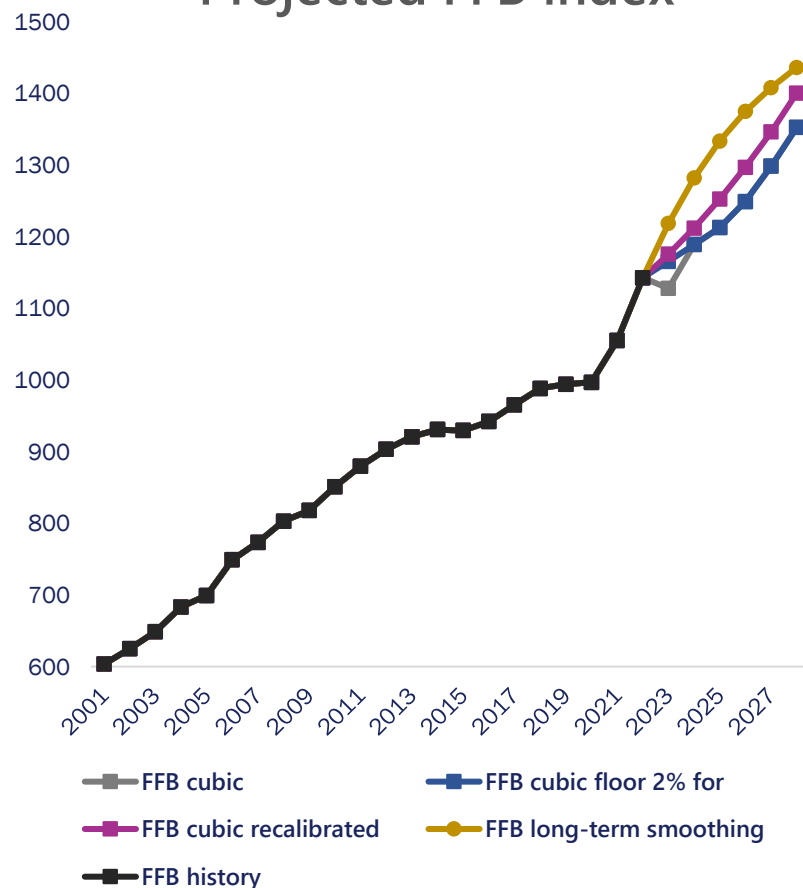


3. Adjustment for inflation using indices

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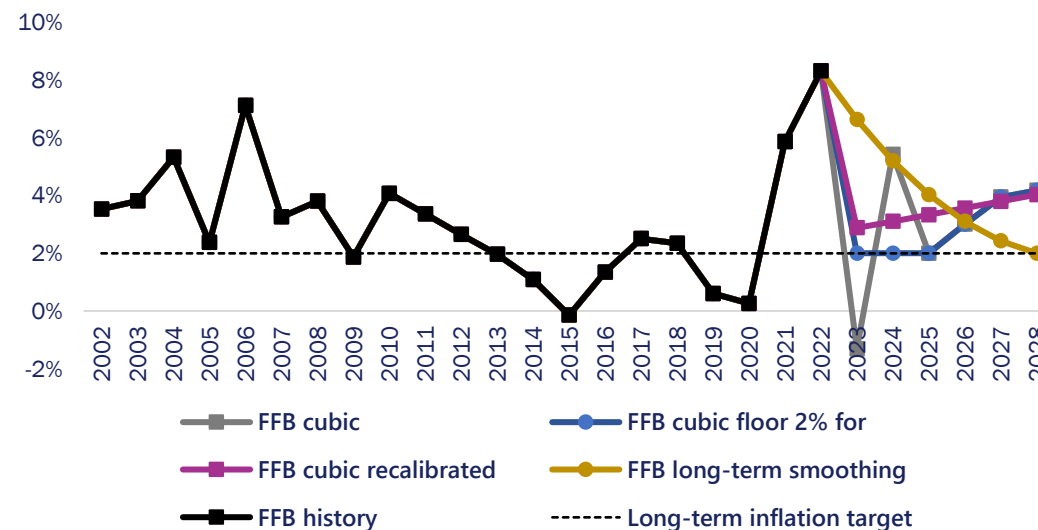


The inflation rate is the rate of change between index n and index $n+1$.

Particularities of the approximation

- ✓ Linear models tend to cause the index to fall in 2023 to a level below 2022 (negative inflation)
- ✓ Possibility of applying a *floor of 2%* to inflation to counter this fall
- ✓ Application of the recursive formula at the last known point (2022) to counter the return to the trend
- ✓ Smoothing inflation towards a long-term target (**ECB's 2% objective**)

Change in the FFB inflation rate



SOMMAIRE



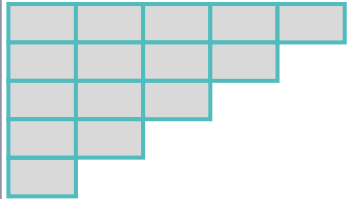
1. Background
2. State of the art
3. Adjustment for inflation using indices
-  4. **Reserving with explicit inflation**

4. Reserving with explicit inflation

Reminder of the process

Calculation of reserves

Initial load triangle



Payments in **current euros**
Reserves at constant euro



Constant euro
conversion of
Past payments

Deflated load triangle



Payments in constant euros
Reserves at constant euro



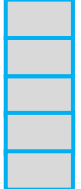
Ultimate
projection

Reserves at constant euro



Conversion of
Future payments

Reserves at **current** euro



Reprocessing of historic inflation

Input:

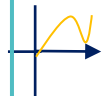
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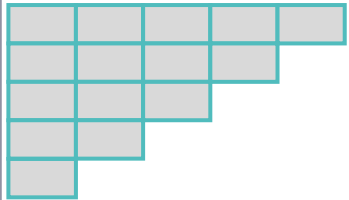


4. Reserving with explicit inflation

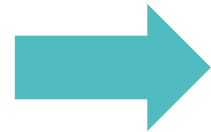
Reminder of the process

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Initial load triangle



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Deflated load triangle



Payments in constant euros
Reserves at constant euro



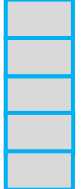
Ultimate
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Reserves at constant euro



Conversion of
Future payments

Reserves at **current** euro



Reprocessing of historic inflation

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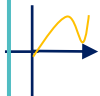
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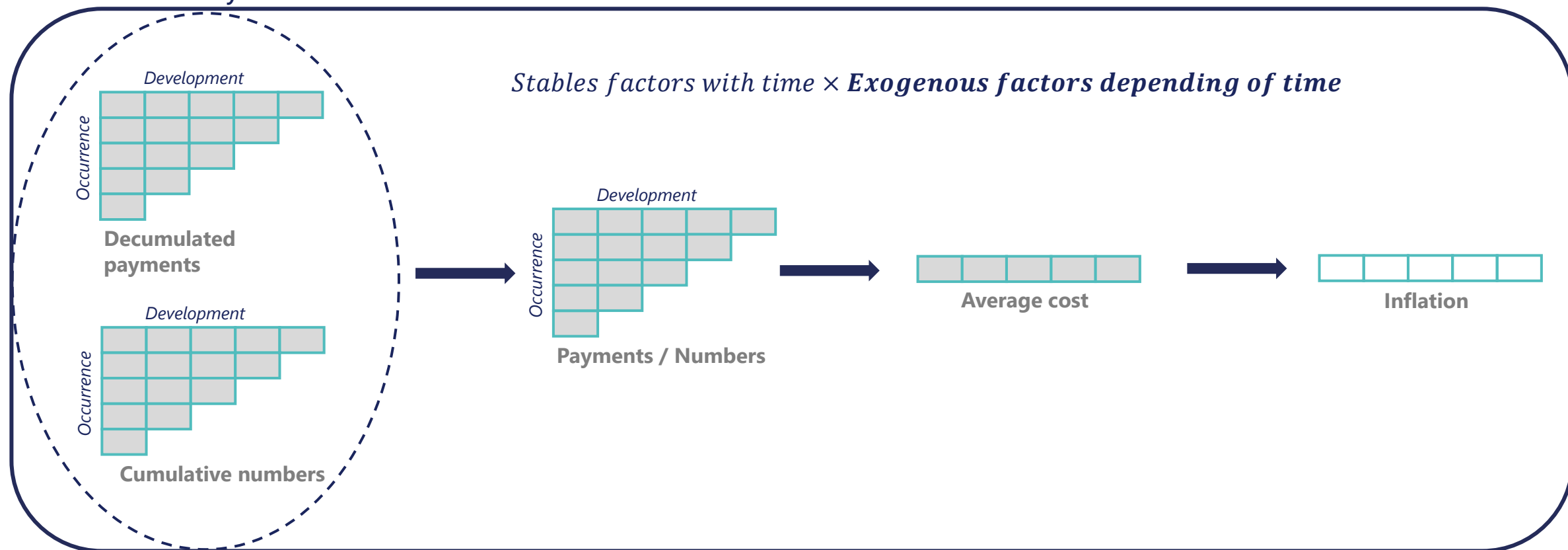
4. Reserving with explicit inflation

Modelling historical inflation - deterministic framework

Portfolio-specific inflation can be obtained using the **Verbeek-Taylor model**.

Verbeek-Taylor method - deterministic framework

Stables factors with time × *Exogenous factors depending of time*

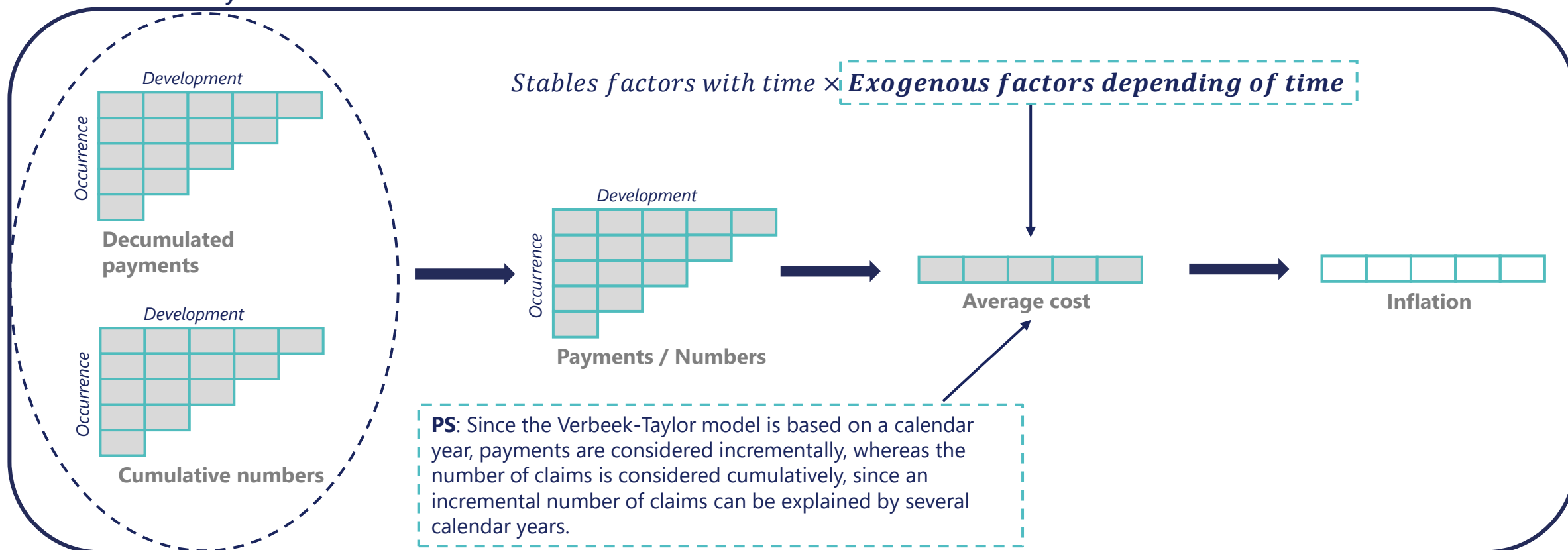


4. Reserving with explicit inflation

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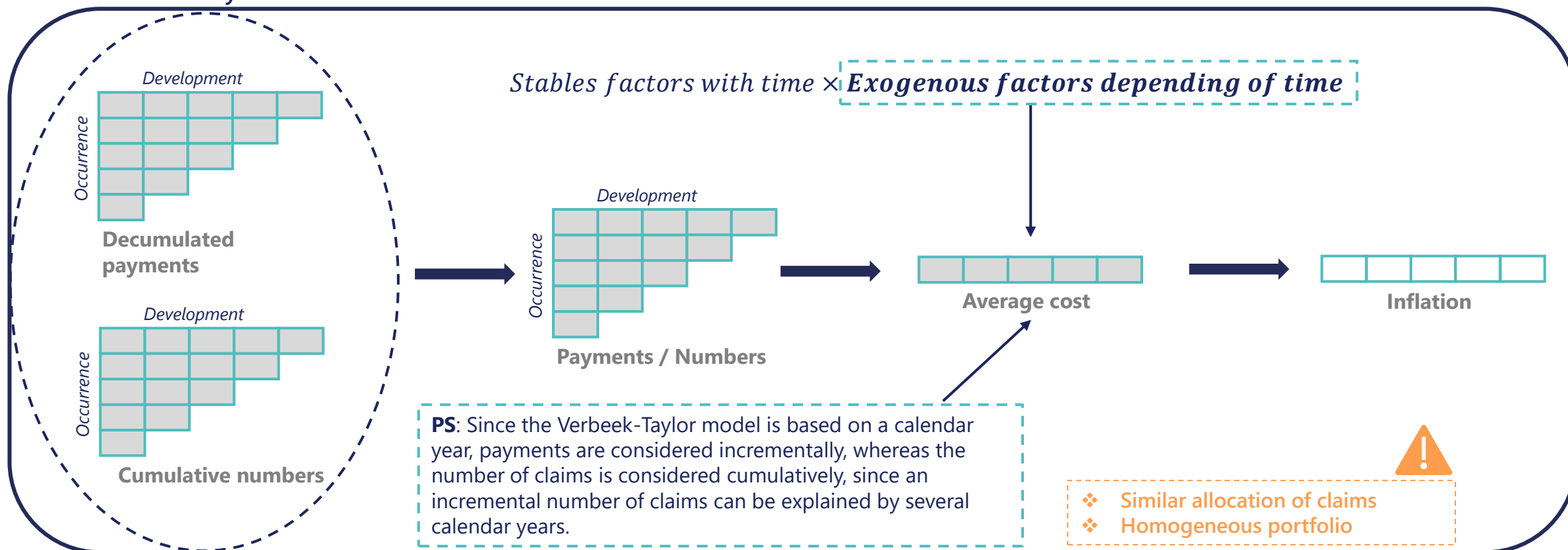


4. Reserving with explicit inflation

Modelling historical inflation - deterministic framework

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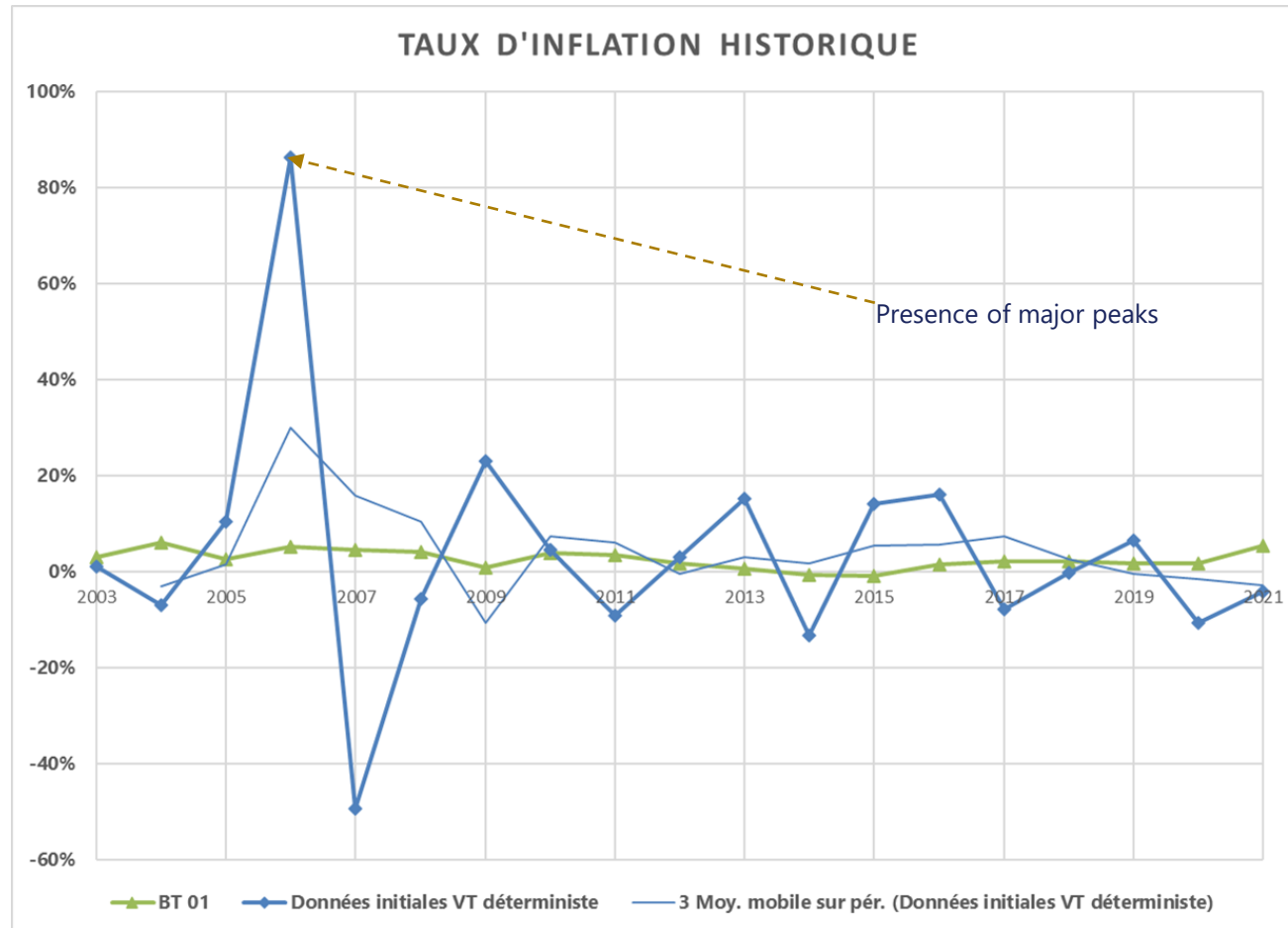
Verbeek-Taylor method - deterministic framework



4. Reserving with explicit inflation

Modelling historical inflation - deterministic framework

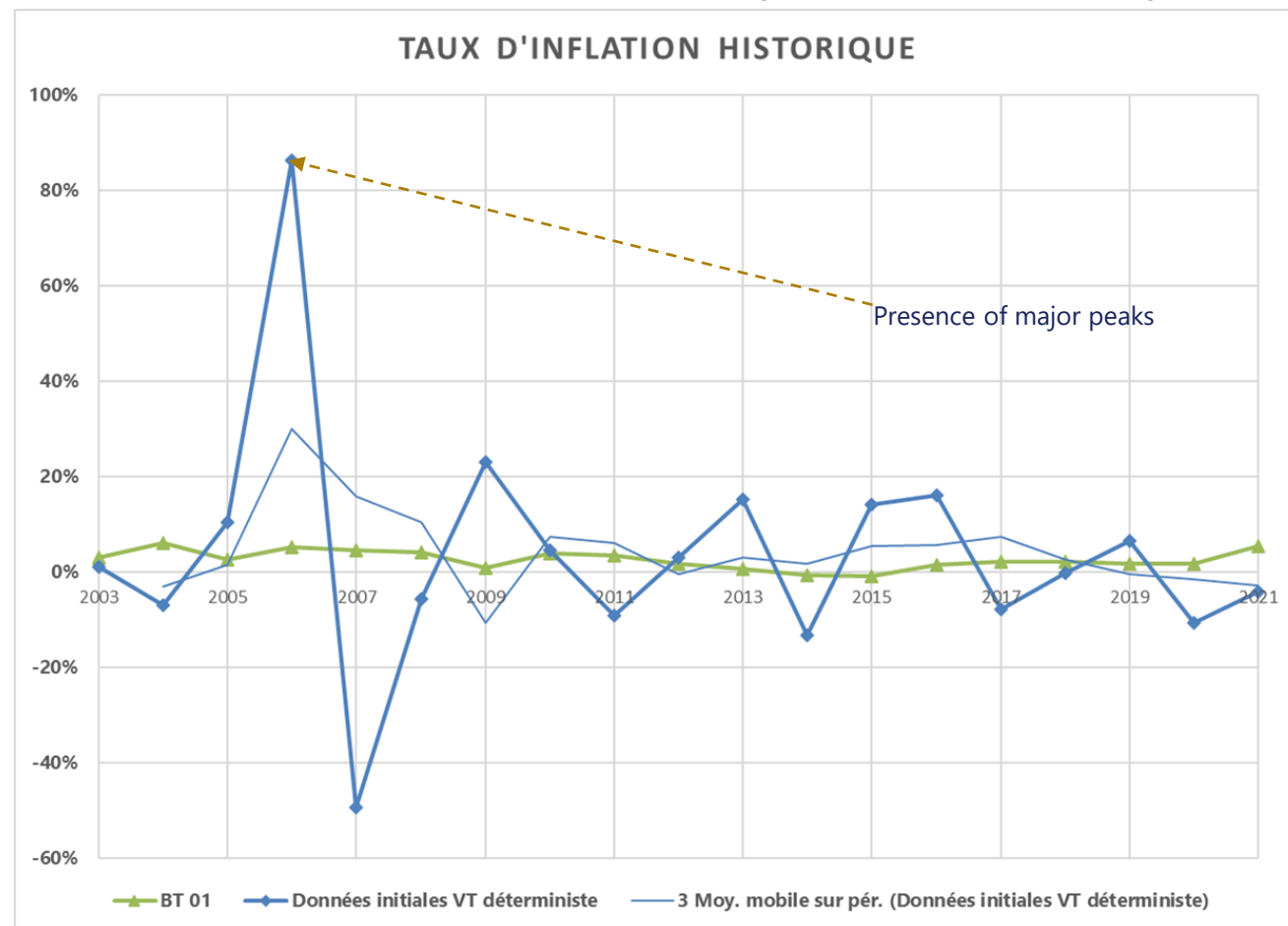
Application of the (deterministic) Verbeek-Taylor model to an liability construction portfolio



4. Reserving with explicit inflation

Modelling historical inflation - deterministic framework

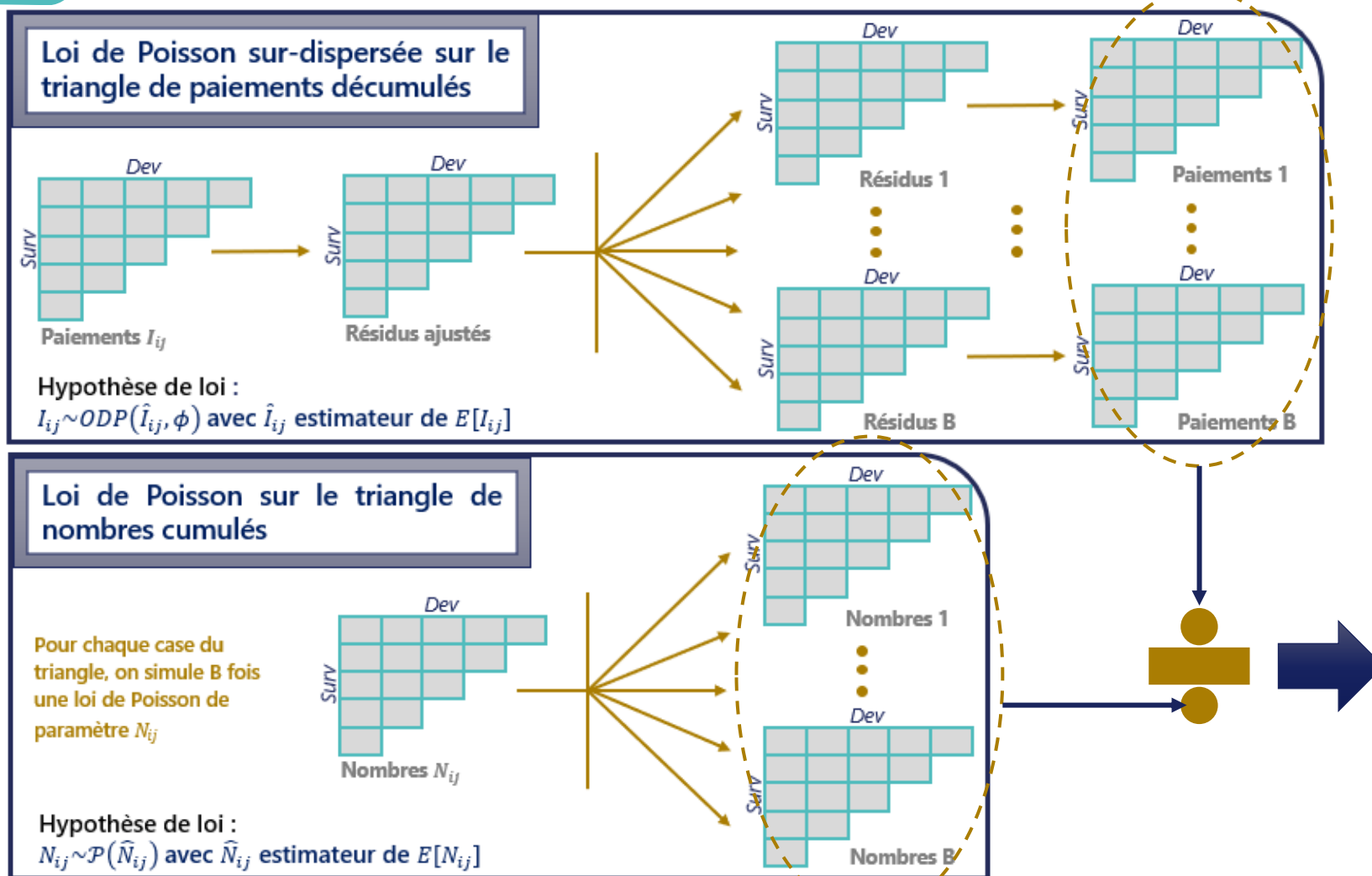
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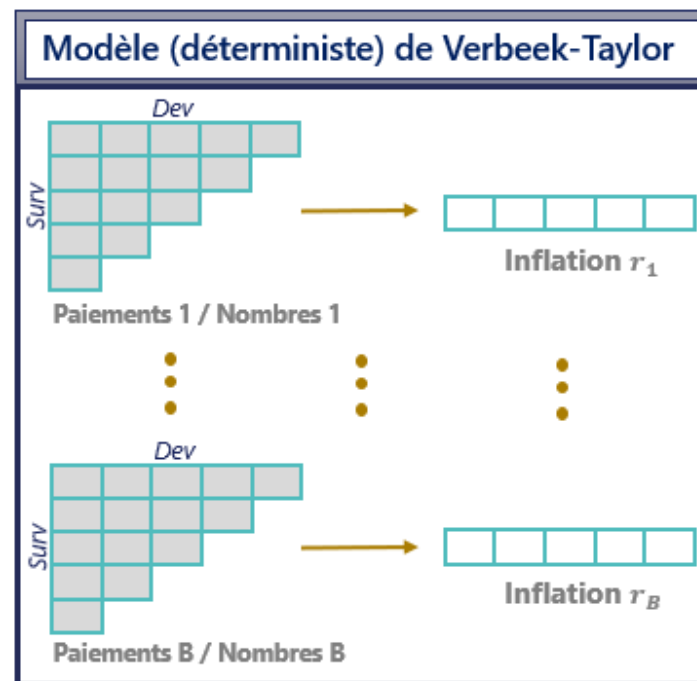
1. Review of the initial triangle of regulations :
- Elimination of atypical claims
 - Focus on attritional costs
2. Resampling

4. Reserving with explicit inflation

Modelling historical inflation - stochastic framework



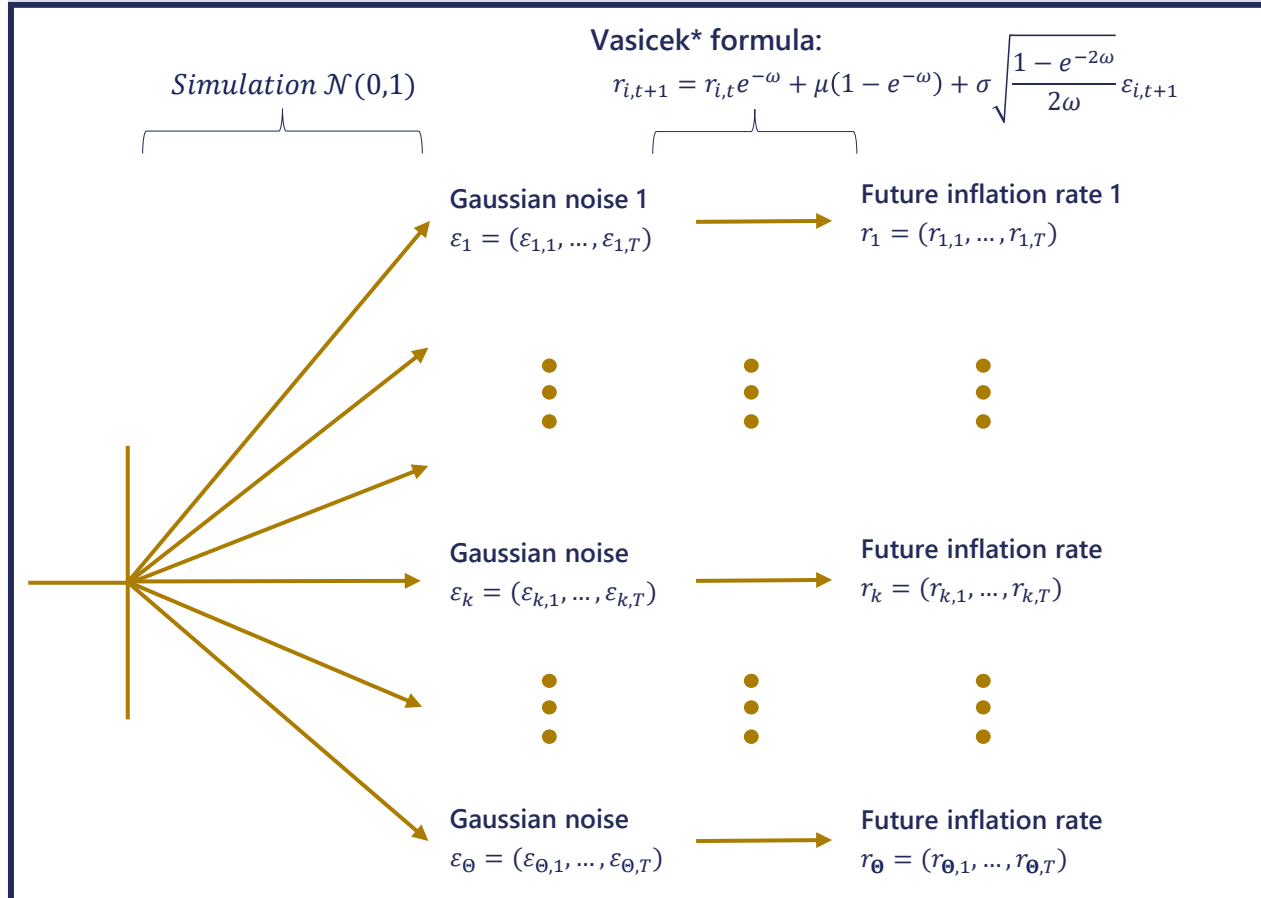
Historical inflation is the average of the simulated inflation vectors.



4. Reserving with explicit inflation

Modelling future inflation - methodology

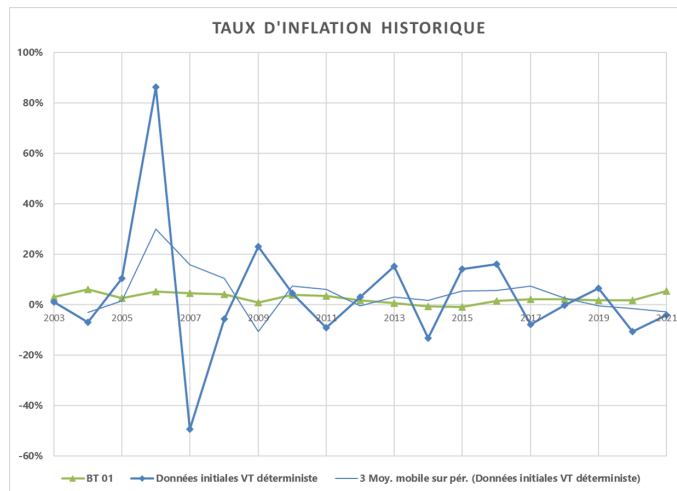
Vasicek model



* The parameters μ , σ , and ω are calibrated on the basis of the historical inflation rates obtained previously.

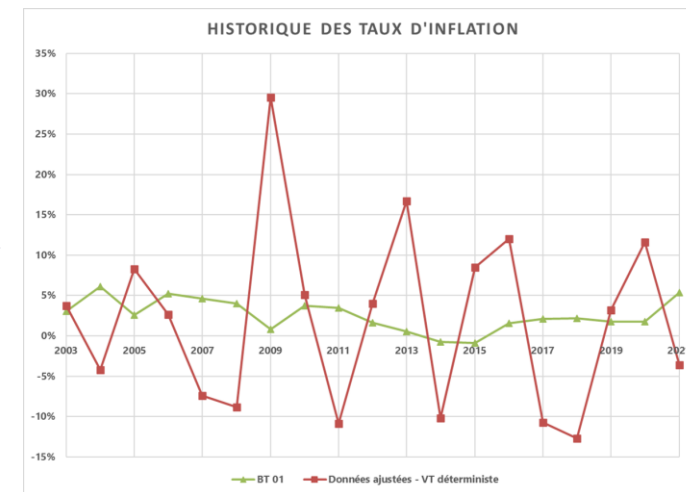
4. Reserving with explicit inflation

Illustrations - historical inflation



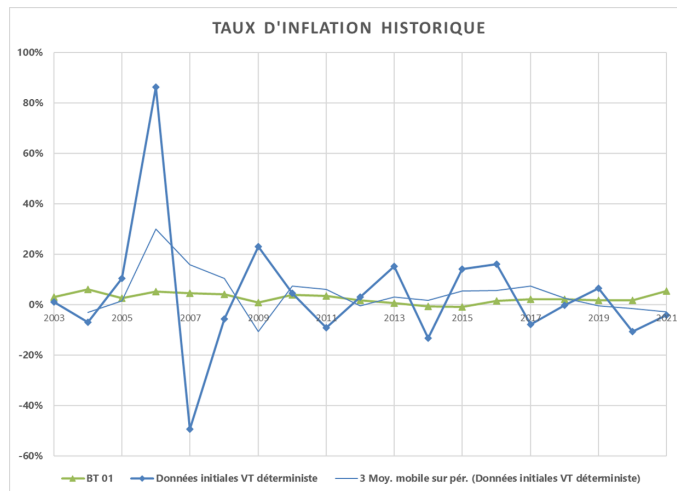
Verbeek-Taylor (deterministic) model applied to an liability construction portfolio

After reviewing the initial triangle



4. Reserving with explicit inflation

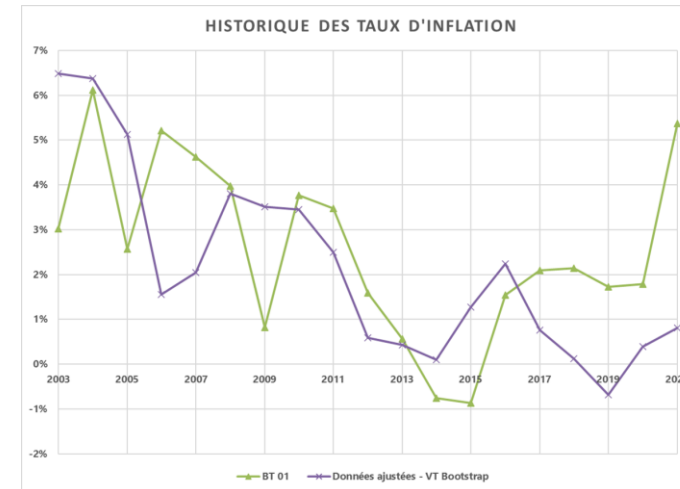
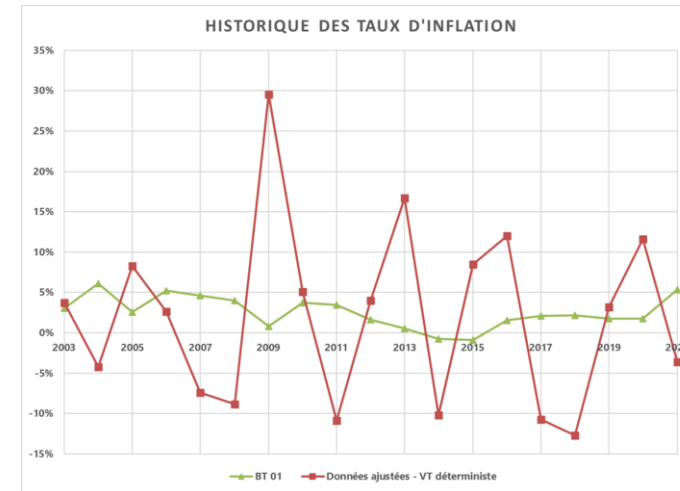
Illustrations - historical inflation



Verbeek-Taylor (deterministic) model applied to an liability construction portfolio

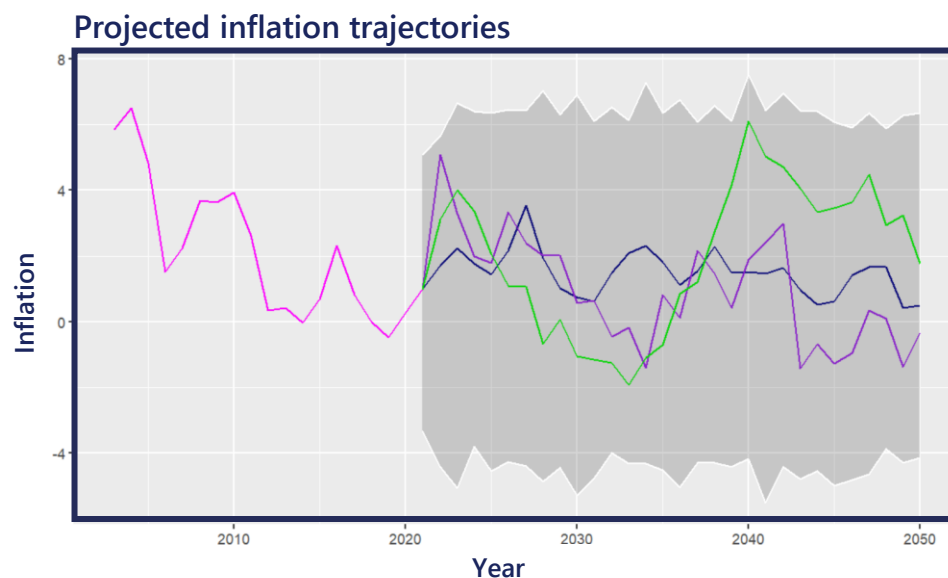
After reviewing the initial triangle

After review and application of the Bootstrap



4. Reserving with explicit inflation

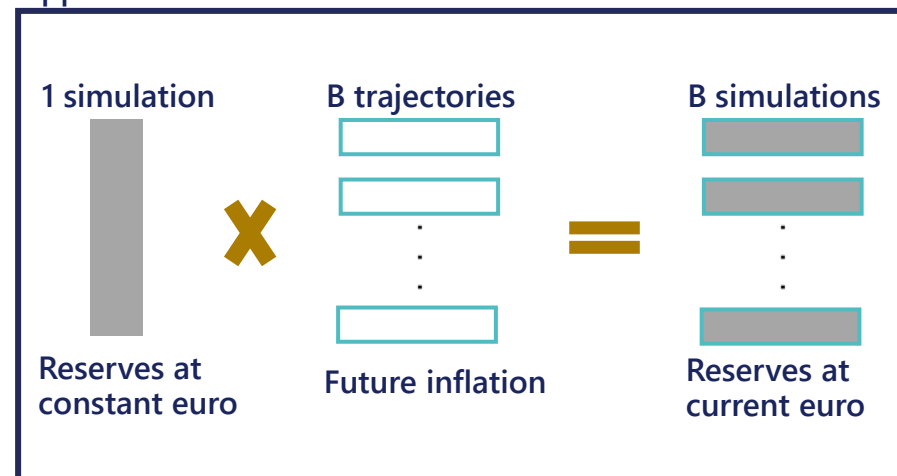
Modelling future inflation - illustrations



Legend

- Historical inflation
- Central inflation
- Inflation scenario 1
- Inflation scenario 2

Application to reserves



4. Reserving with explicit inflation

Impact on reserves

Implicit inflation

- CL on the initial triangle

Explicit inflation with BT01 and a single future rate of 2%

- Deflation of the initial triangle
- CL on the deflated triangle
- Conversion of reserves to the current euro

Explicit inflation with Verbeek Taylor + Vasicek

- Deflation of the initial triangle
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4. Reserving with explicit inflation

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- + **8%** change in relation to the total **implicit** reserve

Explicit inflation with Verbeek Taylor + Vasicek

- Deflation of the initial triangle
 - CL on the deflated triangle
 - Conversion of reserves to the current euro
- **1%** change in relation to the total **implicit** reserve

4. Reserving with explicit inflation

Impact on reserves

Implicit inflation

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Explicit inflation with BT01 and a single future rate of 2%

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+ **8%** change in total **implicit** reserve

 No **explicit** inflation
volatility

 No **explicit** inflation
volatility

Explicit inflation with Verbeek Taylor + Vasicek

- Deflation of the initial triangle
- CL on the deflated triangle
- Conversion of reserves to the current euro

- **1%** change in total **implicit** reserve

 A coefficient of variation of

4%

4. Reserving with explicit inflation

Impact on reserves

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- CL on the initial triangle

Explicit inflation with BT01 and a single future rate of 2%.

- Deflation of the initial triangle
- CL on the deflated triangle
- Conversion of reserves to the current euro

+ **8%** change in total **implicit** reserve

✗ No **explicit** inflation
volatility

✗ No **explicit** inflation
volatility



Over-inflation is taken into account in the explicit volatility inherent in future inflation!

Explicit inflation with Verbeek Taylor + Vasicek

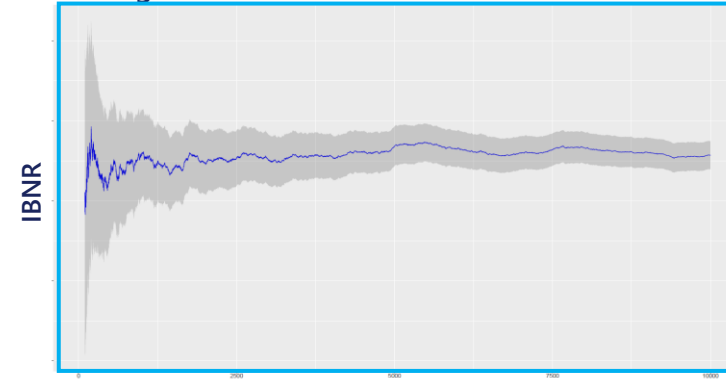
- Deflation of the initial triangle
- CL on the deflated triangle
- Conversion of reserves to the current euro

- **1%** change in total **implicit** reserve

✓ A coefficient of variation of

4%

Average reserve and associated confidence interval



No. of iterations

Conclusion

Lasting inflation

Even if there is a return to stability in the next two or three years, **previous years will continue to disrupt the usual reserving methods, and will have** to be restated.

A theoretical return to a form of stability

In addition to the war in Ukraine, other sources of uncertainty such as climate change, the decline in fossil fuel production and the transition to a more sustainable economy pose **the risk of recurrent inflationary shocks**.



Current methods inadequate

Index-based methods do exist, but they are still **insufficient** for forecasting future inflation. There are **alternative models for modelling inflation**, but expert judgement and sensitivity tests are still needed to apply them.

Impact offset by the yield curve

The increase in reserves could be offset after discounting by the revision of the yield curves.

Thank you!

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