



International Association for the  
Study of Insurance Economics

# Études et Dossiers

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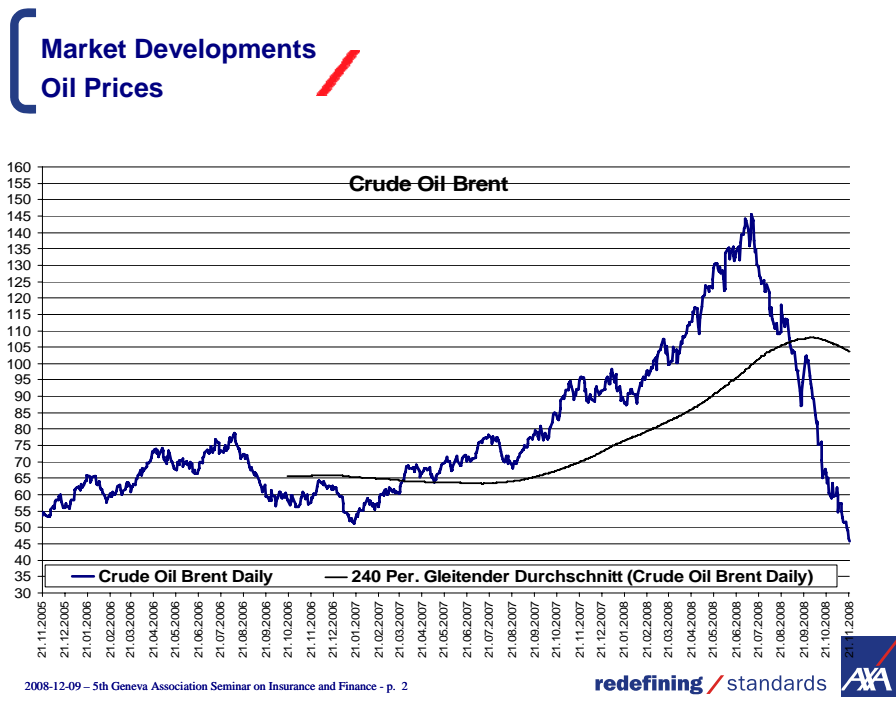
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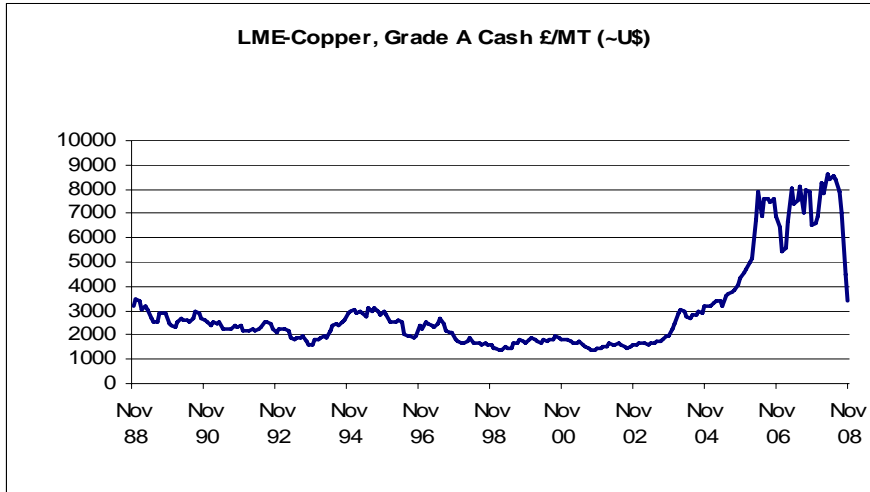
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# Impact of Inflation on the Asset and Liability Management Decisions of Insurance Companies - Managing Inflation in a P&C Insurance Company

François Robinet



**Market Developments**  
**Non-Ferrous Metals Copper**



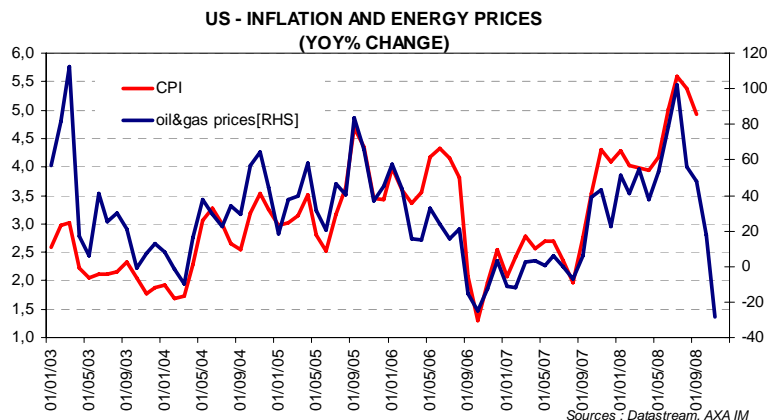
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**Deflation rather than inflation**

□ In advanced economies, the fall in energy prices will be a major force in short term inflation prospects.



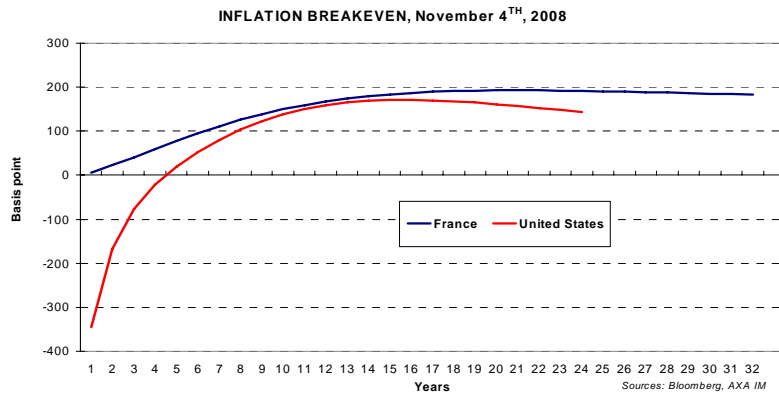
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## Bond market: a deflationary outlook? /

- As for other asset classes, some in the bond market space are calling for the worst case scenario. Indeed, TIPS are pointing to a deflationary environment for the next three years...and beyond



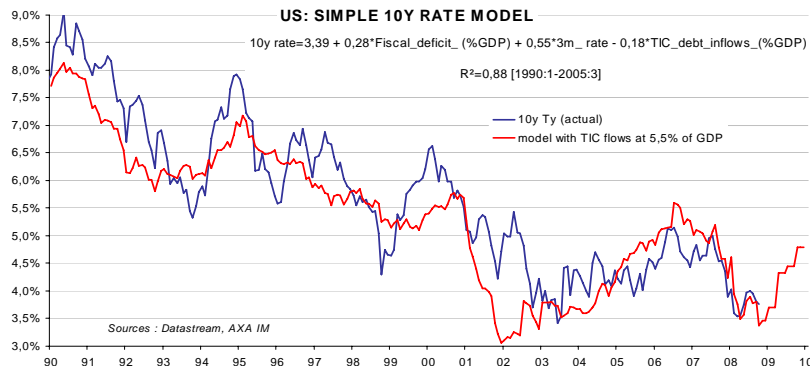
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## Bond market: what to expect from increasing public financing needs? /

- While in the short run government debt is seen as a safe haven, over time the large increase in public debt is likely to move yields up and to bring inflation back in an unexpected way. Nevertheless, the timing of this eventual increase is hard to estimate at this stage.



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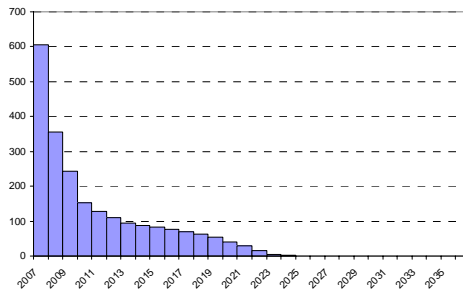
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### Let's work with an example

- Let's consider an example based on a typical book of P&C business with a total amount of 2.0 bn Euro of reserves.
- The projection of the cash flows is based on the assumptions that inflation will remain stable at 2% per year over the entire projection.
- The majority of claims are paid in the first years of the projection. The average duration of the run off cash flows is equal 4.2 years.

Projection of Future Payments (€m)

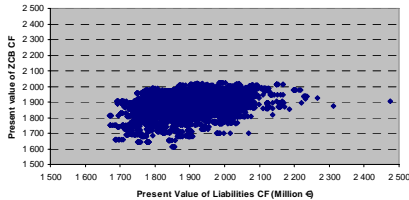


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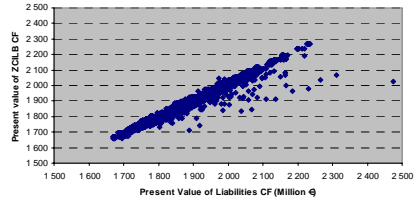
### Inflation explains most of the variability in P&C Cash flows

- Let's analyze the behavior of the portfolio by comparing it with two asset portfolios:
  - A portfolio of government zero coupon bonds (having the same maturity and notional of the liabilities cash flows)
  - A portfolio of inflation linked zero coupon bonds (having the same maturity and notional of the liabilities cash flows)

Replication quality – Govt Bonds



Replication quality – Inflation Linked Bonds

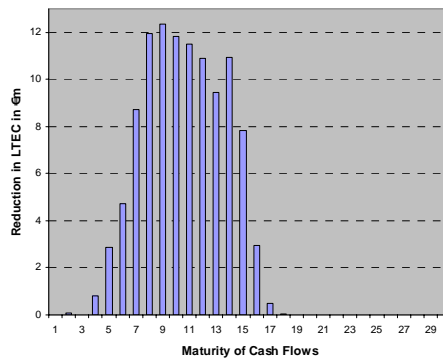


- Inflation explains most of the variability in P&C run off cash flows.
  - The graph shows a good fit ( $R^2$  equal to 97%) between the liabilities and the inflation linked zero coupon bonds portfolio cash flows.

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## Long term cash flows are the main contributors to the exposure to inflation risk

- The graphs shows the marginal impact of inflation risk by maturity on the Economic Capital. More precisely, it shows the reduction in Economic Capital implied by the perfect hedging of a single cash flow:



- Due to the cumulative impact of inflation on loss, cash flows maturing in 5 to 15 years are the main contributors to the exposure to inflation risk.
- "Long Tail" business must be hedged against inflation.

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## How to manage inflation risk? Traditional asset classes vs inflation linked products

- Exposure to inflation risk can be managed either by reallocating the asset portfolio to assets exhibiting a high correlation to inflation or by using inflation linked products.

### Traditional assets positively correlated with inflation

- Inflation can be managed through the reallocation of part of the asset portfolios to asset classes with long term positive correlation with inflation, such as:
  - Commodities
  - Real estate
  - To a lesser extent, equity (with a time lag)
- The approach is simple from an operational standpoint
- However, the relationship between asset returns and claims inflation is imperfect; Moreover, the asset classes showing high correlation with inflation are likely to be illiquid.

### Inflation linked products

- The European inflation linked market has developed rapidly over the past few years and offer a broad range of products to manage inflation
- Inflation can be managed through:
  - the reallocation of part of the assets to inflation linked bonds
  - the investment in inflation derivatives products
    - Swaps
    - Option on inflation
- The relationship between the asset return and claims inflation is significantly improved (even though basis risk still exist)

- Asset strategies based on inflation-linked products seems appropriate to manage inflation

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## How to manage inflation risks? Assets positively correlated with inflation

	Short-term sensitivity	Long-term sensitivity
<b>Equities</b>	<b>Very low sensitivity</b> in the short run, as the positive effect of inflationary shocks (higher expected future nominal earnings) is usually fully offset by negative effects arising from discounting and growth revision	<b>Low, positive sensitivity</b> (~-0.25 elasticity). "Real" earnings are passed through earnings and ultimately dividends and price, but very high inflation tends to be associated with poor growth.
<b>Rates</b>	<b>Very strong negative sensitivity</b> (-1.0 elasticity). Shocks to breakeven inflation or realized inflation tend to be transmitted to nominal rates almost one-for-one. It is important however to note the direction of causality, as rates may fall or increase in a stable inflation environment due to real rate variations.	
<b>Real estate</b>	<b>Low sensitivity.</b> Methodological issues notwithstanding, we find relatively little short-term sensitivity of real estate to inflation.	<b>Positive sensitivity</b> (0.4 to 0.8 elasticity) as inflation tends to feed rental income as well as price appreciation.
<b>Credit</b>	<b>Low, positive sensitivity</b> Very low inflation scenarios tend to be associated with recessions and poor credit performance (spread widening in the short term / defaults in the long term). The cyclicality of inflation is moderate in central scenarios, making real rates a more significant driver of spreads than inflation.	
<b>Commodities</b>	<b>Strong positive sensitivity.</b> Commodity price shocks tend to lead to an upward revision in inflation expectations / breakevens.	<b>Strong positive sensitivity.</b> Commodity price shocks tend to lead to higher realized inflation, particularly for energy.

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## How to manage inflation risk? Linear vs non linear strategy

- ❑ With the development of the European inflation market, it is possible to invest in a broad range of inflation linked products, including linear strategies such as inflation linked bonds or swaps, or non linear strategies such as option on inflation
- ❑ At first glance, inflation risk should be managed using linear strategies as the profile of the liabilities cash flows is symmetric
- ❑ However, it must be stressed that inflation risk is predominant when the level of inflation is high.
  - ➔ In increasing inflation environment, inflation is an important driver of claims inflation
  - ➔ In stable inflation environment, claims inflation can be driven by other factors such as changes in legal environment or changes in litigation culture.
- ❑ Hence the objective of the protection should be to protect the portfolio against a large increase in inflation by using option on inflation (as for natural catastrophe through reinsurance). The main drawback of this strategy is the cost of premium but it should be noted that current prices are particularly low given the low level of expected breakeven inflation.

Linear Strategy	Non Linear Strategy
<ul style="list-style-type: none"> <li>▪ Linear profile corresponding to the liabilities profile</li> <li>▪ No cost for option premium</li> <li>▪ High basis risk</li> </ul>	<ul style="list-style-type: none"> <li>▪ Non linear profile (close to reinsurance contract)</li> <li>▪ Cost of option premium</li> <li>▪ Mitigated basis risk</li> </ul>

❑ **Option based strategies may be the most suitable way to manage inflation**

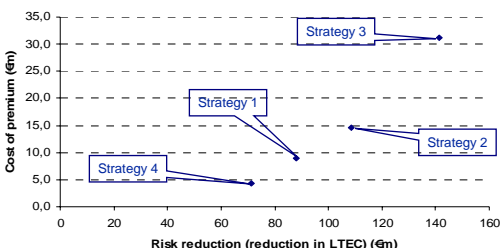
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## How to manage inflation risks?

### CPI Options



- ❑ Several option based strategies have been tested and their effect on Economic Capital assessed.
  - ➔ Strategy 1: buy of 30 calls on inflation, at a 3.5% strike, notional and maturity matching the amount and the maturities of the best estimate liabilities cash flows,
  - ➔ Strategy 2: buy of 30 calls on inflation, at a 3.0% strike (matching notional and maturity),
  - ➔ Strategy 3: buy of 30 calls on inflation, at a 2.5% strike (matching notional and maturity),
  - ➔ Strategy 4: buy of 10 calls on inflation, at a 3.5% strike, notional and maturity matching the amount and the maturities of the best estimate liabilities cash flows maturing between year 6 and year 15.



	Risk Reduction (€m)	Cost of premium (€m)	Cost / reduction in LTEC
1. Full cover @3.5%	88	9	10%
2. Full cover @3%	109	15	13%
3. Full cover @2.5%	142	31	22%
4. Partial cover @ 3.5%	71	4	6%

- ❑ Strategies based on options allows to significantly reduce Economic Capital.
- ❑ The strategy 4 would reduce the Economic Capital by €71m (before diversification effect) and would cost €4m. This strategy seems to be optimal as it saves a significant amount of capital for a relatively low cost.



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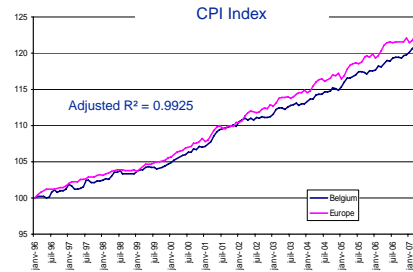
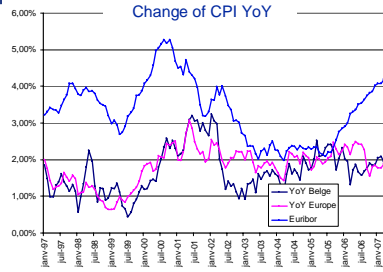
## Basis risk

- ❑ In the previous analysis, claims inflation is supposed to be equal to the European CPI inflation. However, the nature of insurance claims can be very different from one line of business to the other. For instance, motor claims will be more linked to the prices of cars and maintenance of vehicles, physician and hospital fees and wage inflation whereas property claims will be more in line with the building costs inflation.
- ❑ More generally if we use the European CPI to hedge claims inflation, the basis risk can be split into two different categories:
  - ➔ The basis risk between the local CPI and the claims inflation of any specific line of business
  - ➔ The basis risk between European CPI and the local CPI
- ❑ The difference between Local CPI and a specific claims inflation can be significant. However, at a company level, this risk will tend to decrease due to the diversification of business. The level of claims inflation at a company level is closer to the CPI index than a specific line of business claims inflation.
- ❑ The difference between Europe CPI and local CPI will also tend to decrease.
  - ➔ With the set up of the European Central Bank, local CPIs may converge?

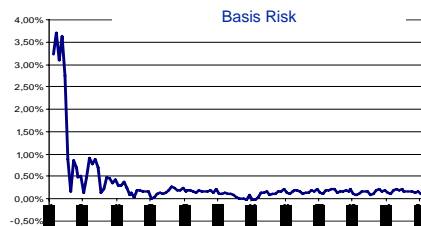
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### Basis risk – Belgium CPI vs European CPI



- ❑ Currently, there is usually no liquid market for local CPI. On the long run, the European CPI is a good proxy of the level of the index
- ❑ The basis risk is limited to more or less 20bps on the long term



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