

**The Actuarial Profession**  
making financial sense of the future

Life conference and exhibition 2010  
Paul Fulcher, Emily Penn & Ross Evans

## Hot Topic Yield curve dynamics

7-9 November 2010

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### The yield curve see-saw

*"The markets can stay irrational a lot longer than you and I can remain solvent"*

**Supply & Demand**

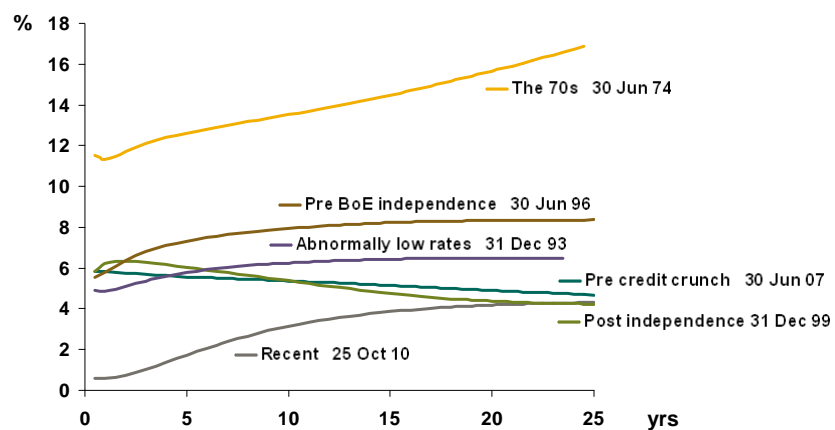
**Macroeconomics**



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## “The future ain’t what it used to be”



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Source: Bank of England

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## Decomposing yields

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## Back to the classroom – Government bonds

$$\text{Return Above Risk-free} = \text{Term Premium} + \text{Liquidity Premium} + \text{Credit Risk Premium}$$

 Inverted at long end

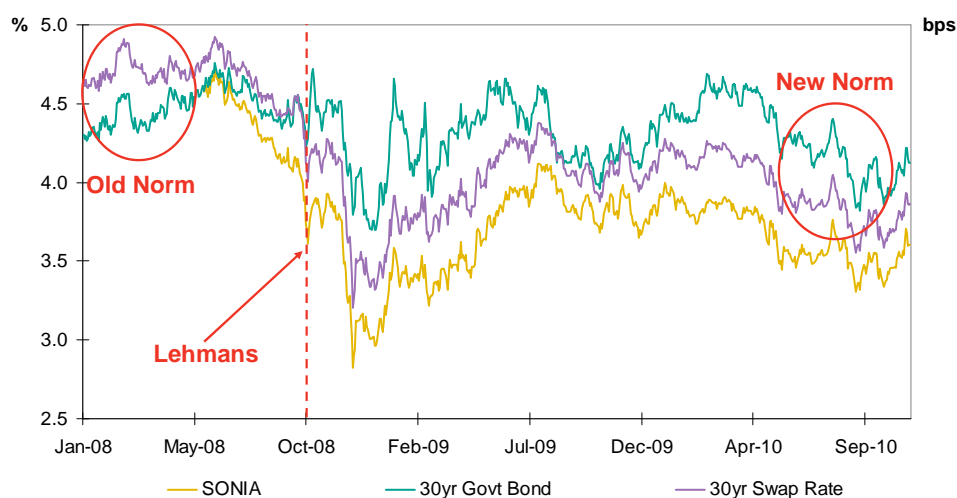
 Negative for many sovereigns

 Major issue in 2010

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## “Risk-free rate” – Pretenders to the throne

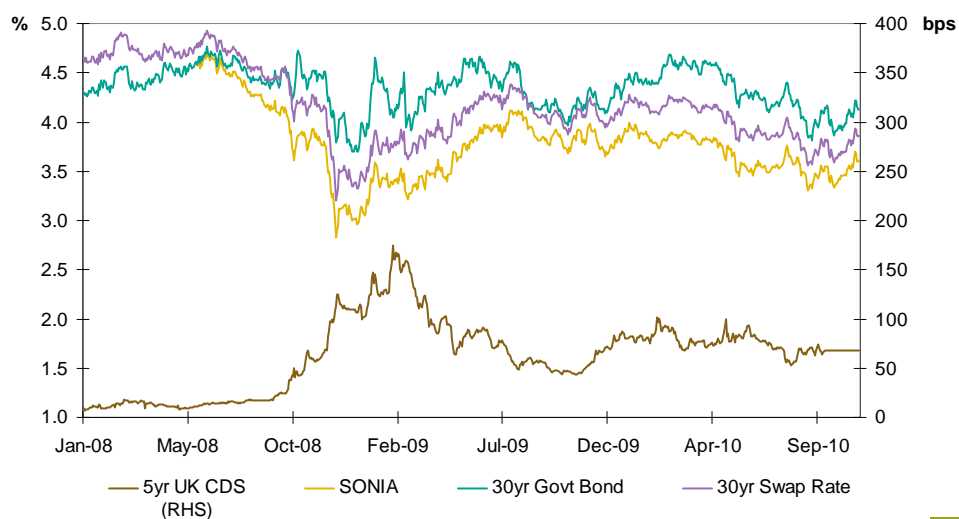


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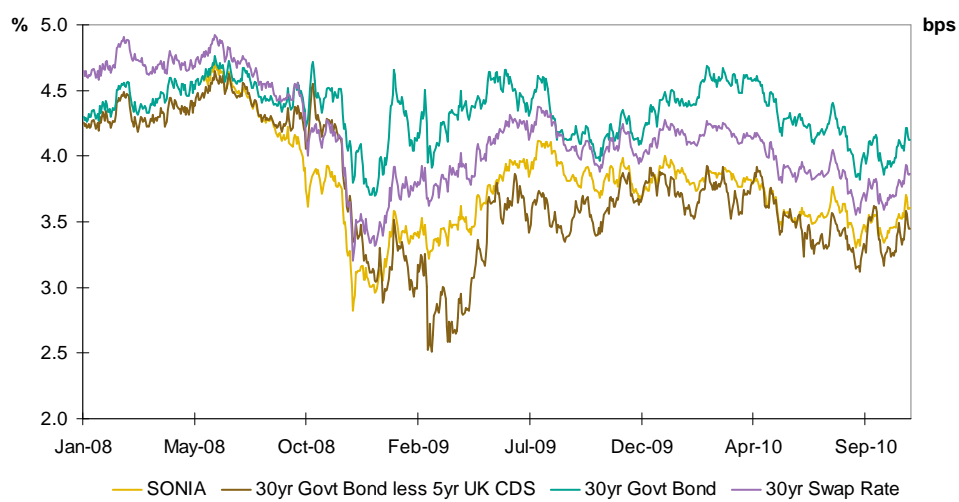
Source: RBS

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## Credit default protection on the UK government

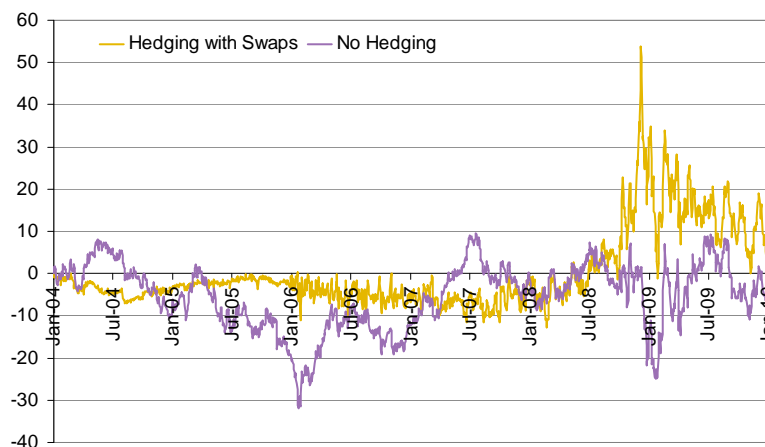


## A fourth contender?



## Gilts vs. Swaps

### Movement in net assets for a 30yr liability valued at Gilts

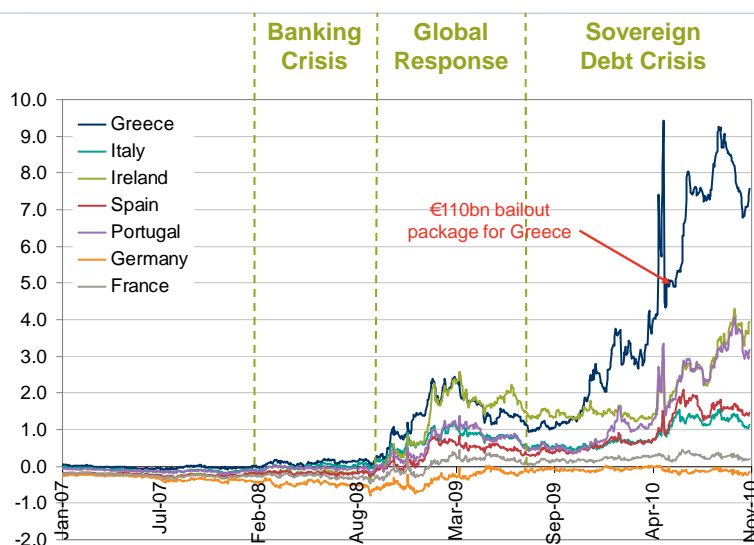


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Source: SIAS paper "Does your hedge do what it says on the tin"

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## EU sovereign debt concerns



Source: Bloomberg

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## Quantitative Easing (“QE”)

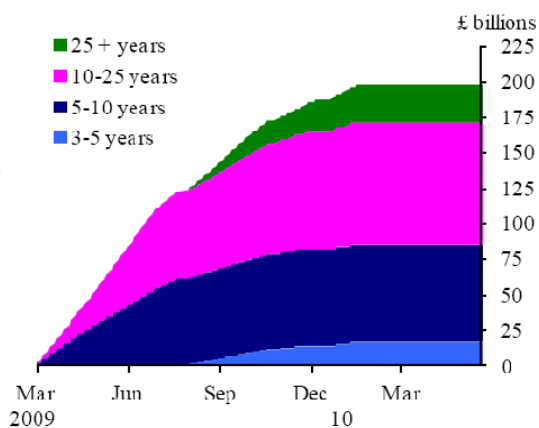
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## What is it?

### Cumulative gilt purchases by maturity

- Response to global financial crisis
- Programme of large scale buy-backs of gilts
- Aim of injecting money into the economy



Source: Bank of England

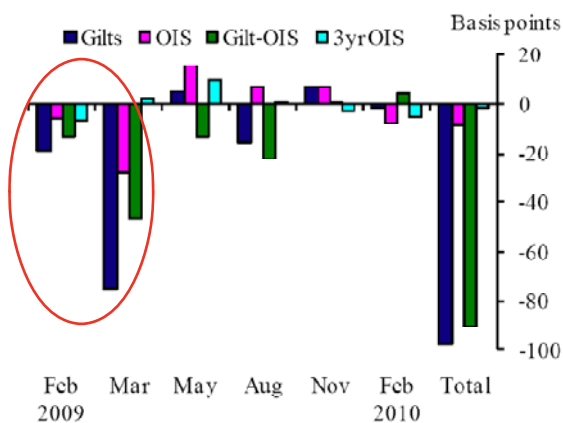
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## Buy the rumour ...

### QE impact on gilt yields, OIS and gilt-OIS spreads

*"Summing over the reactions in gilt yields to each of the QE news events gives an overall average fall of just under 100 bps"*



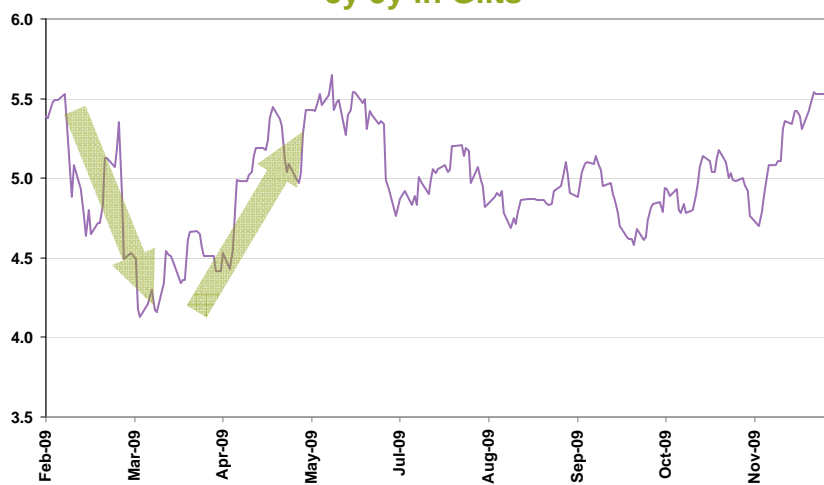
Sources: Bloomberg and Bank calculations.

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## Sell the fact ...

### 5y 5y in Gilts



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Source: RBS

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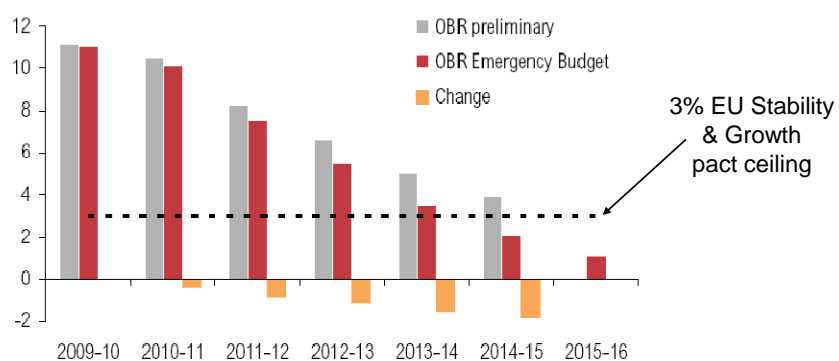
## Short and mid curve dynamics

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## Where we are.....huge budget deficits

**Public Sector Net Borrowing (PSNB)**  
Emergency Budget v OBR prelim. f/c, 2010-11 to 2014-15, % of GDP



Source: OBR/HMT

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## Monetary stimulus

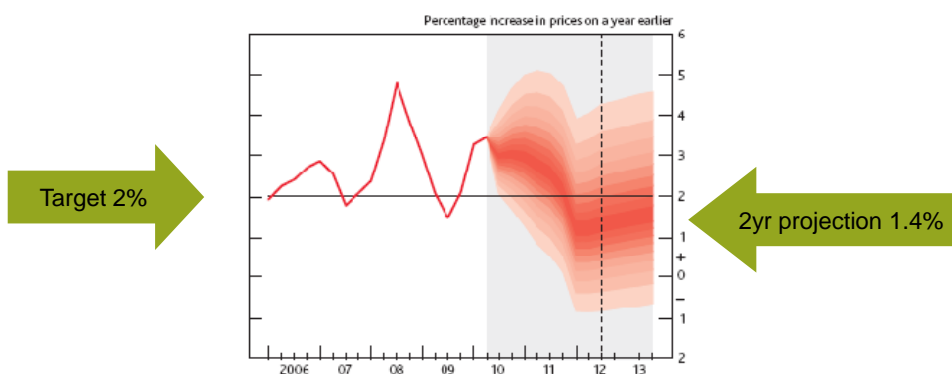


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## Inflation uncertainty....

### CPI inflation projection



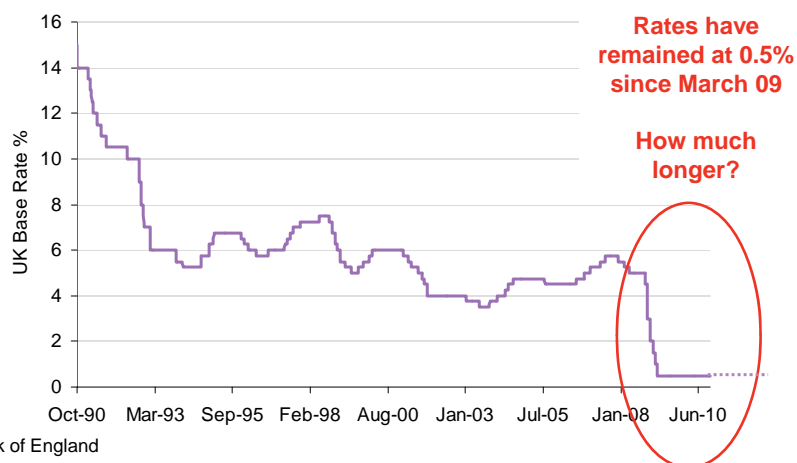
Source: BoE Inflation Report – August 2010

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## UK rates lower for longer

### UK base rate

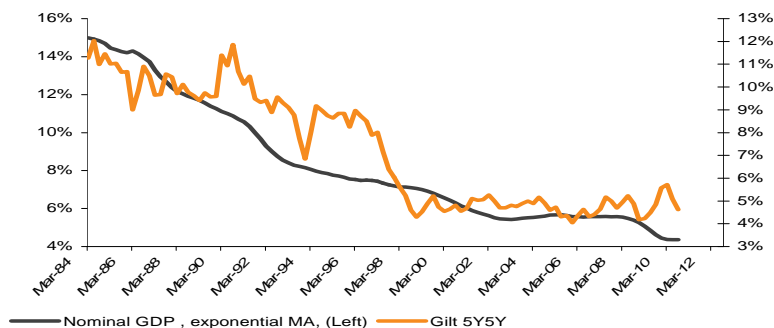


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## Gilts 5Y5Y – Gilts still cheap

- Secular trend towards lower and flatter curves is driven by lower nominal GDP trends

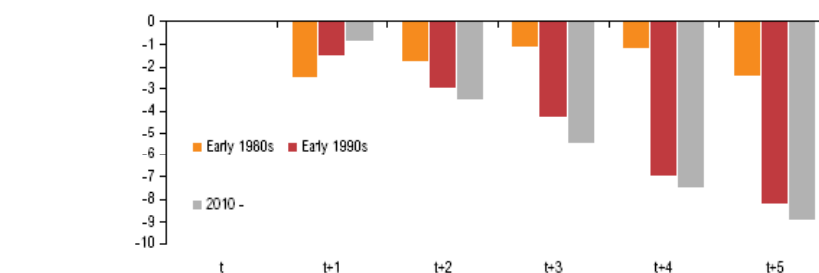


Source: RBS

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## Have we been here before?

### Reductions in PSNB, % of GDP



*t = start of recession*

Source: HMT, RBS

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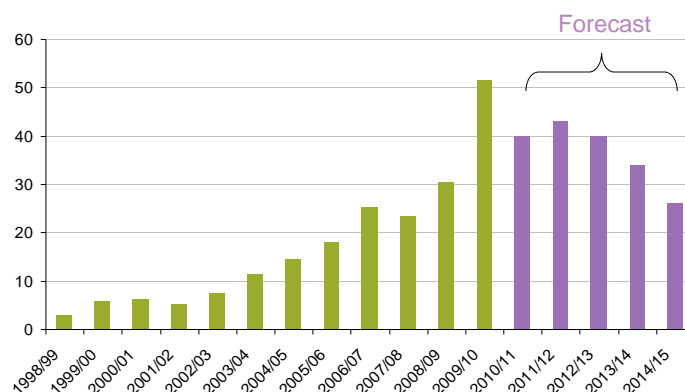
## Long end of the curve

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## Gilt supply

### 15Y+ Gilt issuance

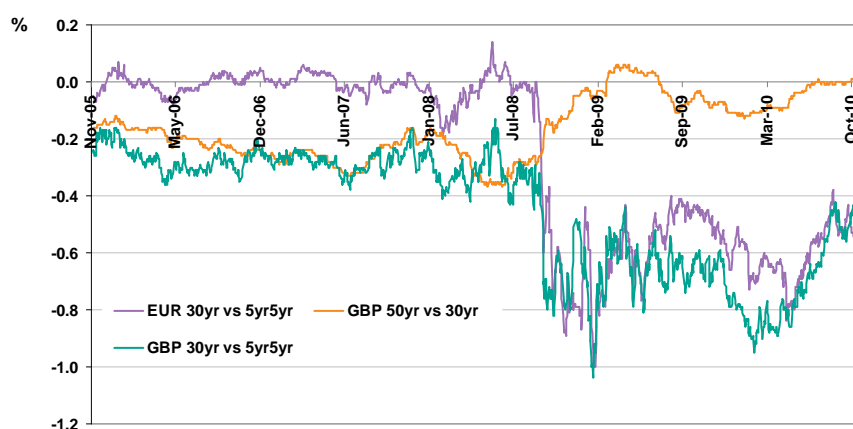


Source: DMO, RBS

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## Rates at the long end

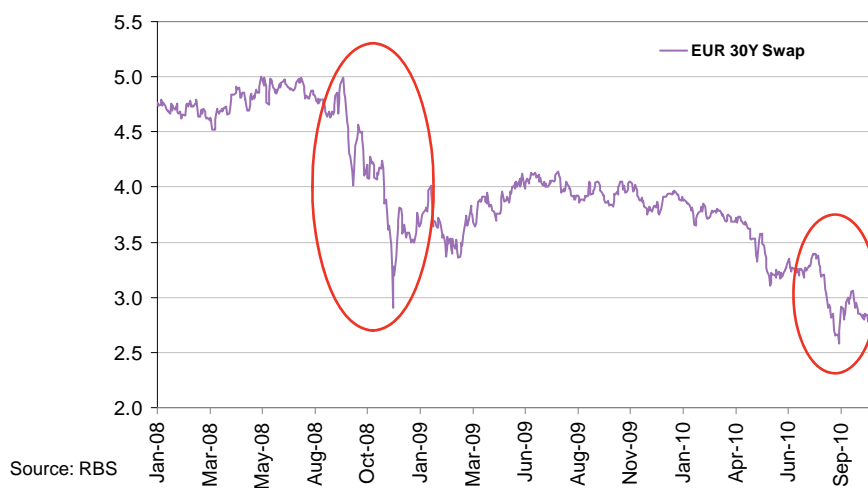


Source: RBS

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## Eurozone – ALM and long end rates



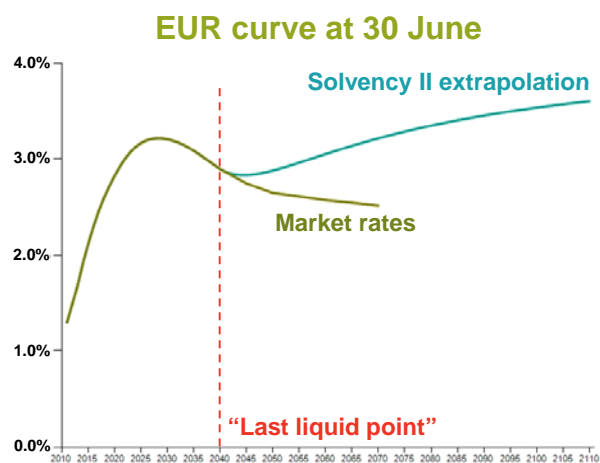
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## Extrapolation methods

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## Solvency II extrapolation

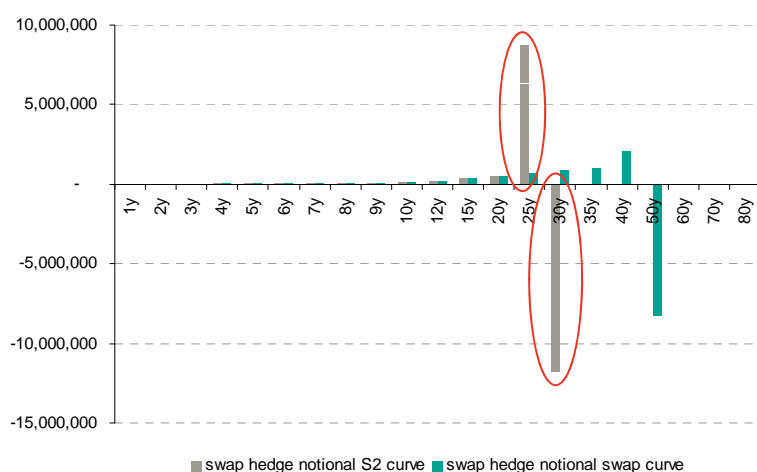


Source: CEIOPS, RBS

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## Hedging implications



Source: RBS

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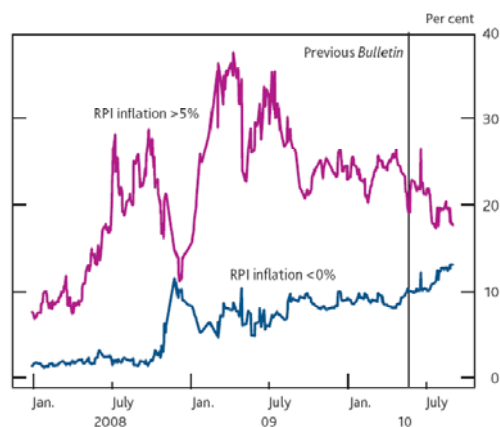
## Market consistency vs. Real world

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## Market consistent PDF – Inflation

### Weight on high and low UK RPI outturns



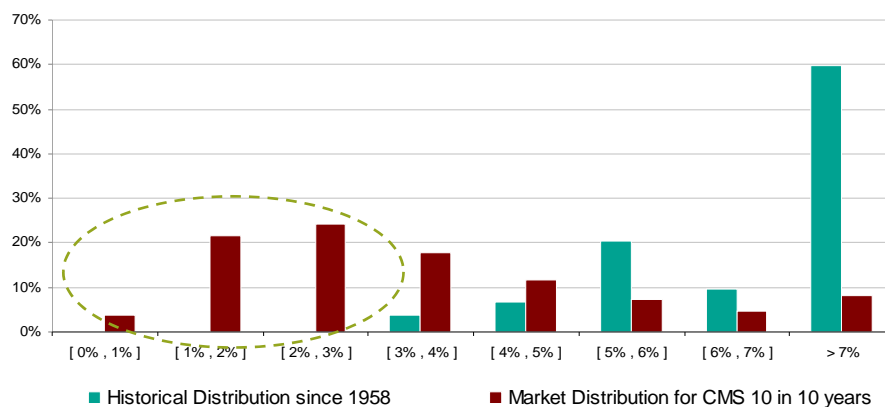
Sources: Bloomberg, Royal Bank of Scotland and Bank calculations.

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## Historical vs. market probabilities for long rates

### Probabilities implied by the market: Euro CMS 10 in 10 yrs time

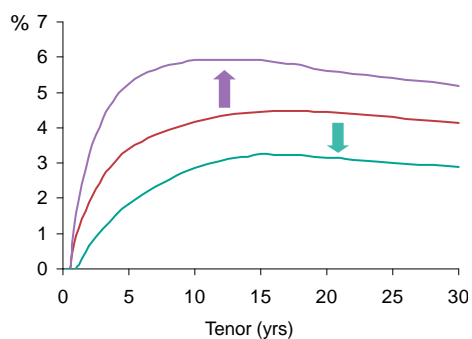


Source: Bloomberg, RBS

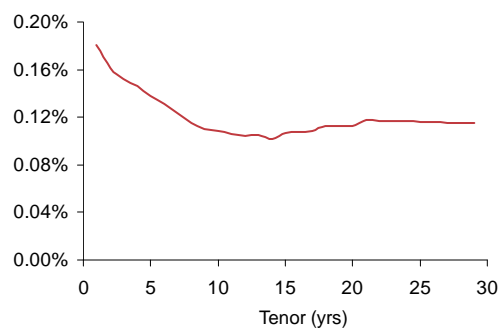
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## Active management of rates under Solvency II

### Interest Rate Shock to QIS5 GBP Yield Curve (31 Dec 2009)



### Required Bias in 1yr Forwards (31 Dec 2009)



Source: CEIOPS, RBS

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## Questions or comments?



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