

Inflation, real returns and inflation hedging

Insurance and Pensions Solutions Group
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Some sources of inflation exposure

Some sources of inflation exposure

- Insurers and reinsurers
 - Life insurers
 - Annuity business (e.g. UK RPI, LPI and CPI)
 - Administrative and other expenses (wage, RPI, other components)
 - P&C and health insurers
 - Claims inflation (wage, legal, medical, property, other components)
 - Administrative and other expenses (wage, RPI, other components)
- Defined benefit pension schemes
 - UK
 - RPI, LPI, CPI
 - Conditional (discretionary) inflation linking of benefits

Some sources of inflation exposure

■ Comments

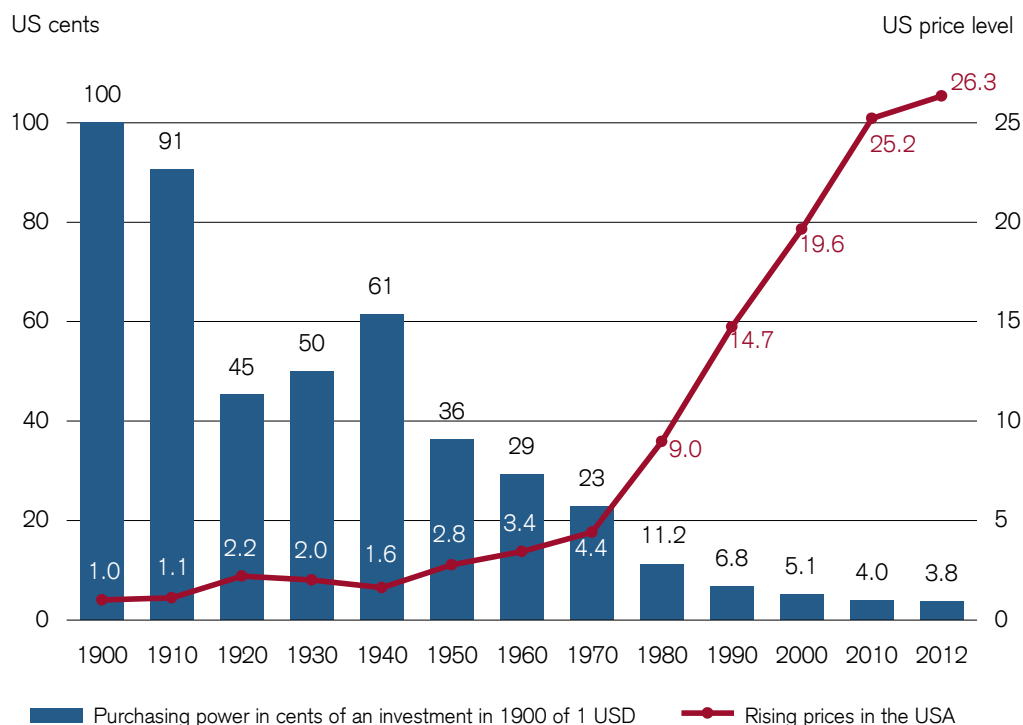
- A portfolio of liabilities may be exposed to various inflation combinations
- The nature of the inflation exposure may change, for example from CPI-based during a deferment period to LPI-based in payment
- For insurers, the current ICA regime requires material exposures to be considered, and these can arise not just from the insurance portfolio, but from the insurer's own employee pension fund related obligations
- For the incoming Solvency II regime, there is limited consideration of inflation risk in determining the SCR, but consideration likely in ORSA
- As inflation is a material risk for many pension schemes, extension of Solvency II to IORPS would likely increase regulatory focus on this risk
- Contingent (discretionary) exposure arises for some schemes where indexing of benefits is contingent on funding levels

Inflation – past experience

Inflation – past experience

■ Consumer price inflation in the United States, 1900–2012

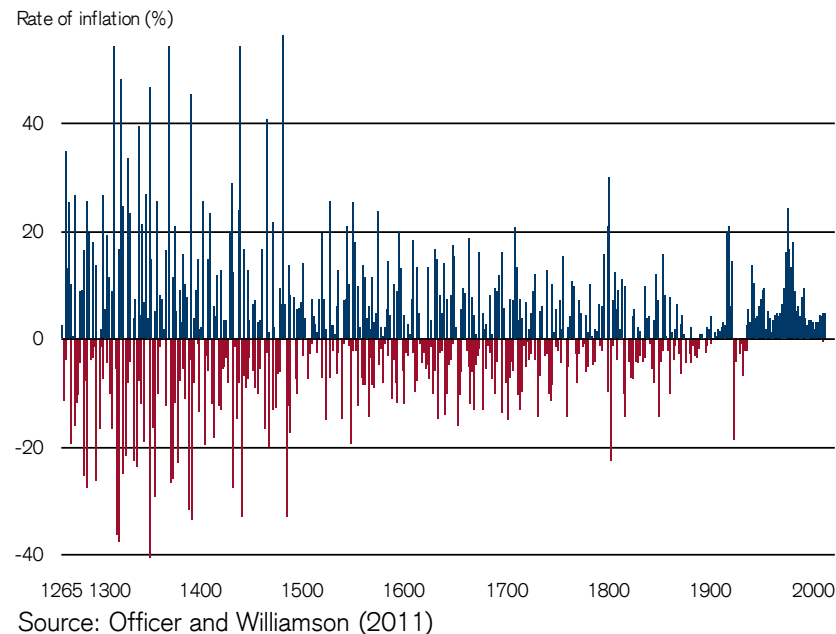
- Inflation has been both positive and negative in the United States during the 20th century with major sustained inflation during the 70's and 80's



Source: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists; authors' updates

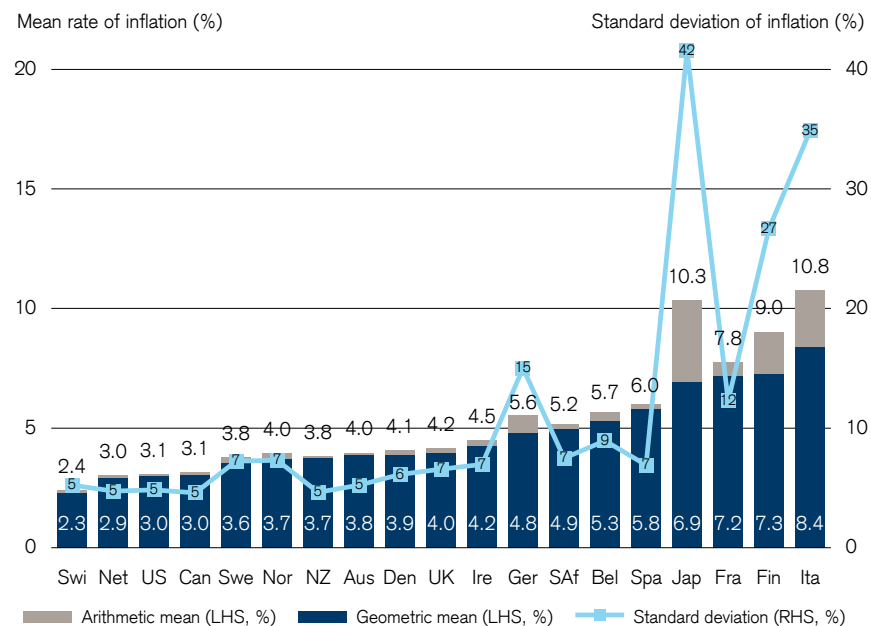
Inflation – past experience

- Annual inflation rates in the United Kingdom, 1265–2011
 - Throughout most of the last 750 years, inflation in the UK has varied widely, fluctuating between major positive and negative rates. It is only since the second half of the 20th century that positive inflation became the “norm”, but even then there have been bouts of high inflation



Inflation – past experience

- Annual inflation rates in the Yearbook* countries, 1900–2011
 - Throughout the 20th century, average inflation in the UK has been relatively low and stable. This has not been universal, e.g., Japan has averaged a rate of 6.9 % (geometric) with significant variation

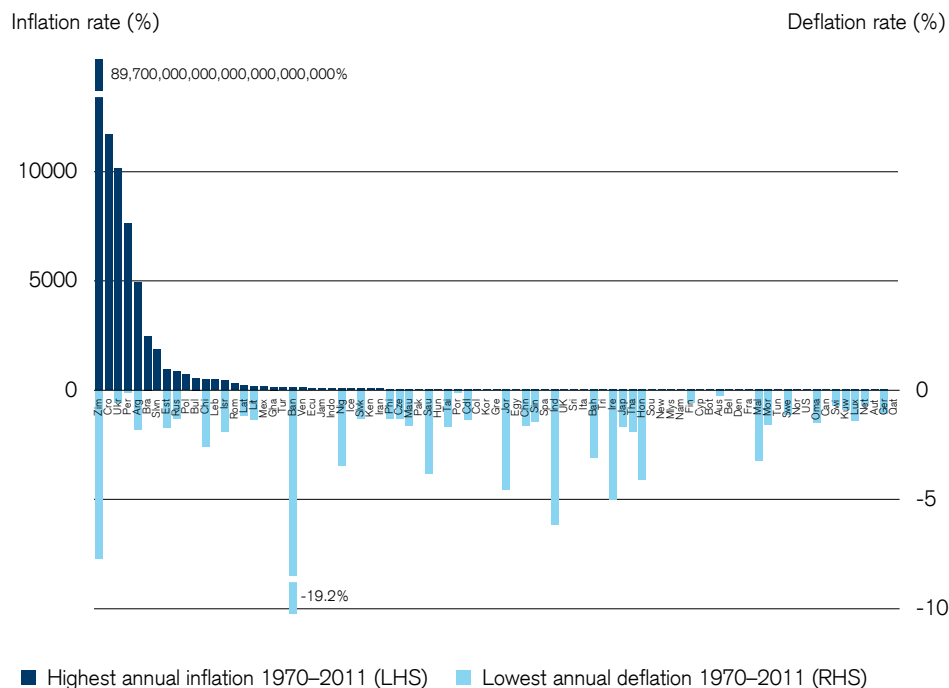


Source: Elroy Dimson, Paul Marsh, and Mike Staunton, Triumph of the Optimists; authors' updates

* Credit Suisse Global Investment Returns, Yearbook 2012, available at: <http://is.gd/CSInvestmentReturnsYearbook>

Inflation – past experience

- Extremes of inflation and deflation: 83 countries, 1970–2011
 - Even in the last 40 years, there have been significant inflationary and deflationary scenarios around the world. These have affected Russia, China, India, Japan, Germany, Luxembourg, Argentina, etc.



Source: Elroy Dimson, Paul Marsh, and Mike Staunton; Hanke and Kwok (2009)

Inflation – past experience

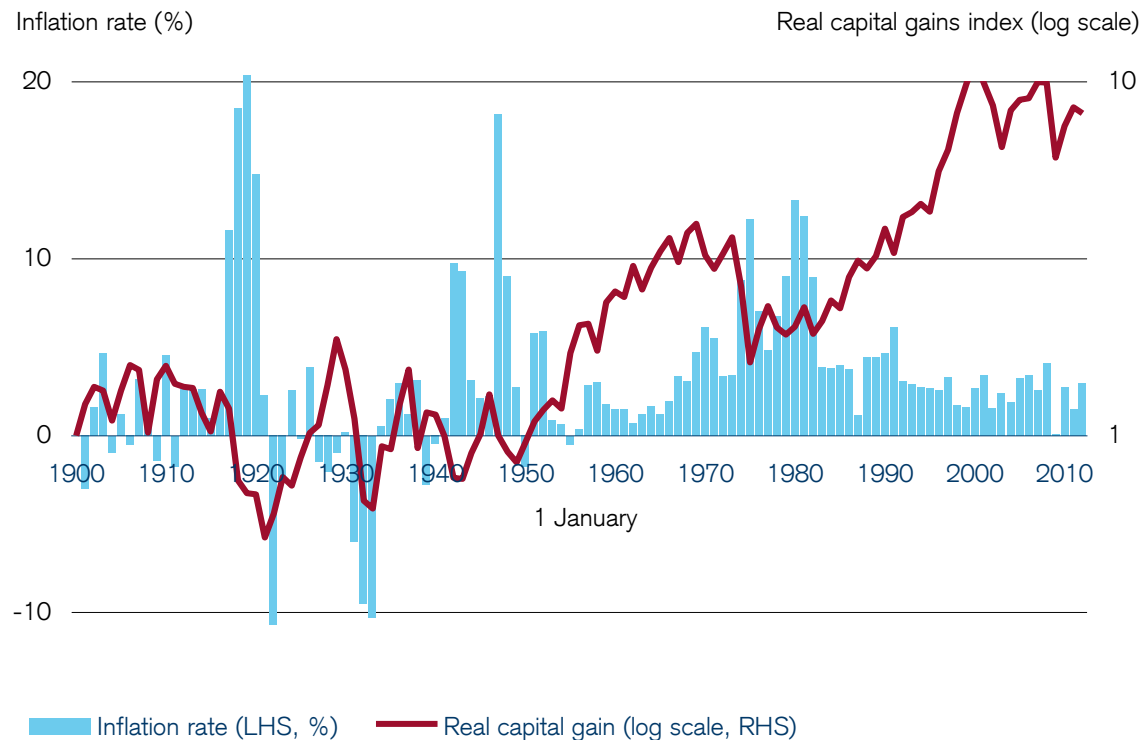
- In summary

- **Upside and downside inflationary shocks are a genuine risk**

Real returns – past experience

Real returns – past experience

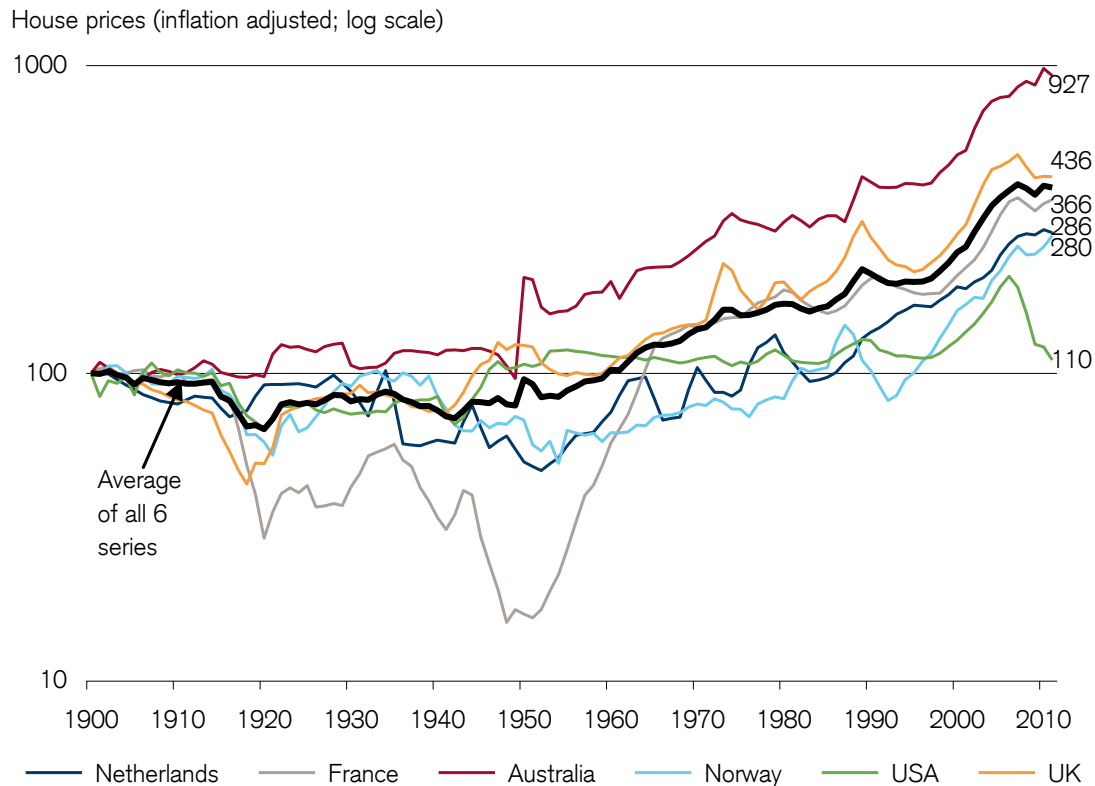
- Inflation and the real level of US equities, 1900–2011
 - Sustained real returns have been posted since 1950, but with significant periods of material negative real returns



Source: Elroy Dimson, Paul Marsh, and Mike Staunton

Real returns – past experience

- Real price of domestic housing in six countries, 1900–2011
 - A similar picture to that for real equity returns



Sources: Eichholtz (1997), Eitrheim & Erlandsen (2004), Friggit (2010), Monnery (2011), Shiller (2011), Stapledon (2011)

Real returns – past experience

■ Real returns and inflation, 1900–2011

Asset	Geometric mean	Arithmetic mean	Standard deviation	Sensitivity to inflation
Equities	5.4%	6.9%	17.7%	−0.52
Bonds	1.7%	2.3%	10.4%	−0.74
Bills	0.9%	1.0%	4.7%	−0.62
Gold	1.0%	2.4%	12.4%	0.26
Housing	1.3%	1.5%	8.9%	−0.20

Equity returns are for world index in USD. Bond and bill returns are US. Gold is converted to USD. All returns are adjusted for inflation. Housing excludes income and is an average of local inflation-adjusted indexes.

Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, IPD, WGCC, and OECD

■ Digging a little deeper, note the volatilities of real returns and their negative correlation with same year inflation for all except gold

Real returns – past experience

Real return vs. inflation 1900–2011

Asset	Coefficient	Std. Error	t-statistic	No of obs.
Equities	−0.52	0.05	−10.60	2123
Bonds	−0.74	0.02	−35.23	2123
Bills	−0.62	0.01	−70.54	2123
Gold	0.26	0.05	5.00	2123
Commercial real estate	−0.33	0.20	−1.60	280
Housing	−0.20	0.07	−2.99	719

Real return vs. prior year inflation 1900–2011

Asset	Coefficient	Std. Error	t-statistic	No of obs.
Equities	−0.31	0.05	−6.19	2104
Bonds	−0.41	0.03	−15.89	2104
Bills	−0.37	0.01	−24.74	2104
Gold	−0.07	0.05	−1.48	2104
Commercial real estate	−0.54	0.20	−2.72	280
Housing	−0.37	0.07	−5.63	719

Regressions of annual real return versus (i) same-year inflation and (ii) prior-year inflation. There is a dummy variable for every country, the intercept is suppressed, and five extreme observations are omitted.

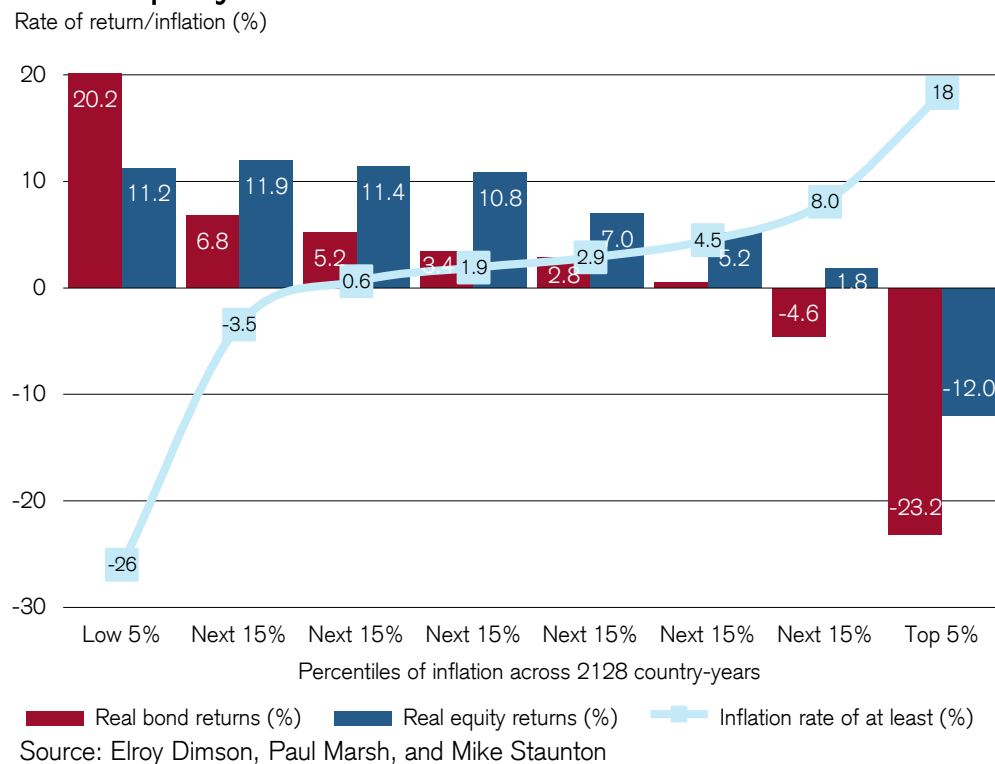
Sources: Elroy Dimson, Paul Marsh, and Mike Staunton, IPD, WGC, and OECD

- Correlations to prior year inflation were generally somewhat less negative, except for property (more negative) and gold (uncorrelated)

- **So, how good are “real” assets as an inflation hedge ?**

Real returns – past experience

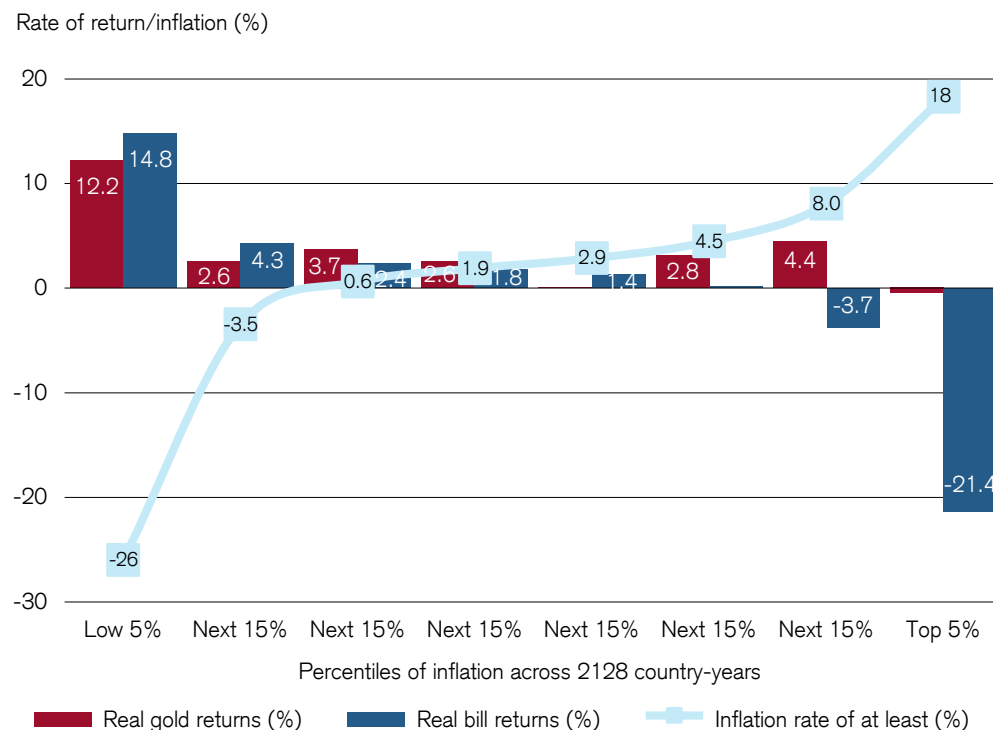
■ Real bond and equity returns vs. inflation rates, 1900–2011



- Real returns on equity decreased for inflation above about 4.5 %, nominal returns on equity were negative in the tails, real returns on bonds fell with rising inflation, neither asset class was a truly good hedge for RPI or LPI

Real returns – past experience

■ Real gold and cash returns vs. inflation rates, 1900–2011



Source: Elroy Dimson, Paul Marsh, and Mike Staunton; WGC, EH.net

- Real returns on gold were fairly stable, nominal returns on gold were negative in the left tail, real returns on cash fell with rising inflation, gold was a reasonably good RPI hedge, neither asset class hedged LPI

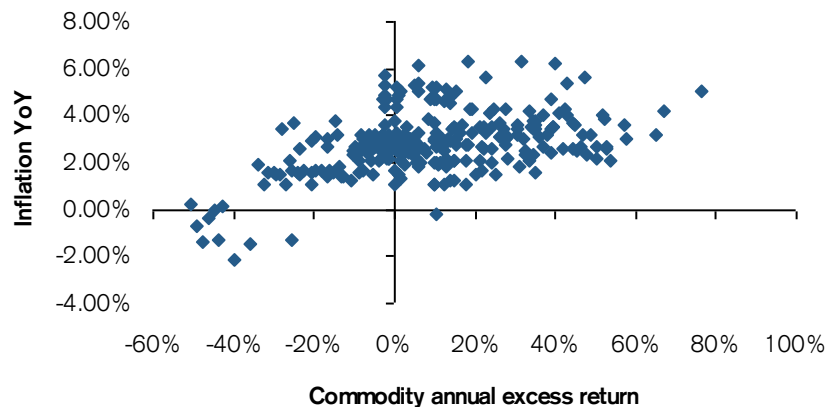
Inflation hedging

Inflation Hedging

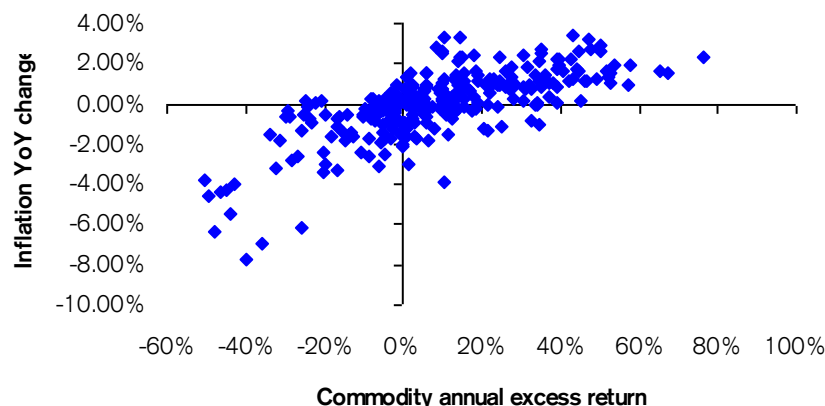
- “Real” assets (reviewed above)
 - Equities, property, gold
- One more “macro” hedge
 - Commodities
- “Direct” alternatives
 - UK Government inflation linked bonds (“linkers”)
 - Inflation swaps

Inflation Hedging

Commodities vs. YoY inflation *



Commodities vs. proxy unexpected inflation *



- We first compare the excess returns of a commodity investment (here represented by the S&P GSCI) with the YoY inflation (based on the US CPI)
- Although there is a strong correlation overall, there are a number of scenarios combining high inflation YoY changes and poor annual commodities performance
- We then compare the commodity excess returns with the unexpected inflation, proxied by the yearly change in YoY inflation, assuming inflation is “sticky”
- The second chart shows a very strong correlation between commodities and unexpected inflation, implying that commodity investments could capture part of the inflation surprise
- Other “real-return” asset classes, such as equity or property, tend to be much less efficient in capturing unexpected inflation moves

Excess return **	S&P GSCI	S&P 500
Overall	2.13%	7.73%
When inflation rises	18.18%	9.47%
When inflation falls	-7.95%	6.57%

* Source: Credit Suisse, Bloomberg; Monthly values, overlapping data

** Source: Credit Suisse, average annualised geometric monthly returns, 1983-2011

Inflation Hedging

- UK Government inflation linked bonds (“linkers”)
 - Coupons and maturity payments are linked to UK RPI
- UK Government inflation linked bonds are a funded hedge, i.e., cash needs to be paid in order to acquire the asset
- Hedging inflation linked cash-flows with UK Government inflation linked bonds requires some form of cash-flow bucketing, since these bonds are not available in strip form. This is not usually a major practical concern however
- UK Government inflation linked bonds pay without caps or floors on RPI and so overhedge LPI in high inflation scenarios and underhedge LPI in low inflation scenarios. Optionality (embedded in providing caps and floors) is not possible using inflation linked bonds

Inflation Hedging

- Inflation swaps
 - Typically entered into on a “Zero Coupon” basis, using ISDA documents, collateralised under a CSA
- Notional and tenor are agreed at outset by the two parties
- Insurer/pension fund is obligated to pay the notional amount, typically rolled up at an agreed, constant rate of interest, to the hedge counterparty, at maturity (roll up may be at an agreed spread to LIBOR)
- The hedge counterparty is obligated to pay the notional amount, rolled up in line with RPI, to the insurer/pension fund at maturity
- Maturity payment is the net obligation from one party to the other
- Inflation swaps, entered into at zero initial cost, are an unfunded hedge
- Zero-coupon inflation swaps can be used to hedge cash-flows precisely
- LPI variations are catered for, annual capping and flooring as standard

Inflation Hedging

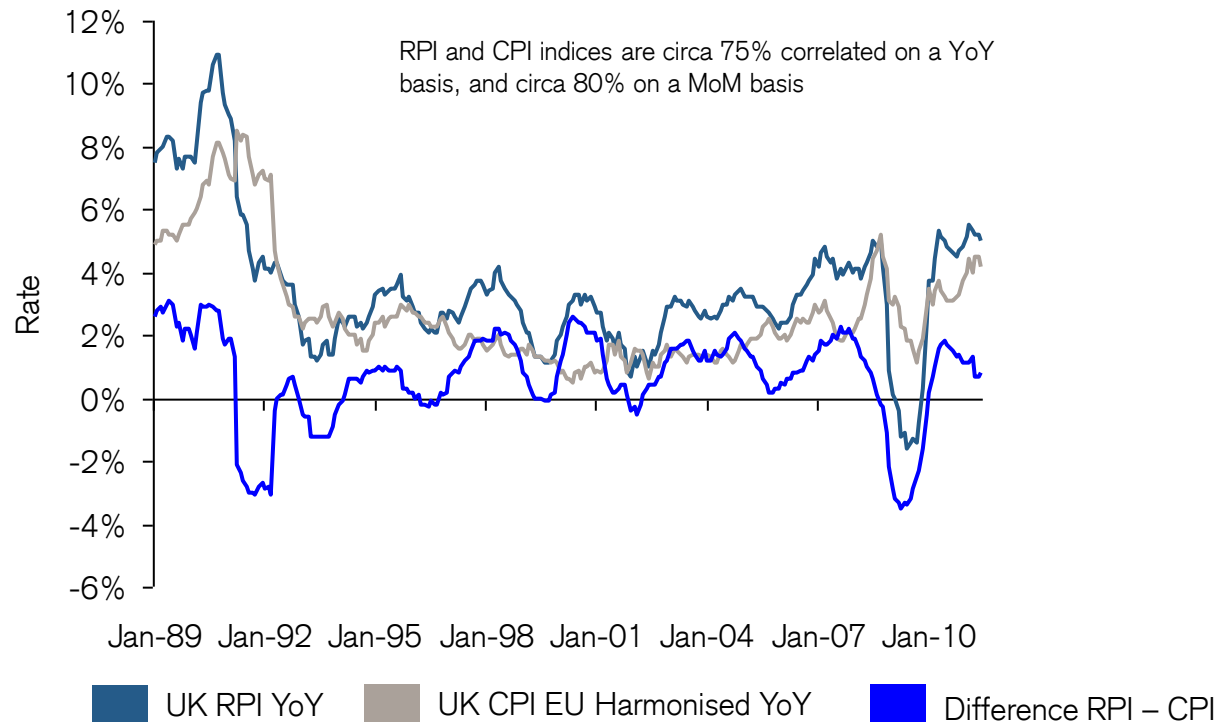
- Various other factors need to be considered
 - Liability valuation basis (are liability cash-flows valued by reference to the gilt curve or the swap curve). This matters since there is a gilt/swap spread which varies over time
 - The extent to which hedges may need rebalancing. Liquidity is generally better in the swaps market, but LPI swaps are less liquid than RPI swaps. Hedges may need rebalancing for a number of reasons, for example where exposure is to CPI pre-vesting and RPI-post vesting, with the total exposure hedged by reference to RPI, rebalancing for relative movements
 - Whilst not usually a practical issue, RPI indexing of inflation linked bonds and swaps involves a lag. This is typically 2-months for swaps, currently 3-months for new issues of linkers and 8-months for some older, outstanding linkers

Inflation Hedging

- Various other factors need to be considered (continued)
 - Inflation hedging should not be considered in isolation
 - In particular diversification effects should be considered and the interaction of interest rate and inflation exposures often proves to be of particular importance

Inflation Hedging

- UK CPI cannot be precisely hedged, either in the swaps market or using linkers, as all market traded UK inflation is RPI
 - RPI hedges can be used, with an assumed drift, rebalancing over time



Source: Credit Suisse.

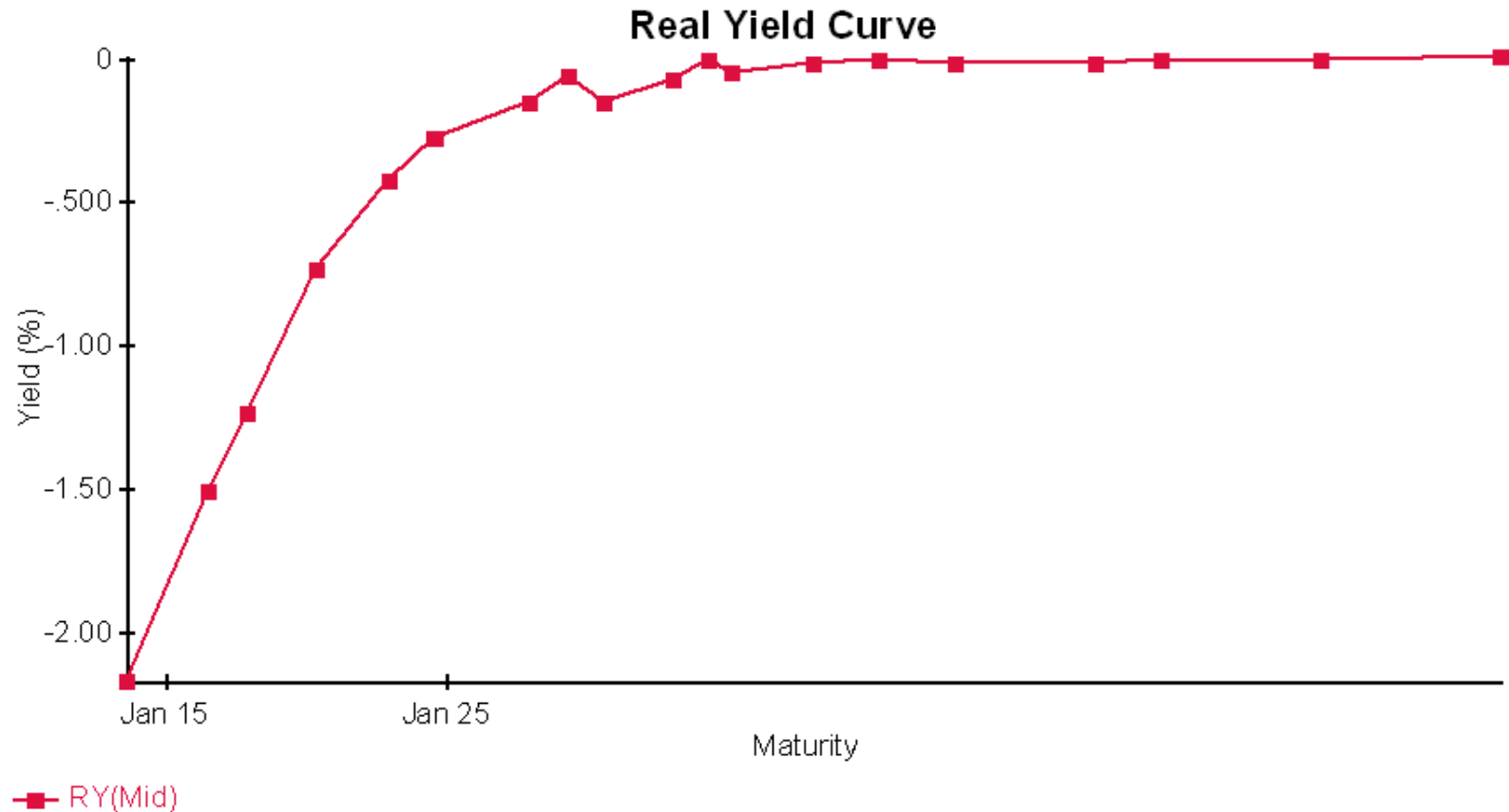
Inflation Hedging

■ Hedging UK inflation risk in isolation - summary

	"Real" assets (equities, real estate, commodities)	UK Government inflation linked bonds	Inflation swaps
RPI	?	Yes	Yes
LPI (0,5)	?	Yes, BUT	Yes
LPI (0,3)	?	Yes, BUT	Yes
LPI (3,5)	?	Yes, BUT	Yes
CPI	?	Partial/basis risk	Partial/basis risk

Inflation Hedging

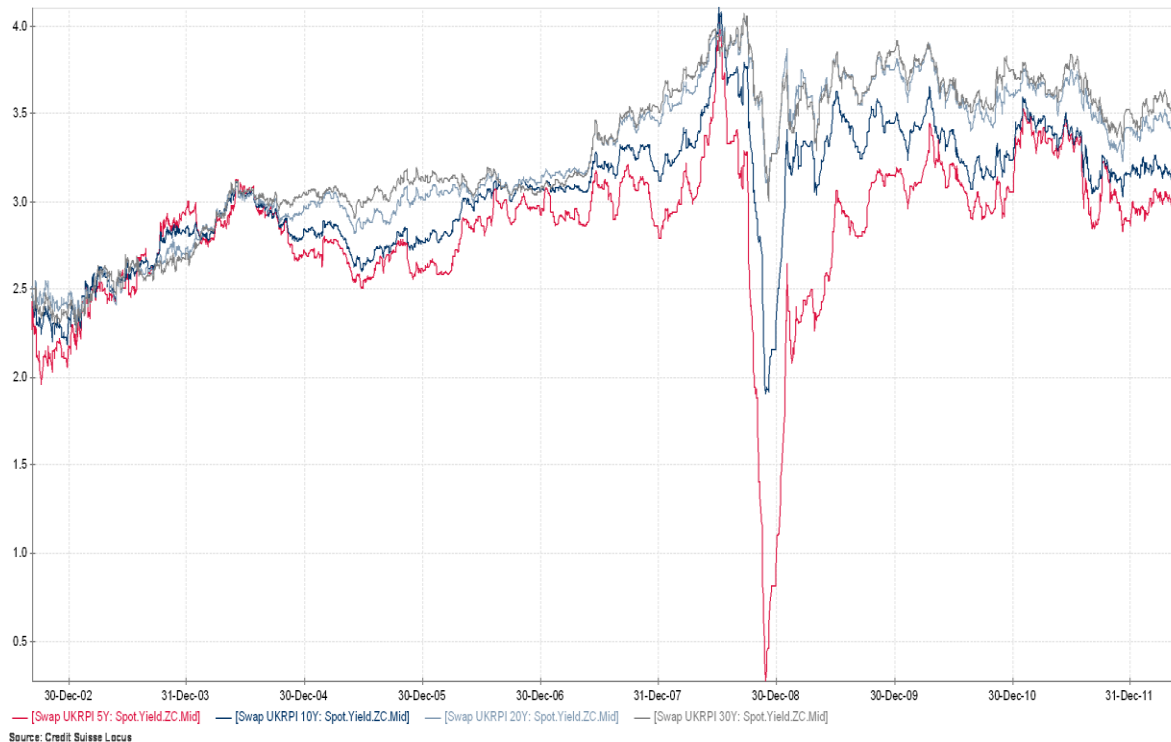
- The real yield curve (linkers) was negative as at 12 June 2012



Source: Credit Suisse Locus

Inflation Hedging

History of Zero-coupon inflation swap rates



Maturity	Real Rate
1Y	-1.319%
2Y	-1.410%
3Y	-1.398%
5Y	-1.270%
7Y	-1.071%
10Y	-0.751%
15Y	-0.471%
20Y	-0.342%
25Y	-0.256%
30Y	-0.258%
40Y	-0.159%
50Y	-0.196%

Source: Credit Suisse.

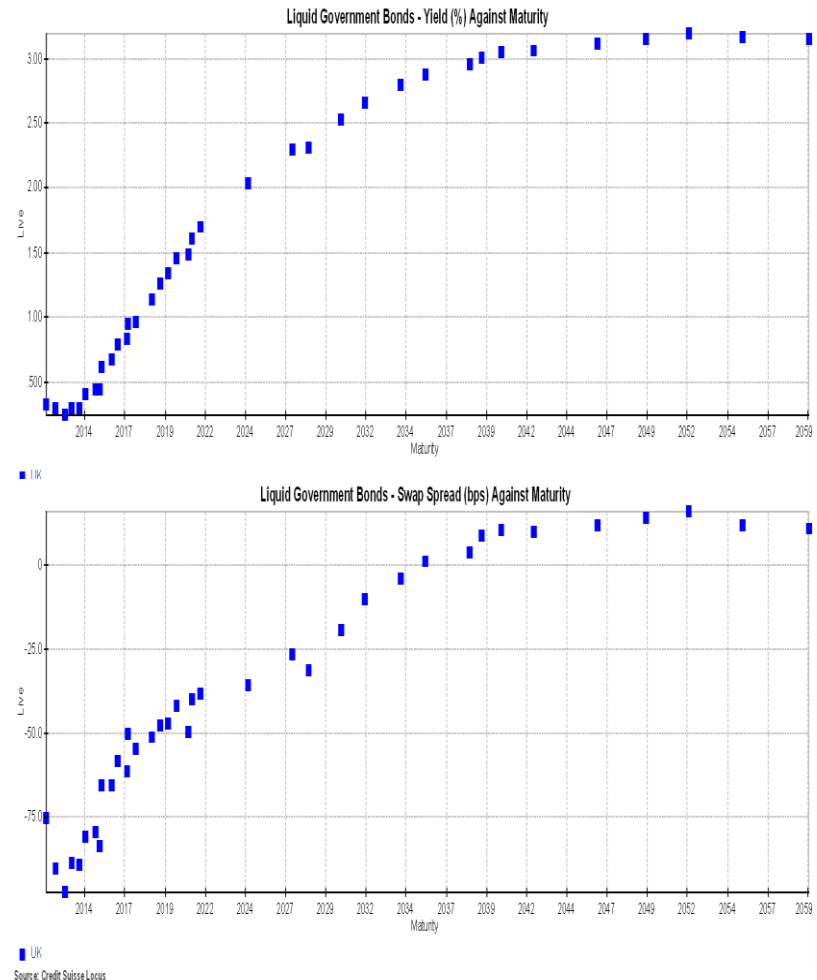
- The inflation swaps real rate curve was also negative at 12 June 2012 (e.g. the 30-year Zero-coupon inflation swap rate shown is about 3.4%, but the 30-year Zero-coupon par swap rate was lower, resulting in a negative real rate)

Inflation Hedging

- For nominal yields, we can compare the UK Government Bond Yield with the corresponding swap rate
- The difference is referred to as the UK Government Bond Swap Spread
- Currently, this is positive at long durations and negative at short durations
 - UK Government Bond yields are above swap rates at the long end and below swap rates at the short end
 - Often this is referred to with “positive” and “negative” interchanged !
- Very loosely (ignoring practicalities, funding, credit risks, balance sheet impacts, liquidity costs, etc.,) it is currently cheaper to hedge long dated fixed cash flows using the UK Government Bonds market than the swaps market and cheaper to hedge short dated fixed cash flows in the swaps market
- A similar relationship holds for hedging RPI linked cash flows

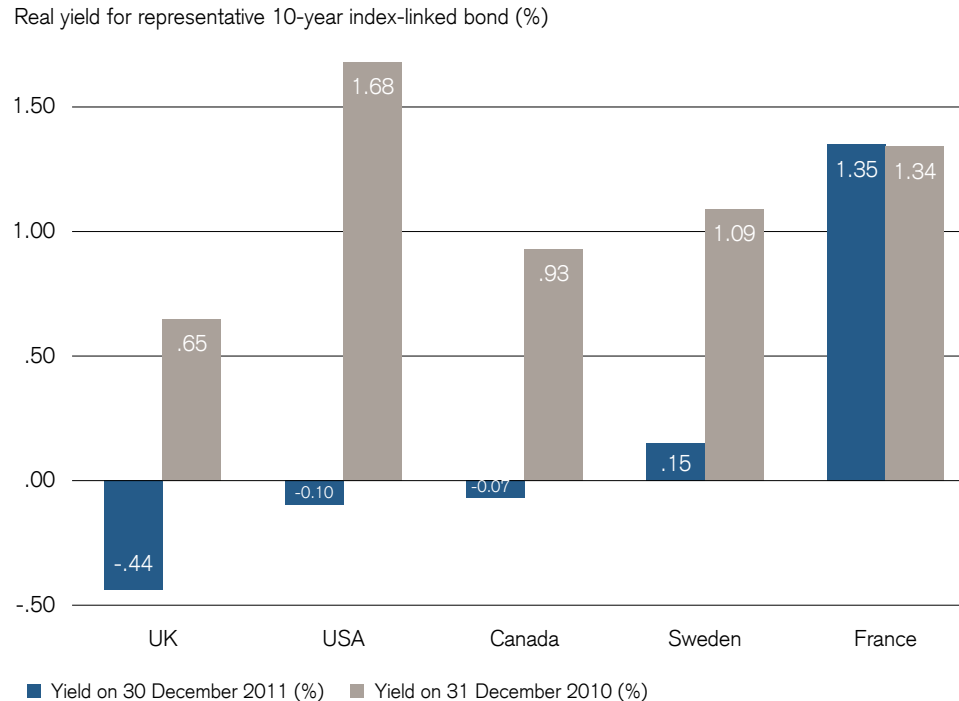
Inflation Hedging

- Looking at the UK Government Bond Swap Spread, it is significantly cheaper to hedge short dated fixed cash flows in the swaps market.
- At the long end, whilst at first glance gilts provide a cheaper hedge, allow:
 - For liquidity/funding costs
 - For balance sheet effects from bond/swap spread
- Similar points arise for hedging RPI linked cash flows, but in addition
 - No strips to hedge individual cash flows
 - Can't hedge LPI effectively



Inflation Hedging

- Other factors should also be considered, for example ...



Source: FT table of representative stocks (UK '21, US '28/'31, Canada '21, Sweden '20/'22, France '20).

- Higher real yields can be obtained by reference to other sovereign inflation linked bonds. The inflation reference and currency need to be swapped, but much of the additional real return can be retained

Inflation Hedging

- Other strategies might be to consider cheapening the cost of protection by taking a view on the path of future inflation. Consider the following indicative prices for inflation options, based on year-on-year UK RPI

Tenor	Collar (S/L) (0%,5%)	Floor (S) (0%)	Floor (S) (-1%)	Cap (L) (5%)
5 years	0.3 %	1.8 %	1.4 %	1.6 %
10 years	1.0 %	5.3 %	4.5 %	4.5 %
20 years	2.6 %	10.7 %	9.3 %	8.5 %
30 years	4.2 %	14.7 %	12.9 %	11.0 %
Premium	received	received	received	paid

L = Long S = Short
Source: Credit Suisse

- The table shows premiums per unit of notional
- In each year during the tenor, the payout is determined by reference to the RPI rate in that year and the unindexed notional of the option

Inflation Hedging

- As one example, if a view is taken that inflation is unlikely to become negative, then selling downside protection in a negative inflation scenario, would fund the purchase of upside protection in scenarios of inflation above 5 % year-on-year (indeed, a net premium would be received)
- As another, if there is concern about a spike in inflation in a future period, protection can be obtained by purchasing a cap with a expiring at the end of that period and selling a cap expiring at the start of that period on the same notional (the notional could be chosen based on inflation expectations to the start of the period)

Tenor	Collar (S/L) (0%,5%)
5 years	0.3 %
10 years	1.0 %
20 years	2.6 %
30 years	4.2 %
Premium	received

L = Long S = Short
Source: Credit Suisse

Inflation Hedging

■ In conclusion

- Inflation exposures are material
- Inflation (and deflation) risks are real risks and shouldn't be ignored
- “Real” assets are not particularly good inflation hedges, either on a period-by-period basis or when considering tail experience
- Direct hedging of UK RPI and LPI is possible, with CPI hedging subject to basis risk (however real rates are currently negative for both linkers and swaps)
- The inflation swaps market is more liquid, more flexible and enables more precise hedging (and is often cheaper)
- Wider factors should be taken into consideration in deciding a hedge
- Options are also available and these permit views on the inflation path to be taken into account in deciding strategy for any hedging exercise

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