

# Inflation: Risks and Opportunities

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Dublin



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A Passion to Perform.

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# What is inflation?



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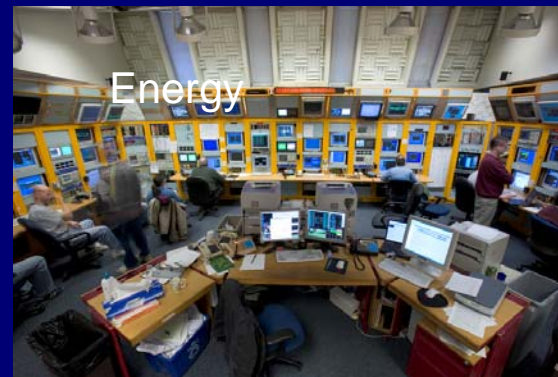
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# The French CPI Basket



Alcohol & Tobacco



# The UK RPI Basket



# The Irish CPI

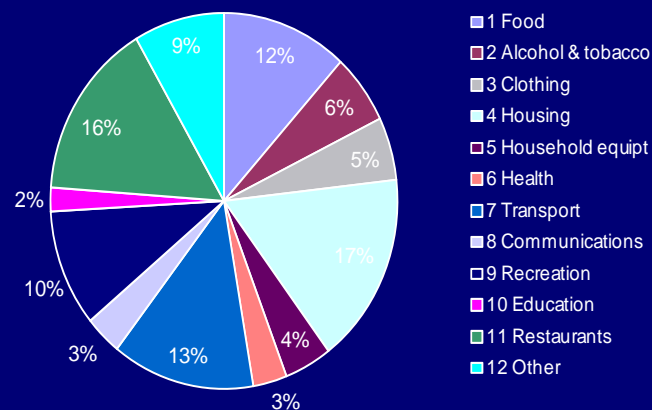
The Irish consumer price index (CPI) measures the change in the average level of prices paid for consumer goods and services by all private households in the country (as well as foreign tourists)

- it includes owner occupied housing via mortgage interest costs

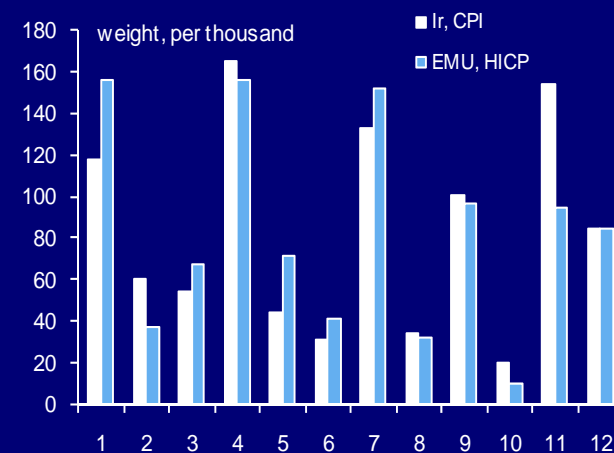
## Comparing Ire CPI and EMU HICP weights

- The Irish CPI has a relatively large weight for Alcohol & tobacco, housing and restaurants and a relatively low weight for food, household equipment and clothing

CPI weights, Ireland...

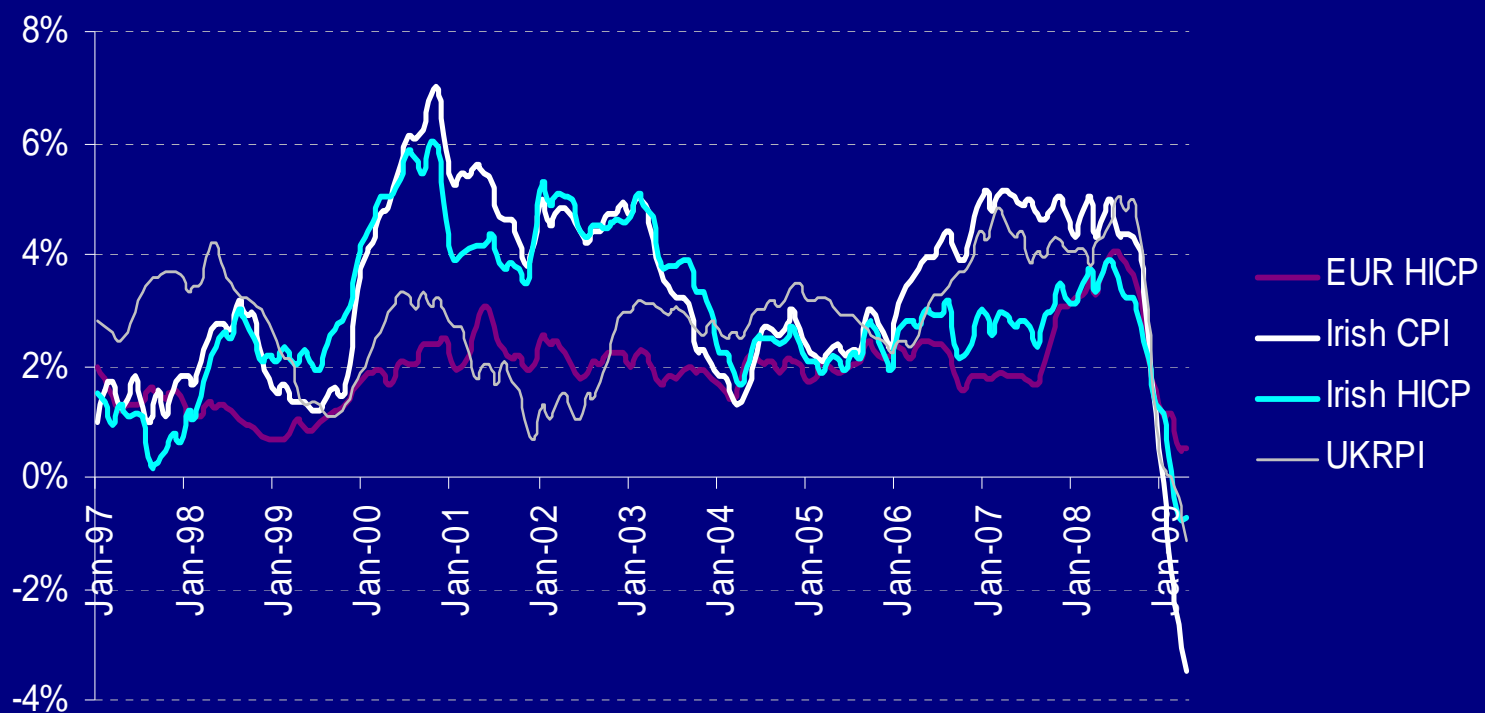


...and compared to EMU HICP



# Ireland has exhibited higher than average inflation

Annual Inflation



# How can I hedge inflation risk?



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# The Risk Premium

## The Fisher Equation

- Nominal Yields
- Real Yields
- Inflation
- Risk Premium
- Liquidity Premium

$$(1 + N) = (1 + R) * (1 + I) * (1 + RP) * (1 + LP)$$

Nominal Yield

Real Yield

Break Even  
Inflation

Index  
Linked  
Bond

Real Yield

Break Even  
Inflation Swap

Break Even  
Inflation

## The Markets

- Nominal Bonds
- Real Bonds
- Break even swaps

*Inflation swaps contain the risk premium*



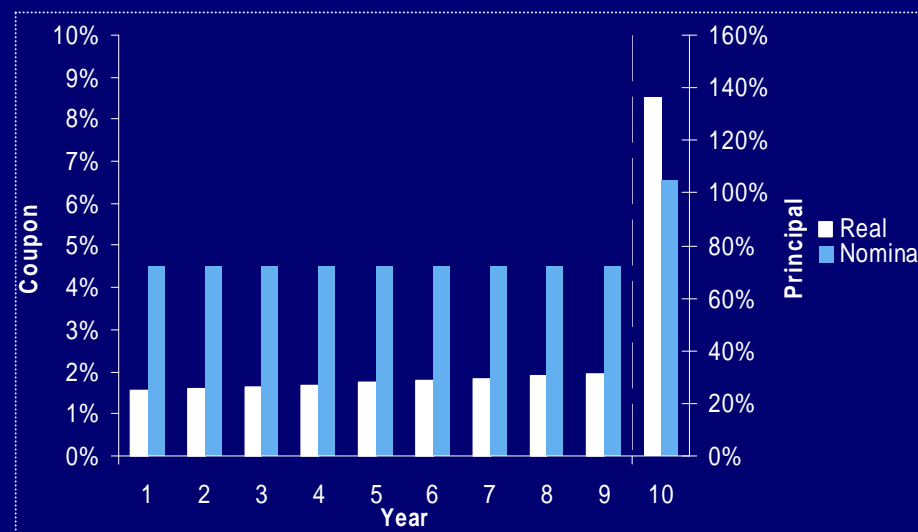
# Inflation Bonds (“Linkers”)

A vanilla fixed rate bond pays a fixed coupon and redeems at 100

- Interest Paid = Fixed Rate \* Constant Notional (e.g. 5% \* 100 = 5)
- Redemption = Constant Notional (e.g. 100)

A “Canadian style” Linker pays a “real” coupon and redeems at 100 in “real” terms

- Index Ratio = CPI Index on Payment Date / CPI Index on Issue Date
- Interest Paid = Fixed Rate \* Inflated Notional
  - = Fixed Rate \* Notional \* Index Ratio (e.g. 2% \* 100 \* 1.5 = 3)
- Redemption = 100 \* Index Ratio (e.g. 100 \* 1.5 = 150)



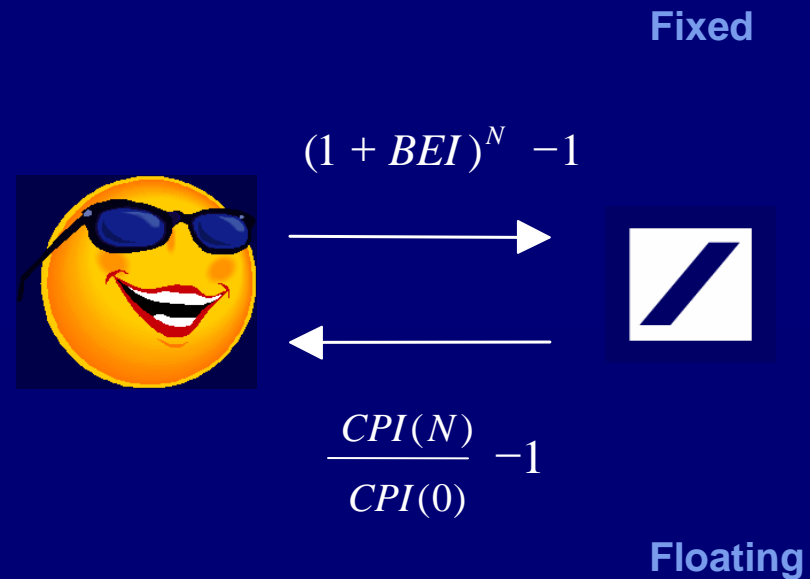
# What is an inflation swap?

## The cash-flows

- Receive Compounded Inflation from Start to Maturity: pay one cash-flow
  - $CPI_t/CPI_0 - 1$
- Pay a **known Fixed** cash-flow at Maturity
  - $(1 + X\%)^t$
  - $X$  is known as the **break-even inflation rate**

## What is the break-even rate?

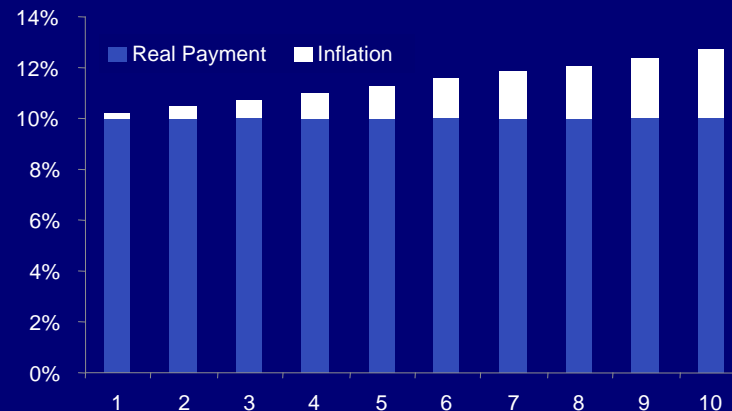
- The rate where the market is indifferent between buying and selling inflation
- Includes the risk premium
- Is often thought of as the average expected inflation rate



# How do I hedge insurance risks using swaps?

## What are the underlying risks?

- Insurer is exposed to compounded inflation from today to payment date on each flow
- Thus a zero-coupon swap is required for each payment
- Combining the individual swaps gives an “annuity” swap with a single rate



# The Option Market

## Year on Year

- Pays Year on Year inflation ( $\text{CPI}_{-3M}/\text{CPI}_{-15M} - 1$ ) minus strike
- For example 10 year 3% cap costs 6.14% (0.73% p.a.)
- 0% floor costs 1.15% or 0.14% p.a.

## Zero Coupon

- Pays compounded inflation minus compounded strike
  - $(\text{CPI}_t/\text{CPI}_0) - (1+X\%)^t$
- For example 10 year 3% cap costs 6.14% (0.73% p.a.)
- 0% floor costs 1.15% or 0.14% p.a.

## LPI

- Indexation of inflation is capped and/or floored
  - $\text{LPI}_t = \text{LPI}_{t-1} * \max(\text{CPI}_t/\text{CPI}_{t-1}, 1)$
  - E.g. if inflation is floored at 0% 10 year annuity swap moves from 2.05% to 2.5% due to option value

# What is going on in Inflation Markets?



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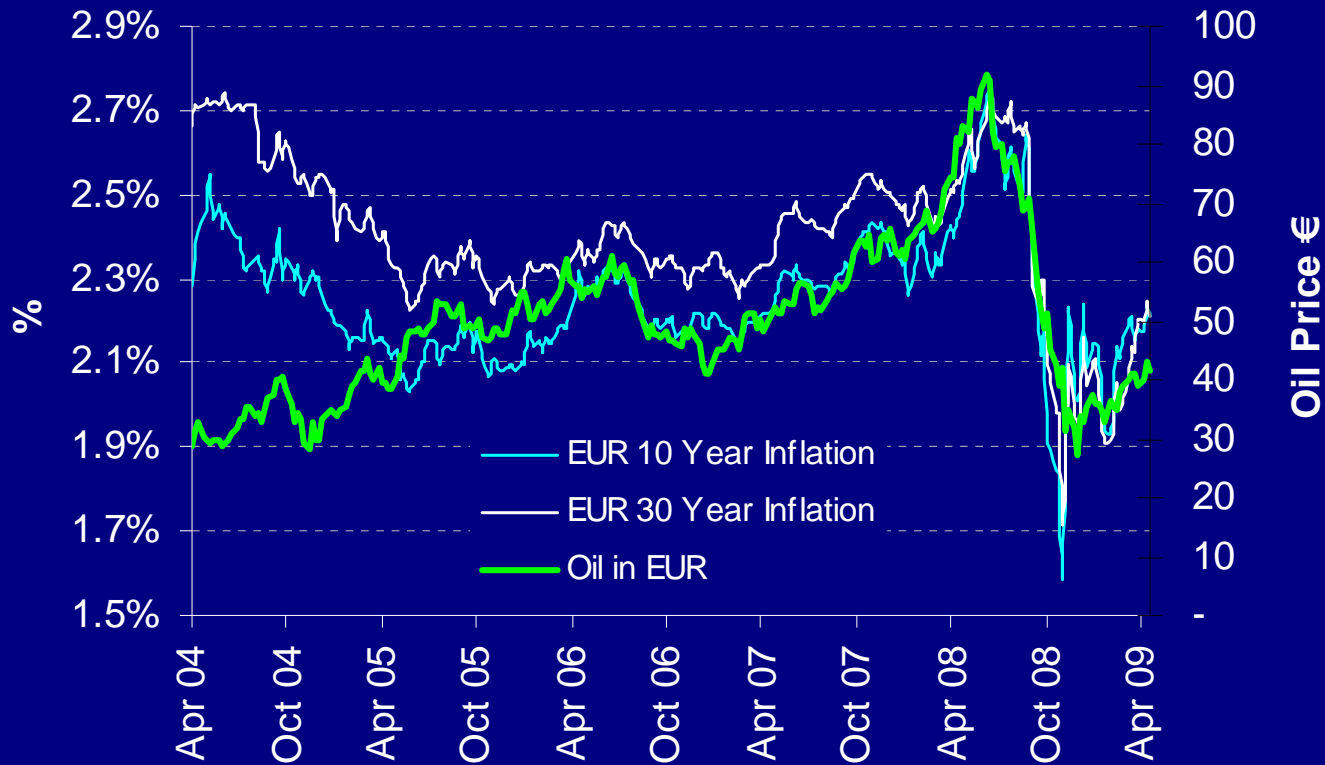
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# EUR Inflation Swaps

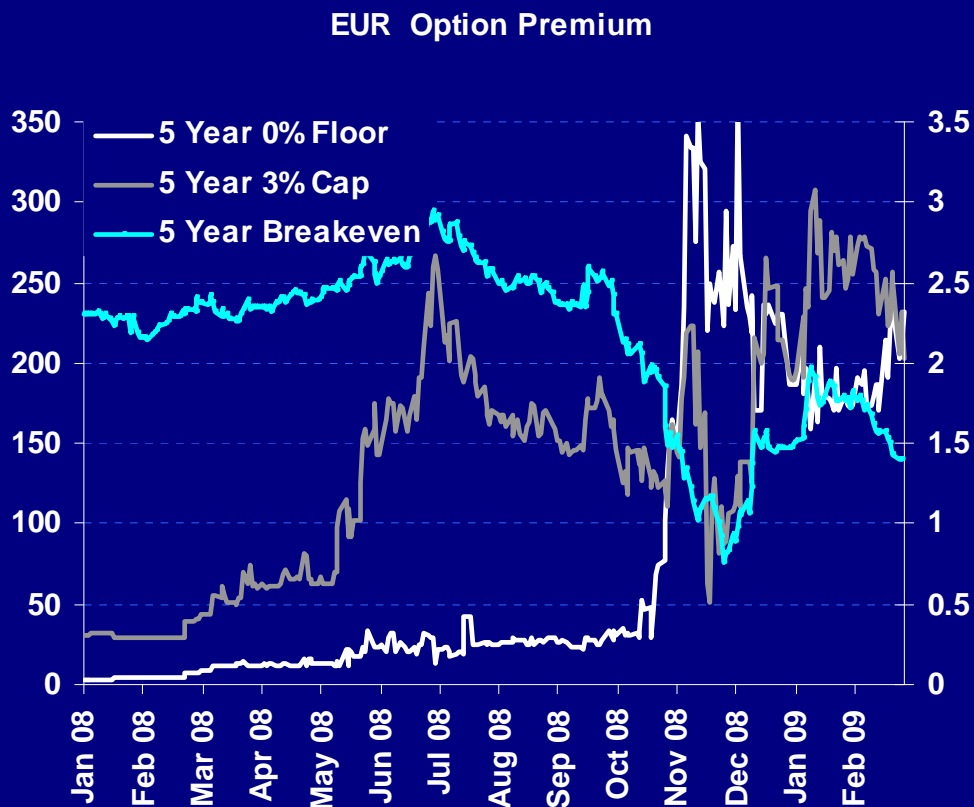
## Annual Inflation



Inflation is measured every year

Oil at \$150 and stable is not inflationary

# Volatility has driven breakevens



- Breakeven fall has caused gamma hedging by the street to hedge retail 0% floors
- 3% cap premiums 0.5% higher despite a sell off of over 1% in 5 year breakeven
- Low strike floors are trading at a premium and well above their fair economic value given unlikely prolonged deflation scenario

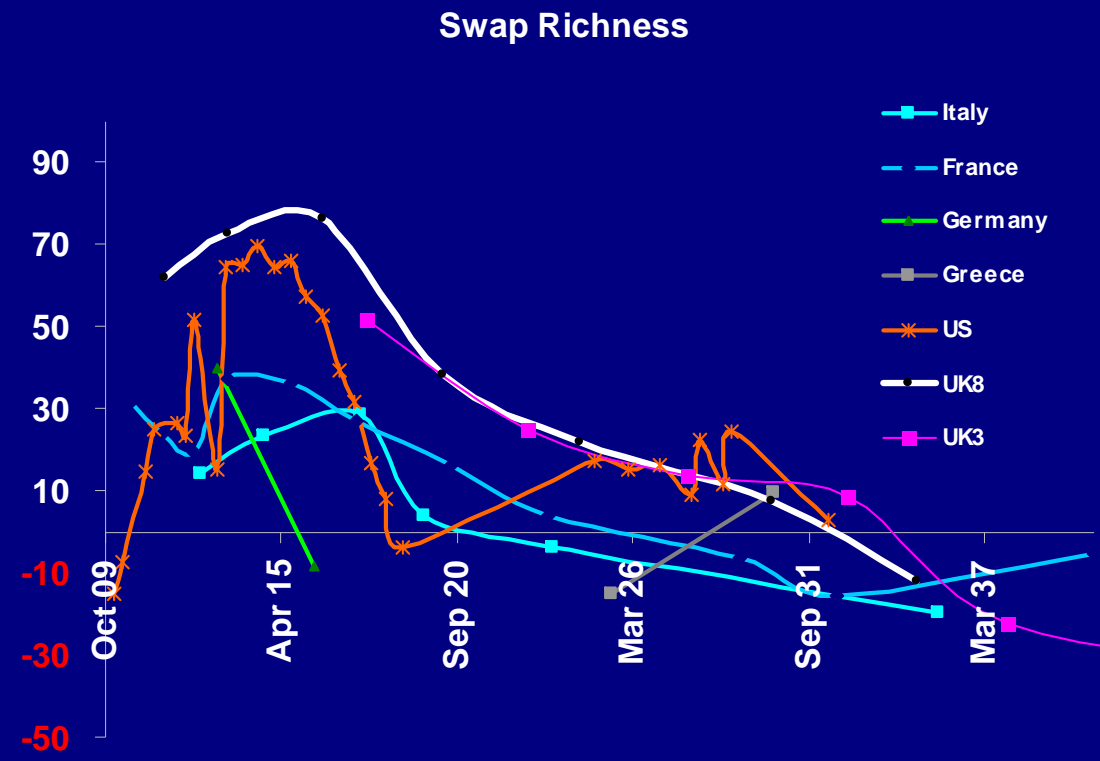




# Bonds and Swaps Diverge...

Swap Richness is the difference between the implied and like for like inflation rate in the bond and that in the swap market

This represents an arbitrage



# How to Take Advantage of Market Disruption



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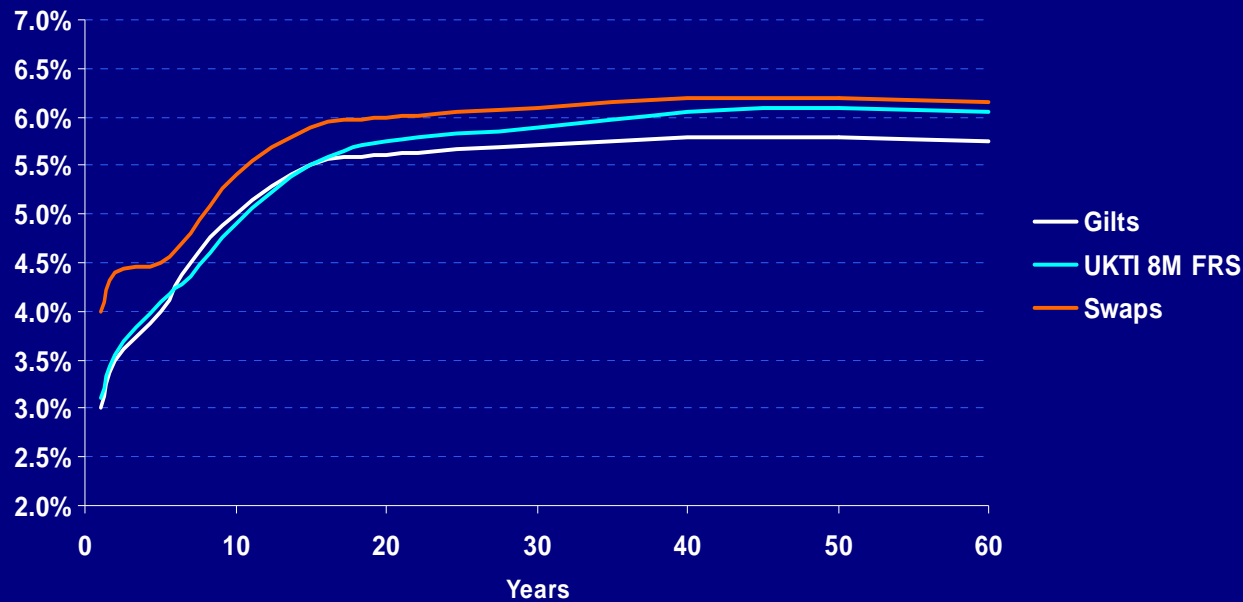
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# Typical Yield Curves

UK Yield Curves



Positive Slope

Swap Yields < Gilt Yields

Linker Asset Swaps slightly above Gilt Asset Swaps

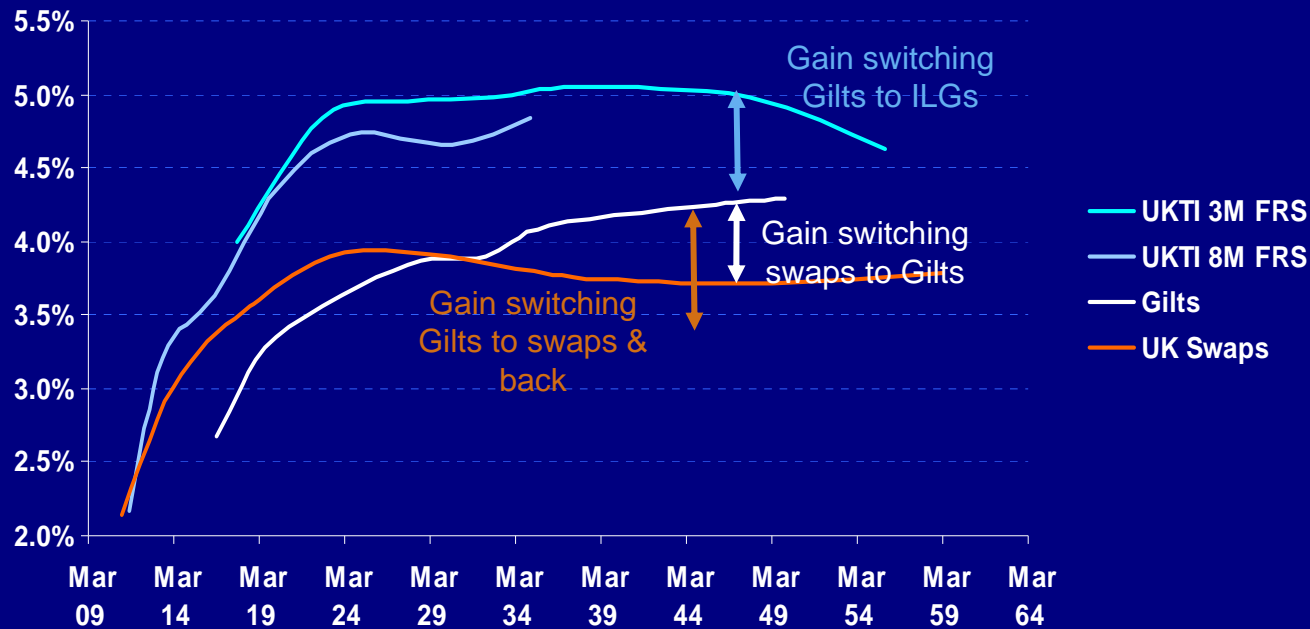
Investment Portfolios typically short dated as this is where majority of issuance is

Liabilities Long Dated off Government curve

Many investors sell short dated bond cashflows via swap and receive flows to match liabilities

# Current Yield Curves

UK Yield Curves



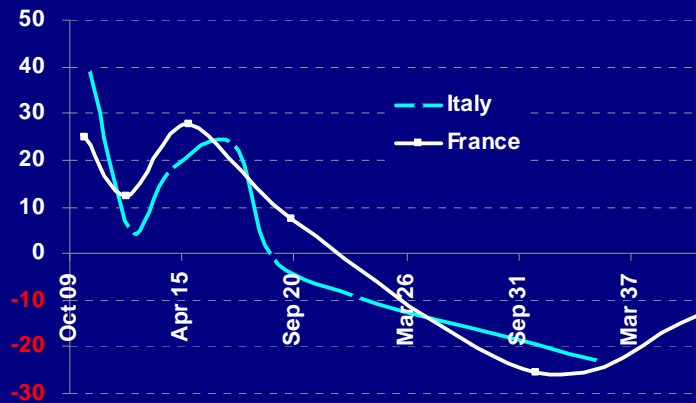
Swap spread has inverted in back tenors

Investors are switching back to bonds from swaps and monetising initial spread and current spread

Clients are also arbitraging between Linkers and Gilts

# Horses for courses

EUR Swap Richness



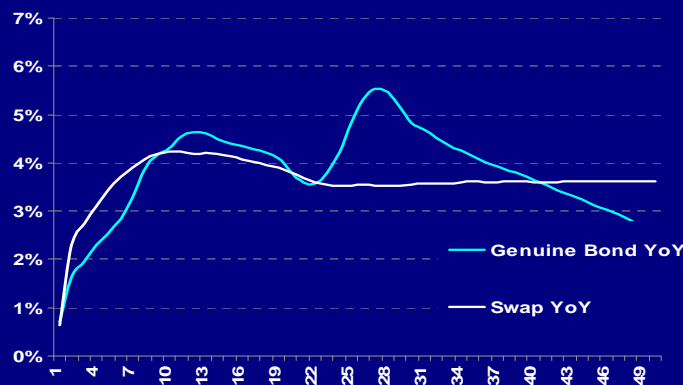
**Bond and swap markets have different and arbitrageable implied inflation rates**

- Neither can be said to be "correct"
- Bonds incur balance sheet and funding issues

**Swap Richness is the inflation swap rate minus the implied rate in the bond**

- To calculate this is difficult
- Proxies are often used

Inflation Arbitrage: UK



## What is a portfolio switch?

The recent turmoil has thrown up a significant opportunity to obtain substantial pickups over nominal bonds

- **Selling nominal government bonds**
- **Buying inflation linked government bonds (“Linkers”) and**
- **Swapping them to a fixed rate for attractive pickups**

This pickup can be realized as both

- **A running yield enhancement**
- **An upfront cash release (duration \* pick up)**
  - **should the client choose to invest less for the same given income**

## Where does the pick up come from?

We have a clear arbitrage by maturity between the price of inflation in the bond market versus the inflation swap market

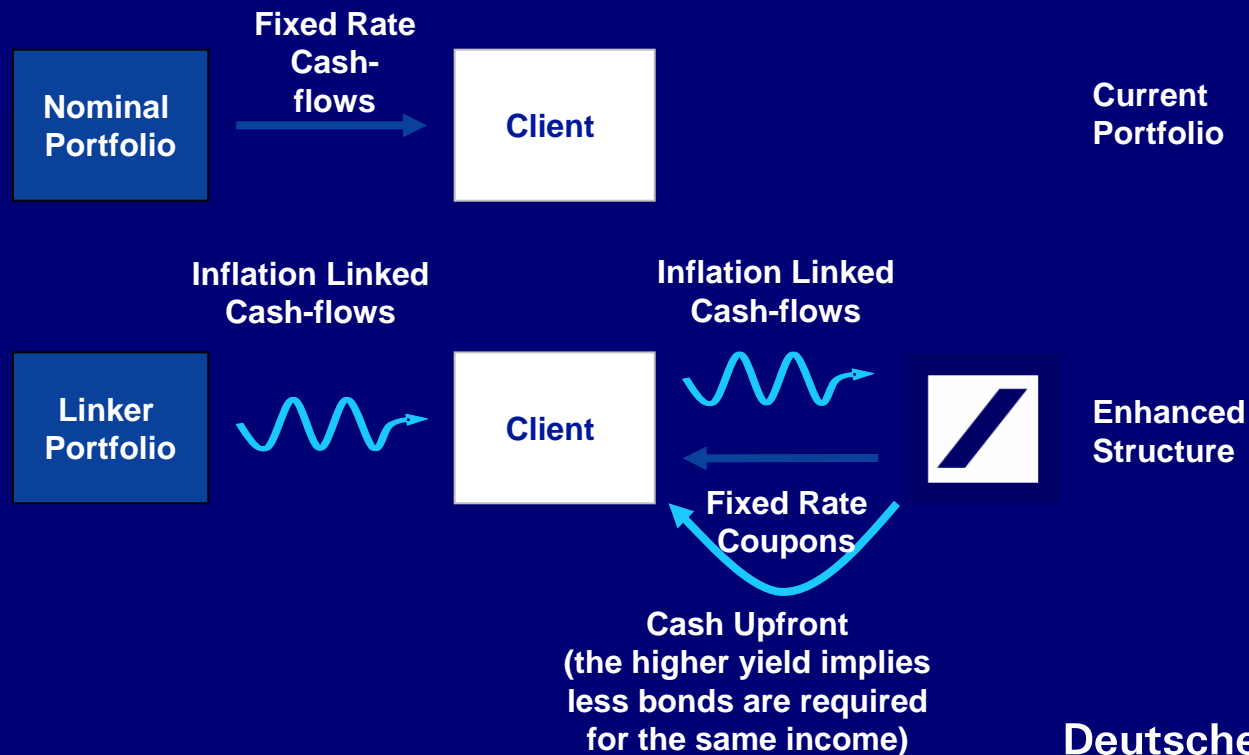
**This has been driven by**

- **inflation bonds not being included in the flight to quality**
- **Banks unwinding bonds held on balance sheet to provide inflation for swaps**
- **Hedge funds and street stopping out of bond v swap inflation basis position**
- **Retail and institutional selling of Linkers in the face of oil sell off**

In normal markets the basis described is between -10 and 20 basis points in the EUR and UK markets

# The Linker Switch: boxes and arrows

- Client sells Nominal bonds to DB and buys Linkers of equal value
- Client pays all of the cash-flows on bonds to DB via swap
- DB pays Fixed rate cash-flows to Client to the maturity of each underlying bond
- Client is immune to inflation as all inflation cash-flows are neutralised via the swap





# Example Portfolio Switch

Over 0.8% yield pick-up for switching from Gilts to Gilts...

Pick-up \* Present Value of 1bp to maturity

Bond	Notional	Proceeds	Yield	Asset Swap	DV01	Linker	Asset swap	Pick Up	Saving	Cash Saving
UKT 16	100,000,000	108,336,348	2.85%	-64.5	6.5	UK3 17	22	86	5.61%	6,072,601
UKT 20	100,000,000	110,849,163	3.63%	-19.9	9.0	UK3 22	36	56	5.01%	5,556,889
UKT 27	100,000,000	102,224,835	4.23%	8.4	13.1	UK3 27	40	32	4.17%	4,259,161
UKT 32	100,000,000	101,919,835	4.25%	17.0	15.0	UK3 32	50	33	4.98%	5,077,567

£423,330,181

£21m PV value created from switch

20,966,218

## What are the risks and rewards?

Assuming there is no default by the issuer then the client receives an enhanced fixed rate to maturity generating additional revenue

–Client is exposed to default of issuer as with nominal bonds

Throughout the life of the trade the client is exposed to the mark to market of the fixed rate asset swap

–No ex-ante reason why this should be more volatile than equivalent fixed rate bond

The relative value changes from time to time and so further revenue can be made by switching to between currencies e.g. UK and US Linkers/Nominals depending on degree of anomaly

–Pick up under 20 would imply advisable to switch back

–US trading over Italy in EUR would suggest time to buy the TIPS market

By engaging in this type of opportunity the client can gain not just the initial pick up but can generate multiples of this over time

# Alternative Strategies

## Positive exposure under CSA from derivative transactions

- Cancel/ Recoupon the swap to release MTM
- Buy Linker Asset Swaps
- Libor asset is replaced by Libor plus asset

## Negative Exposure Under CSA from derivative transactions

- Buy Linker asset swaps
- Replace cash collateral with Linkers
- Receive Libor/Euribor + > 100 instead of Sonia/Eonia

## Replace existing Linkers with foreign currency Linkers swapped to real yield

- Sell OATei 2040 @ 2.07% Real Yield
- Buy Foreign Currency denominated inflation/nominal bond
- Pay foreign currency cash-flows to match bond
- Receive identical cash-flows as per EUR Bond
- Receive cash upfront

# Conclusion

## Inflation hedging releases regulatory capital

## Inflation markets present opportunity

- Arbitraging govvy or swap curves
- Selling volatility at absurdr levels
- Switching from inflation bonds to swaps to improve performance

## This type of arbitrage activity can generate alpha for no minimal risk

- Govvies, Linkers or swaps under a csa will all deliver the required cashflows
- Cheapest market differs by tenor and by market

**Clients should act swiftly to monetize this market opportunity !**

## Appendix: Euro Bonds

Linker	Maturity	Clean Price	Dirty Price	Yield	Par ASM	Proceeds ASM	Proceeds Fixed	Pick-up	PV of Gain V Bonds	PV of Gain V Swaps	Nominal Maturity	Richness	Z	Z Diff
OAT 10s	25 Jul 10	102.005	110.884	-0.40%	1.4	1.3	1.31%	26	0.31%	0.02%	12 Jul 10	37	1	27
OAT 11s	25 Jul 11	102.460	113.954	0.47%	9.1	8.0	1.82%	26	0.55%	0.17%	12 Jul 11	29	8	27
OAT 12s	25 Jul 12	108.080	127.888	0.45%	14.1	11.1	2.23%	19	0.58%	0.34%	12 Jul 12	21	11	20
OAT 13s	25 Jul 13	106.450	121.068	0.92%	47.4	39.2	2.84%	35	1.43%	1.58%	25 Apr 13	40	40	35
OAT 15s	25 Jul 15	101.835	113.141	1.30%	44.0	38.9	3.34%	32	1.84%	2.25%	25 Apr 15	37	38	30
OAT 17s	25 Jul 17	96.105	102.662	1.52%	57.1	55.6	3.83%	34	2.52%	4.09%	25 Apr 17	27	51	29
OAT 20s	25 Jul 20	104.170	118.683	1.84%	56.4	47.5	4.07%	20	1.89%	4.51%	25 Apr 21	13	45	16
OAT 23s	25 Jul 23	102.410	106.939	1.91%	44.1	41.3	4.22%	14	1.62%	4.67%	25 Oct 23	3	37	9
OAT 29s	25 Jul 29	121.670	145.724	2.08%	61.5	42.2	4.39%	7	1.07%	6.04%	25 Apr 29	-5	39	1
OAT 32s	25 Jul 32	119.630	138.632	2.08%	48.4	34.9	4.30%	-4	-0.56%	5.42%	25 Oct 32	-16	31	-11
OAT 40s	25 Jul 40	95.480	101.867	2.00%	50.5	49.5	4.34%	5	0.88%	9.05%	25 Oct 38	-7	37	-9
OBLi 13	15 Apr 13	104.855	110.228	0.99%	27.0	24.5	2.61%	38	1.45%	0.93%	12 Apr 13	41	24	38
Bundi 16	15 Apr 16	102.005	108.902	1.21%	9.0	8.3	3.17%	18	1.12%	0.53%	04 Jan 16	-9	8	17
BTPi 10	15 Sep 10	101.085	111.031	0.18%	38.6	34.8	1.71%	48	0.63%	0.46%	01 Aug 10	51	35	49
BTPi 12	15 Sep 12	103.000	108.229	0.95%	52.8	48.8	2.66%	9	0.28%	1.59%	15 Oct 12	14	49	7
BTPi 14	15 Sep 14	103.215	116.000	1.54%	82.6	71.2	3.46%	22	1.13%	3.59%	01 Aug 14	24	70	19
BTPi 17	15 Sep 17	100.620	107.692	2.04%	96.8	89.9	4.19%	36	2.72%	6.72%	01 Aug 17	28	85	27
BTPi 19	15 Sep 19	100.457	102.458	2.32%	107.1	104.6	4.57%	29	2.60%	9.32%	01 Feb 20	3	97	18
BTPi 23	15 Sep 23	99.800	105.033	2.64%	115.5	109.9	4.92%	28	3.23%	12.55%	01 Aug 23	-4	99	13
BTPi 35	15 Sep 35	94.180	103.763	2.68%	123.3	118.8	5.10%	1	0.21%	19.84%	01 Aug 34	-21	92	-30
GGB 25	25 Jul 25	96.400	112.046	3.19%	187.6	167.5	5.57%	18	2.22%	20.80%	20 Mar 24	-22	147	-3
GGB 30	25 Jul 30	82.960	89.149	3.45%	184.0	206.3	6.03%	42	6.21%	30.41%	20 Sep 37	3	162	-0



## Appendix: UK Bonds

Linker	Maturity	Clean Price	Dirty Price	Yield	Par ASM	Proceeds ASM	Proceeds Fixed	Pick-up	PV of Gain V Bonds	PV of Gain V Swaps	Nominal Maturity	Richness
UK3 17	22 Nov 17	102.480	111.794	0.94%	25.7	22.9	3.92%	84	6.23%	1.70%	07 Sep 16	54
UK3 22	22 Nov 22	109.925	112.956	1.08%	41.4	36.7	4.45%	58	6.16%	3.88%	07 Mar 20	27
UK3 27	22 Nov 27	103.810	113.045	1.02%	46.2	40.9	4.58%	34	4.41%	5.35%	07 Dec 27	16
UK3 32	22 Nov 32	106.623	103.775	0.93%	52.7	50.8	4.61%	34	5.16%	7.70%	07 Jun 32	11
UK3 37	22 Nov 37	107.569	112.403	0.83%	58.8	52.3	4.56%	11	1.91%	8.83%	07 Mar 36	-20
UK3 47	22 Nov 47	101.606	103.350	0.70%	52.7	51.0	4.51%	7	1.40%	9.96%	07 Dec 46	-31
UK3 55	22 Nov 55	121.340	133.419	0.71%	53.0	39.8	4.43%	-2	-0.32%	8.35%	07 Dec 55	-19
UK8 11	23 Aug 11	292.360	294.074	0.40%	20.9	7.1	2.09%	59	1.29%	0.16%	07 Dec 11	62
UK8 13	16 Aug 13	248.210	249.759	0.98%	59.7	23.9	3.19%	58	2.32%	0.96%	07 Mar 13	72
UK8 16	26 Jul 16	281.690	283.792	0.99%	46.2	16.3	3.70%	78	4.98%	1.05%	07 Sep 16	80
UK8 20	16 Apr 20	287.790	288.399	1.07%	92.5	32.1	4.23%	54	4.84%	2.90%	07 Mar 20	41
UK8 24	17 Jul 24	253.410	255.304	1.14%	98.5	38.6	4.53%	36	4.09%	4.43%	07 Mar 25	25
UK8 30	22 Jul 30	245.510	247.678	1.01%	93.4	37.7	4.52%	18	2.56%	5.37%	07 Dec 30	10
UK8 35	26 Jan 35	150.830	151.621	0.88%	69.9	46.1	4.53%	5	0.81%	7.35%	07 Mar 36	-9

## Appendix: TIPS (US linkers)

Linker	Maturity	Clean Price	Dirty Price	Yield	Par ASM	Proceeds ASM	Proceeds Fixed	Pick-up	PV of Gain V Bonds	PV of Gain V Swaps	Nominal Maturity	Richness
TIPS Jan 10	15 Jan 10	102.461	131.286	0.60%	-59.8	-45.5	0.20%	-16	-0.11%	-0.30%	15 Jan 10	-11
TIPS Apr 10	15 Apr 10	99.895	112.153	1.09%	-40.2	-35.9	0.38%	-4	-0.04%	-0.33%	30 Apr 10	-1
TIPS Jan 11	15 Jan 11	104.219	128.739	0.97%	-30.3	-23.6	0.83%	13	0.21%	-0.39%	15 Jan 11	15
TIPS Apr 11	15 Apr 11	102.531	110.025	1.07%	-17.6	-16.0	1.02%	15	0.29%	-0.30%	30 Apr 11	25
TIPS Jan 12	15 Jan 12	106.477	128.837	0.93%	-33.9	-26.3	1.32%	16	0.44%	-0.70%	31 Jan 12	26
TIPS Apr 12	15 Apr 12	103.195	108.277	0.91%	-37.4	-34.5	1.36%	6	0.16%	-0.99%	30 Apr 12	23
TIPS Jul 12	15 Jul 12	106.230	126.790	1.02%	-12.5	-9.8	1.72%	31	0.96%	-0.31%	31 Jul 12	52
TIPS Apr 13	15 Apr 13	99.316	99.916	0.83%	-47.9	-47.9	1.65%	-6	-0.22%	-1.83%	31 Jul 13	16
TIPS Jul 13	15 Jul 13	102.613	119.484	1.25%	5.5	4.6	2.27%	47	1.90%	0.19%	31 Jul 13	66
TIPS Jan 14	15 Jan 14	102.672	118.884	1.42%	8.4	7.1	2.46%	43	1.95%	0.32%	15 Feb 14	64
TIPS Jul 14	15 Jul 14	102.715	116.585	1.47%	16.8	14.4	2.67%	49	2.45%	0.71%	15 Aug 14	68
TIPS Jan 15	15 Jan 15	100.395	112.362	1.57%	16.1	14.3	2.81%	45	2.41%	0.77%	15 Feb 15	65
TIPS Jul 15	15 Jul 15	101.805	111.939	1.58%	23.3	20.9	2.98%	51	2.97%	1.21%	15 Aug 15	66
TIPS Jan 16	15 Jan 16	102.324	110.304	1.64%	24.6	22.3	3.09%	46	2.89%	1.39%	15 Feb 16	58
TIPS Jul 16	15 Jul 16	105.855	112.305	1.64%	31.2	27.8	3.23%	44	2.92%	1.84%	15 Aug 16	54
TIPS Jan 17	15 Jan 17	105.238	111.769	1.66%	26.7	23.9	3.27%	38	2.65%	1.68%	15 Feb 17	39
TIPS Jul 17	15 Jul 17	107.617	111.281	1.64%	29.4	26.4	3.37%	35	2.57%	1.96%	15 Aug 17	32
TIPS Jan 18	15 Jan 18	99.891	101.901	1.65%	26.1	25.6	3.42%	33	2.58%	2.00%	15 Feb 18	18
TIPS Jul 18	15 Jul 18	98.047	97.095	1.62%	25.6	26.4	3.48%	29	2.41%	2.16%	15 Aug 18	8
TIPS Jan 19	15 Jan 19	104.590	104.255	1.62%	20.7	19.9	3.47%	24	2.04%	1.70%	15 Nov 18	-4
TIPS Jan 25	15 Jan 25	101.508	115.371	2.27%	68.2	59.1	4.25%	23	2.82%	7.29%	15 Feb 26	17
TIPS Jan 26	15 Jan 26	96.141	103.683	2.29%	64.0	61.7	4.30%	25	3.28%	7.95%	15 Feb 26	15
TIPS Jan 27	15 Jan 27	101.227	107.542	2.30%	67.0	62.3	4.32%	24	3.19%	8.34%	15 Feb 27	16
TIPS Jan 28	15 Jan 28	92.559	94.507	2.25%	55.8	59.0	4.29%	17	2.31%	8.20%	15 Nov 27	9
TIPS Apr 28	15 Apr 28	119.797	157.868	2.33%	100.3	63.5	4.34%	21	2.93%	8.90%	15 Aug 28	22
TIPS Jan 29	15 Jan 29	104.234	104.032	2.24%	59.5	57.2	4.28%	15	2.18%	8.22%	15 Feb 29	12
TIPS Apr 29	15 Apr 29	124.539	161.483	2.33%	103.7	64.2	4.46%	22	3.22%	9.30%	15 Feb 29	24
TIPS 32	15 Apr 32	123.781	148.593	2.07%	60.6	40.8	4.24%	-2	-0.30%	6.44%	15 Feb 31	3





New York: 1 212 250 0508 Frankfurt: 49 69 910 30201  
 London: 44 207 547 0220 Singapore: 65 6423 6628  
 Hong Kong: 852 2203 8386

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## GLOBAL INFLATION

### Inflation Linked Bonds

- 1) EUR
- 2) GBP
- 3) USD

### CPI Forecasts

- 4) EUR,FRF,GBP & USD CPI

### Inflation Linked Options

- 5) Euro HICP Caps/Floors
- 6) UK RPI Caps/Floors
- 7) French CPI Caps/Floors

### Inflation Linked Swaps

- 8) Euro HICP
- 9) French CPI
- 10) UK RPI
- 11) US CPI
- 12) Swedish CPI

### Domestic Inflation Swaps

- 13) German CPI
- 14) Italian CPI
- 15) Spanish CPI
- 16) Netherlands CPI

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