

Inflation  
Hedging it & Trading it

*Passion to Perform*





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# Introduction

## Why inflation, why now?



Interest Rate Derivatives  
House of the Year

There has never been a better time to talk about inflation:

- Inflation has been running above central bank targets again
- At the same time monetary policy seems to be constrained by high unemployment, elevated debt levels and fragile financial markets
- Higher uncertainty about the inflation outlook raises the incentive to hedge inflation risks
- Any investor with a bond portfolio is exposed.

Deutsche Bank is very strongly positioned to advise clients on what to do:

- We were recently voted Interest Rate Derivatives House of the Year by Risk Magazine
- We have a large global inflation derivatives trading and structuring team
- We have extensive experience of helping clients find inflation solutions.

The Deutsche Bank inflation team has developed this briefing document to:

- Set out the challenges and opportunities faced by clients
- Explain the products and strategies we have developed.

[The Deutsche Bank Global Inflation team can help.](#)

1

# Deutsche Bank's credentials and capabilities in the Inflation market

How Deutsche Bank's inflation offerings differ from competitors



## Deutsche Bank's credentials and capabilities in the Inflation Market

We offer a full range of inflation services

Our primary capabilities are demonstrated by our leading position in the league tables; we've also played an important role in maintaining order

in the secondary markets, distributing and recycling bonds and swaps across the world. DB is the global leader in inflation-linked bond syndication.

Issuing long dated inflation in large sizes can be difficult to manage; debt managers turn to the strongest banks who have the best track record for risk management and distribution – Deutsche Bank leads in this space

### Lead syndication mandates awarded to market counterparties

\*between September 2009 and November 2011  
Source: Bloomberg, Deutsche Bank

Date	Deal	No. Leads	DB	UBS	RBS	Barc	HSBC	GS	JPM	Nomura	BNPP	Credit Agricole	BOA	SG	Calyon	MPS	RBC	CS	ING	Citi	MS	Others	
24 Sep 09	UKTI50	4	1	1			1	1															
29 Sep 09	ACGBi25	3	1	1	1																		
21 Oct 09	BTPei41	4	1		1	1					1												
27 Jan 10	UKTI40	4	1	1		1				1													
21 Apr 10	BTPei21	5		1		1								1	1		1						
11 May 10	UKRAIL47	2	1		1																		
26 May 10	UKTI50	4		1			1	1	1														
27 Jul 10	UKTI40	4	1		1		1	1															
14 Sep 10	ACGBi30	3		1	1				1														
27 Jan 11	UKTI55	4	1		1	1					1						1						
09 Feb 11	OATei27	5			1	1	1				1	1											
24 May 11	UKTI34	4			1		1						1					1					
08 Jun 11	BTPei26	5		1					1			1							1			1	
26 Jul 11	UKTI34	4		1			1			1										1			
25 Oct 11	UKTI62	4	1				1	1			1												
22 Nov 11	UKTI29	4			1					1			1									1	
<b>Total number</b>			<b>7</b>	<b>8</b>	<b>9</b>	<b>5</b>	<b>7</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

We are outperforming the competition around the world

Deutsche Bank is:

- No 1 in ICAP market share for EUR Inflation/Asset Swaps (2009, 2010)
- No 3 in ICAP market share for UKRPI Inflation/Asset Swaps (2009, 2010)
- No 1 in BGC market share for all US products (Inflation, Asset Swaps, Options) 2010

Fig.1: Global Linker Syndications as Lead Manager

Source: Bloomberg, Deutsche Bank

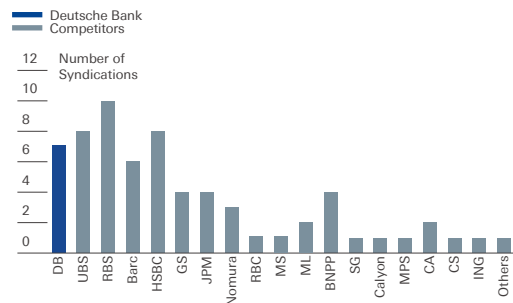


Fig. 2: Total Syndication Size for Global Linkers (mm)

Source: Bloomberg, Deutsche Bank

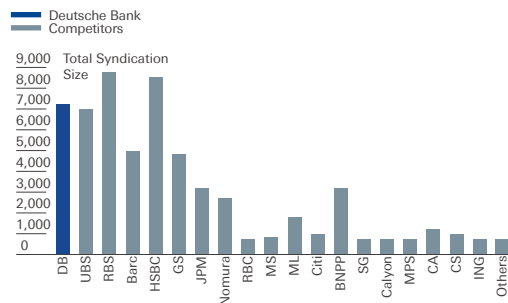
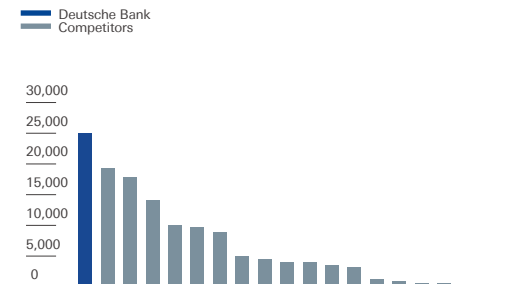


Fig. 3: USD Inflation Market by Volume 2011

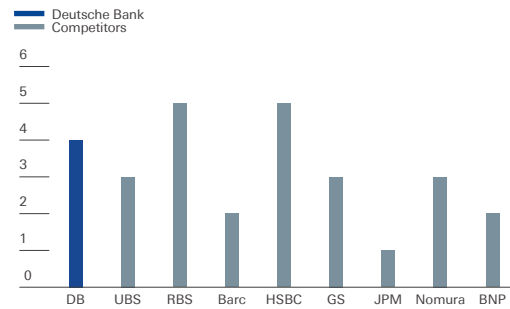
Source: Bloomberg, Deutsche Bank



We are outperforming the competition in the UK

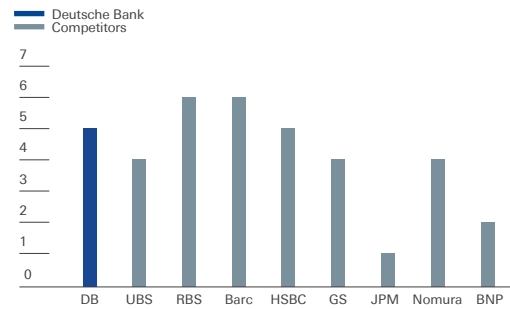
**Fig. 1:**  
UK Linkers Syndications as Lead Manager

Source: Bloomberg, Deutsche Bank



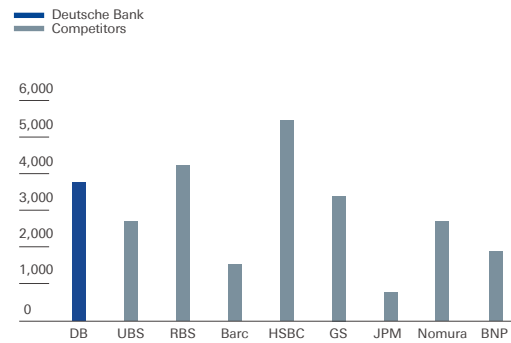
**Fig. 2:**  
UK Linkers and Nominals Syndications as Lead Manager

Source: Bloomberg, Deutsche Bank



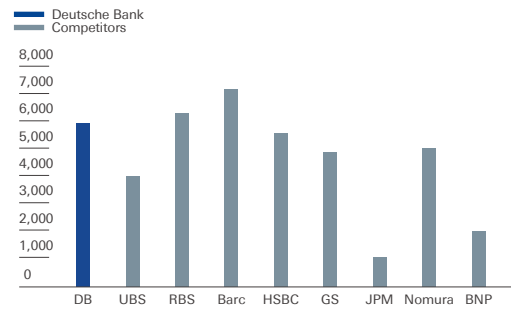
**Fig. 3:**  
UK Linkers Total Syndication Size (mm)

Source: Bloomberg, Deutsche Bank



**Fig. 4:**  
UK Linkers and Nominals Syndications as Lead Manager

Source: Bloomberg, Deutsche Bank



### Integrated trading, structuring and research

Unlike some of our competitors, Deutsche Bank's inflation trading, structuring and research professionals work closely together, combining strategic and technical expertise with the macro-economic insights so important to this offering.

### Bloomberg

Forecasts, inflation linked bonds, inflation swaps and inflation linked options (figure 1)

The market is pricing much more upside risk than downside risk – contrary to what we see in other markets

### Trade Finder

State of the art inflation analytics, from bond carry and butterfly scans, to forward matrices for the main inflation swap markets (figure 2)

Fig. 1:  
Our inflation page on Bloomberg DBII



Fig. 2:  
Inflation on Trade Finder



# 2

## Market Overview

Components of Inflation indices



### All G7 nations issue inflation-linked bonds

#### Markets

**US TIPS** – the US Sovereign linker market is the largest globally with a total market value of over USD700bn.

**UK – IL Gilts** – first issuance 1981; total market value exceeds GBP270bn

**EUR sovereign linkers** - total market value exceeding EUR320bn as of now; France, Italy, & Germany issue ILBs. Italian, German and Greek ILBs are linked to euro area inflation; France issues bonds linked to EUR inflation and bonds linked to FRF inflation

**Industrial country sovereign linker markets** – Other important markets include Australia, Canada and Sweden. AUD: govt suspended issuance in 2003, started again in 2009. Sweden: linkers account for almost 30% of total govt bond market, higher share than in any other industrial market

**EM sovereign linker markets** - most LatAm inflation markets have long histories; Brazil is the largest market, suppression of investment restrictions in 2006 spurred international demand. Chile, Colombia & Uruguay also issue ILB. Israel is big (USD27bn market value). More recently: South Africa, Poland, Turkey (2007) and South Korea (2007)

Fig. 1:  
A Fast Growing Asset Class

Source: Deutsche Bank

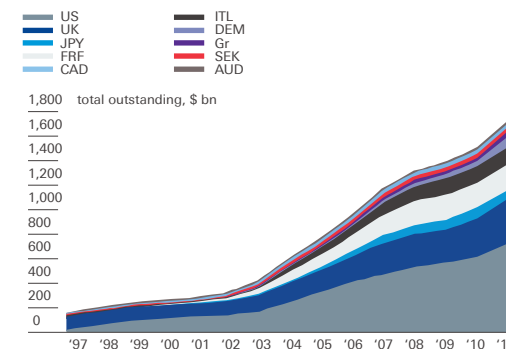


Fig. 1:  
UK: CPI

Source: Deutsche Bank

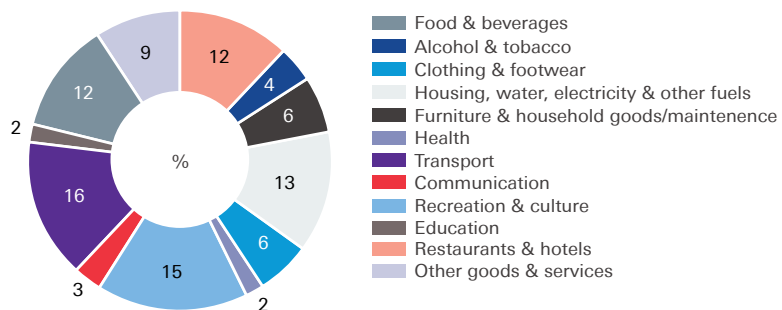


Fig. 2:  
UK: RPI

Source: Deutsche Bank

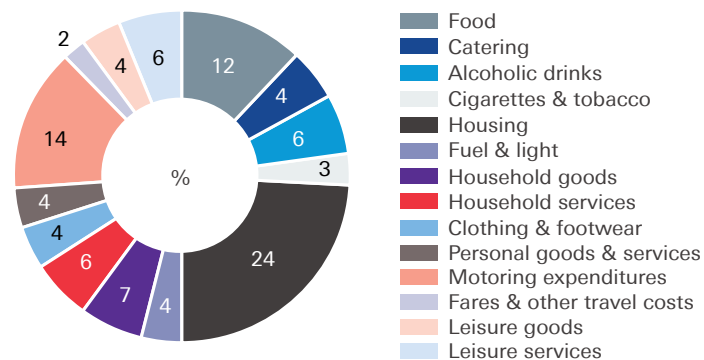
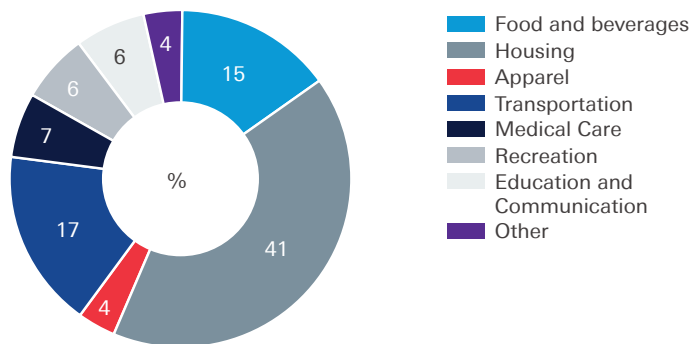


Fig. 3:  
US: RPI

Source: Deutsche Bank



# 3

## Inflation Linked Bonds

Inflation Linked Bonds

Real Yield and Breakeven Inflation and Inflation Protection

Indexation and Breakeven Inflation

Risk Measures, EM Sovereign Linkers, Seasonality and US TIPS

UK Index Linked Gilts, EUR Sovereign and other Important Markets

ILB coupon frequency and settlement characteristics

### Inflation Bonds 'Linkers'

Inflation Linked Bonds (also known as inflation indexed bonds) or 'Linkers'.

These are Treasury bonds designed to cancel the capital eroding effects of inflation. Called TIPS (Treasury Inflation Protection Securities) in the US, their interest rate remains fixed but the principal is adjusted to match changes in a price index.

For example:

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

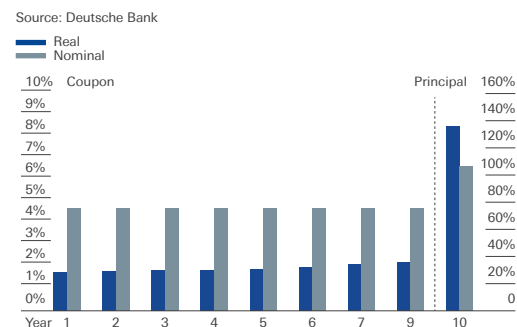
- Interest Paid = Fixed Rate \* Constant
- Notional (e.g. 5% \* 100 = 5)
- Redemption = Constant Notional (e.g. 100)

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

- Index Ratio =  $\frac{\text{CPI Index on Payment Date}}{\text{CPI Index on Issue Date}}$
- 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)

Some ILBs (like US TIPS or OATe/i) have a deflation floor, meaning a principal repayment of minimum par is guaranteed by the issuer

Fig. 1:  
Vanilla Fixed Rate Bond versus Inflation Linked Bond



### Real Yield and Breakeven Inflation

Components of nominal interest rate:

- Real yield
- Expected Inflation
- Risk Premium
- Liquidity Premium

Issuing nominals means investors need compensation for inflation uncertainty.

Linkers save issuers the risk premium by providing certainty about real cash flows in the future i.e. their increase in purchasing power is 'locked in'. (figure 1)

### Inflation Protection

With positive inflation, the ILB's cash flows will increase over time to secure the investor's purchasing power.

Compared to a nominal bond early coupon payments will tend to be lower, and the final repayment will tend to be higher.

The examples below assume an annual coupon and inflation at 2%. (figures 2 and 3)

Fig. 1:  
Components of Nominal Yield

Source: Deutsche Bank

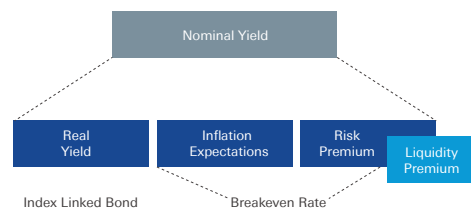


Fig. 2:  
Nominal cash flows

Source: Deutsche Bank

■ Coupon Linker (2%)     ■ Notional Conventional (rhs)  
■ Coupon Conventional Bond (4%)     ■ Notional Linker (rhs)

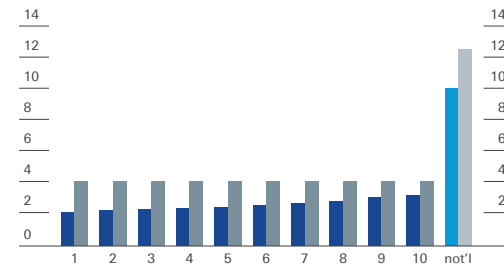
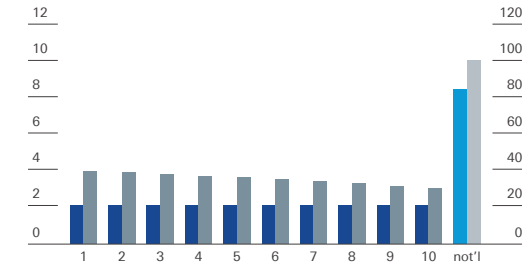


Fig. 3:  
Real cash flows (purchasing power of the CFs)

Source: Deutsche Bank

■ Coupon Linker (2%)     ■ Notional Conventional (rhs)  
■ Coupon Conventional Bond (4%)     ■ Notional Linker (rhs)



### Indexation

To offer inflation protection you need to: (i) choose a price index, (ii) define precise linking rules.

Price index: typically a non-seasonally adjusted, official consumer price index

Indexation: the 'Canadian' model is now the benchmark, adopted among others by TIPS, EUR ILBs and new UKTi (figure 1)

- Problem: CPI only monthly and published with a delay
- The price factor used to inflation adjust cash flows, the 'Daily Inflation Reference' (DIR), is a linear interpolation of the two monthly values of the official price index three months earlier and two months earlier, e.g.:

- The DIR for 1 June is the official CPI March (released mid-April)
- The DIR for 1 July is the official CPI April (released mid-May)
- The DIR for 23 June is :  $CPI(Mar) + \frac{22}{30} * [CPI(Apr) - CPI(Mar)]$

### Breakeven Inflation

Canadian style linkers are quoted in real terms and the real price (P) - real yield (r) relationship is equivalent to that of a conventional bond (c: coupon):

ILBs' value is often expressed in terms of inflation rather than in terms of real yields by considering the difference in yield between nominal and real bonds.

BEI (Breakeven Inflation) is the inflation rate that equates the expected return of an ILB and a comparable nominal bond; i.e. if actual inflation until maturity exceeds BEI, linkers outperform nominals.

In practice, the market looks at simple yield spreads (figure 2).

Fig. 1:  
Indexation

Source: Deutsche Bank

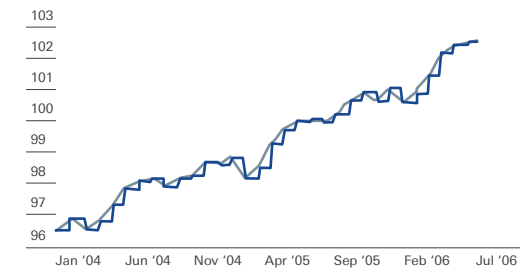
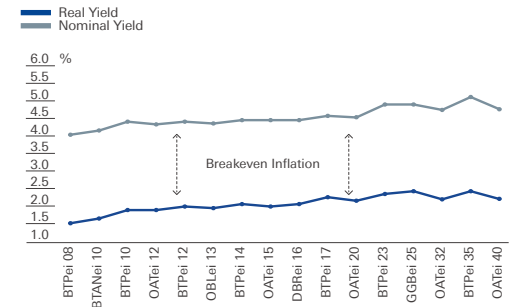


Fig. 2:  
 $BEI \approx \text{nominal yield} - \text{real yield}$

Source: Deutsche Bank



### Risk Measures

- The concepts of duration and convexity can be applied to linkers in the same way as for conventional bonds
- But in the case of linkers, duration describes the sensitivity of the price to a change in the real rate
- Linkers have a higher duration than same maturity conventionals
- Convexity rises exponentially with duration, for the same maturity ILBs have a higher convexity than nominals

### EM Sovereign Linker Markets

- Most Latin American inflation markets have long histories; Brazil is by far the largest market, suppression of investment restrictions in 2006 spurred international demand
- Chile, Colombia & Uruguay also issue ILB
- Israel has a large linker market (USD27bn market value)
- More recently South Africa, Poland, Turkey (2007) and South Korea (2007)

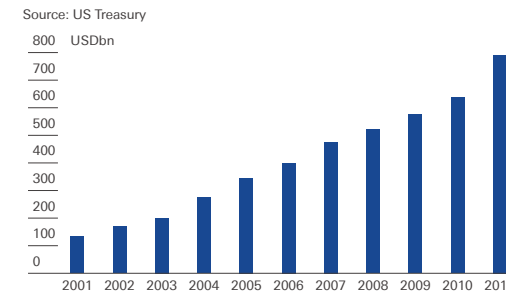
### Seasonality

- Seasonal movements in price indices mean that inflation accrual is not linear
- Quoted real yields of ILB adjust to the changing inflation uplift
  - real yields & BEI exhibit seasonal patterns
  - detecting the seasonal pattern in prices is important for valuing ILBs
- Estimation of seasonal factors is not without difficulties, especially in the euro area where there is instability
- There is no consensus on their precise value

### US TIPS

- The US sovereign linker market is the largest globally with total market value in excess of USD700bn (figure 1)
- TIPS were first issued in 1997; in recent years, there have been two 5y, two 20y and four 10y auctions per year; in February 2010 30y TIPS were reintroduced, replacing the 20y
- Maturities range from 1y to 30y

Fig. 1:  
US TIPS total outstanding market value



### UK Index Linked Gilts

- The UK linker market is the oldest in Europe (first issuance 1981)
- Total market value exceeds GBP270bn and more than 20% of sovereign debt is linked to inflation
- Traditionally bonds have an 8M indexation lag, but since Sep 2005 all new issues follow the 3M lag model; UKTi have no deflation floor
- Issuance has been weighted towards the long end
- Maturities range from 1Y to 50Y, with issues available on all main curve points (figure 1)

### EUR Sovereign Linkers

- Euro area sovereign inflation-linked bond (ILB) markets are expanding rapidly with the total market value exceeding EUR320bn today
- France, Italy, Germany & Greece issue ILBs
- Italian, German and Greek ILBs are linked to euro area inflation; France issues both bonds linked to EUR inflation and bonds linked to FRF inflation
- Maturities range from 1Y to 32Y, with issues available on all main points on the curve (figures 2 and 3)

### Other important markets include Australia, Canada and Sweden

- AUD: govt suspended issuance in 2003, but started again in 2009. Strong liability related demand from PF and insurance companies
- Sweden: linkers account for almost 30% of the total government bond market, a higher share than in any other industrial market

Fig. 1:  
UK Total Outstanding Market Value

Source: UK DMO

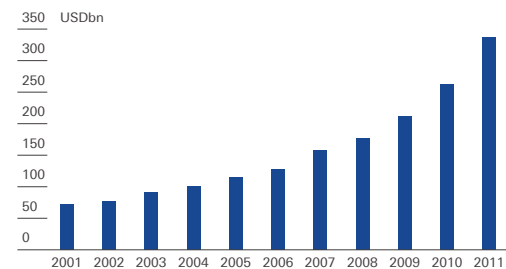


Fig. 2:  
EUR Sovereign Linker Issuance

Source: National Treasury

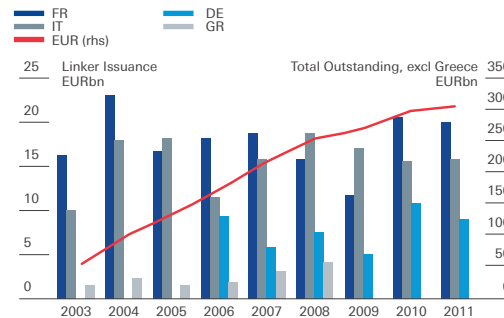
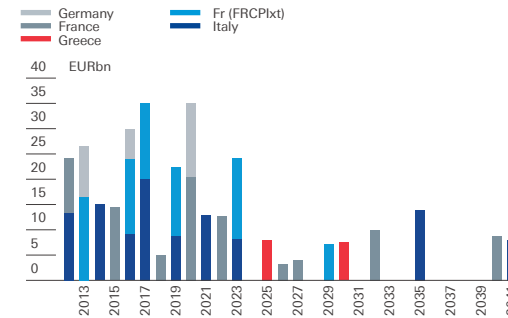


Fig. 3:  
Sovereign Linkers, Outstanding Volume

Source: National Treasury



## ILB coupon frequency and settlement characteristics

Most ILBs have coupon frequency and settlement characteristics in line with the nominal market

	Price index	BBG	Index lag	Deflation floor	Coupon
US	CPI-U	CPURNSA	3M	YES	semi-ann
UK	RPI	UKRPI	8M/3M	NO	semi-ann
FR	CPI x tob, FR	FRCPXTOB	3M	YES	annual
	HICP x tob, EMU	CPTFEMU	3M	YES	annual
IT	HICP x tob, EMU	CPTFEMU	3M	YES	semi-ann
JP	CPI x fresh food	JCPNJGBI	3M	NO	semi-ann
SE	CPI	SWCPI	3M	YES (new ILB)	annual
CA	CPI	CACPI	3M	NO	semi-ann
GR	HICP x tob, EMU	CPTFEMU	3M	YES	annual
DE	HICP x tob, EMU	CPTFEMU	3M	YES	annual
AU	CPI quarterly	ACIF	6M	YES	quarterly

# 4

## Inflation Swaps

ILS Swaps and Markets  
UK Swaps, Corporate Linkers and US Swaps  
ILS Indexation  
ILS Pension Fund Demand



Inflation Linked Swaps (ILS) – a pure inflation product as opposed to a real rate product

**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
- $(1 + X\%)^t$

**What is the break-even rate?**

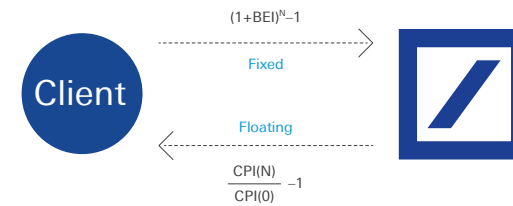
- Receive Compounded Inflation from Start to Maturity: pay one cash-flow
- $CPI_t / CPI_0 - 1$
- Pay a known Fixed cash-flow at Maturity
- $(1 + X\%)^t$

**ILS Markets**

The most liquid ILS are typically those linked to the same price index as the inflation-linked government bonds of the corresponding market (US CPI-U, EUR HICP ex-tobacco, French CPI ex tobacco, UK RPI).

For the major markets, ZC ILS are usually quoted for tenors out to 30 years, sometimes 50 years.

Fig. 1:  
Inflation Swaps



### UK Swaps and Corporate Linkers

Non-sovereign inflation supply in bonds & swaps has grown rapidly in the UK in particular 2006 and H107

Market	Price Index	Lag	CPI Fixing
US	CPI-U	3M	Interpolated
Euro area	HICP ex tobacco	3M	Straight
France	CPI ex tobacco	3M	Interpolated
UK	RPI	2M	Straight

### US Swaps

The inflation swap market has developed rapidly from 2004, but remains less liquid than its European counterparts

A lack of 'natural' inflation swap supply translates into structural richness in swap BEI vs bond BEI... and wide linker ASW discounts

Fig. 1:  
Bond Breakevens vs Swap Breakevens

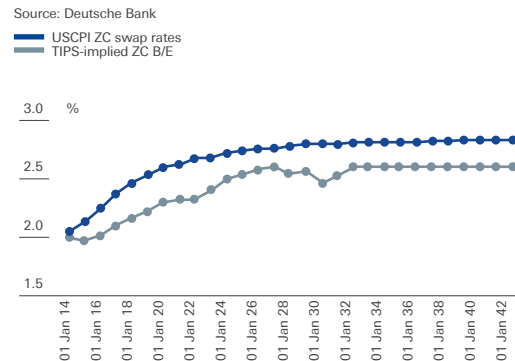
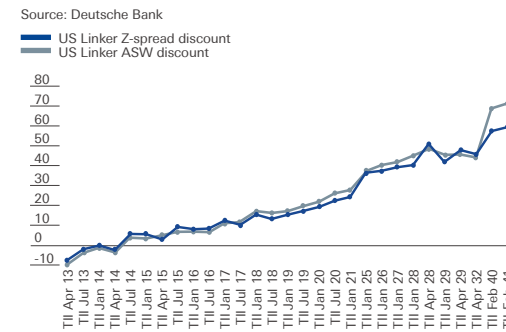


Fig. 2:  
Measures of Relative Value: ASW Spread and Z-spread



## ILS Indexation

### ILS Indexation

For FRCPIxt & US CPI, the indexation lag convention is the same as for the corresponding inflation-linked bond markets

- Strong demand has led to a low level of real interest rates, lock in low financing costs
- PFI projects with inflation component (usually bonds, but typically transformed into ASW)
- Credit wrapping allowed corporates to issue highly rated debt which is more appealing to institutional investors

But has fallen significantly during the credit crisis

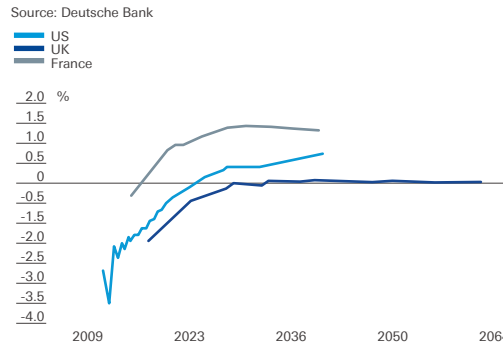
Main sources: regulated utilities, PFIs, property leases, railway companies, retailers, supranationals

Alternative supply has led to two-way swap market and narrow swap-bond B/E spread, but swap richness has increased again during the crisis

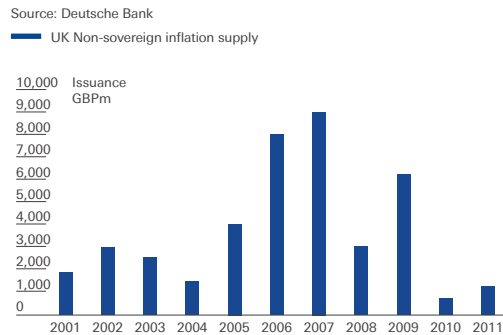
**ILS Pension Fund demand**

- In the UK, pension indexation to RPI (LPI) is more explicit than elsewhere and the pension industry is larger than in other European countries
- Accounting rules ('Financial Reporting Standard 17') have encouraged pension funds to match their indexed liabilities more closely
- As a result, demand growth from pension funds and life insurers has outstripped supply leading to low real yields and expensive BEI at the long-end of the curve But has fallen significantly during the credit crisis
- Long-term investors own the majority of ILB as a hedge for their real liabilities

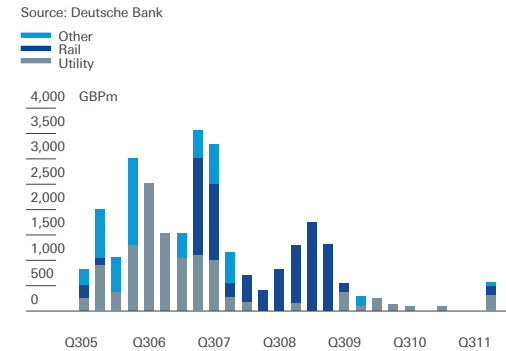
**Fig. 1:  
Real Yields**



**Fig. 2:  
UK Non-sovereign Inflation Supply**



**Fig. 3:  
UK Non-sovereign Inflation Supply**



# 5

## Assessing Relative Value

Linker Asset Swap and the Leverage Effect  
5 Sources of Asset Swap Difference  
What is the 'Fair' Price for Inflation Protection?  
Fair Credit Spread of Inflation Linked Bonds  
Hedge with Bonds or Swaps  
Summary



### Linker Asset Swap

- Investor buys an Inflation Bond
- Investor agrees to pay away all the cash-flows (P+I) from the bond
- Investor receives in return Libor + x% until maturity as well as a principal payment

“The increasing credit exposure, and thereby return, on a linker asset swap generates significant outperformance...”

– Daragh McDevitt,  
Global Head of Inflation Structuring

### The Leverage Effect

Sophisticated investors may not be able to borrow to buy additional nominal bonds due to constraints, hence are willing to give up some of their excess return

Some investors just like the pick-up over equivalent tenor nominal bonds on asset swap (figure 2)

#### For example

This is how we expect a Linker to increase in the Eurozone over time

#### Why is this important?

Sovereign default is currently very real possibility... like for like exposures need to be carefully assessed for fair value – some investors have increased credit risk for very little reward

Fig. 1:  
Linker Asset Swap

Source: Deutsche Bank

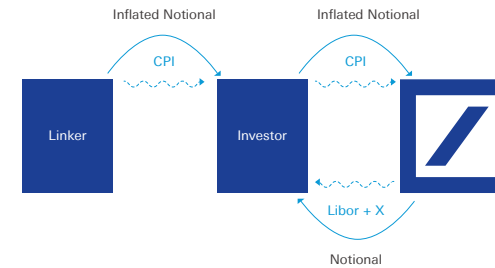
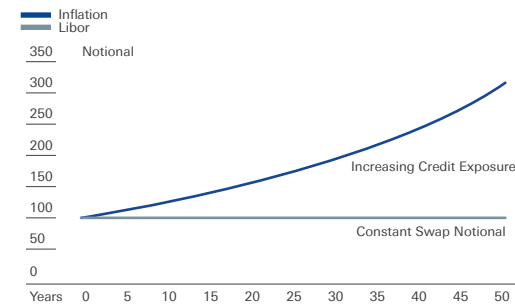


Fig. 2:  
The Leverage Effect

Source: Deutsche Bank



# 5 Sources of Asset Swap Difference

## 5 Sources of Asset Swap Difference

### PV01 difference

- Linkers have a higher duration

### Swap richness

- The spread between inflation-linked swaps and implied bond break-evens gives rise to different asset swap levels for linkers and nominals
- It also usually tells the story of swap supply and demand...

### Seasonality

- See the section on page 3.4

### Credit / Liquidity

- Mis-priced credit cost leading to 'value' for issuers

### Tax

- Favourable deferrals for issuers encourage supply

The difference between a nominal asset swap and a Linker Asset Swap of the same maturity is a function of the larger credit exposure, the term structure of credit and the swap richness

### For example

20 bps richness results in an additional 28 bps on asset swap – a 40% increase

Fig. 1:  
Measures of Relative Value

Source: Deutsche Bank

	Adjusts for Dirty Price	Accounts for Cashflow Pattern	Accounts for Term Structure of Credit	Fair Value Discounting
Par par ASW				
Net Proceeds ASW	√			
Z spread	√	√		
'Richness'	√	√	√	√

"Of these comparative measures... richness is the true measure"

– Stephane Salas,  
Global Head of Inflation Trading

## What is the 'Fair' Price for Inflation Protection?

What is the 'Fair' Price for Inflation Protection?

Inflation 'Breakeven' is not equal to market inflation expectations but is a factor of

- Inflation expectations
- 'Risk Premium'
- 'Liquidity Premium'

Inflation expectations over the very long run are hard to judge but tend to be based on current economic policy

- ECB target rate is 'under, but close to 2%'

Risk Premium includes

- Potential change in monetary policy target (e.g. 4% plus or minus 1% instead of under 2%)
- Abandonment of monetary policy in favour of employment or currency board
- EUR breakup, expansion or succession
- Asymmetric elasticity of inflation: wages are easier to raise than to cut

Liquidity premium includes

- Relative demand and supply for inflation bonds v nominal bonds
- Balance sheet costs of holding inflation bonds to recycle inflation
- Opportunity cost of capital for cash used to hedge inflation

"The biggest mistake people make with inflation-linked bonds is thinking that the breakeven inflation is the market's expected inflation rate. It is not and should not be. The breakeven includes what the market expects inflation to be and the major portion of the risk premium that you should find in the nominal market, and the liquidity premium"

– Markus Heider,  
Global Head of Inflation Research

### Fair Credit Spread of Inflation Linked Bonds

Issuing Linkers equates to borrowing more over time in nominal terms i.e. it can be thought of as a set of forward starting bonds

Forward starting bonds = greater credit risk

#### Two components to fair price:

- The issuer's current credit spread for the maturity of the bond
- Forward credit spreads for each of the forward starting borrowings i.e. forward credit spreads

A simple point, but investors may not recognise and price this correctly

Fig. 1:  
Linker as a Series of Forward Starting Bonds

Source: Deutsche Bank

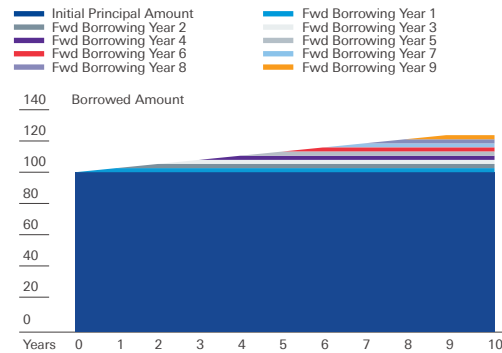


Fig. 2:  
Creating a synthetic 30-year old Nominal Bond

Source: Deutsche Bank



The Question is...

**Hedge with Bonds or Swaps**

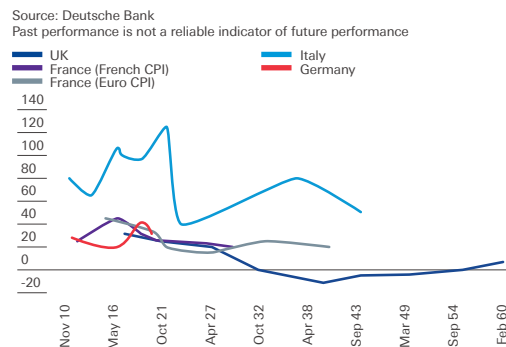
Traditionally, many investors have primarily considered inflation-linked bonds to hedge exposure

However, a more modern approach is:

- Bonds can be cheaper or more expensive than swaps
- Buy the cheapest asset
- Hedge the inflation with swaps
- Opportunistically switch between assets

This also gives a lot more flexibility to hedge the desired cash flows, since at the long-end there are only relatively few bonds outstanding (and liquidity can be better as well)

**Fig. 1:**  
Swap Inflation Price – Bond Inflation Price



**The Bond Universe**

**Value within the UK – for example**

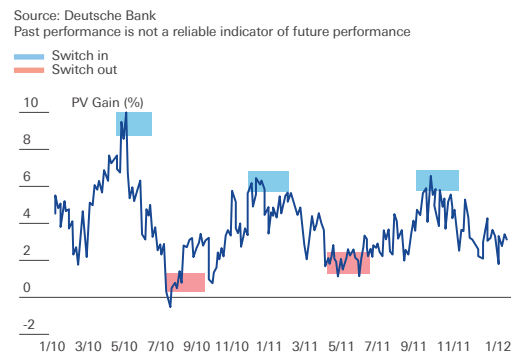
Figures 3 and 4 on the right depict the value that can be created by switching between similar maturity nominal and inflation linked bonds.

Figure 2 below depicts the value in switching between short and long maturity linkers.

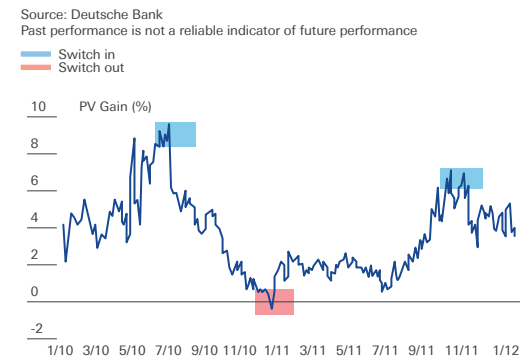
In terms of trading capability, how does this work?

We should always be free to switch between UK Bonds and UK Linkers

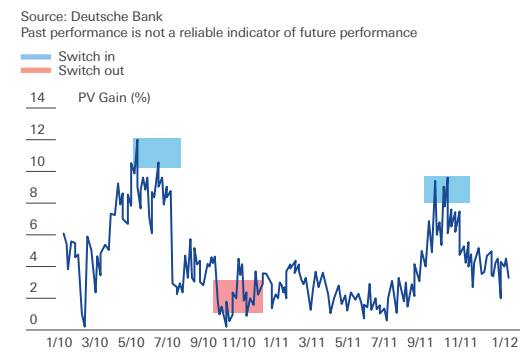
**Fig. 2 :**  
PV Gain of UKTi40 over the UKTi27



**Fig. 3:**  
PV Gain of UKTi27 over the UKT27



**Fig. 4:**  
PV Gain of UKTi40 over the UKT40



## Summary

### To sum up...

- Given the displacement between inflation and nominal markets, there are opportunities for arbitrage
- Asset swap spreads on linkers represent a premium for credit that is hard to price, and when coupled with demand/supply imbalances and higher duration, they offer a pickup to nominals for the same underlying issuer
- Switching between equivalent risk sovereigns/supra sovereigns can often, driven by dynamics of the cross currency swaps market, provide additional yield pick-ups
- These displacements can be assessed by a variety of metrics
- The value of switching is evident from the incremental excess pickup that is generated by selling the costlier asset to buy the cheapest asset from time to time
  - Used as a systematic strategy this can yield substantial returns over medium term horizons
- These represent incredible opportunities for 'asset-heavy' investors, and the markets will likely normalize with time, hence it is important to act quickly

“There isn’t one risk free curve, there are 100, 150, 200... the key is when do you pick ‘the fruit’, when is the bond cheap enough?”

– Daragh McDevitt,  
Global Head of Inflation Structuring

“...there are incredible opportunities for asset-heavy investors...it is important to act quickly”

– Haroon Sana,  
Global Head of Rates Sales

# 6

## Inflation Options

Inflation Options

Who are the major players in the options market?

Option Products

What are the trading opportunities?

Option Strategies

Creating Optimal Hedges



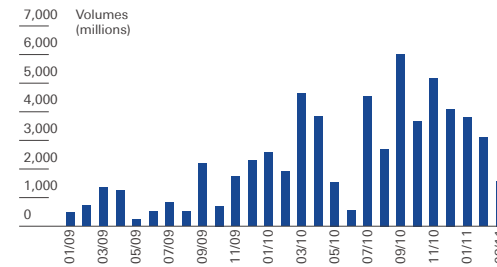
A relatively new market, inflation options traded between Europe and the US have doubled every year since trading started in inflation swaps in 2002/2003. 2010 saw a particular growth spurt.

Long term growth looks set to continue at this explosive rate, which is clearly indicative of its importance to clients and represents a substantial opportunity to DB as intermediary between buyers and sellers of inflation.

Interbank volumes reached 50bn in 2010, up from 13bn in 2009, and just 1bn in 2005.

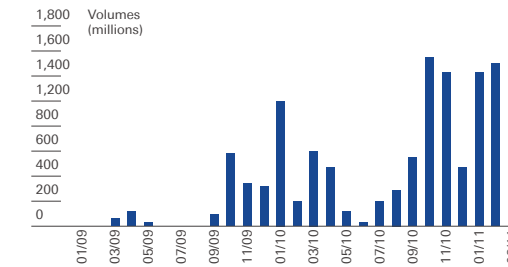
**Fig. 1:**  
London Options Volumes

Source: Tullett Prebon



**Fig. 2:**  
NY Options Volumes

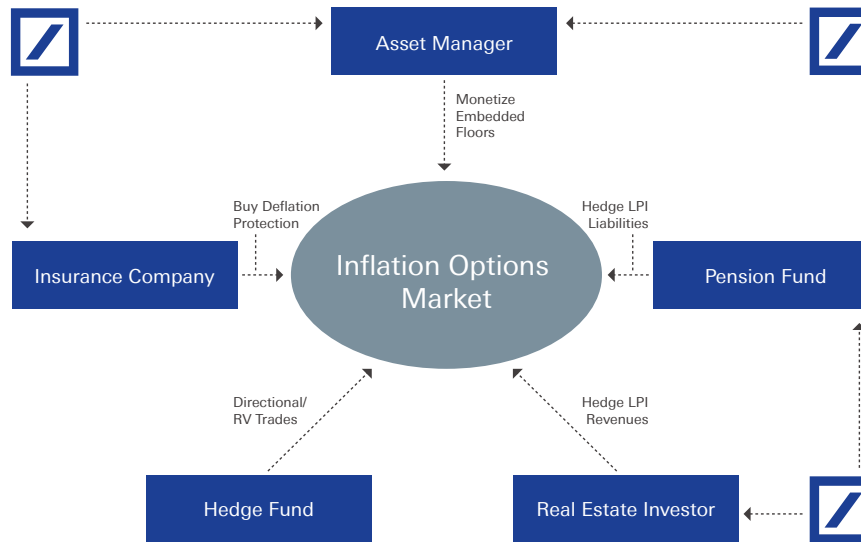
Source: Tullett Prebon



The market is becoming more and more complex as sophisticated new players such as hedge funds, liability driven investors, and non-life insurance practitioners are added to the mix.

**Any client:**

- holding a bond portfolio
  - subject to tail inflation – high or low
  - who has revenues or liabilities that are indexed to inflation
- is exposed to inflation risk



**Year on Year cap/floor**

- YoY floorlet :  $\text{Max} [ K - \text{YoY}_t, 0 ]$
- With  $\text{YoY}_t = I_t/I_{t-1} - 1$
- A 5 year 0% YoY floor costs 140c or 30bps p.a.
- Demand from retail notes >> Supply from premium sellers

**Zero Coupon cap/floor**

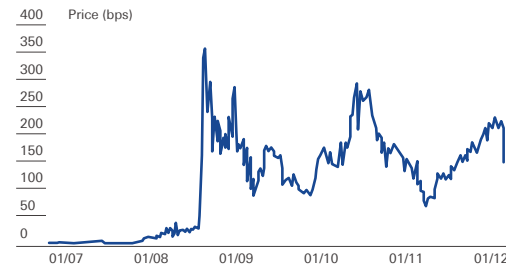
- ZC floor:  $\text{Max} [ (1+K)^t - I_t/I_0, 0 ]$
- A 10 year 0% ZC floor costs 36c
- Supply from linkers and asset swaps >> Demand from deflation hedgers

**Limited Price Index (LPI)**

- $\text{LPI}_t = \text{LPI}_{t-1} * \{ 1 + \text{max} [ \text{min} [ \text{YoY}_t, 5\% ], 0\% ] \}$
- Inflation observed annually, collared, compounded... and paid at maturity
- Demand from LDI funds >> Supply from real estate investors

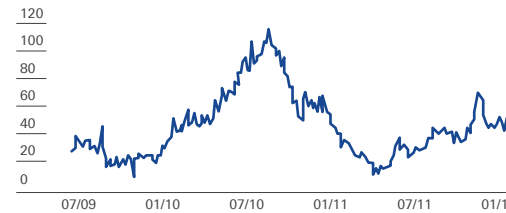
**Fig. 1:**  
**5y 0% YoY floor HICPxT**

Source: Deutsche Bank  
Past performance is not a reliable indicator of future performance



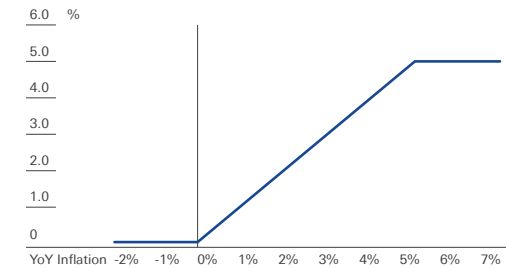
**Fig. 2:**  
**10y 0% ZC floor HICPxT**

Source: Deutsche Bank  
Past performance is not a reliable indicator of future performance



**Fig. 3:**  
**Limited Price Index (LPI)**

Source: Deutsche Bank



**Fig. 4:**  
**DB Inflation pages: DBII**

EUR HICPxT		Premium in bp upfront, EUR 20m notional					
CPI/FEM		Price for trade with inflation swap delta					
EUR Cap	Strike	2.0%		2.5%		3.0%	
Term		Bid	Ask	Tm	Bid	Ask	Tm
2 Year	€ 77	187	194	18	48	58	7/04
5 Year	€ 131	135	140	18	231	256	7/04
7 Year	€ 158	105	110	18	397	439	7/04
10 Year	€ 182	95	100	18	459	511	7/04
15 Year	€ 185	107	110	18	1000	1104	7/04
20 Year	€ 1782	102	105	18	1400	1548	7/04
30 Year	€ 2410	105	110	18	1662	1769	7/04
EUR Caps	Strike	3.5%		4.0%		5.0%	
Term		Bid	Ask	Tm	Bid	Ask	Tm
2 Year	€ 24	28	30	18	19	22	7/04
5 Year	€ 134	149	154	18	110	123	7/04
7 Year	€ 243	239	249	18	202	224	7/04
10 Year	€ 424	481	494	18	362	401	7/04
15 Year	€ 702	777	794	18	587	650	7/04
20 Year	€ 927	1025	1041	18	724	806	7/04
30 Year	€ 1315	1456	1484	18	1008	1214	7/04

**LPI Collars represents a great inflation-hedging alternative**

Inflation risk for Pension funds and other liability-driven investors is big, 20 – 30% of scheme risk.

Breakevens are deemed expensive: if, for example, breakeven is 3.7% and the scheme expected inflation of 2.8%, hedging loses value (figure 1).

**What’s the solution?**

Cover inflation risk by creating an inflation collar

- Pay LPI
- Receive RPI

“The catalyst that makes this trade work is inflation at above 5% – this 5% strike is currently lower than spot inflation – a change from the last five years”

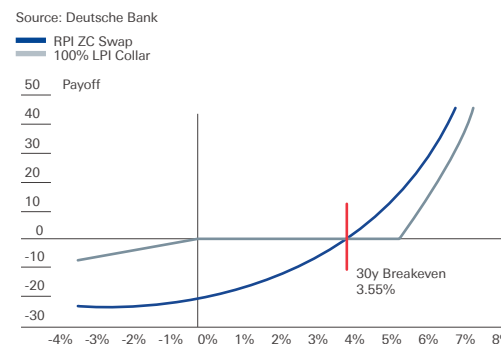
- Nicolas Tabardel, Global Head of Inflation Volatility and Exotics

Expert historical perspective Markus Heider, responsible for European inflation research at DB Global Markets Research, provides a useful long term perspective: this graph shows how the volatility we have seen in the last three years is nothing compared to the last 200 years. In the long run, inflation is a very volatile entity, which means risk and therefore, opportunity.

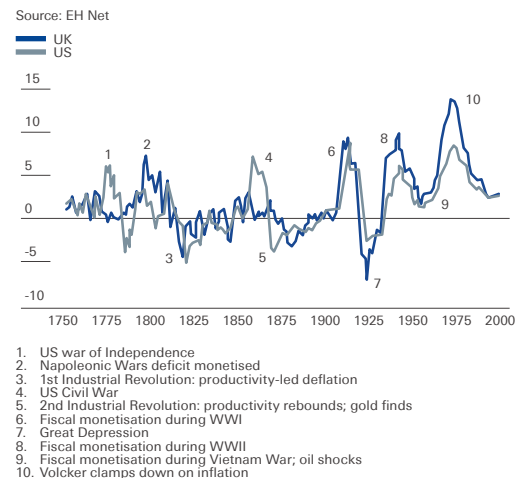
The relative stability we’ve seen in the last 20 years can very quickly change

Significant risk factors currently include governments with unsustainable deficits and globalisation; the need to hedge inflation risk is becoming increasingly relevant

**Fig. 1: Assumed Constant Year on Year Inflation Return**



**Fig. 2: Consumer price inflation, y/y%, 11-yr MA**



### Market vs Economist Expectations

UK RPI future inflation: the market in the long term is pricing much more downside risk than upside risk. In the UK, the risks of inflation overshooting are much higher than them undershooting. This is contrary to what we see in other markets.

In Europe and the US, there is more balance; caps are becoming more much more expensive than floors.

Consensus economist predictions indicate that market implied volatility is too high; tails are too fat and the skew is too deep. Caps have no natural supply in Europe or the US so the tail risk is always expensive (figure 1).

In Europe, volatility is too high, tails are too fat, and the skew is too steep.

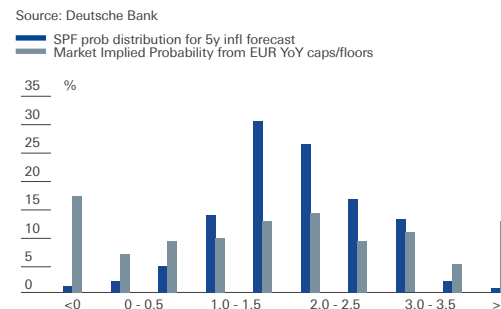
What does this mean?  
Selling volatility now is a good idea

The skew was pricing floors higher than caps; the skew is now symmetric (figure 2).

“Tail risk continues to remain overpriced with both tails almost equally flat, reflecting the high uncertainty over the inflation/deflation debate”

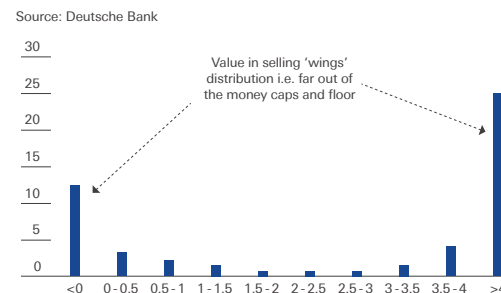
– Nicolas Tabardel,  
Global Head of Inflation Volatility & Exotics

Fig. 1:  
Skew prices floors higher than caps



1. Deflation risk is overpriced
2. Consensus economist predictions imply market implied volatility is too high
3. 'Fat Tails'

Fig. 2:  
Ratio of market implied probability vs. Economist Expectations



**Collars (figure 1)**

- Sell Floor
- Buy Cap

**Strangles (figure 2)**

- Sell OTM Floor
- Sell OTM Cap

**Straddles**

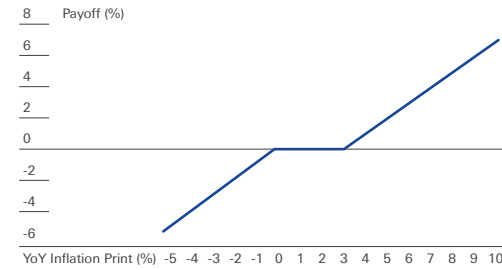
- Sell Floor and Cap at same strike

**Range Accruals**

- Pays  $N/12 * \text{Fixed Rate}$ , Annual
- $N = \text{No. of months } 1\% < \text{YoY EUR HICP} < 3\%$
- 5y Note with DB funding, Fixed Rate = 3.25%

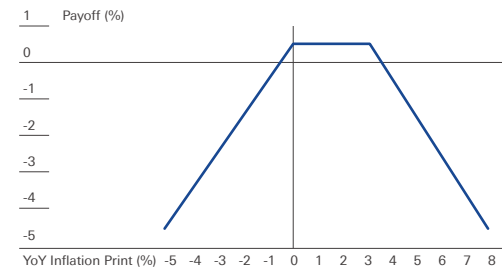
**Fig. 1:  
Long (0,3) Collar**

Source: Deutsche Bank



**Fig. 2:  
Short (0,3) Strangle**

Source: Deutsche Bank



**Building Blocks**

- Selling a 0% YoY floor
- Selling a 1x / 2x cap spread

**Premiums**

- 5Y 0% floor generates 120c
- 5Y 2.5% cap costs 320c
- 2x 5Y 5% cap costs 200c

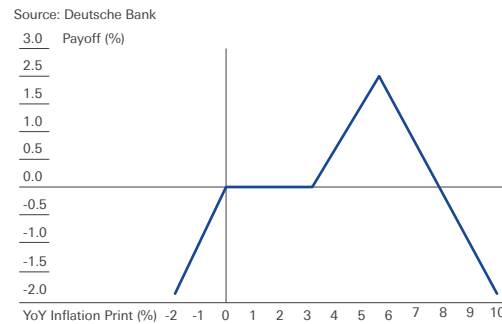
**Using these components...**

Zero cost and benefits from inflation between 2% and 7.5%

**Covered Linker Switches**

- Sell nominal bond
- Buy Linker
- Sell year on year caps @ 2.5% on coupons and principal

**Fig. 1:  
Sell 0% floor, But 1x/2x Cap Spread**

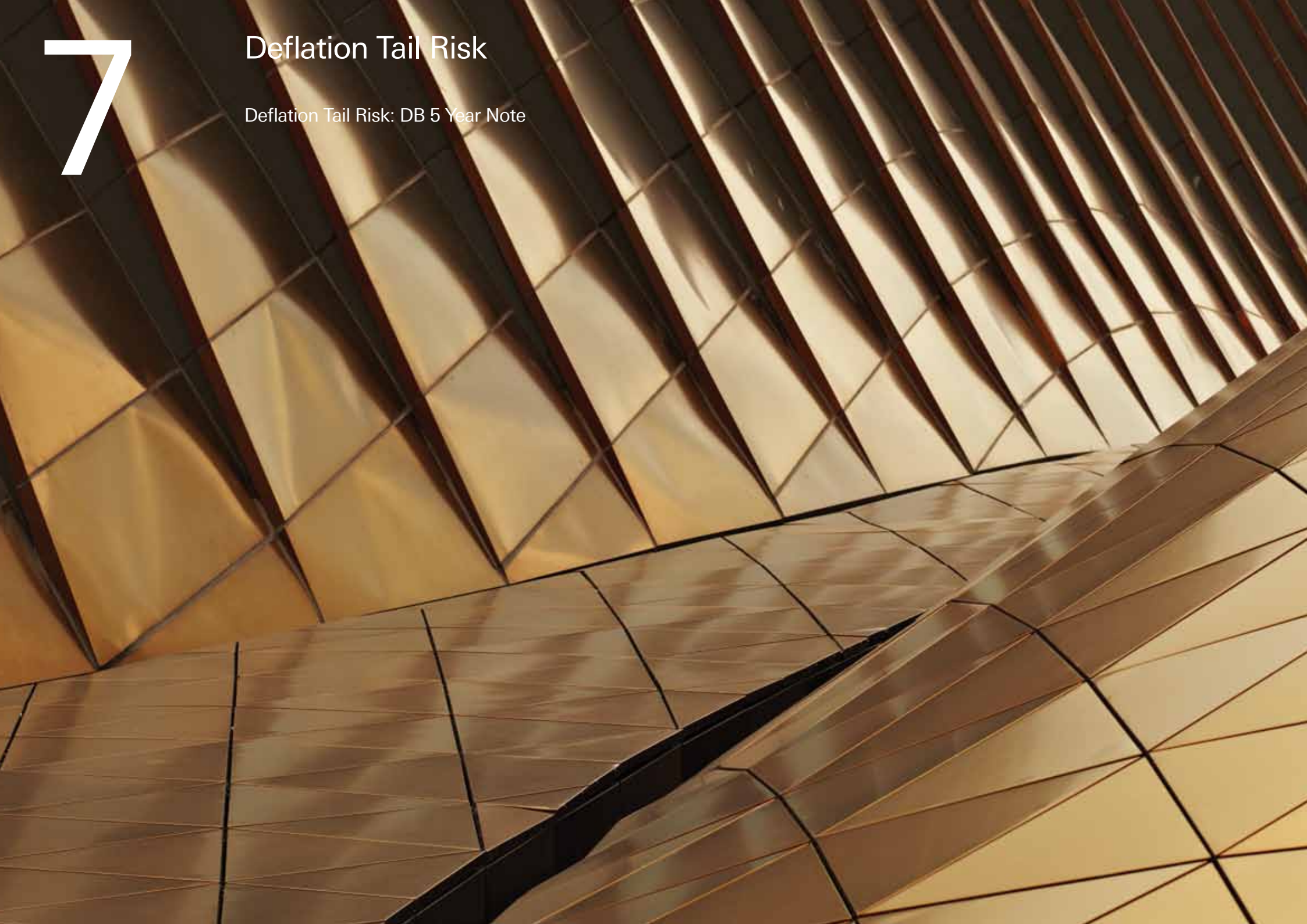


	OATei22	OATei32
<b>Covered Caps</b>	<b>(%)</b>	<b>(%)</b>
Upfront Premium	5.00%	14.90%
Running Premium (annual, 30/360)	53 bps	92 bps
Real Yield Pick-Up	43 bps	51 bps
<b>Minimum Inflation to outperform nominal</b>	<b>1.49%</b>	<b>1.63%</b>

# 7

## Deflation Tail Risk

Deflation Tail Risk: DB 5 Year Note



## Deflation tail risk: DB 5 Year Note

**Deflation tail risk: DB 5 Year Note**  
Investors can take advantage of the substantial dislocations in the Inflation Option Market by selling deep out of the money Inflation Floors.

A 5 year DB Deflation Note provides a return over 3.5% per annum if YoY Eurozone Inflation prints above -2.0%, providing 235bps of pick up over 5y EUR Swap Rates.

Euro-zone inflation printing below -2.0% is an unprecedented event, never seen in ANY Euro economy.

The below note details indicative terms and compelling reasons for investors to take on this risk for above market returns. The last section looks at variations in USD, GBP in addition to alternate ways of monetizing the opportunity in EURs

The underlying market dislocations are unsustainable and will soon be removed by exogenous liquidity provided by real money accounts. This opportunity represents clear value.

### DB Short Deflation Risk Note – Indicative Trade Terms

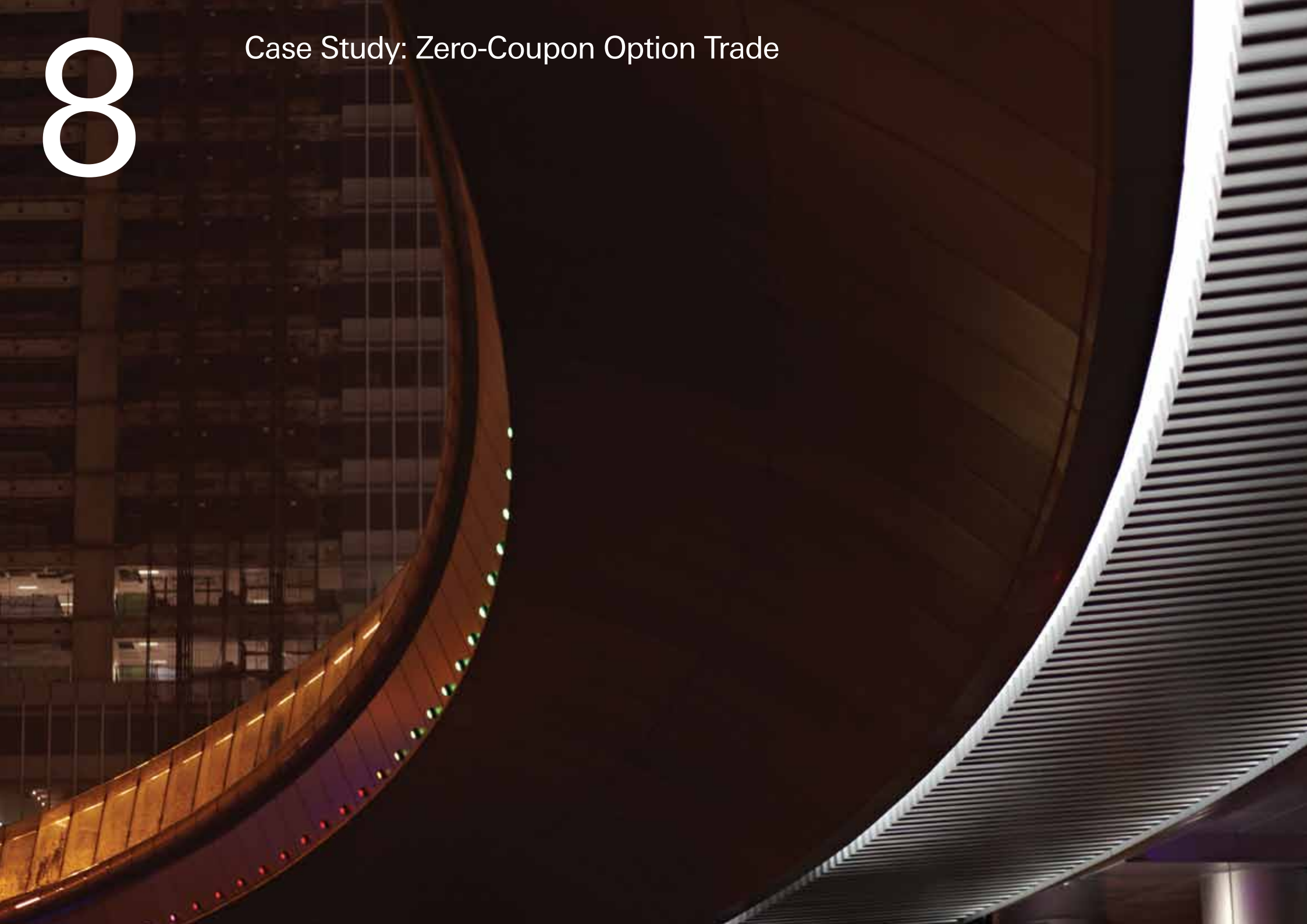
Indicative Terms	
Currency	EUR
Format	DB Funded Note
Maturity	5 years
Issue Price	100.00
Re-Offer	99.00
Redemption	121 - Floor(T), minimum return of 0.00
Where	
FLOOR(T)	121 * Sum [Floor(t) for t = 1,2,3,4,5]
Floor(t)	12 * Max (Floor Strike - YoY Inflation, 0%)
Floor Strike	-2.00%
YoY Inflation	$\frac{CPI(t)}{CPI(t-1)} - 1$ Where CPI(t) is the EUR HICP ex Tobacco Index (CPTFEMU Index) 3m prior to Observation Date t CPI(t-1) is the EUR HICP ex Tobacco Index (CPTFEMU Index) 15m prior to Observation Date t

### Reference Rates

5y Inflation B/E	2.01%
5y Swap Rate	1.61%
Max IRR	3.56%

# 8

## Case Study: Zero-Coupon Option Trade



## Case Study: Zero-Coupon Option Trade

During the first six months of 2010, a Toronto-based insurer purchased deflation protection worth \$21.539 billion in notional, paying \$173.7 million in premium. The 10-year zero-coupon 0% options were denominated in dollars, euros and sterling, and were executed by Deutsche Bank and Citi.

The other side of the trade was largely taken by California-based fixed-income manager Pimco, which reported it had sold more than \$8 billion of 10-year zero-coupon 0% inflation floors in a filing dated August 27. The floors were sold in return for more than \$70 million in premium, with Deutsche and Citi as counterparties.

The transaction made perfect sense for both participants. For the insurer, the 0% floors acted as a hedge against deflation and the impact that would have on its equity portfolio. At the same time, Pimco was able to cash in on 0% inflation floors embedded in its sizable portfolio of Treasury inflation-protected securities (TIPS). Dealers say the headlines generated by the trade had a positive impact on the market, encouraging other clients to express

their views on the direction of inflation by buying or selling zero-coupon options.

Daragh McDevitt, DB Global Head of Inflation Structuring said, “It sparked interest because you have very intelligent investors on both sides who are taking opposite sides of the trade.”

Since Q2, 2010, quantitative easing has encouraged more clients to sell implied inflation volatility at levels that look expensive. In particular, many market players have looked to play inflation volatility versus interest rate volatility – for example, by buying interest rate caps and selling inflation caps at similar strikes. “We’ve seen a lot of clients coming in on the same side as Pimco, viewing the probability of deflation priced in by these options to be inflated. They are either selling the options embedded in their bond portfolios, selling the options outright or entering into some kind of interest rate options strategy,” says McDevitt.

The transaction made perfect sense for both participants. For the insurer, the 0% floors acted as a hedge against deflation and the impact that would have on its equity portfolio. At the same time, Pimco was able to cash in on 0% inflation floors embedded in its sizable portfolio of Treasury inflation-protected securities.

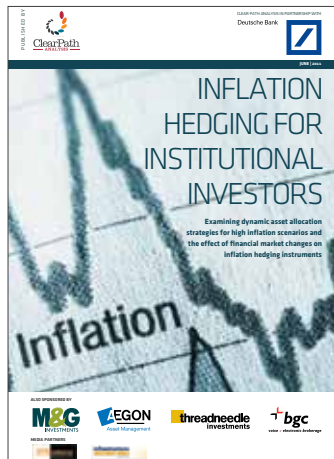
# 9

## Further Reading



# Further Reading

**Inflation Hedging for Institutional Investors**  
Examining dynamic asset allocation strategies for high inflation scenarios and the effect of financial market changes on inflation hedging instruments.



**Weekly Inflation Research update**

Country	Year	Q1	Q2	Q3	Q4	YTD
US CPI	2010	1.6	1.5	1.4	1.3	1.4
US PCE	2010	1.5	1.4	1.3	1.2	1.3
UK CPI	2010	2.6	2.5	2.4	2.3	2.4
UK PPI	2010	2.5	2.4	2.3	2.2	2.3
EU CPI	2010	1.9	1.8	1.7	1.6	1.7
EU PPI	2010	1.8	1.7	1.6	1.5	1.6
JP CPI	2010	0.2	0.1	0.0	-0.1	0.0
JP PPI	2010	0.1	0.0	-0.1	-0.2	0.0

**Inflation Big Picture Study**

**Research Inflation Markets Guide**

Please go to [gm.db.com/inflation](http://gm.db.com/inflation) for more information.

# 10

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### Integrated trading, structuring and research

Unlike some of our competitors, Deutsche Bank's inflation trading, structuring and research professionals work closely together, combining strategic and technical expertise with the macro-economic insights so important with this offering.



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