CG Asset Management

Introduction to Index-Linked Bonds

February 2024

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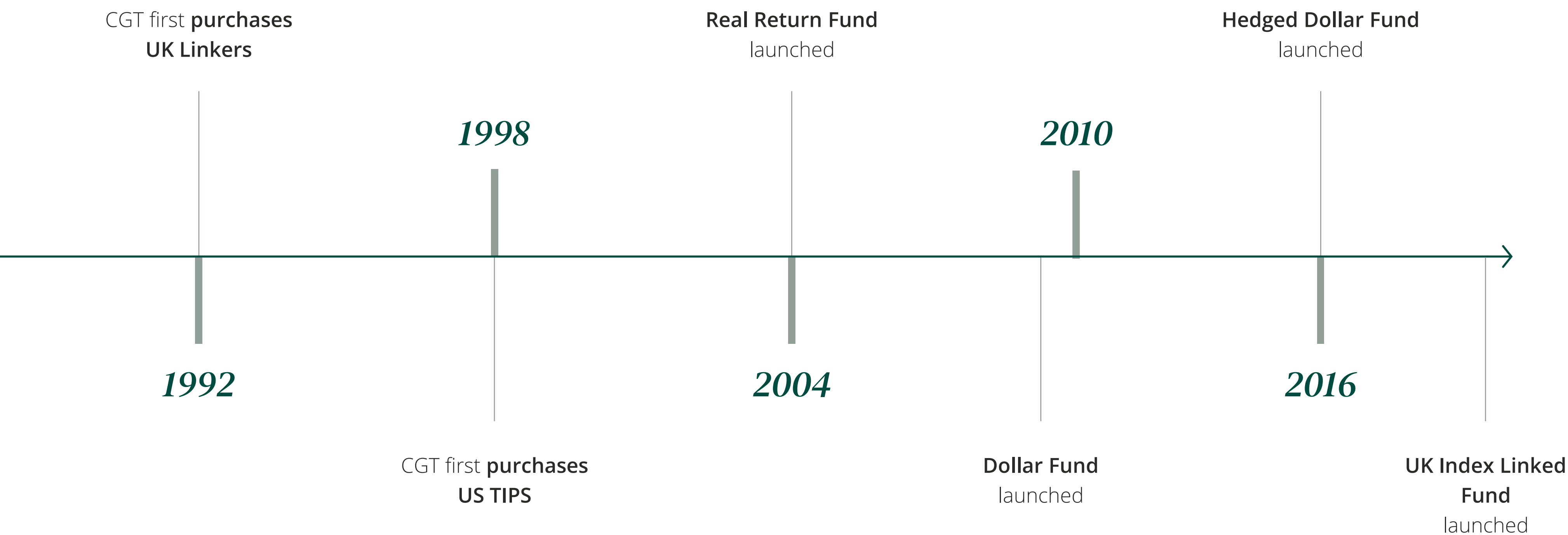
Agenda

1. Index-linked, a user's guide — *Emma Moriarty*
2. The index-linked market today — *Chris Clothier*
3. The outlook for inflation — *Emma Moriarty*
4. Portfolio construction with index-linked bonds — *Chris Clothier*

We are boutique fund manager with £3.6 bn under management

Strategy	Fund	Launched	AUM	Structure	Fees (AMC)
Absolute Return Long only investments in a portfolio of bonds, equities and commodities	Capital Gearing Trust	1982	£1,100m	Investment Trust	0.37%
	CG Absolute Return Fund	2016	£900m	UCITS	0.35%
	Capital Gearing Portfolio	2001	£370m	UCITS	Closed
Real Return Long only investments in index linked bonds	Real Return Fund	2004	£500m	UCITS	0.30% / 0.20%
	Dollar Fund	2009	£765m	UCITS	0.25% / 0.15%
	UK Index Linked Fund	2023	£10m	UCITS	0.15%

CGAM has a long pedigree of investing in index-linked bonds



CGAM manages **£2.4bn in index-linked** bonds across **8 jurisdictions**, including **£500m in UK index-linked.**

Past performance is not indicative of future results

Our existing index-linked funds have outperformed their benchmarks since their inception, and we manage more than £2.4 bn in index-linked globally

Dollar Fund – Performance since inception

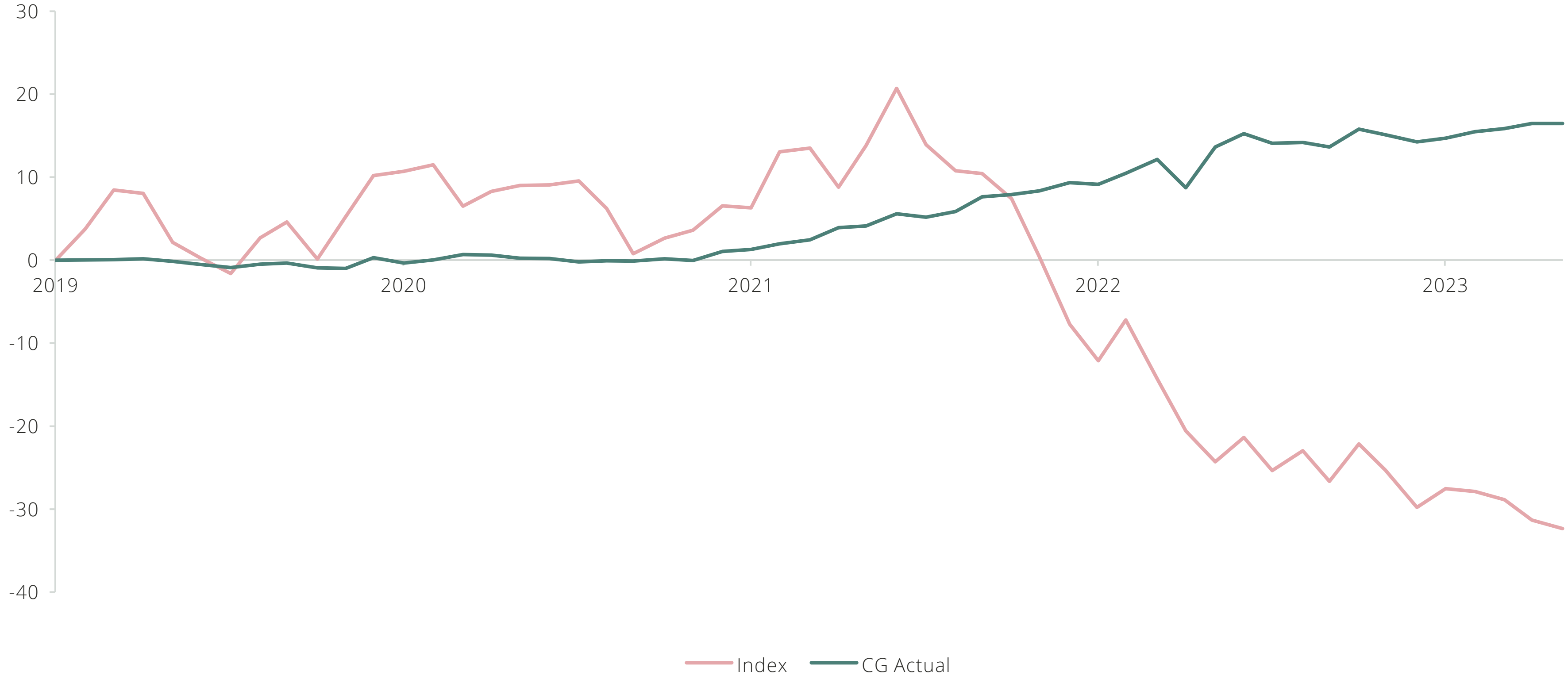
Real Return – Performance since inception

Source: Bloomberg Finance LP, Northern Trust

Past performance is not indicative of future results

Our holdings of UK linkers have dramatically outperformed the index in recent years

CG Performance – UK Linker Holdings



CG Actual represents performance of CGAM UK index linked holdings within Capital Gearing Trust. Index refers to Bloomberg UK Govt Inflation-Linked All Maturities Total Return Index. Please note these analyses are theoretical and should be construed in that light.
Source: Northern Trust, Bloomberg Finance L.P., CGAM

Meet the investment team

Peter Spiller

Co-Chief Investment Officer

Prior to founding CGAM in 2000, Peter was a partner and strategy director at Cazenove & Co Capital Management and a US equity investor at Capel Cure & Myers. Peter has managed Capital Gearing Trust plc since 1982.

Chris Clothier

Co-Chief Investment Officer

Chris joined CGAM in 2015 and has co-managed the funds since that date. Prior to that he was a director at IPGL Limited, a private investment vehicle with a range of public and private interests.

Alastair Laing

CEO, Fund Manager

Alastair joined CGAM in 2011, and has co-managed the funds since that date. Alastair joined CGAM from Hg Capital LLP and previously worked with the mergers and acquisitions team at Deloitte LLP.

Hassan Raza, CFA

Investment Manager

Hassan joined CGAM in 2021. Prior to that he worked in M&A and Leveraged Finance at HSBC. He began his career at PwC in 2013, advising on corporate finance for infrastructure assets.

Emma Moriarty

Investment Manager

Emma joined CGAM in 2022. Before joining, she worked as a macroeconomist at the Bank of England for eight years, focusing on risks in financial markets.

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Index-linked: a user's guide

February 2024

What is an index-linked government bond?

- A **conventional government bond** pays semi-annual coupons throughout its life and will pay the principal at maturity. The £ value of **the coupon payments and principal are known in advance**.
  - e.g. UKT 0.5% 01/31/2033 (conventional gilt) will pay a coupon of 0.25% (=0.5/2) semi-annually and a principal of £100 at maturity.

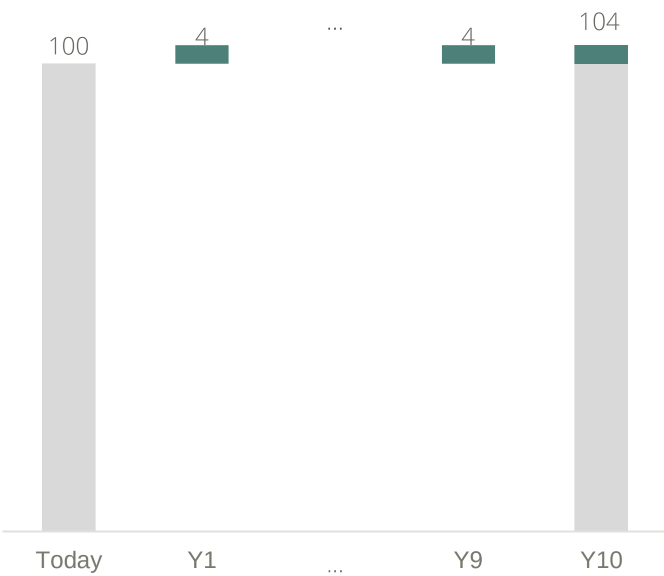
- An **index-linked government bond** also pays semi-annual coupons and a principal at maturity.

- The **coupon payments and principal are indexed to the level of inflation experienced** over the life of the bond. In the UK, they are indexed to the RPI.

- The purpose of this is to **maintain the purchasing power of the coupons and the principal** over the life of the bond.
  - e.g. UKTI 0.125% 03/22/2029 (index-linked gilt) will pay a 0.0625% semi-annually and a principal of £100 *in real terms.*
  - At the time of issuer, they are designed to deliver the level of purchasing power equivalent to a 0.125% coupon and a principal of £100 in 2029.

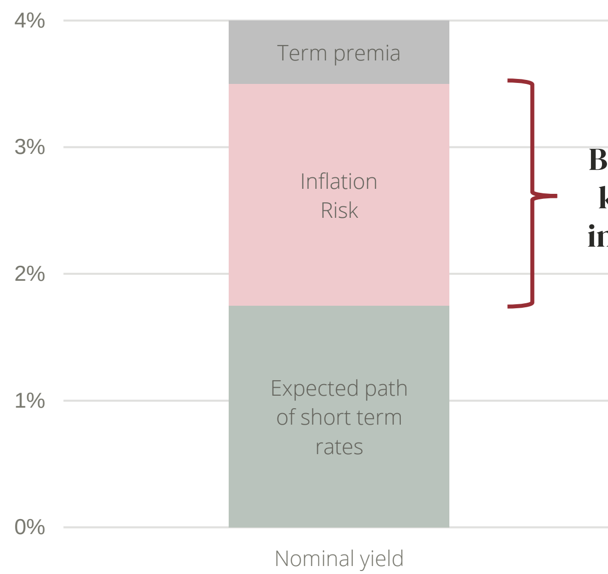
Nominal bond cashflows are known at the outset but carry inflation risk

£100 at par into a nominal bond with a 4% coupon



4% yield compensates for…

Key components of the nominal yield



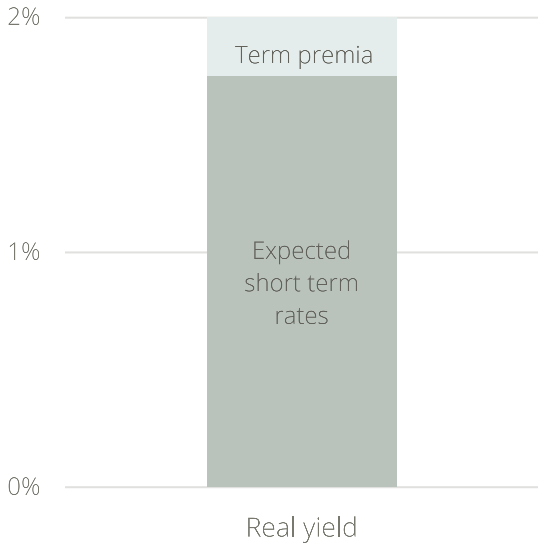
But we don't know what inflation will be

The value of a nominal bond changes with nominal interest rates

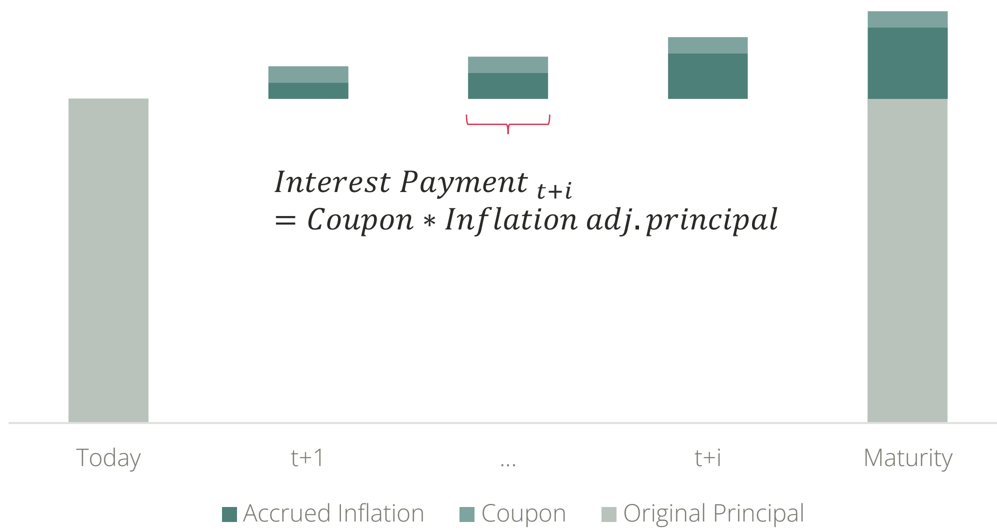
Source: CGAM

Index-linked bond cash flows are known *in real terms* but the nominal amount is not known

£100 at par at issue with a 2% coupon



…but the coupon payments and principal go up with inflation

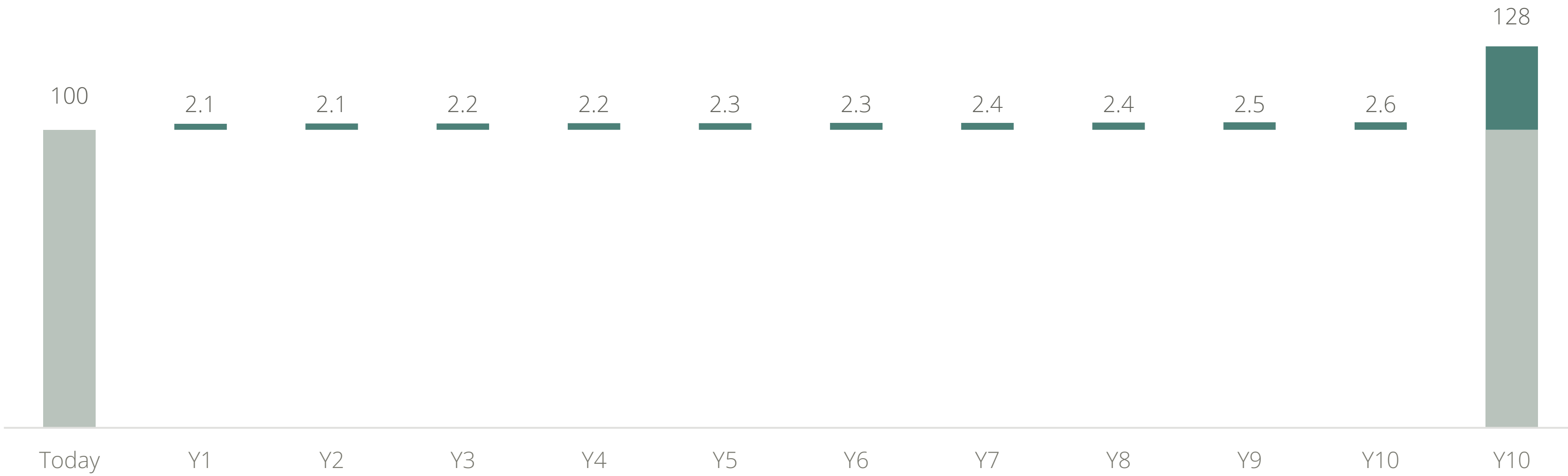


Just as the value of a nominal bond changes with *nominal interest rates*, the value of an index-linked bond changes with *real interest rates*

Source: CGAM

In the case of index-linked bonds the *nominal cashflows* are unknown but the *real return* is certain

Cashflows from investing £100 at par into an index-linked bond with a 2% coupon and average 2.5% inflation



Coupon		2%	2%	2%	2%	2%	2%	2%	2%	2%	2%	
Index ratio		103	105	108	110	113	116	119	122	125	128	
Interest paid		2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5	2.6	
Principal	-100											128

Source: CGAM

Nominal vs. real yield and the breakeven rate of inflation

Fisher equation

- Nominal yield ≈ Real yield + Expected Inflation
- Rearranging: Expected Inflation ≈ Nominal Yield (known) – Real Yield (known)

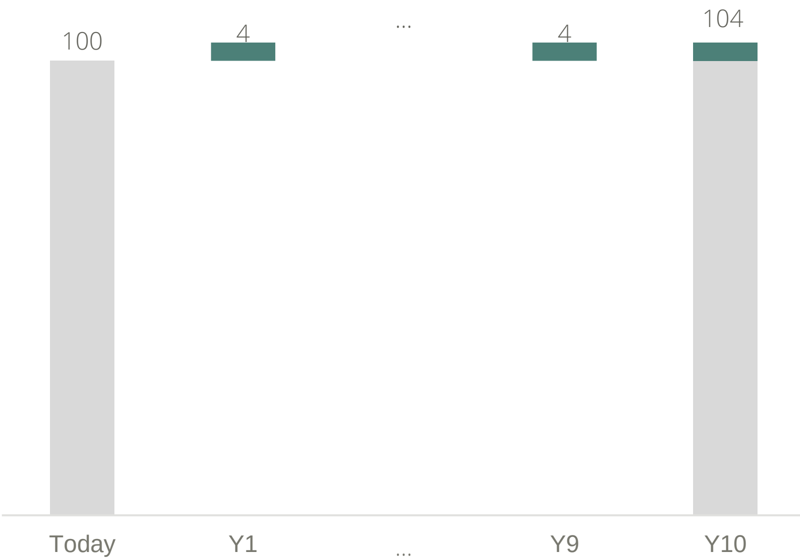
We call this the "**The breakeven rate of inflation**"

Two interpretations:

1. What is the level of average inflation you would need over the life of the bond for the returns on a nominal and index-linked bond to be the same; or
2. The market's expectation of what inflation will be over the life of the bonds

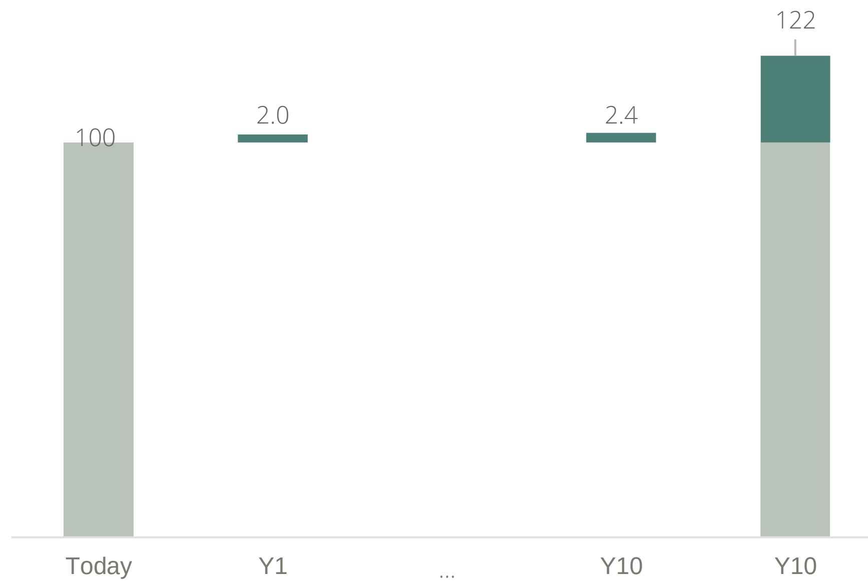
Example 1: If realised inflation equals expected inflation

Nominal bond with a 4% coupon



Return = **4%**

I/L bond with a 2% coupon and average 2% inflation

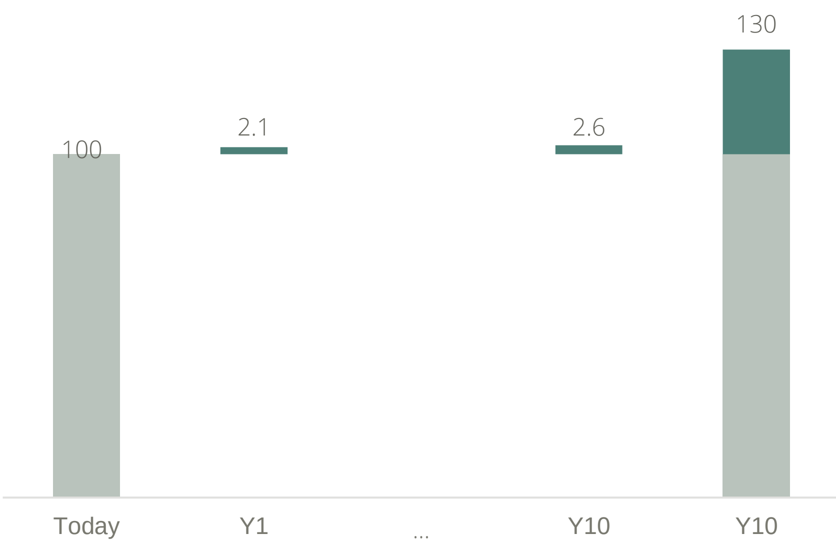


Return = **4%**

Source: CGAM

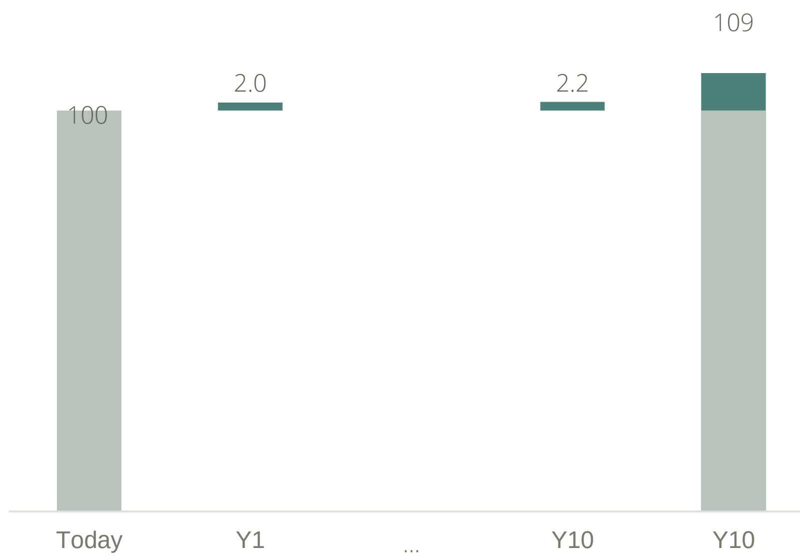
Example 2: If realised inflation is not as expected

I/L bond with 2% coupon and 3% inflation



Return = 4.8%

I/L bond with 2% coupon and 1% inflation



Return = 2.9%

Source: CGAM

The index ratio is a key component for pricing index-linked bonds

Index Ratio Calculation (from UK Debt Management Office):

(A) $$Index\ Ratio_T = \frac{Ref\ Index_T}{Ref\ Index_{Issue}}$$

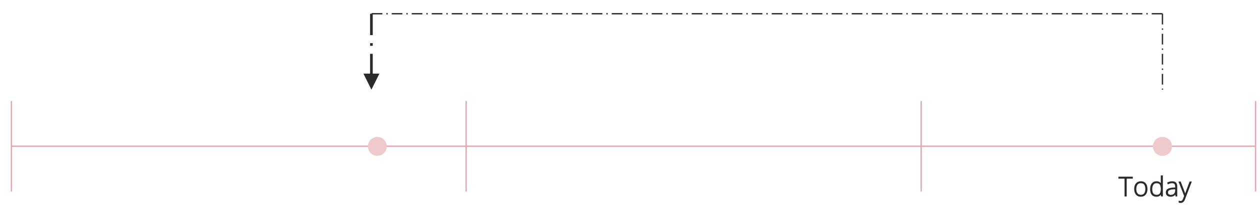
(B) $$RefIndex_T = Ref\ Index_M + \left(\frac{T-1}{D}\right)\left[Ref\ Index_{M+1} - Ref\ Index_M\right]$$

(C) $$Interest\ Payment_T = \frac{Coupon}{2} * (Index\ Ratio_T)$$

(D) $$Principal_T = 100 * (Index\ Ratio_T)$$

Source: DMO

Calculating the index ratio: almost all UK index-linked bonds now use a three-month interpolated lag



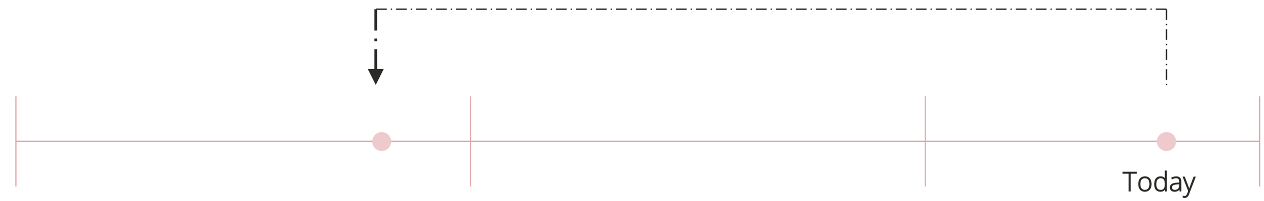
Date	30 Nov	31 Dec	31 Jan	29 Feb
Convention	m -3	m -2	m -1	m=0
RPI Index	377.3	379	378	n.a.

$$Today's\ index = 377.3 + \left(\frac{20}{29}\right)[379 - 377.3] = 378.5$$

$$Index\ ratio = \frac{Today's\ index}{Index\ at\ issue}$$

Source: CGAM, Bloomberg Finance L.P.

Fortunately, there are tools to do this work for you! (Bloomberg, the DMO)



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$$Today's\ index = 377.3 + \left(\frac{20}{29}\right)[379 - 377.3] = 378.5$$

$$Index\ ratio\ = \frac{Today's\ index}{Index\ at\ issue} = 378.5\ /\ 242.4 = \boxed{1.561}$$

Source: CGAM, Bloomberg Finance L.P.

Clean vs. dirty prices: how much do I pay if I want to buy £100,000 nominal?

$Clean\ price, T+1$

$$Total\ to\ pay = Accrued\ \ principal + \ accrued\ coupon$$

Source: CGAM, Bloomberg Finance L.P.

How much do I pay if I have £100,000 in nominal value to buy?

$Clean\ price, T+1$

$$Total\ to\ pay\ = Accrued\ \ principal + \ accrued\ coupon$$

$$Accrued\ princpal\ \ = Nominal\ * Clean\ price\ * Index\ ratio$$

$$= 100k * (\frac{99.579}{100}) * 1.561 = £155{,}466$$

$$Accrued\ coupon\ \ = Nominal\ * \frac{Coupon}{2} * Index\ ratio * Accrued\ Days$$

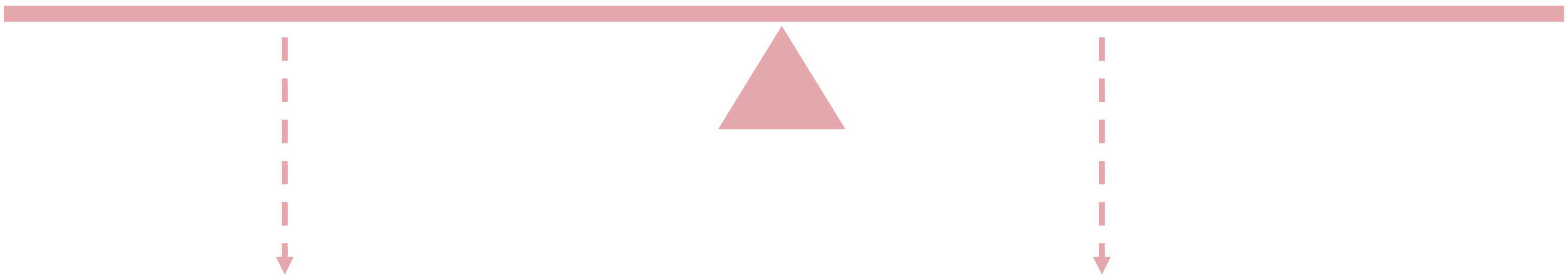
$$= 100k * 0.125\%/2 * 1.561 * \left(\frac{152}{182}\right) = £81$$

$$Total\ to\ pay = £155{,}466\ + £81 = £155{,}547$$

Source: CGAM, Bloomberg Finance L.P.

Why did bonds go down in 2022 when inflation was at a 40 year high?

Shorter duration | **Longer duration**



Key factor:

Realised inflation

I/L performance is almost entirely determined by short term inflation

Nominals suffer from higher nominal rates

Real yield

Short term in I/L performance is determined by real interest rates

Source: CGAM

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A History of Index-Linked Bonds

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The history of inflation is long and storied: it dates back to the death of Alexander the Great

Statue of Alexander the Great (356-323 BC)

Photo credit: Cleopatra Egypt Tours

…but it was the Americans who first invented instruments to hedge against inflation, which had arisen from excessive money printing

18th Century Massachusetts Bank Bills

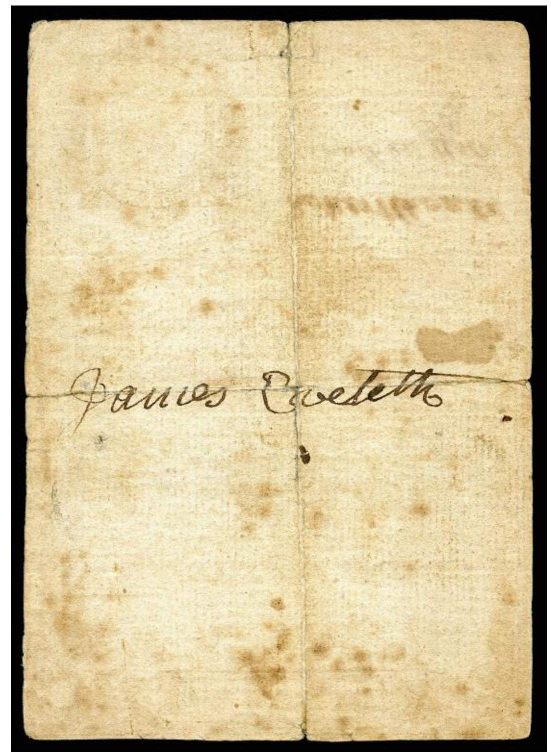

Photo credit: Wikipedia (Creative Commons)

Past performance is not indicative of future results

INDEX-LINKED BONDS - A HISTORY

In the 20th century, governments began to issue index-linked bonds to signal a commitment to monetary stability and fiscal prudence

1945

Finland issues first index-linked bonds

1955

Israel and Iceland begin issuing index-linked bonds

1960s-70s

Various South American countries issue index-linked bonds

1980

United Kingdom launches first index-linked Treasury Stock in 1981

Australia begins to issue index-linked bonds in 1985

1990

Canada (1991), **Sweden** (1994), **New Zealand** (1995), **USA** (1997), **France** (1998) issue their first index-linked bonds

Past performance is not indicative of future results

The global Index-Linked bond market today

Issuer	Indexed nominal value (£bn)	Number of index-linked bonds	Percentage of total government debt
United States	1,550	52	7%
United Kingdom	620	33	24%
France	235	19	11%
Italy	220	20	9%
Spain	75	8	6%
Germany	70	4	3%
Japan	70	7	3%
Canada	40	8	14%
Australia	30	7	4%
Sweden	20	8	18%
New Zealand	15	4	16%
Denmark	5	2	5%

Source: Bloomberg Finance L.P, Bank for International Settlements, CGAM calculations. Note that nominal issuance amounts are rounded to nearest £5bn, and percentages of government debt are stated to the nearest percentage point.

We invest in a narrower group of high-quality sovereign issuers

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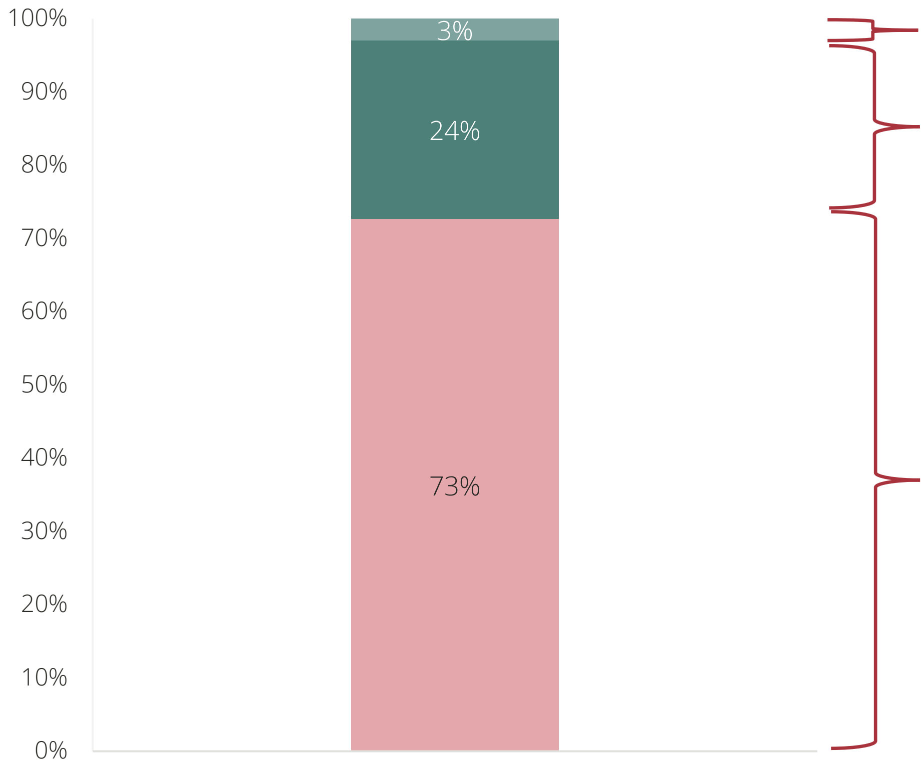
Source: Bloomberg Finance L.P, Bank for International Settlements, CGAM calculations. Note that nominal issuance amounts are rounded to nearest £5bn, and percentages of government debt are stated to the nearest percentage point.

The UK has the highest proportion of index-linked debt in the world

Breakdown of UK government debt outstanding (%)



Treasury Bills

Index-linked gilts

- £620 bn outstanding
- 33 bonds currently in issue

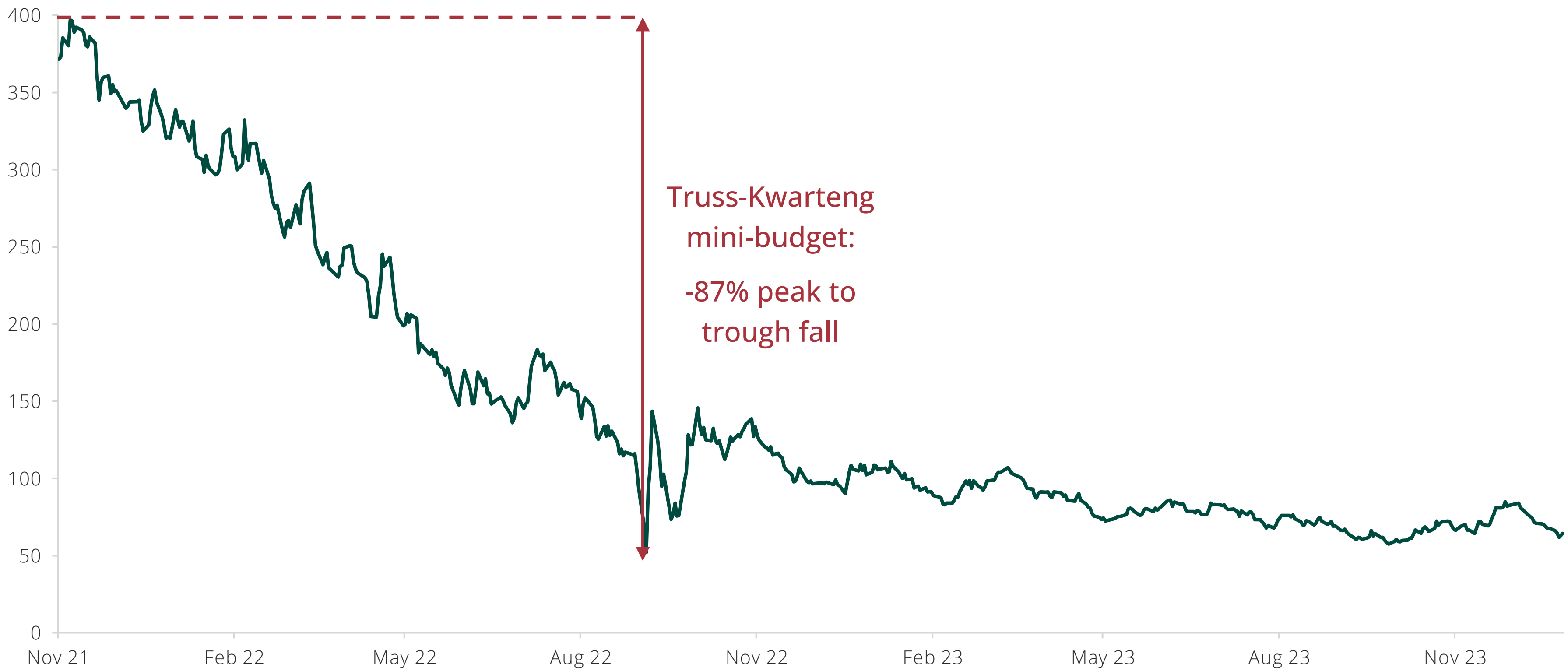
Conventional gilts

- £1,850 bn outstanding
- 63 bonds currently in issue

Source: Bloomberg Finance LP, UK Debt Management Office. Data as at 21 January 2024.

How to lose money on a risk-free asset?

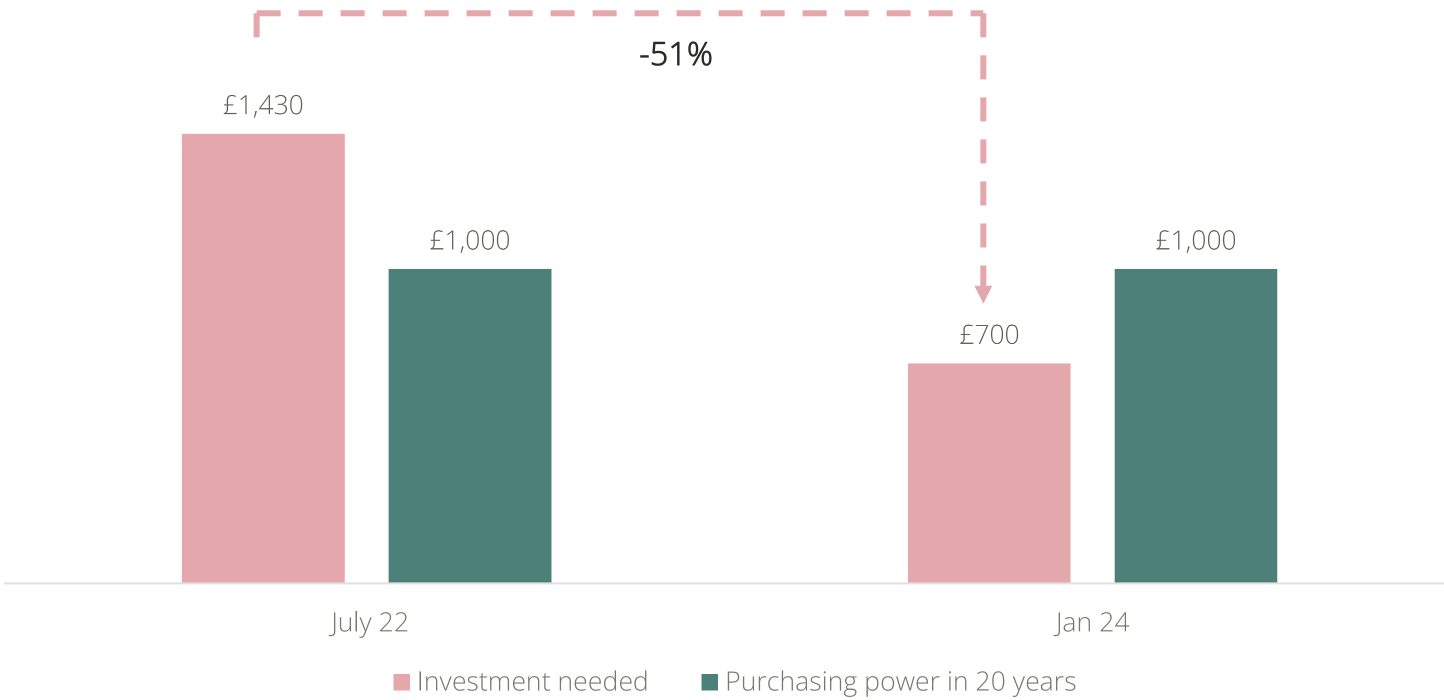
Price of 50-year UK index-linked gilt (UKTI 2073)



Source: CGAM, Bloomberg Finance L.P.

Why now? Because fundamental value has changed dramatically

Investment needed to preserve £1,000 (inflation adjusted) 20 years into the future



Source: CGAM, Bloomberg Finance L.P.

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The outlook for inflation: it's getting sticky in here!

February 2024

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How did we get here?

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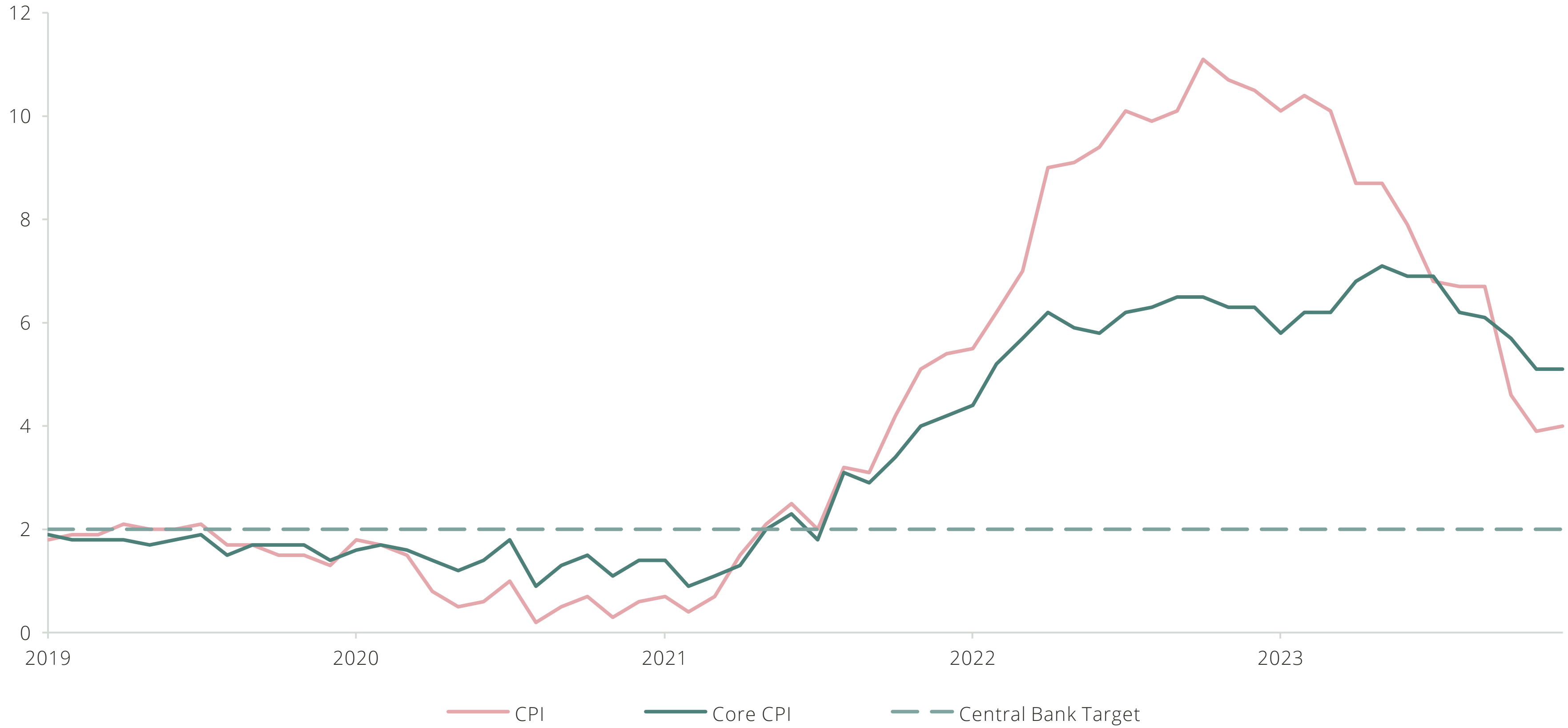
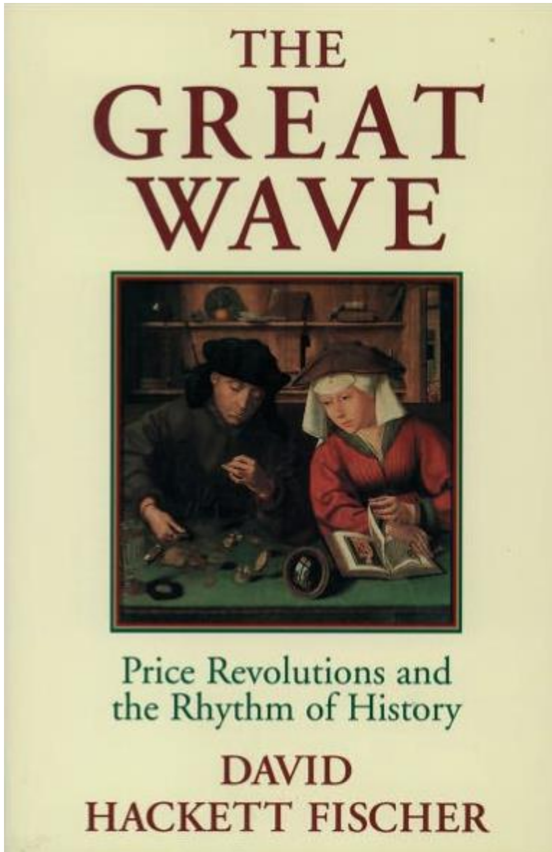
How did we get here?

UK Inflation (% YoY increase to headline CPI and core CPI)



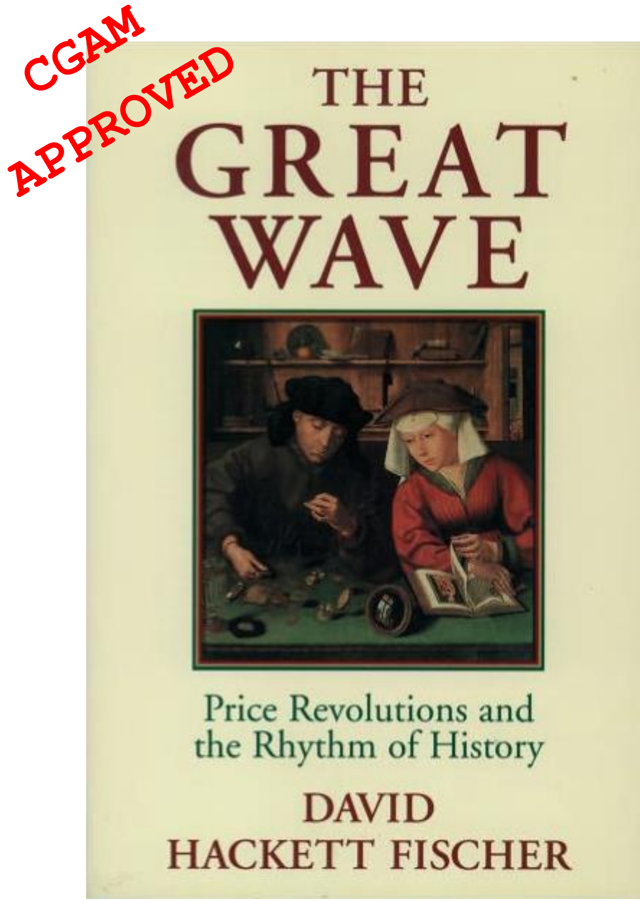
Source: Bloomberg Finance L.P, Office for National Statistics

When in doubt, read the classics



1. Monetarist
2. Malthusian
3. Marxist
4. Neoclassical
5. Agrarian/ Environmental
6. Historicist

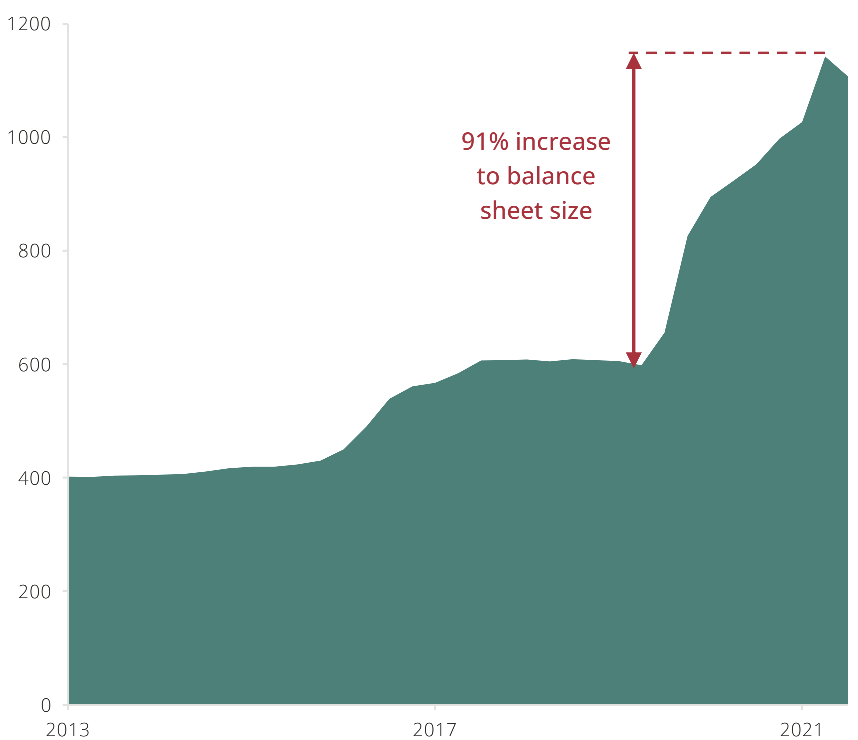
Inflation is so much more than a monetary phenomenon…



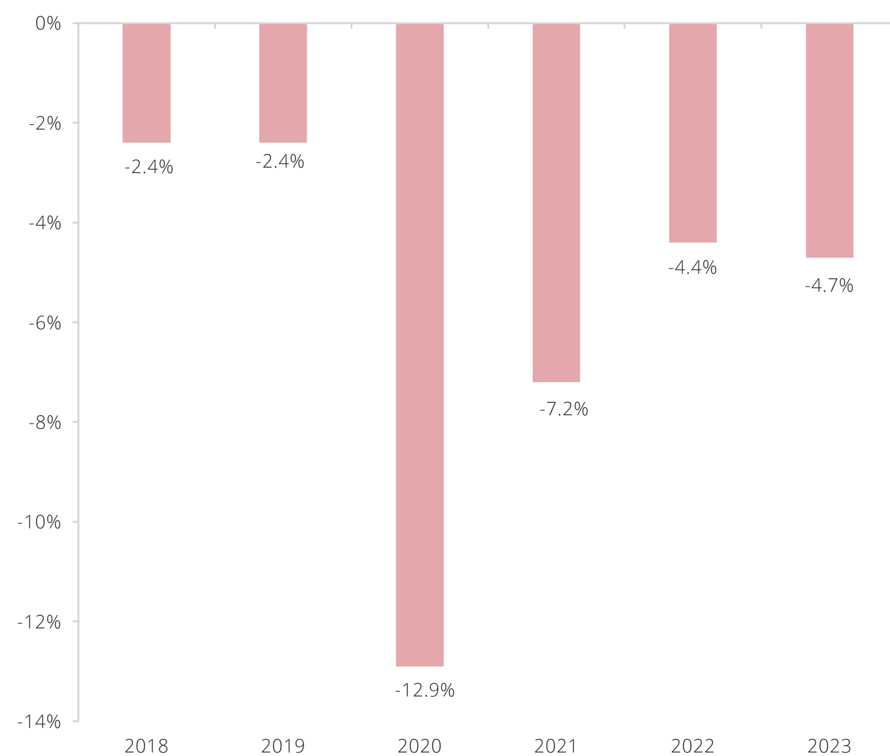
1. Monetarist	Always and everywhere a **monetary phenomenon**
2. Malthusian	**Scarce resources** available to the population
3. Marxist	Bargaining power between **labour and capital**
4. Neoclassical	**Supply and demand imbalances** in the macroeconomy
5. Agrarian/ Environmental	**Harvest conditions** and **environmental events**
6. Historicist	Each inflationary episode arises from different, **unique circumstances**

…but this time, monetary (and fiscal) stimulus *might just* have played a role

Total assets on the Bank of England's balance sheet (£ billion)



UK fiscal deficit (as % of GDP)

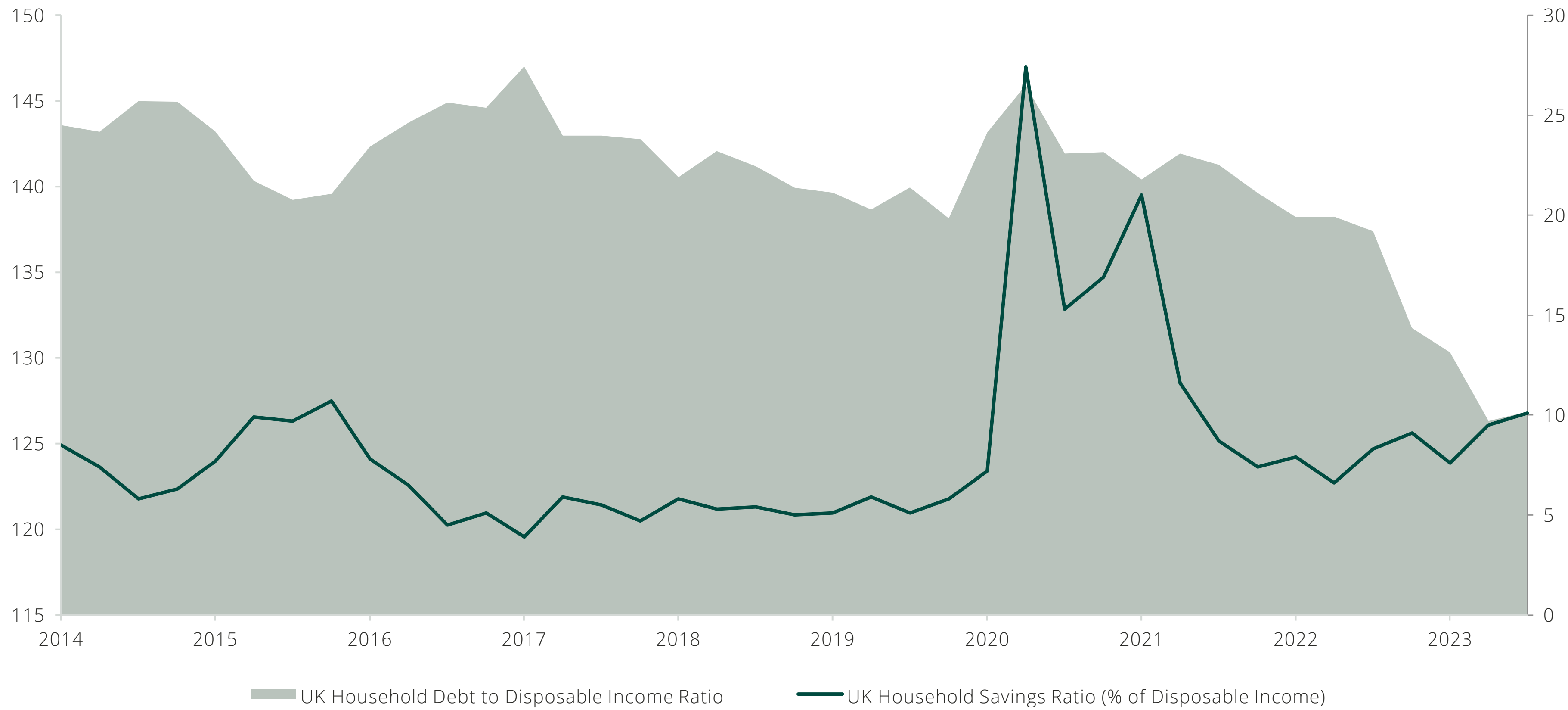


Source: Bloomberg Finance L.P., Office for National Statistics

INFLATIONARY BACKDROP

UK households reacted by saving, using the stimulus to improve their balance sheets

Household Savings: UK Debt to Disposable Income Ratio (%), UK Household Savings Ratio (%)

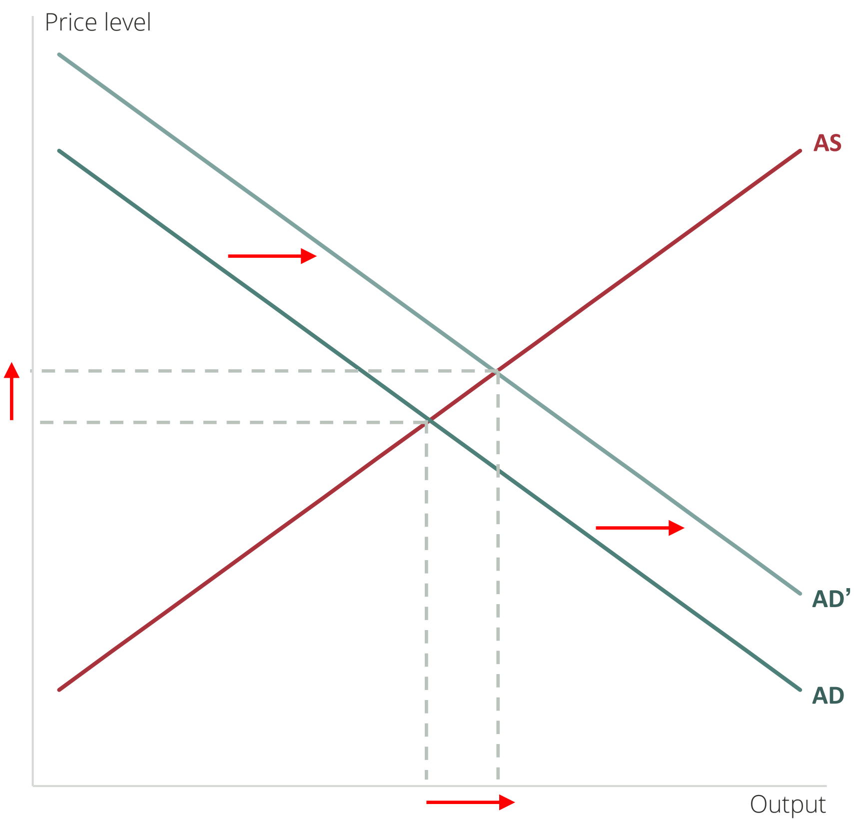


Source: Bloomberg Finance L.P., Office for National Statistics

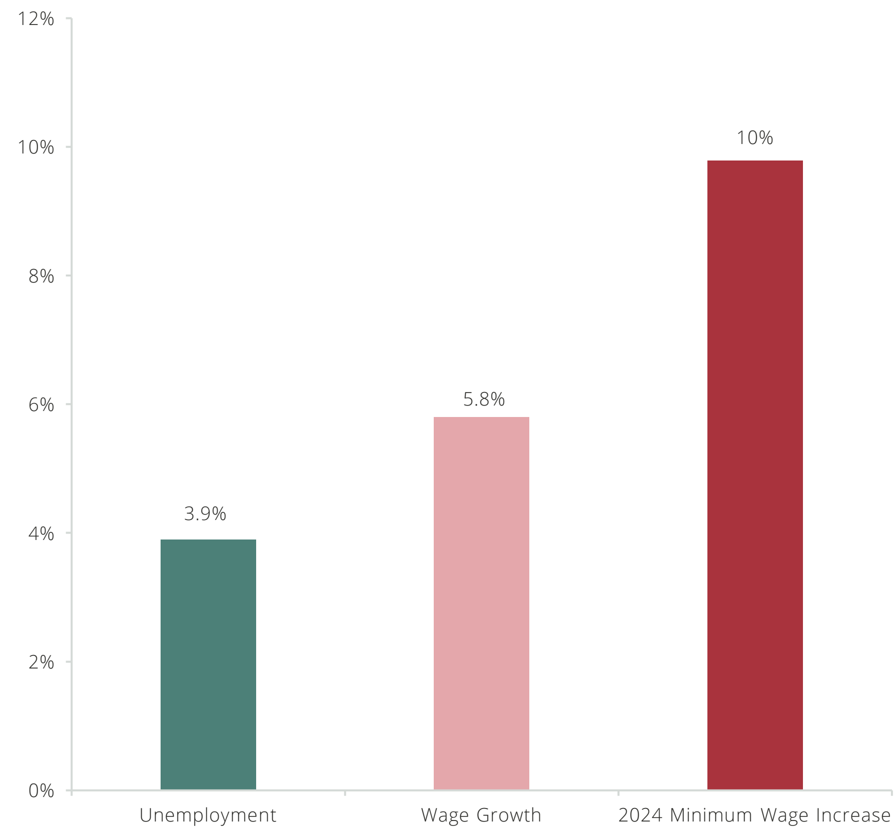
Past performance is not indicative of future results

When lockdown ended, households had money to spend, but supply couldn't keep up. The UK labour market *suggests that this is still true*

Aggregate demand increased quickly, but supply with a lag



UK labour market indicators (most recent)



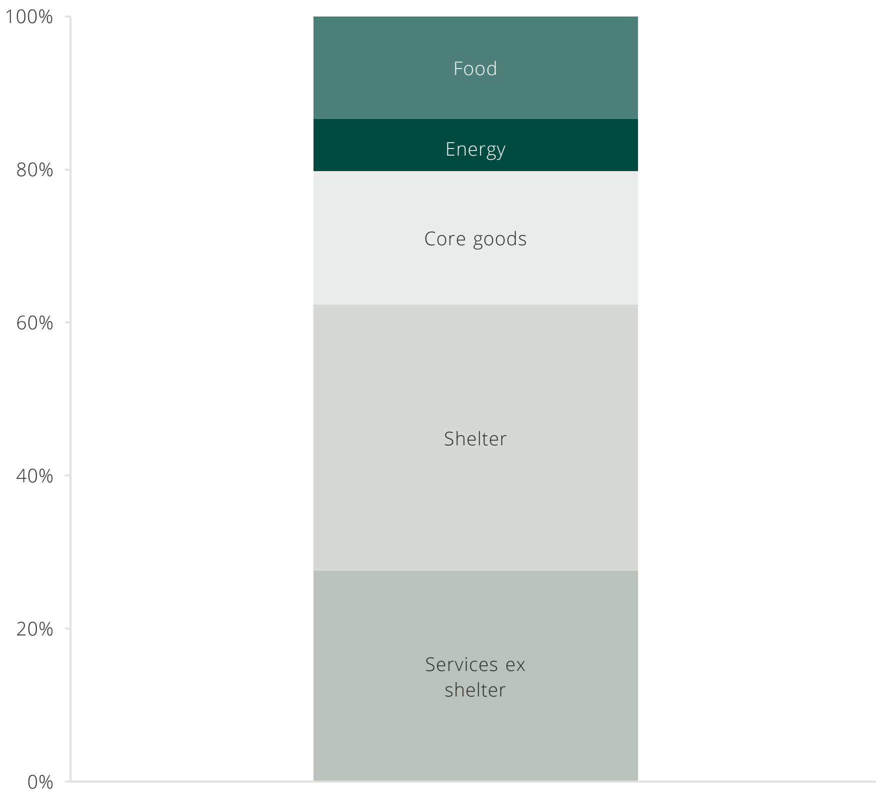
Source: Bloomberg Finance L.P., Office for National Statistics, GOV.UK, CGAM calculations

The components of inflation

INFLATION COMPONENTS

There is a range of different inflation indices, but they all break down into similar component parts

Breakdown of US CPI weights

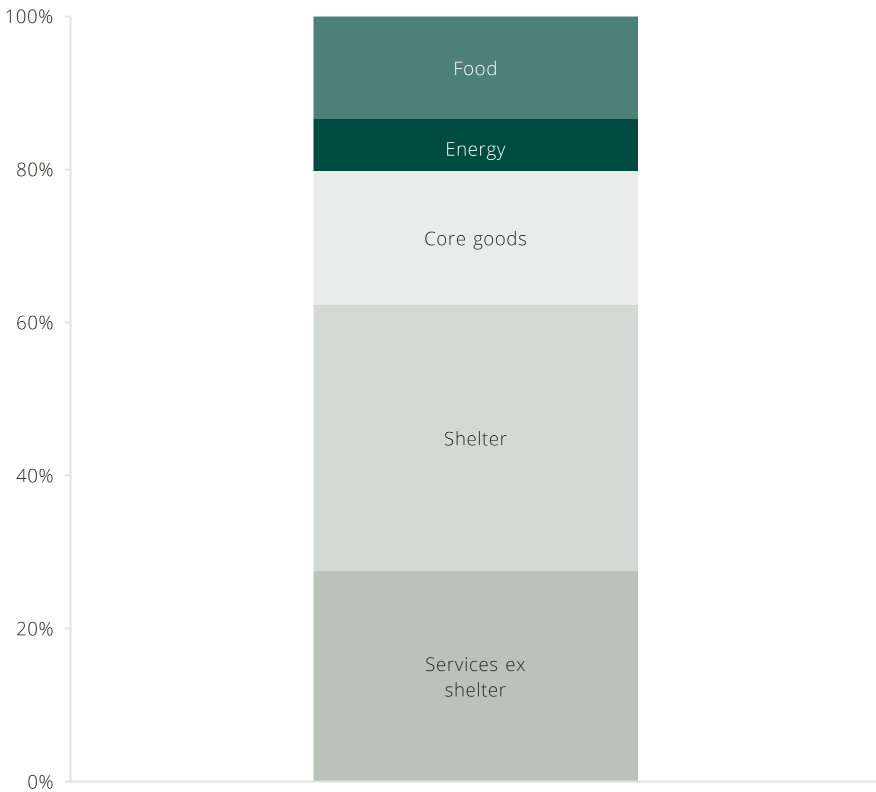


Source: Bloomberg Finance L.P.

Past performance is not indicative of future results

Goods and services prices adjust at different speeds…

Breakdown of US CPI weights



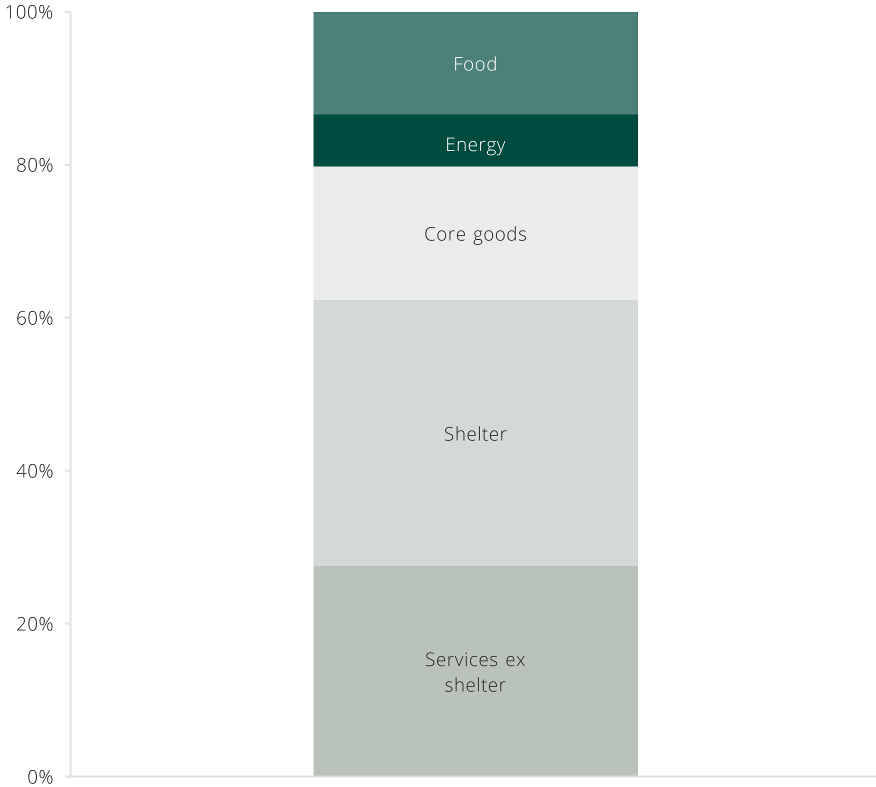
Goods prices are capable of adjusting quickly:

- Energy and food are left out of core CPI
- Note many goods price changes will include an element of services inflation

Ssurce: Bloomberg Finance L.P.

…but inflation begets inflation!

Breakdown of US CPI weights



Goods prices are capable of adjusting quickly:

- Energy and food are left out of core CPI
- Note many goods price changes will include an element of services inflation

Services and shelter prices adjust slowly:

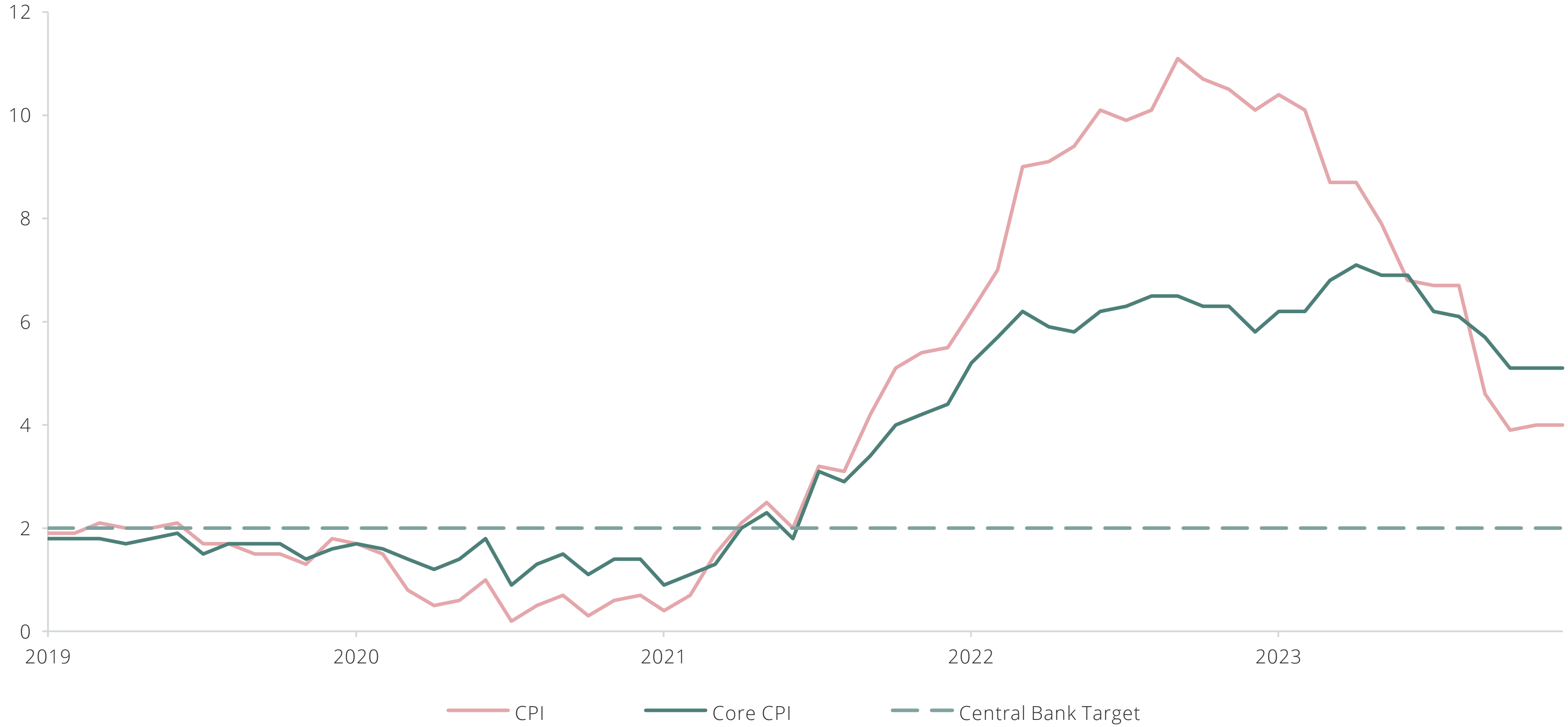
- Primarily due to the length of contracts involved
- Note that many services price changes will be linked to wage increases

Ssurce: Bloomberg Finance L.P.

The outlook for inflation

Although headline levels of inflation are falling, core inflation persists at challenging levels and remains above target

UK Inflation (% YoY increase to headline CPI and core CPI)

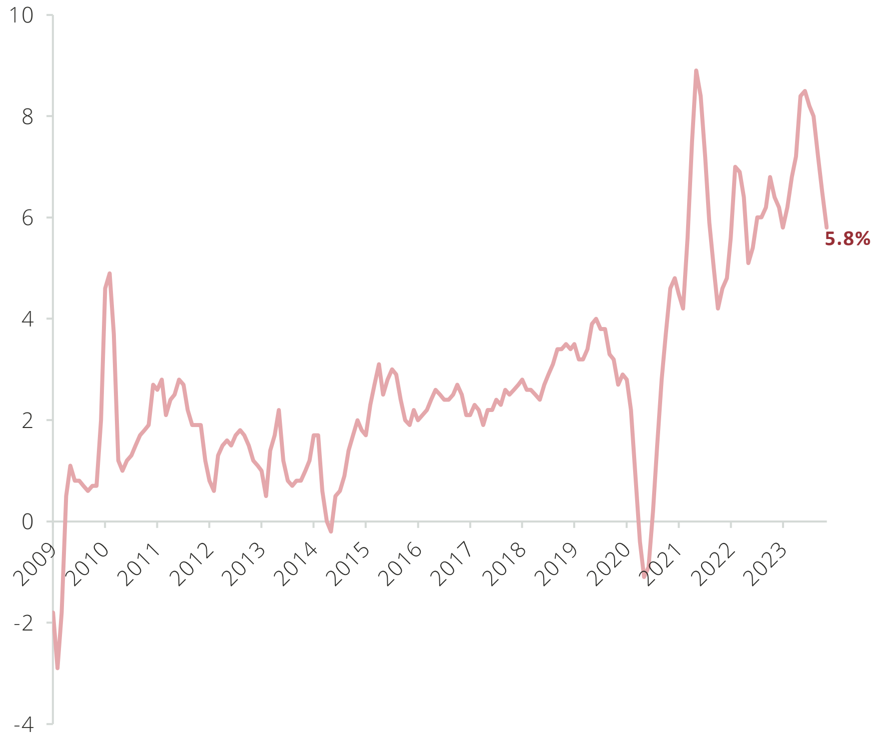


Source: Bloomberg Finance L.P., Office for National Statistics

INFLATION OUTLOOK

…and there are several indicators to suggest that UK inflation will be stickier than markets expect

UK Average Weekly Earnings Growth (3m avg, YoY, %)



UK Housing Rental Growth (Actual Rents) (YoY, %)

Source: Bloomberg Finance L.P., Office for National Statistics

INFLATION OUTLOOK

We believe that the era of low inflation that has characterised the last 25 years has come to an end

Globalisation Unwind

- Deflationary tailwind of globalisation diminishing as China wages approach those of developed economies
- Reshoring will increase costs
- Significant capex required to bring about reshoring will be inflationary

Energy Transition

- Energy transition will require massive capital investment
- Likely to generate a shortage of key materials notably copper and other metals
- Requires decommissioning of otherwise productive assets

War / Defence

- Defence spending will rise globally in response to Russian war in Ukraine
- Trade will continue to flow along political rather than economic lines
- Massive rebuilding programme for Ukraine will be required

Capital vs. Labour

- Labour share of GDP has been falling
- Unionisation and union assertiveness is rising in response to recent inflation

CG Asset Management

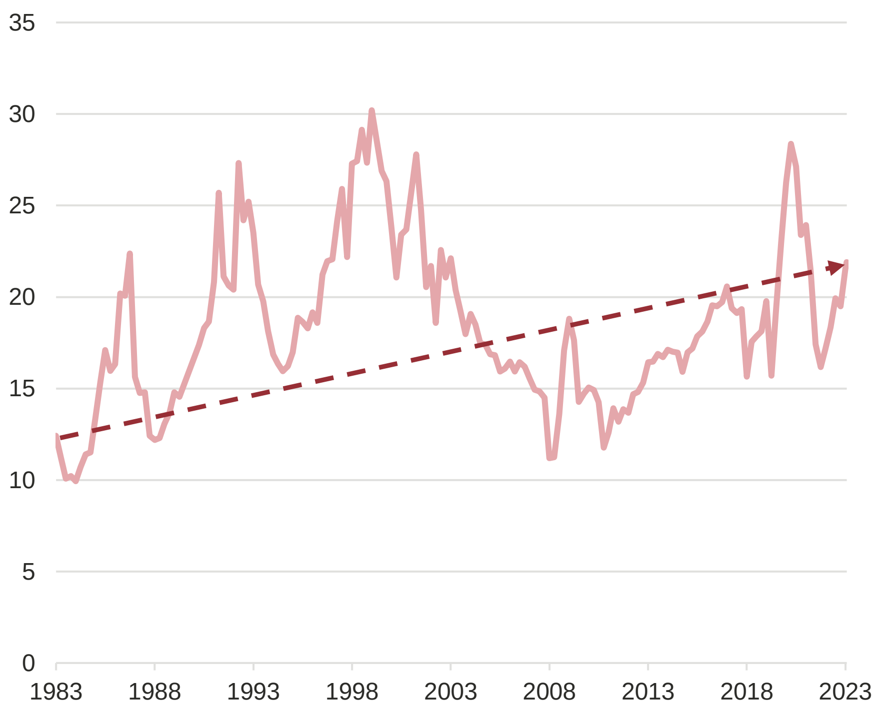
Cui Bono – Portfolio Construction using Index-Linked

February 2024

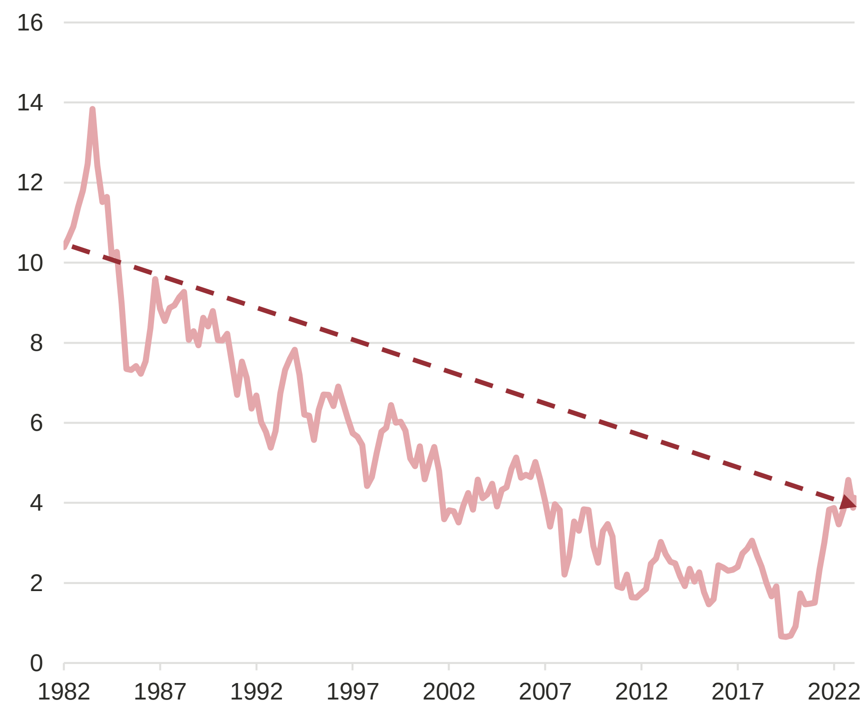
cgam

Asset allocation has been easy over the past 40 years … an era characterized by falling inflation

S&P500 P/E Ratio



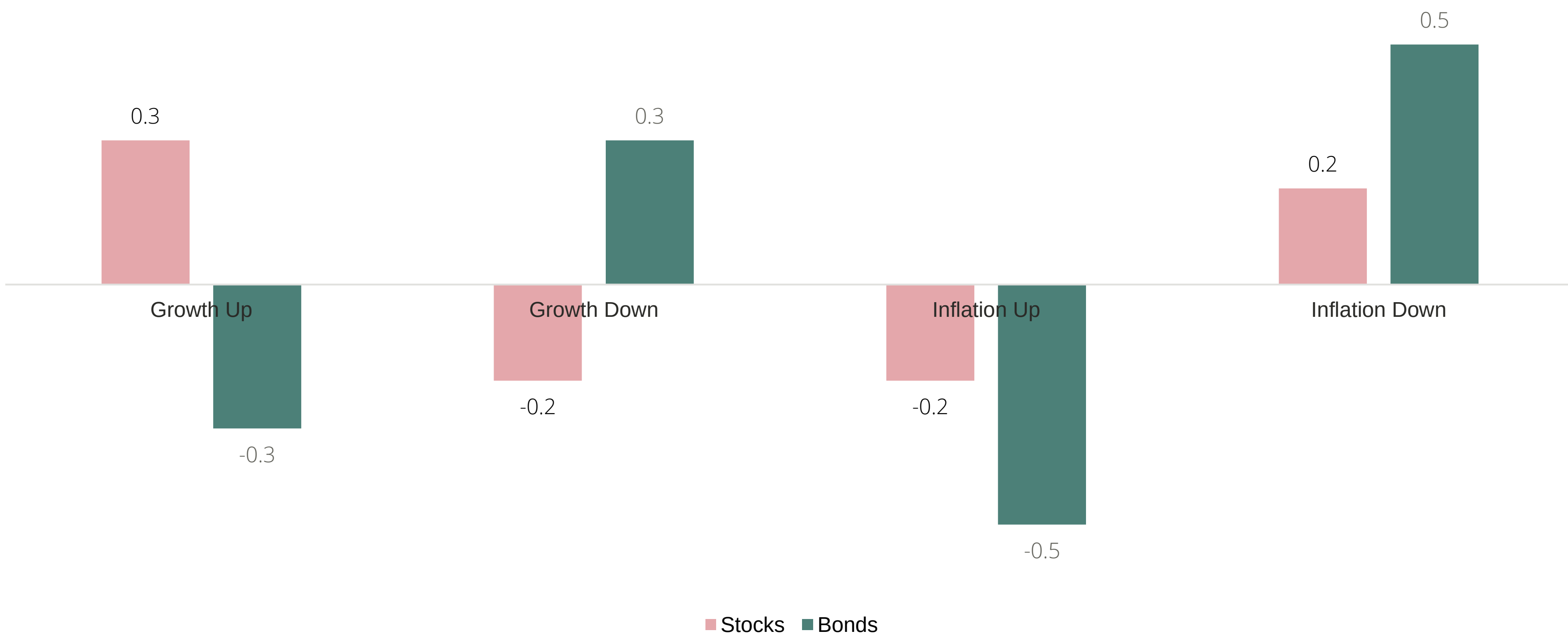
US 10Y Yield (%)



Source: Bloomberg LP

When we widen our lens to incorporate more varied macroenvironments a different picture appears

Sharpe Ratio Differentials by Macro-economic Environment 1972-2022



Source: Journal of Portfolio Management 49:4 March 2023

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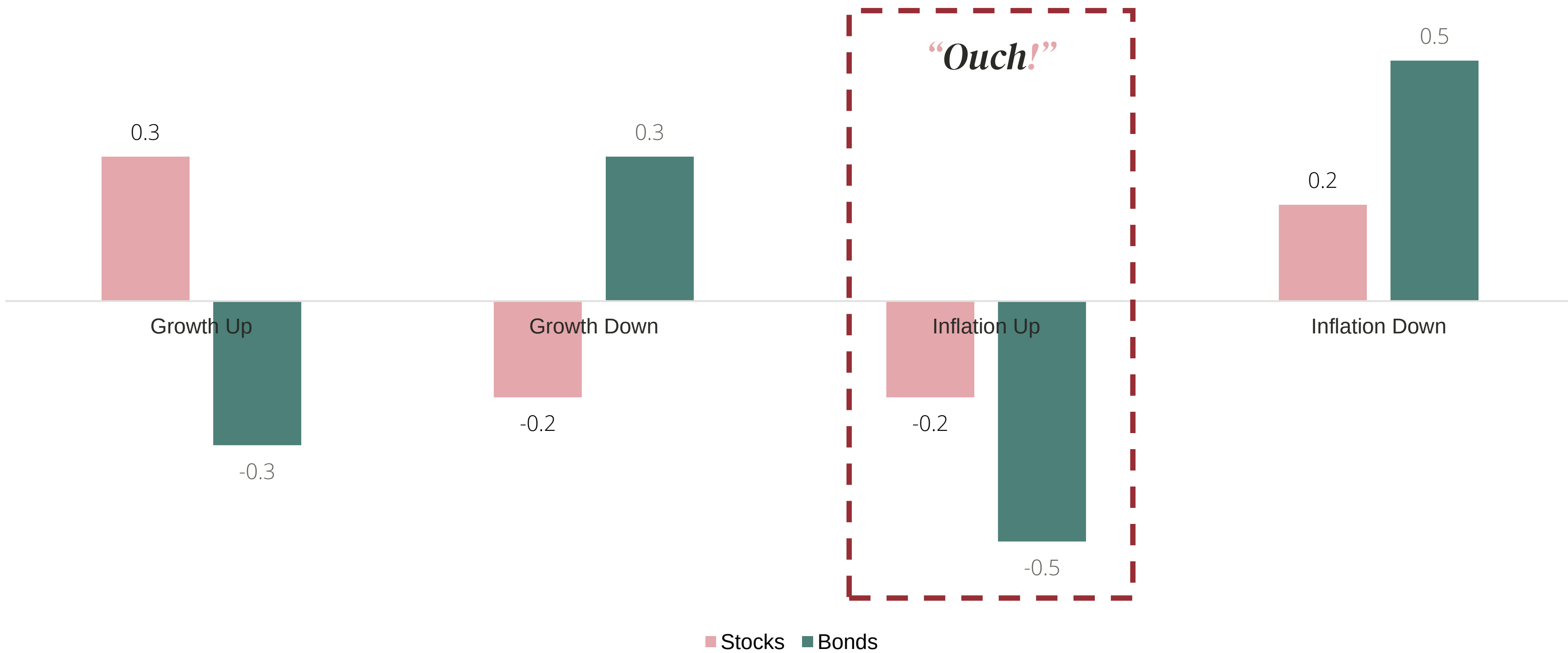
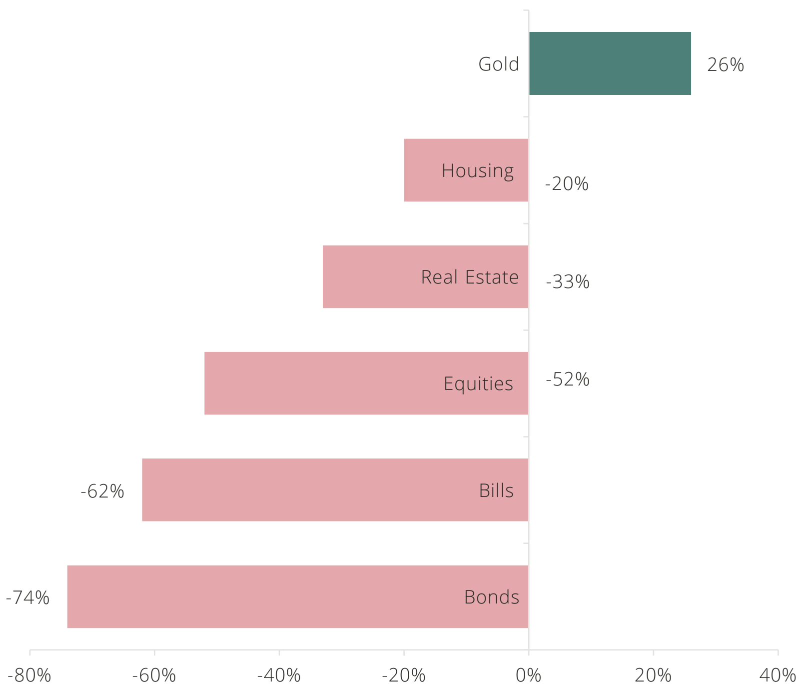


Source: Journal of Portfolio Management 49:4 March 2023

PORTFOLIO CONSTRUCTION

And it is not just bonds and equities that suffer when inflation is high…

Real Return vs. Inflation 1900-2011



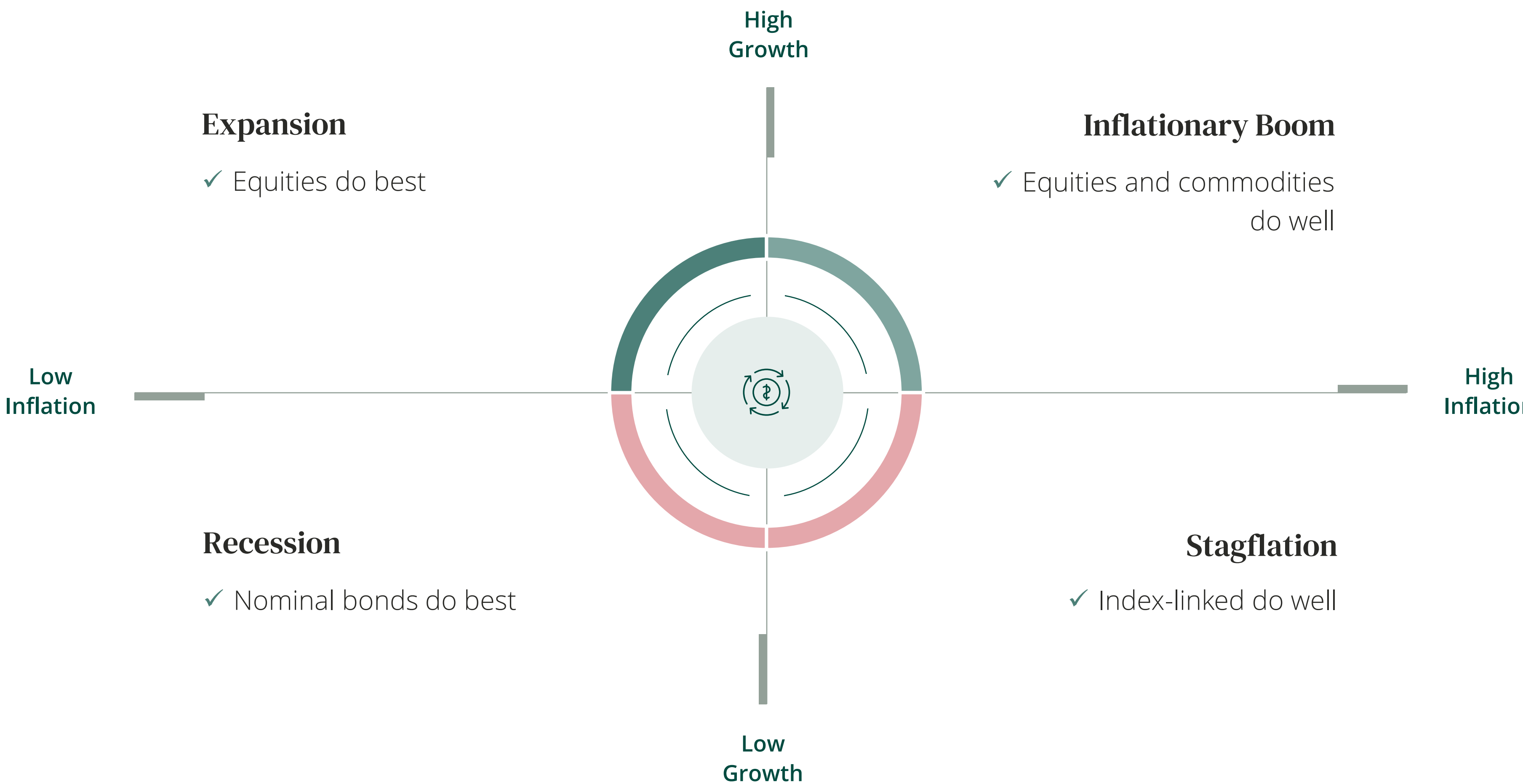
Regression of annual real return vs. same-year inflation across 19 developed countries

> “For a variety of reasons reviewed here, inflation tends to raise investors’ required real rate of return on equity and to lower real capital income for tax-related reasons. As a result there is a strong negative correlation between inflation and real and nominal stock prices.”

John Tatom, Nov 2011
Inflation and Asset Prices

Source: Credit Suisse Global Investment Returns Yearbook 2012, Dimson and Marsh

Index-linked bonds are the most reliable protector against stagflation



PORTFOLIO CONSTRUCTION

Index-linked bonds are the most reliable protector against stagflation

High Growth

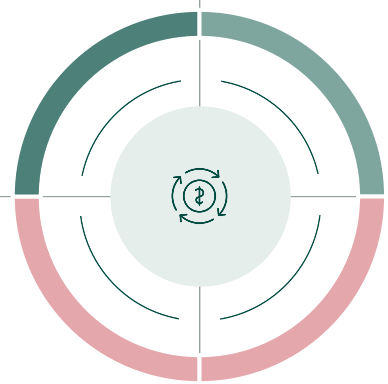
Expansion

- ✓ Equities do best
- ✓ Commodities do well
- × Index Linked do poorly
- × Nominal bonds do poorly

Inflationary Boom

- ✓ Equities do best
- ✓ Commodities do well
- ✓ Index-linked do fine
- × Nominal bonds do poorly

Low Inflation



High Inflation

Recession

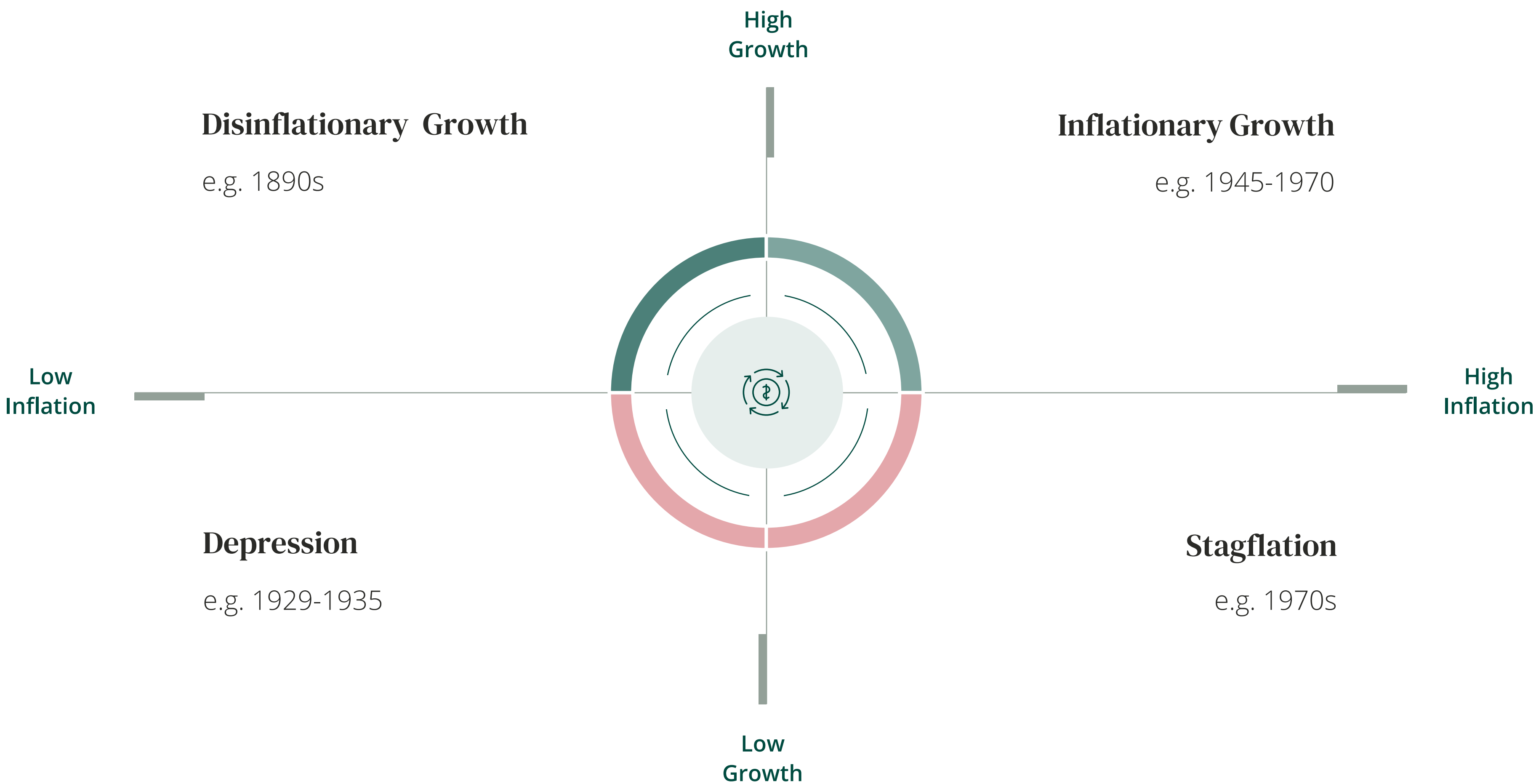
- ✓ Nominal bonds do best
- ✓ Index-linked do well
- × Equities do worst
- × Commodities do poorly

Stagflation

- ✓ Index-linked do well
- ✓ Commodities (esp. Gold do well)
- × Equities do poorly

Low Growth

What is true for the business cycle is also true for long-term Macroeconomic regimes



PORTFOLIO CONSTRUCTION

Index-linked bonds have outperformed nominal bonds since the turn of the century. We believe this outperformance will continue

Index-Linked Bond – Total Returns (UK)

Index-Linked Bond – Total Returns (US)

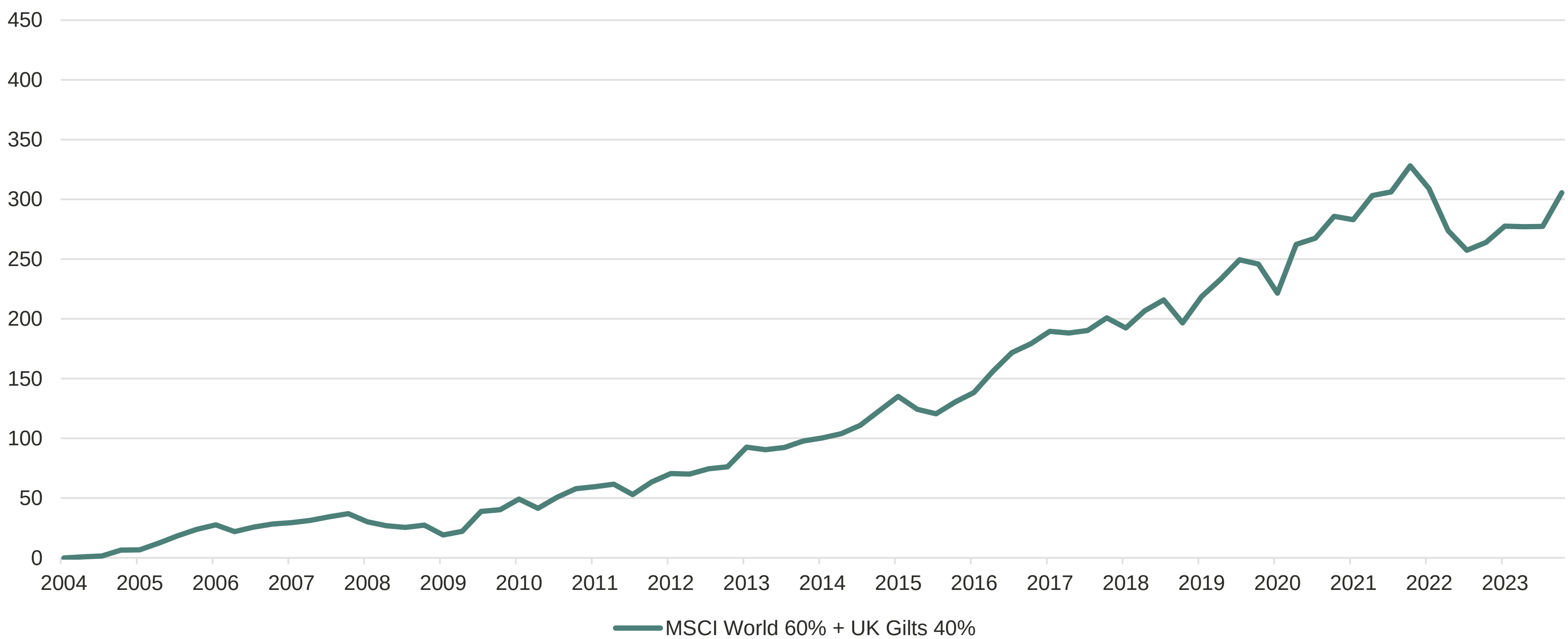
Source: Bloomberg Finance L.P.

Past performance is not indicative of future results

PORTFOLIO CONSTRUCTION

Adding index linked to a balanced portfolios improves returns

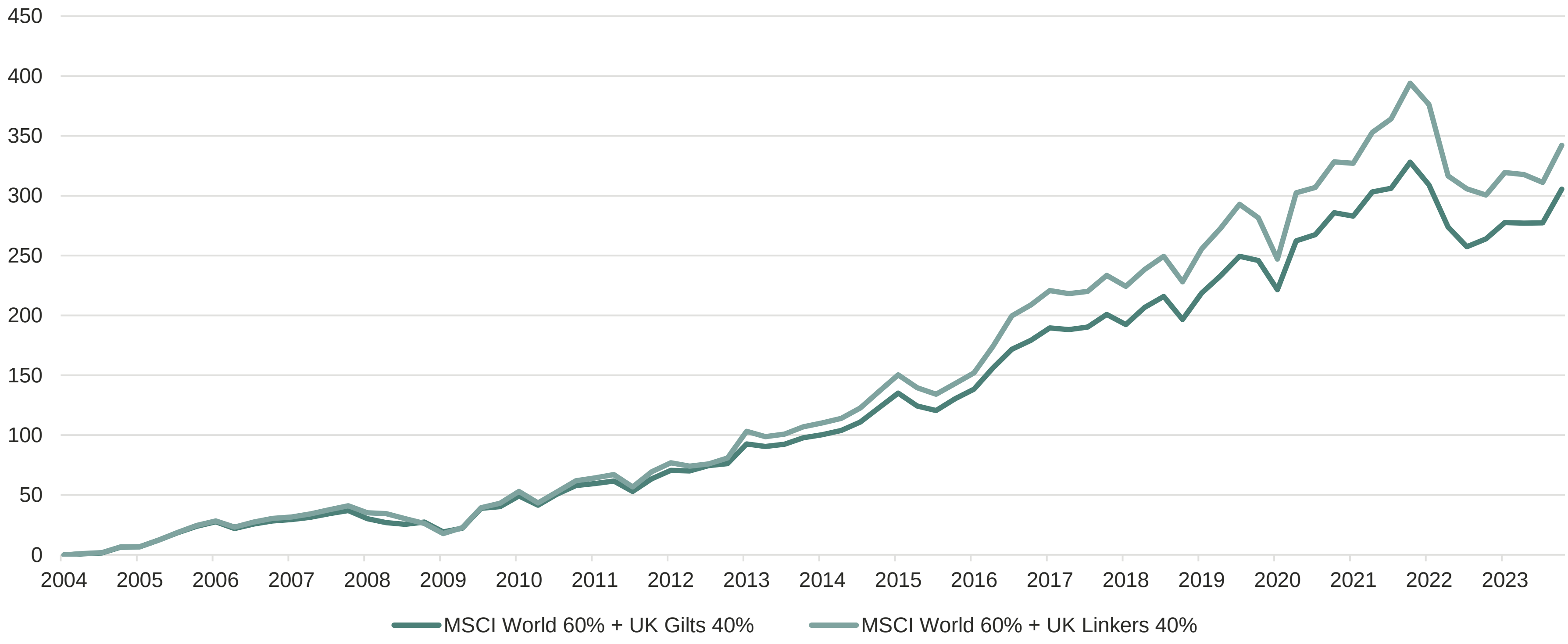
Balanced Portfolio Total Returns (GBP, % Mar 04 - today)



Source: Bloomberg LP, CGAM calculations

Adding index linked to a balanced portfolios improves returns

Balanced Portfolio Total Returns (GBP, % Mar 04 - today)

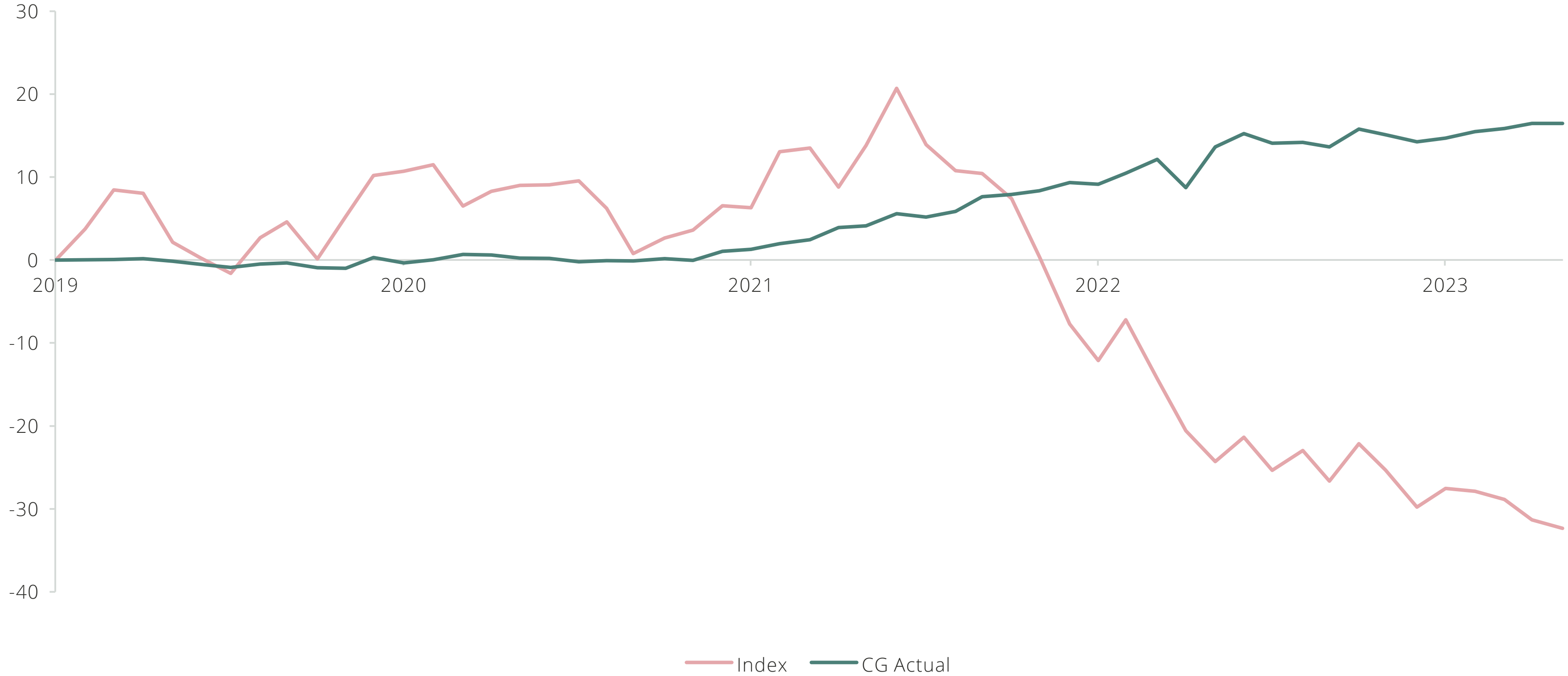


Source: Bloomberg LP, CGAM calculations

PORTFOLIO CONSTRUCTION

Our holdings of UK linkers have dramatically outperformed the index in recent years

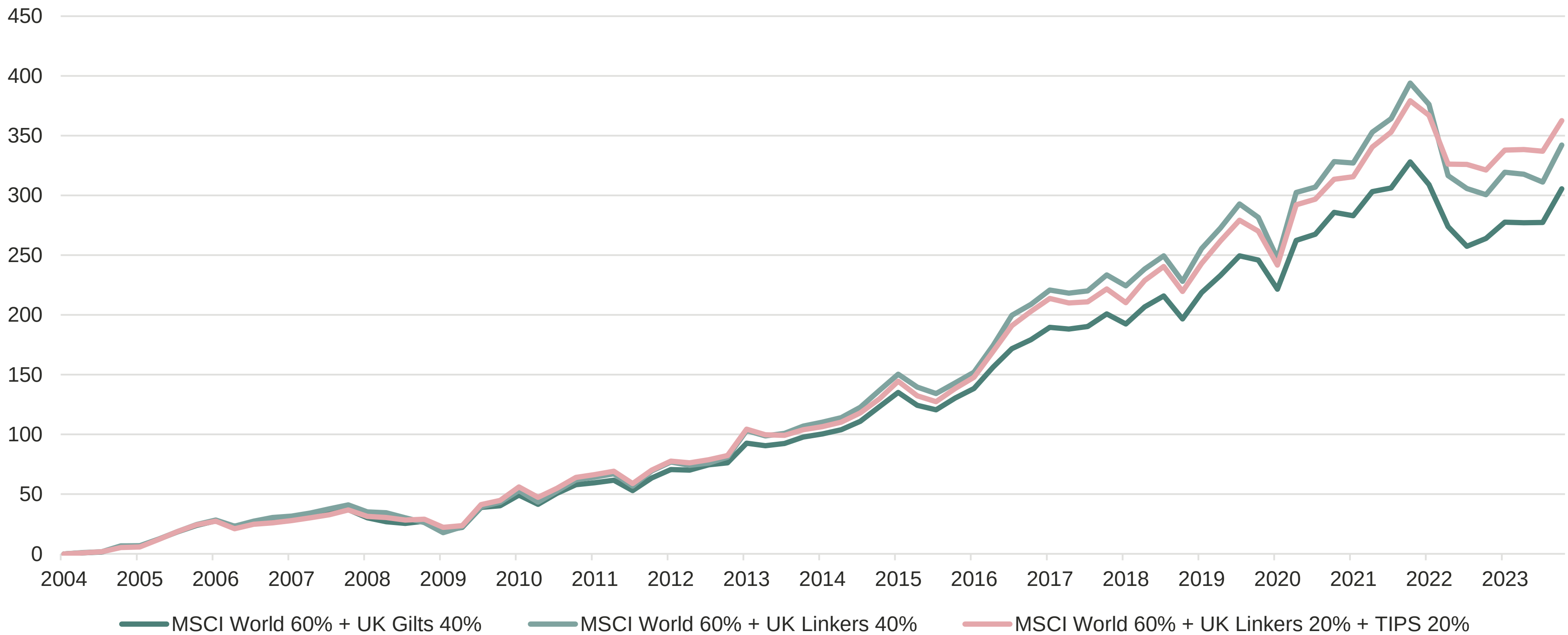
CG Performance – UK Linker Holdings



CG Actual represents performance of CGAM UK index linked holdings within Capital Gearing Trust. Index refers to Bloomberg UK Govt Inflation-Linked All Maturities Total Return Index. Please note these analyses are theoretical and should be construed in that light.
Source: Northern Trust, Bloomberg Finance L.P., CGAM

Adding index linked to a balanced portfolios improves returns

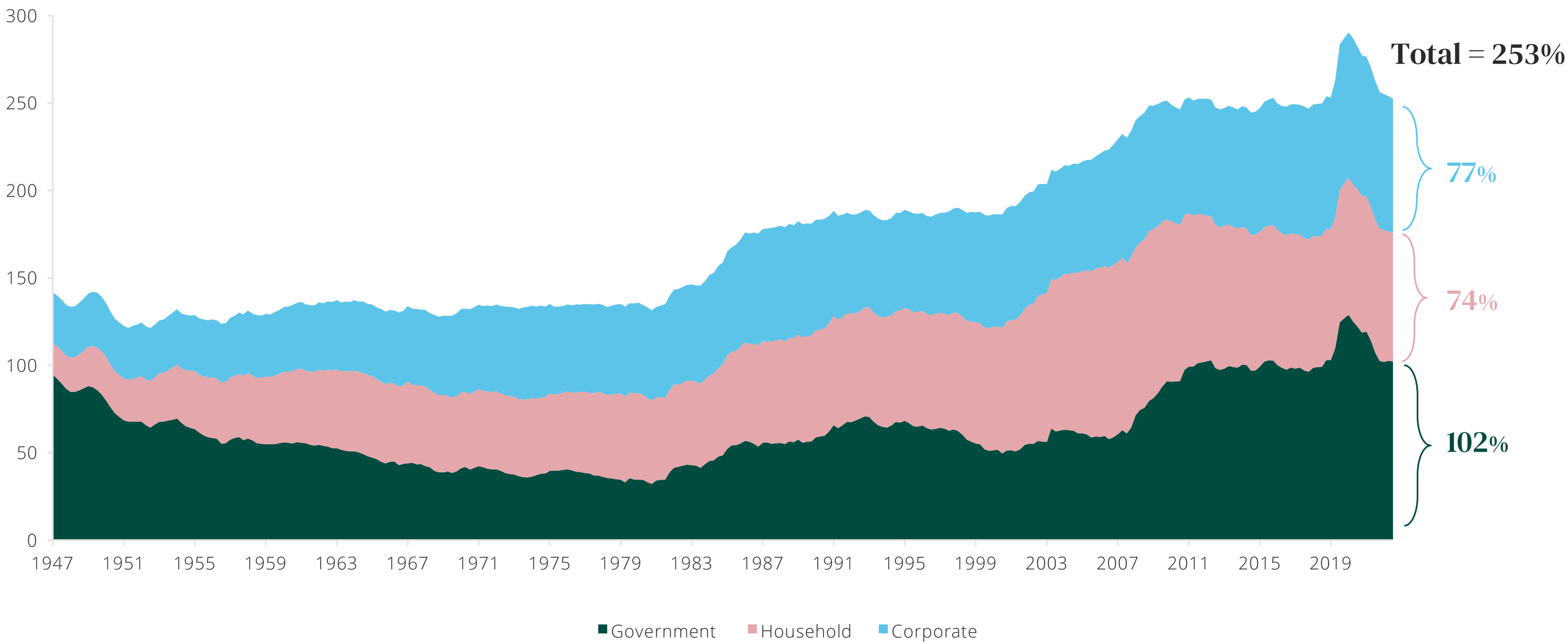
Balanced Portfolio Total Returns (GBP, % Mar 04 - today)



Source: Bloomberg LP, CGAM calculations

The fundamental problem the global economy faces is one of too much debt

US Non-Financial Debt to GDP (%)



Source: Bank for International Settlements, numbers rounded to nearest percentage point

Next steps

ANOTHER TIME...

We haven't been able to cover everything today, but we may cover off more in a future 'advanced' course:

1. Old vs. new style index-linked bonds
2. Seasonality effects
3. Curve fitting
4. Curve positioning
5. Adjusting yields for RPI/CPI differences
6. And lots more...

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