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Tail risks in the future

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The sting in the tale…

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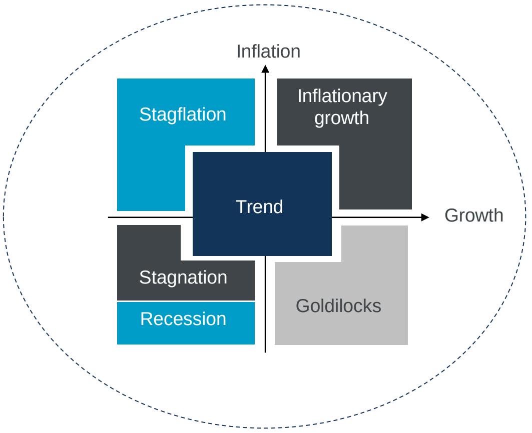
What are tail events and why do we care?

- Outside of likely outcomes
- Potentially extreme
- “Death Events”?
- Change course permanently
- Hard to quantify
- Swans vs. ugly ducklings



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Black swans

- High-impact, hard-to-predict, rare
- Non-computable
- Hindsight

Nassim Nicholas Taleb, The Black Swan (2007)

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White swans

- *"Contrary to conventional wisdom, crises are not black swans but white swans: the elements of boom and bust are remarkably predictable"*


Nouriel Roubini, Crisis Economics (2011)

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The changing landscape

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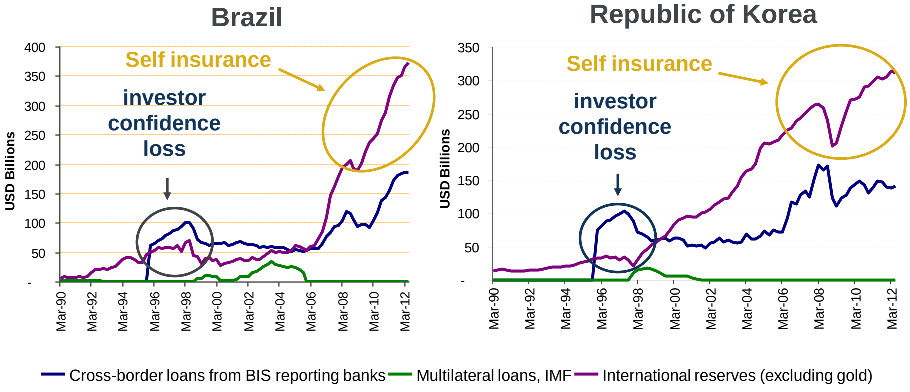
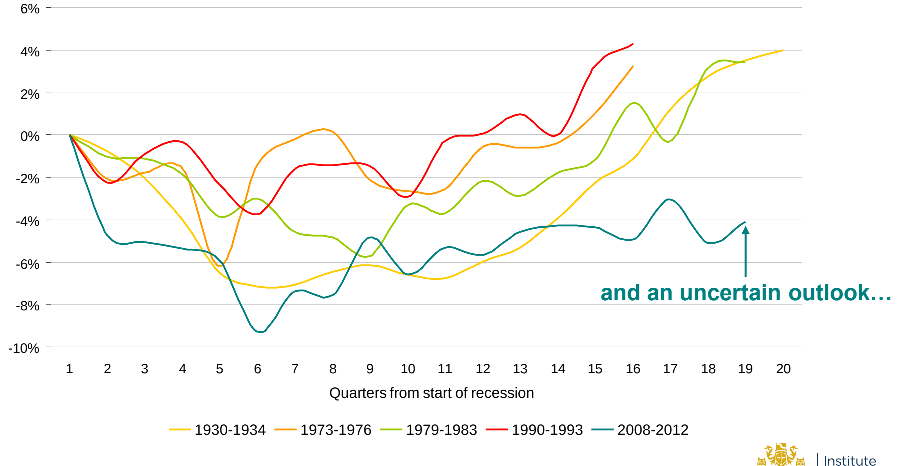
Shift in emerging market vs. developed market risks

Learning from past problems



Source: Joint BIS-IMF-OECD-WB External Debt Hub

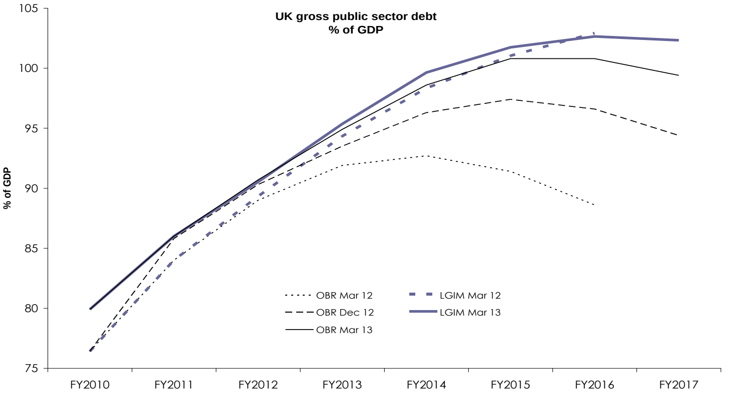
Starting from a precarious position



Source: ONS

Walking a financial repression tightrope

- Cap interest rates
- Create and maintain a captive domestic audience
- In the long run we're all debt



Sources: LGIM, Office of Budgetary Responsibility, "The liquidation of government debt", Carmen M. Reinhart, M. Belen Sbrancia, Working Paper 16893, National Bureau of Economic Research

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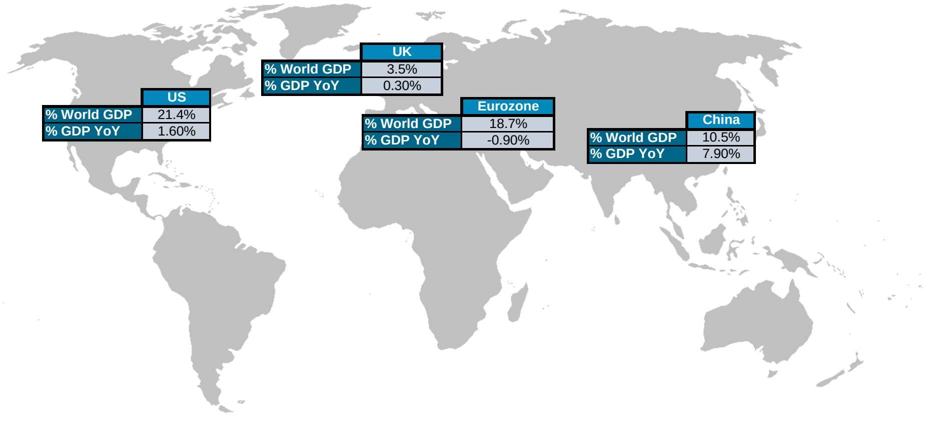
World GDP growth



Source: Bloomberg, ONS

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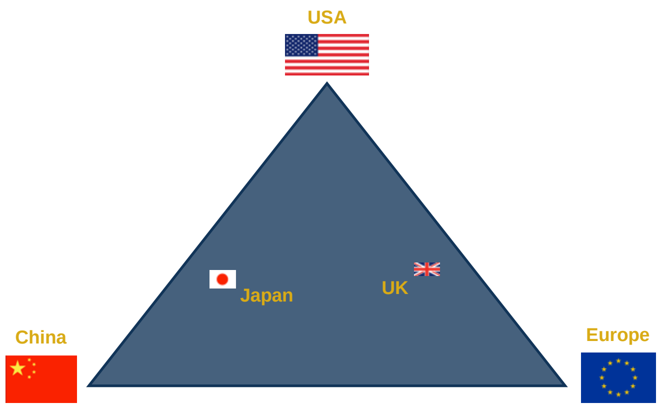
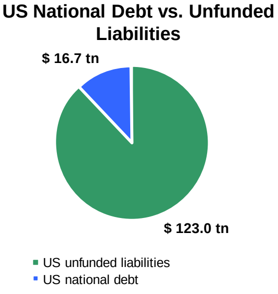
Fault lines

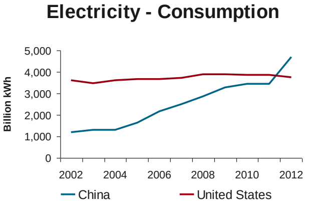
- "Too big to fail" economies?
- Contain country shocks

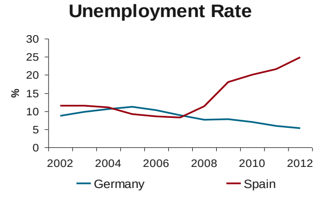


Macroeconomic shock drivers

Debt | **Resources** | **Equality**







Source: US Treasury, Federal Reserve

Source: CIA World Factbook

Source: IMF

Right here, right now

- Debt overhang to last generations
- Money printing and inflation bias
- Unfunded liabilities on top

- Risk of a wealth monopoly
- Loss of jobs in tradable sectors

- Capacity constraints, prone to supply shocks

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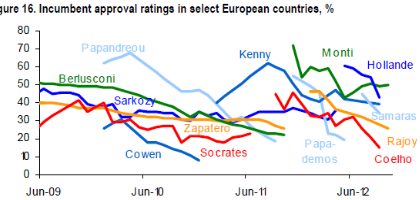
Politics and Policy

- Coalitions
- Split power
- Populist parties

Figure 16. Incumbent approval ratings in select European countries, %



Source: Citi Research, national press, national polling agencies

- Competitiveness
- Benefits
- Capital and labour migration

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From chatter to matter – Quantifying scenarios

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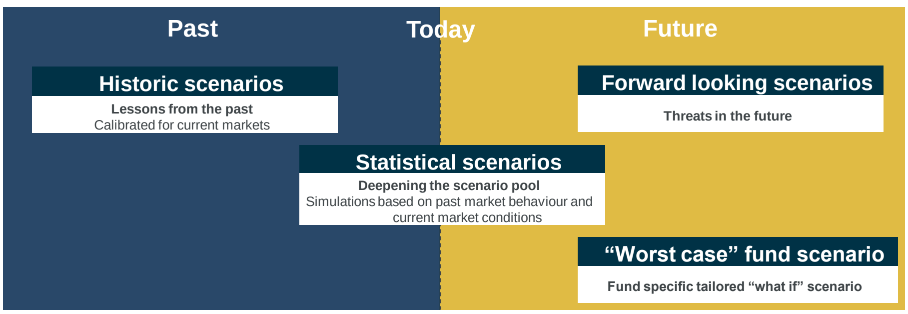
Tail risk hedging

A robust estimation of downside risks

- From abstract ideas to quantitative scenarios
- Discussion, challenge, consensus, review



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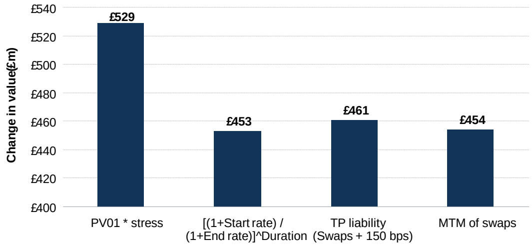
Why simplifications don’t work well

Estimating liability values and swap MTM



Calculation	Error
PV01 * Stress	16.5%
[(1+Start rate) / (1+End rate)] ^ Duration	-0.2%
Change in TP liabilities	1.5%
Correct swap MTM	0%

1. “PV01 * Stress “ can be significantly misleading
2. “[1+ start rate / 1 + end rate]^ duration“ is much closer
3. Can be misleading to consider hedges as a proportion of TP liability risk

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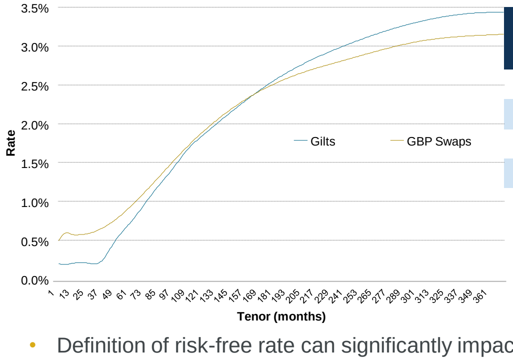
Why simplifications don’t work well

Expected returns assumptions



Tenor / Projection (Years)	Gilts p.a.	GBP Swaps p.a.	Spread p.a.	Cumulative Error
5	0.7%	0.9%	0.2%	1.1%
10	1.8%	1.9%	0.0%	0.4%
15	2.5%	2.5%	0.0%	-0.6%
20	3.0%	2.8%	-0.2%	-3.7%
30	3.4%	3.1%	-0.3%	-8.3%

- Definition of risk-free rate can significantly impact projected assets
- Allowance for downgrades and defaults is often overlooked, it reduces credit returns by c.25bps p.a.

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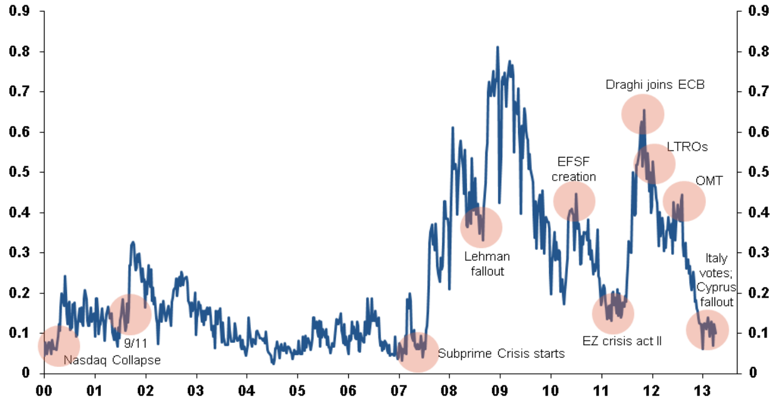
Receding tail risks or complacency?



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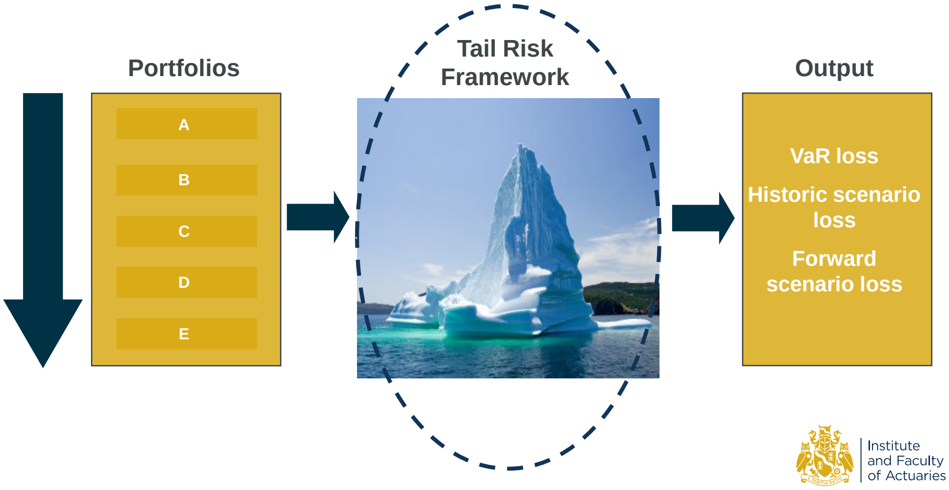
Understanding sensitivity of alternative candidate portfolios



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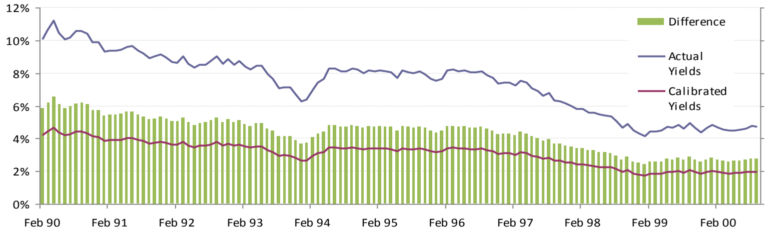
Historic scenario example: Japan's Lost Decade(s)

UK government yields – original & recalibrated for current interest rate levels



Data source Bloomberg L.P.

- Banking deregulation and high saving led to excessive lending, particularly in real estate
- Reduced interest rates failed to stimulate the economy, with investors reluctant to take risk
- Growth was anaemic and inflation steadily fell, along with ongoing banking stability issues
- Stimulus packages misallocated capital and rising fiscal concerns led to mixed policies

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Stagflation scenario – a brief description

- **Year 1&2 – Austerity Plus More QE (see Debt Deflation)**
  - Weak UK and US growth - government austerity and consumer deleveraging, corporates remain conservative
  - Fed Quantitative Easing effects are muted, more stimulus is required each time and desperate measures
- **Year 3 – Problems escalate as destabilising tendencies increase**
  - Stimulus generates real economic growth, but inflationary pressures increase. Realised inflation overshoots
  - Despite destabilising tendencies, governments and central banks continue austerity and monetary easing
  - Towards the end of the year, the economy is at a cliff's edge and financial markets show signs of a panic
- **Year 4 – Governments retain control over solvency and economic conditions, but growth suffers and inflation expectations have increased**
  - Government accepts higher interest rates and weaker economic performance
  - Growth stalls and a lack of further stimulus. Corporates focus on repaying debt, but suffer defaults
  - Previous monetary stimulus drives inflation to an elevated level of 5%
  - Belief remains that inflation is not spiralling out of control, but inflation expectations move up permanently

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Stagflation – impact on assets

Assets	Nominal Returns	Real Returns	Comment
GBP EQUITY	-19.5%	-38.4%	
EUR EQUITY	24.9%	6.0%	Unhedged
JPY EQUITY	15.0%	-3.9%	Unhedged
USD EQUITY	-10.4%	-29.3%	Unhedged
EMERGING MARKET EQUITY	20.0%	1.1%	Unhedged
GBP PROPERTY	-0.5%	-19.5%	
GBP CORP 10 YEAR	-11.1%	-30.0%	
EUR CORP 10 YEAR	-4.0%	-22.9%	Hedged
USD CORP 10 YEAR	-13.1%	-32.0%	Hedged
GILT LINKED 10 YEAR	19.2%	0.3%	
GILT 10 YEAR	-12.1%	-31.0%	
BUND 10 YEAR	-2.6%	-21.5%	Hedged
UST 10 YEAR	-12.1%	-31.0%	Hedged
OIL	11.6%	-7.3%	Unhedged
GOLD	29.0%	10.1%	Unhedged
ACTUAL RPI INFLATION	4.4%		Annual
EUR GBP	28.3%		
EM GBP	42.9%		
JPY GBP	21.9%		
USD GBP	10.0%		

- The (GBP) returns above are expected cumulative asset class returns over the 4-year scenario horizon
- The more extreme the scenario, the greater uncertainty and views across this scenario differ significantly
- Given heightened uncertainty it is more appropriate to analyse market impacts as broad asset classes
- Excessive focus on specific markets could lead to over confidence in actions taken to mitigate this scenario

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Attribution by risk driver across scenarios

Focus in on fewer, key scenarios based on likelihood and impact

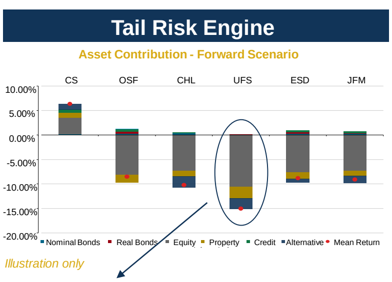
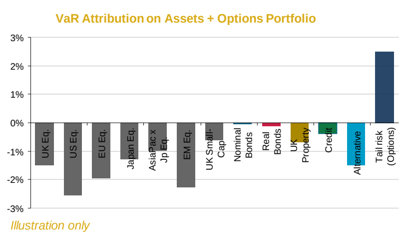


Illustration only

- ✓ Identify key risks and drivers
- ✓ Assess alternative hedge attractiveness
- ✓ Build a safety net

- ✓ Improving asset allocation
- ✓ Opportunistic hedging
- ✓ Systematic hedging



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