

Economics and the Defined Benefit pension problem

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September 2009

The future of Defined Benefit pension provision

- According to the latest Association of Consulting Actuaries survey of pension trends amongst employers:
 - 69% of the defined benefit (DB) schemes surveyed are closed to new entrants but remain open to new accruals, while 18% are closed to both new entrants and to future accrual.
- The survey also found that:
 - 34% of DB schemes are under active review
 - 39% of the employers surveyed are considering changes to future accrual
 - 35% are considering moving to a career average revalued earnings formula
 - 22% are considering moving to defined contribution (DC)
- DB pension provision will eventually be a thing of the past

The defined benefit problem*

*See Brigden, A., Clare A, R. Driver, M. Selvaggi (2009), 'The Road To Buyout', Pensions, p.90-110

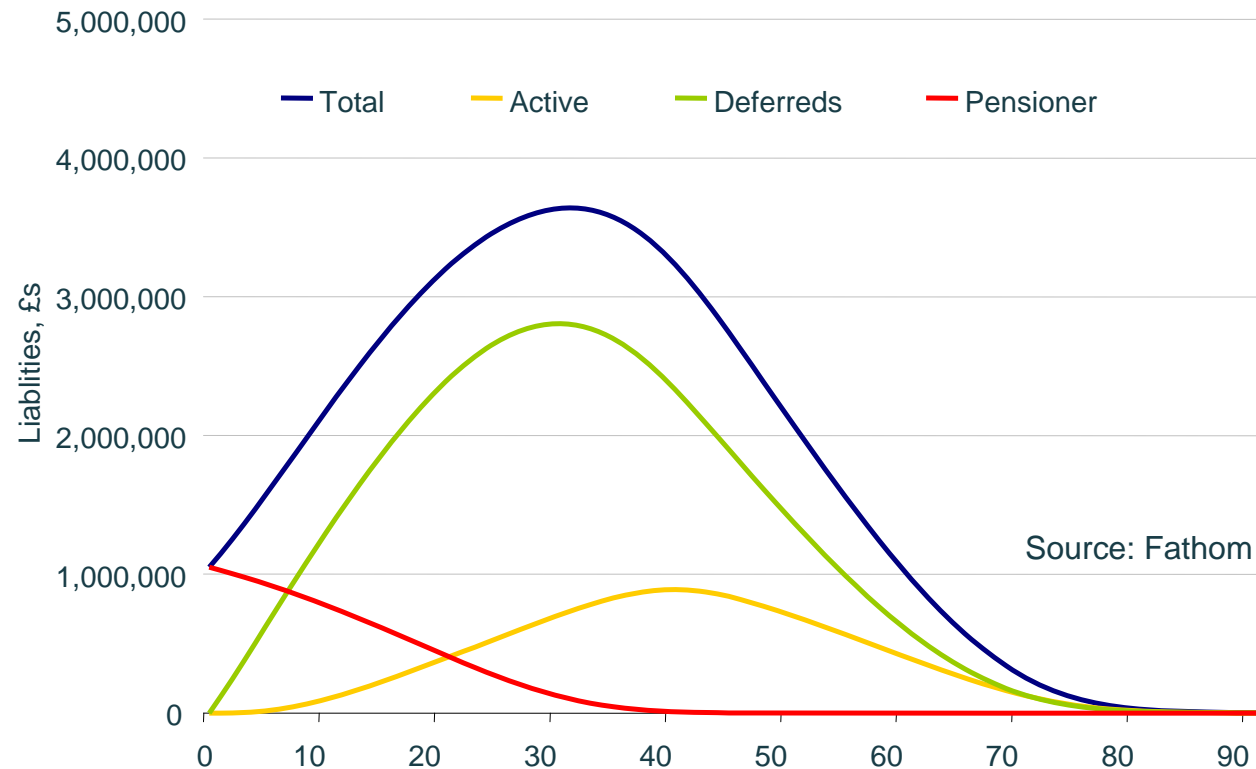
A typical scheme

- DB scheme closed to new entrants but open to future accrual
- Key parameters include:
 - scheme opened in 1970 and closed in 2003
 - scheme membership representative of UK labour force
 - pay scales relative to national average – 1.0
 - rate at which pension benefits accrue $\frac{1}{80}$ of “final” salary per year of service
 - years of service over which “final” salary is averaged – 3 years
 - post 1997 benefits inflation-linked
 - men retire at 65; women at 60
 - mortality: GAD medium cohort (2004)

Scheme funding characteristics

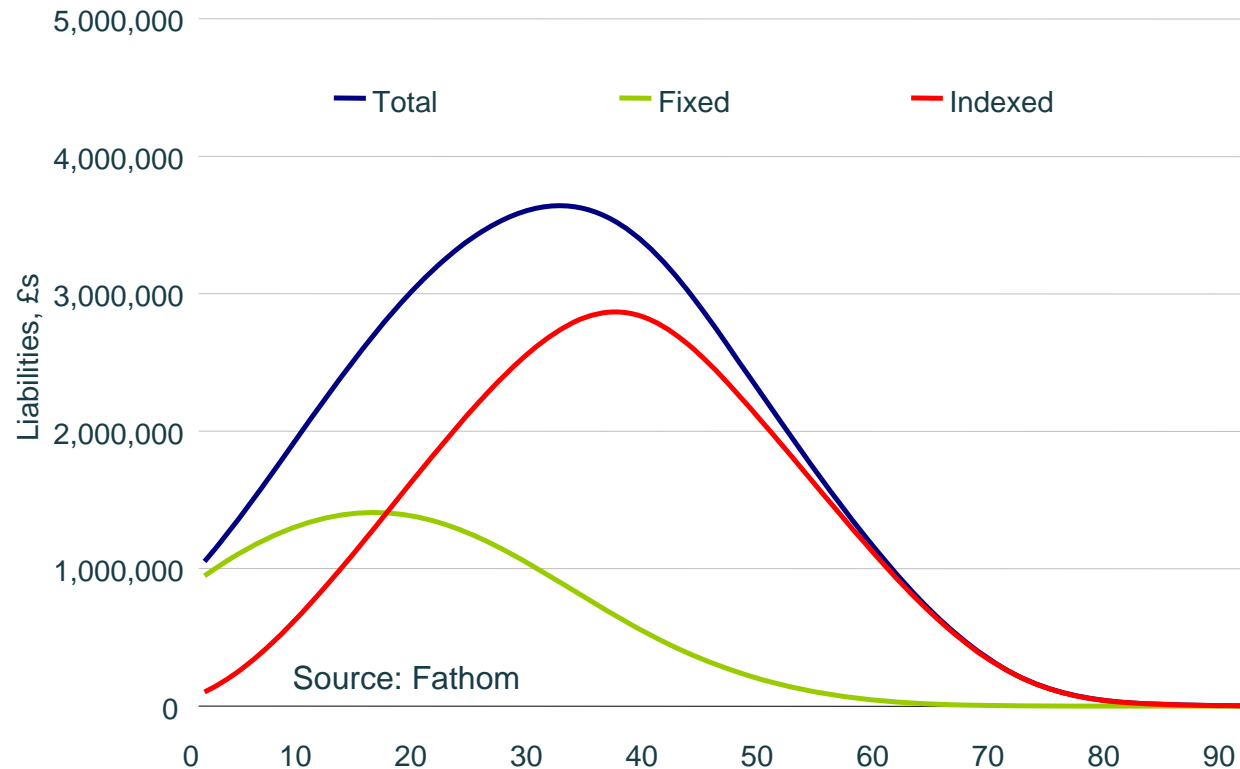
- Key parameters include:
 - employer and employees contribute 6%pa of gross pensionable salary
 - additional employer contributions possible/probable
 - asset allocation, a typical allocation being:
 - UK equities 50%
 - Gilts 10%
 - Index-linked gilts 10%
 - £ corps (BBB) 30%

Make up of membership



- Deferred (62%) and active (12%) members represent the bulk of pension fund liabilities
- This is typical of many schemes

Fixed v inflation-linked cash flows



- Pension promise prior to 1997 fixed, after 1997 LPI(0,5)
- Significant inflation exposure in this scheme

The DB problem

- To invest scheme assets such that it maximises the likelihood of providing the promised benefits
- Strategy should not imperil the scheme sponsor
- With the benefit of hindsight we can now see that the DB promises were overly generous.
- Who would start a company today and set up a 1/80th DB scheme?

The risks inherent in liabilities

- The pension promise:
 - payment of pension until death
 - a fixed pension promise: like issuing a conventional bond
 - an inflation-linked pension promise: like issuing an index-linked bond (RPI, LPI(0,5), LPI (0,3))
- The scheme is in the position of any bond issuer but:
 - committed to substantial index-linked payments
 - uncertain about when the “bond” will mature

The risks inherent in scheme assets

- Asset allocation:
 - what return will the assets produce ... over the next few decades ?
 - how volatile will these returns be ?
 - how correlated will the returns be ?
 - should asset allocation be static, or dynamic ?

The risks around the covenant

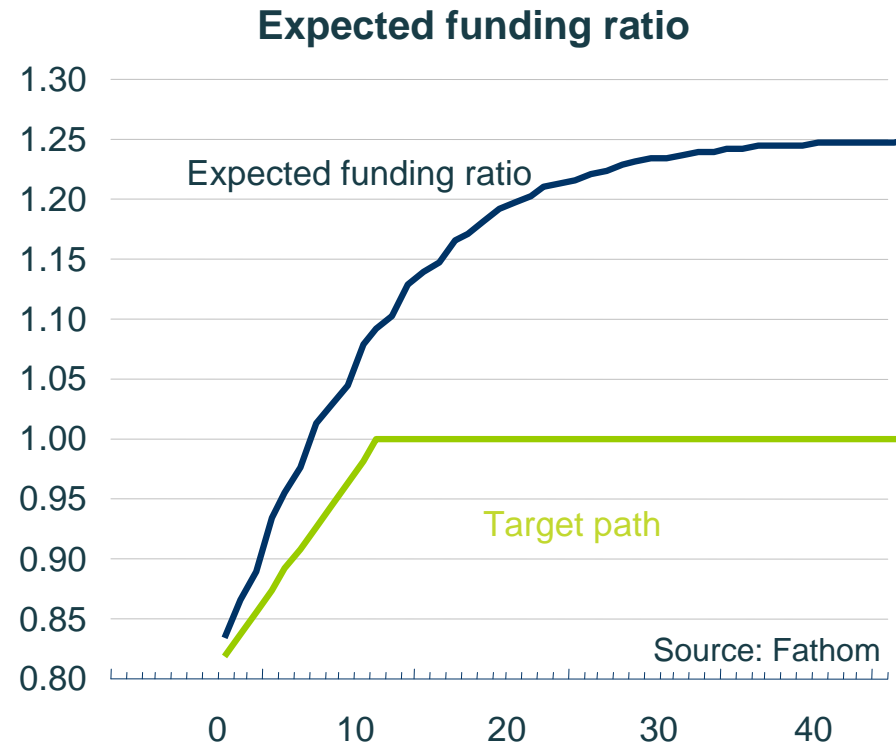
- How committed is the sponsor to the scheme?
 - what sort of business are they in?
 - can they be relied upon to top up the scheme
 - what is their leverage/credit rating ?

Simulating the problem

What are some of the economic ingredients?

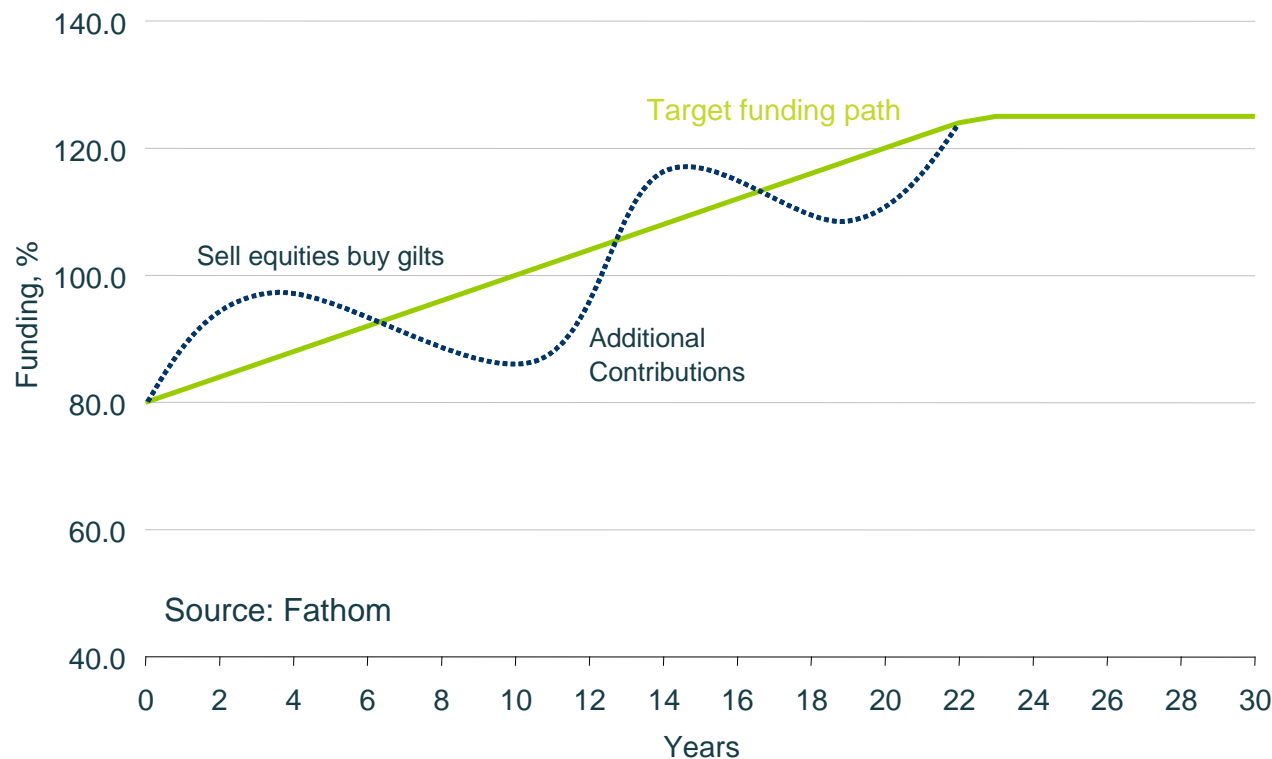
- Longevity assumptions
- Growth environment (productivity)
- Inflation environment
- Interest rate environment
- Asset class returns, volatilities and correlations
- Credit quality of scheme sponsor
- What sort of analysis are we trying to undertake ...

The “expected” outcome



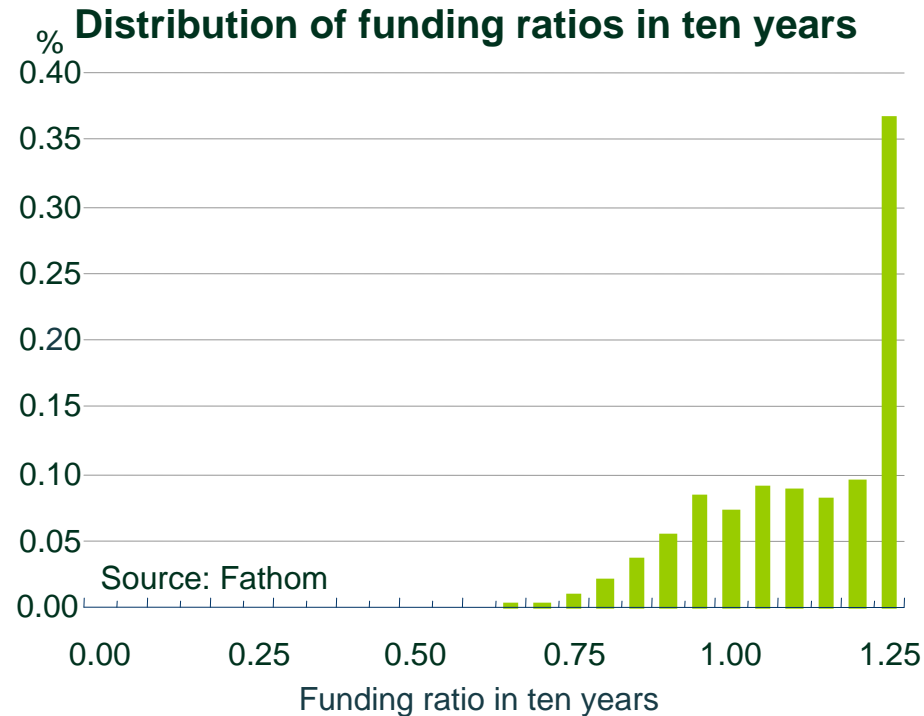
- Assume the scheme begins life with a 20% deficit
- If expectations are fulfilled the scheme will be more than fully funded within ten years, though it only just gets to a buy-out level

Contribution/asset allocation strategy



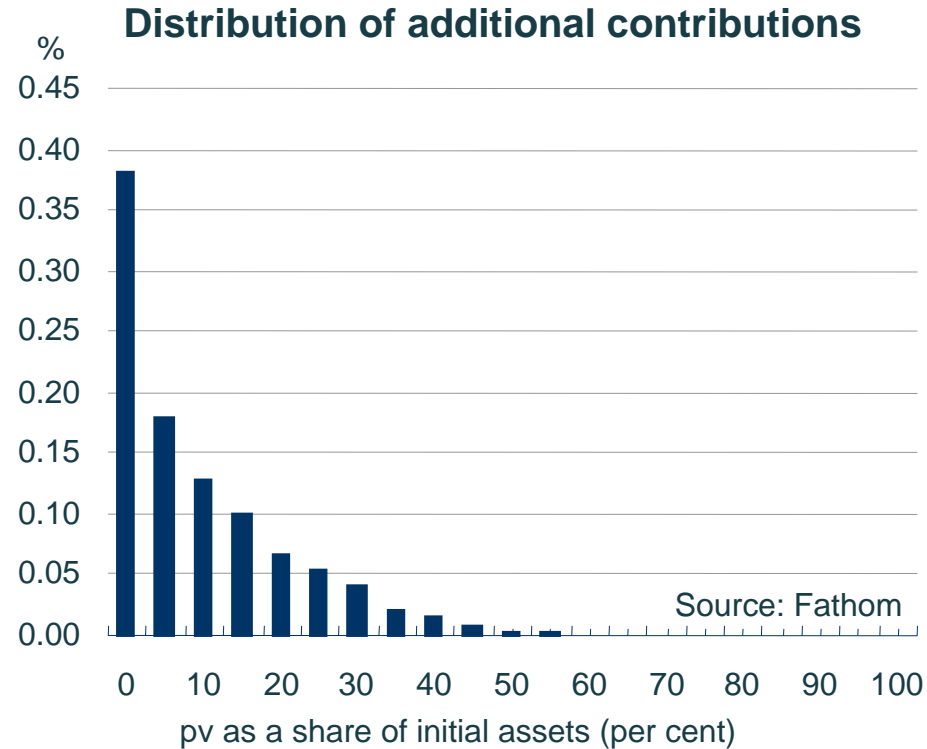
- Every three years, if the scheme is:
 - below the path, we ask them to inject 50% of the shortfall into the scheme;
 - 1% above, the scheme switches 2% from equities into gilts

Distribution of funding after ten years



- Having rolled the dice 2,000 times this is the distribution of the funding ratio in ten year's time – the Pension Regulator's preferred recovery plan length
- A 5% chance that the scheme will have funding of less than 80%

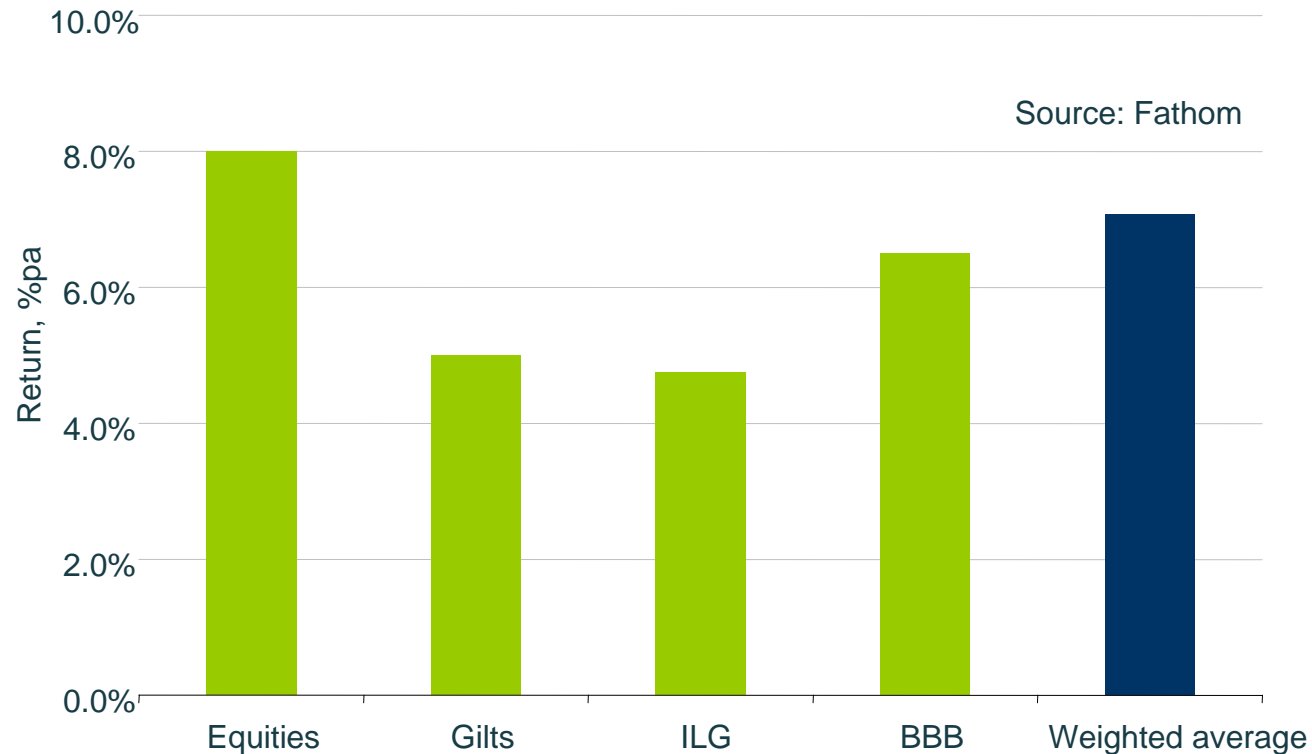
Distribution of additional contributions



- Burden on the scheme sponsor can be high in some cases
- 5% chance of having to top-up scheme by more than 30%

What influences the inputs?

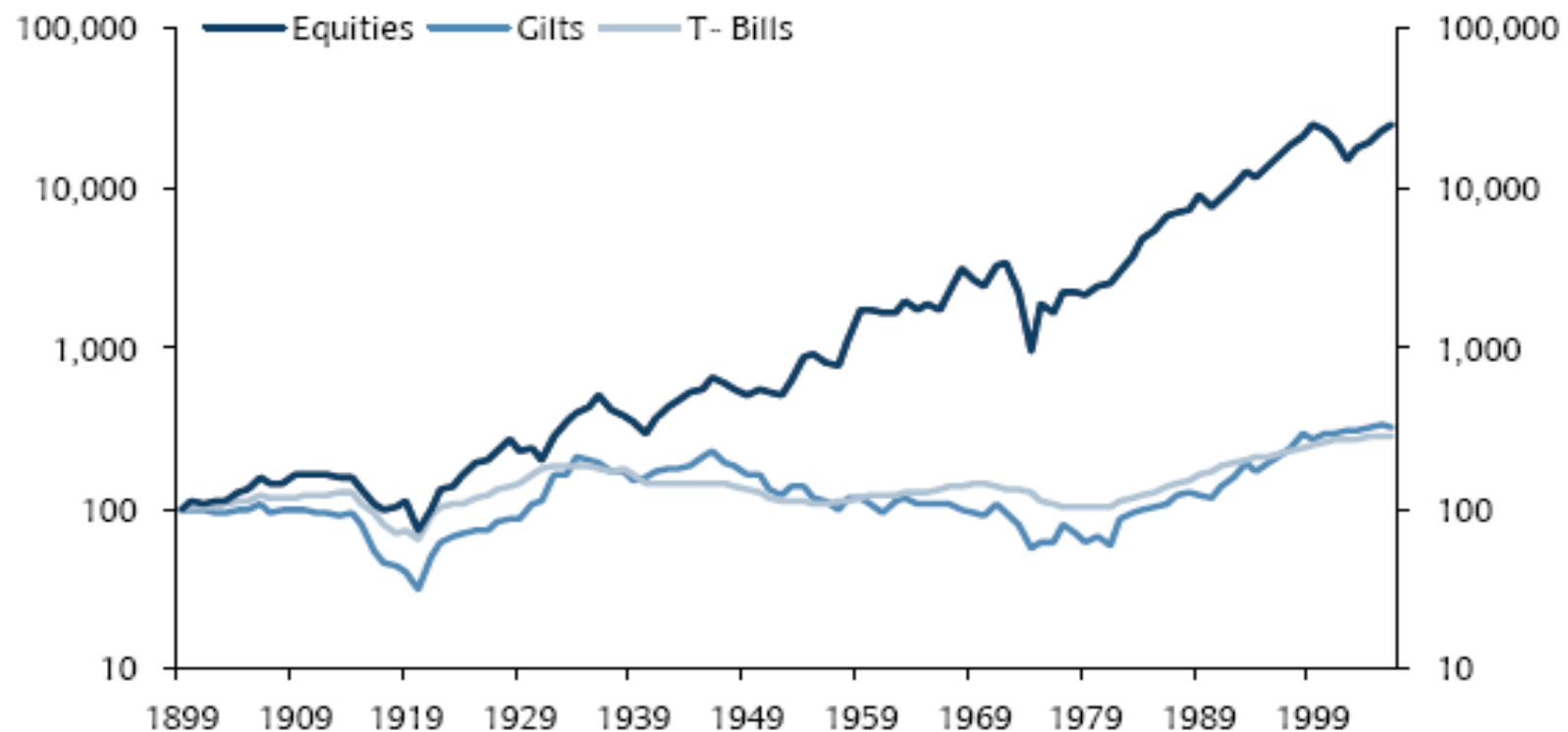
Expected return on assets



- These estimates are fairly close to the industry standard assumptions

A historic perspective on expected returns

Figure 86: Barclays total return indices in real terms with gross income reinvested



Source: Barclays Capital.

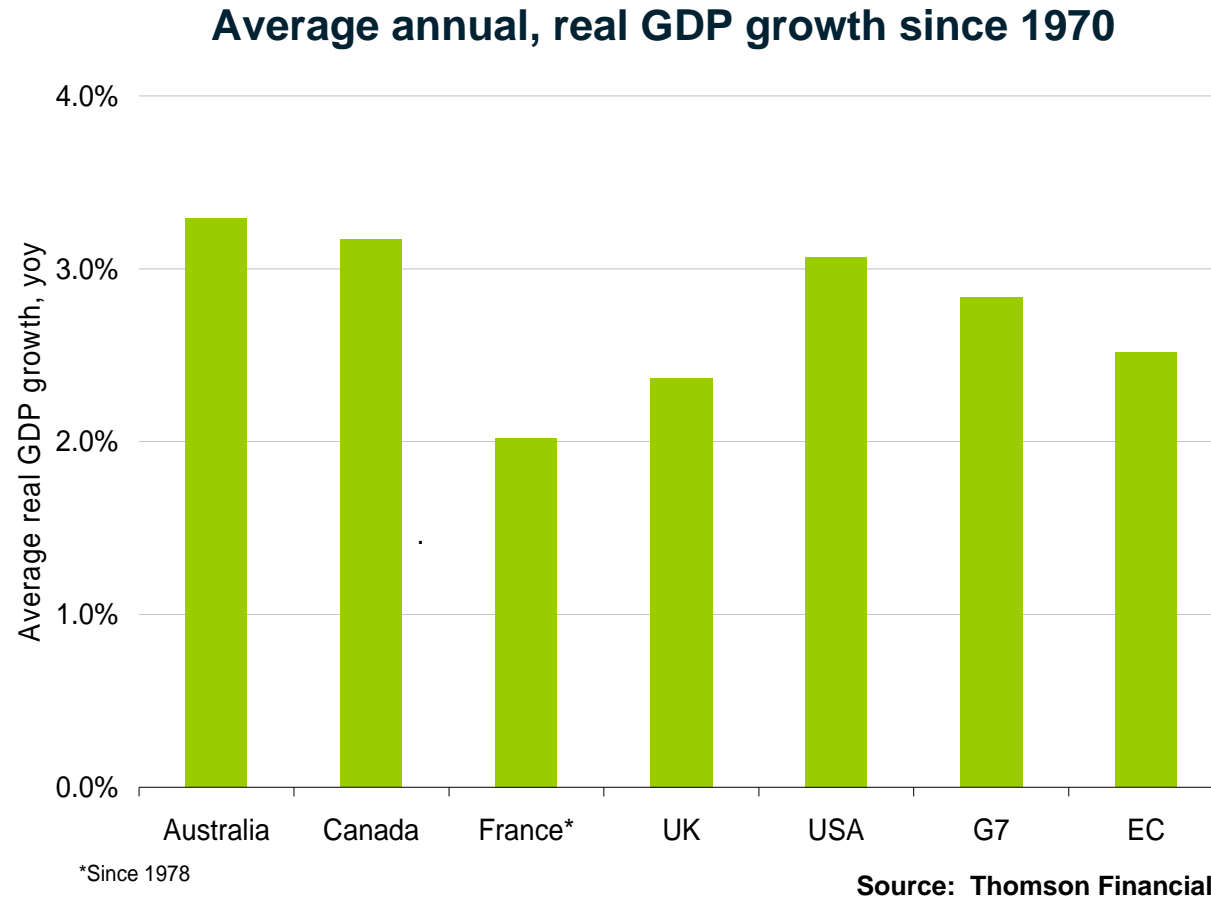
Long-term expected return components

- There are three components of expected return on all assets
 - Ex ante real return
 - Compensation for future inflation
 - Compensation for risk
- Let's begin by determining the “neutral rate”, which comprises the first two components

The ex ante real return

- In a world with no inflation and no risk, investors would still require a return from their investments, but how much ?
- It would depend upon the 'opportunity cost' of foregone consumption
- It's closely related to the potential growth rate of the real economy

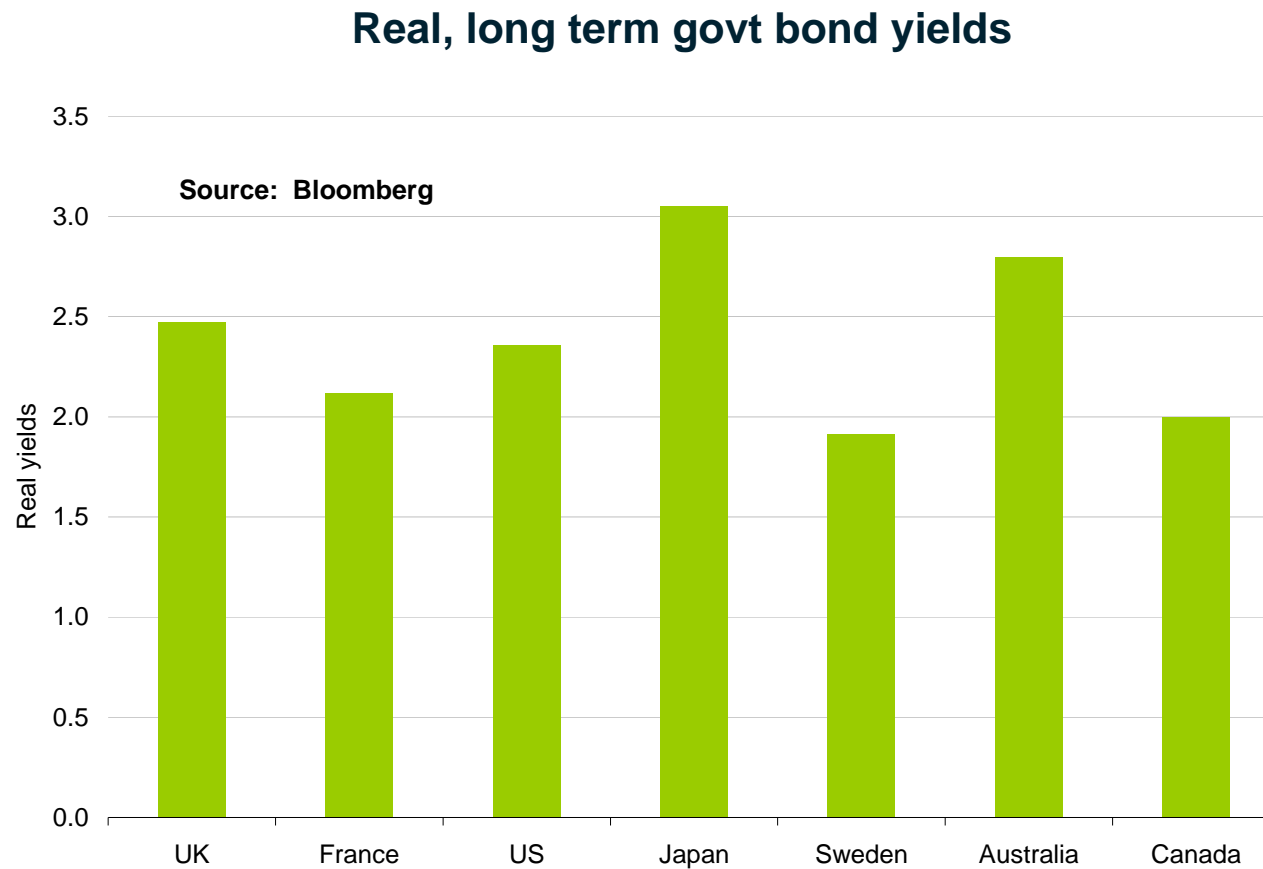
Average real GDP growth since 1970



The ex ante real return

- Despite many new inventions - railways, telephones, microchip, the internet etc - economic growth has actually been remarkably stable
- Perhaps then historic GDP growth will be a good guide to long term future real GDP growth
- On the other hand, is the credit crunch a paradigm shifting event ... the end of capitalism as we know it ?
- Such estimates probably a good proxy for the long term ex ante real return
- Yields on long-dated index-linked gilt market can give us a clue to what the market thinks about trend growth

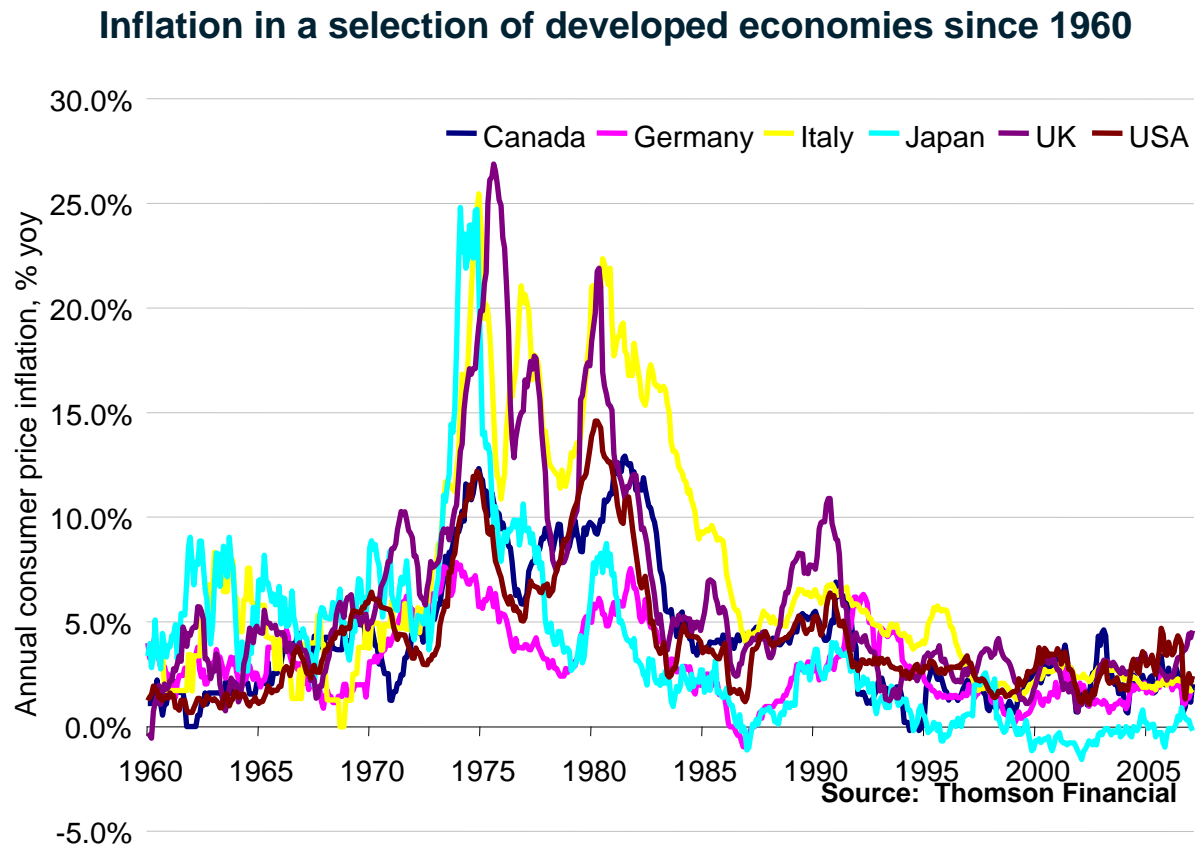
Yields on long-dated index-linked bonds



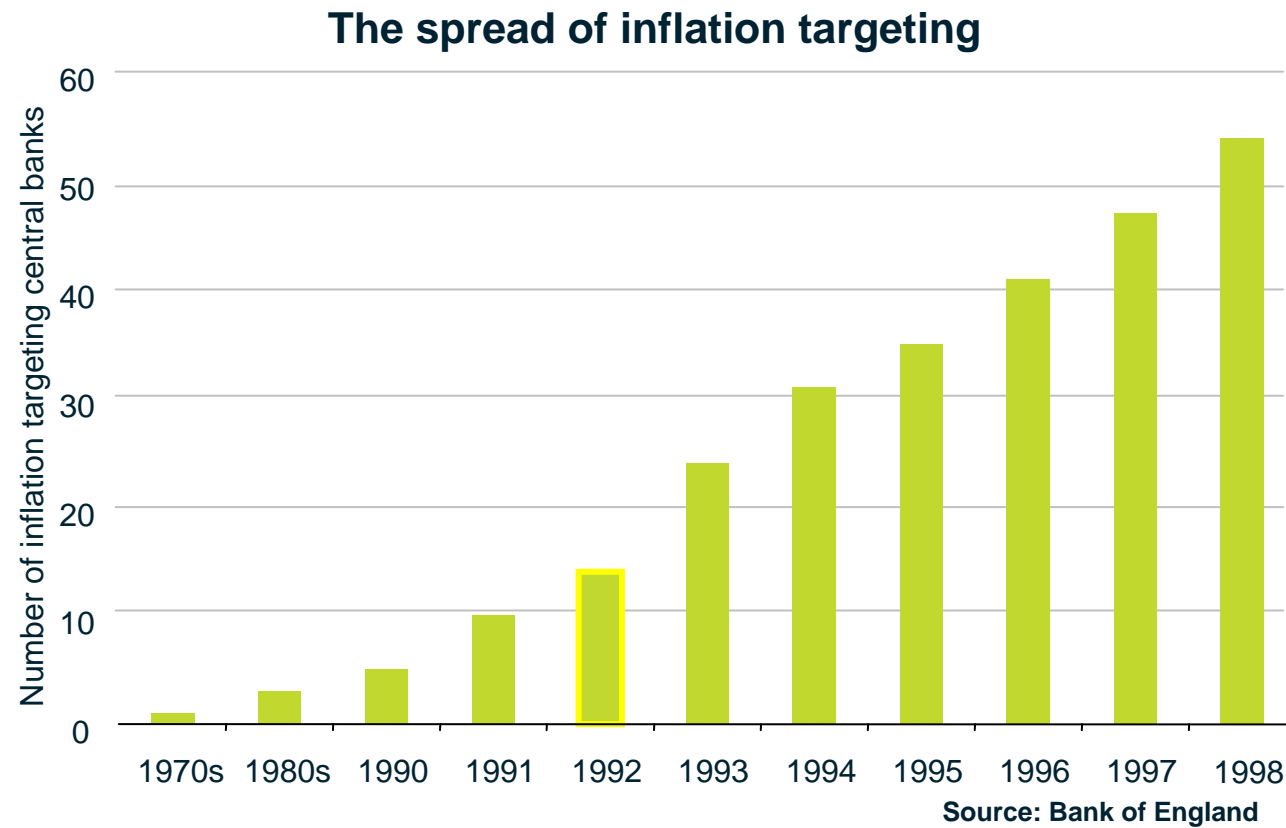
The inflation environment

- How do we forecast inflation?
- Are historic trends a good guide?

The recent low inflation environment



Inflation targeting



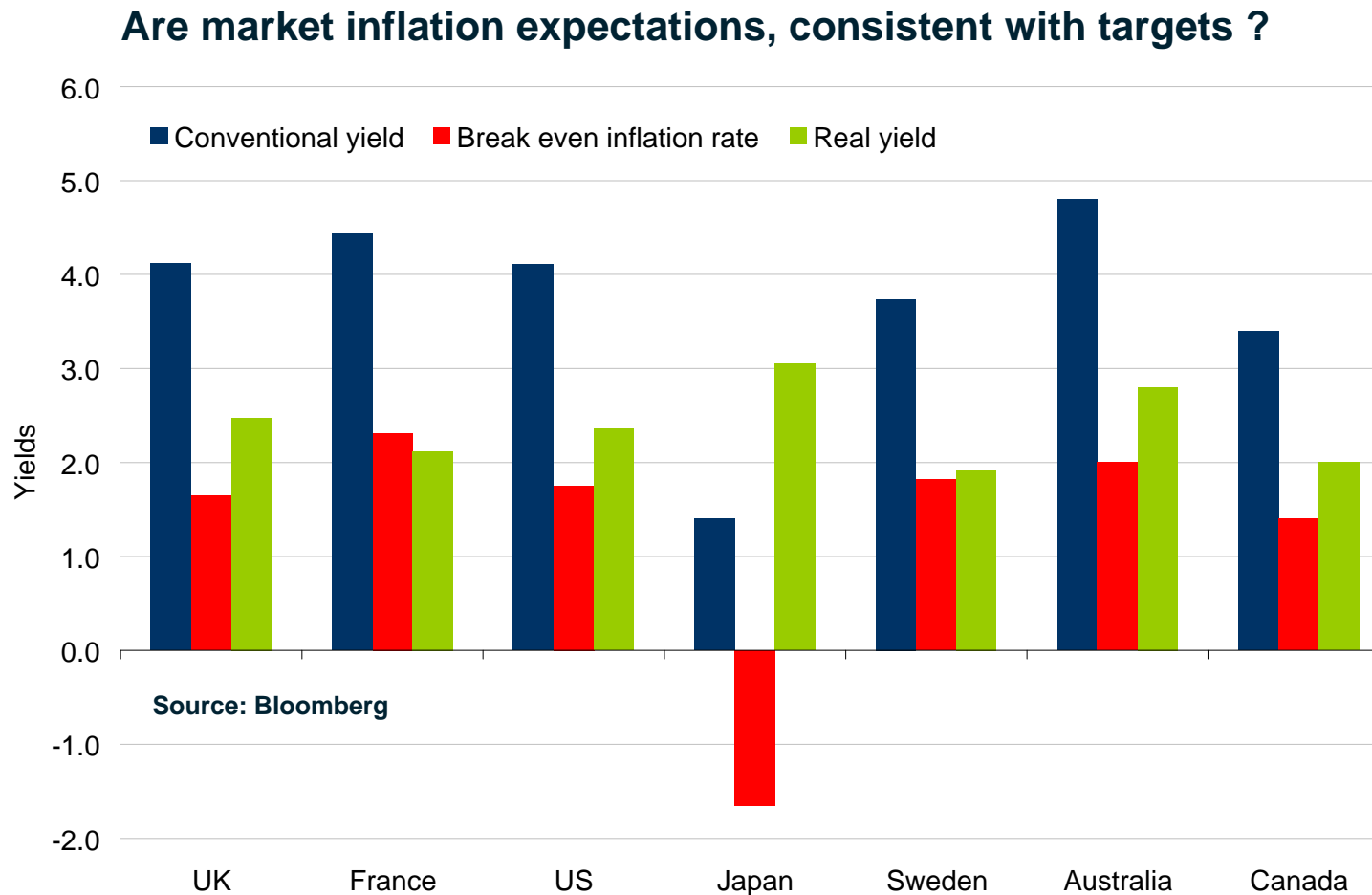
Inflation targeting

Inflation targets in a selection of developed economies

Country/region	Target/inflation goal
Euro-area	ECB aims to keep CPI inflation below ceiling of 2.0%
UK	MPC aims to keep CPI inflation within $\pm 1.0\%$ of 2.0% target
Australia	Australia's FRB target inflation between 2.0% to 3.0%
Canada	Bank of Canada aims to keep CPI inflation within $\pm 1.0\%$ of 2.0% target
New Zealand	Reserve Bank of New Zealand aims to keep CPI between 1.0% to 3.0%
Sweden	Riksbank aims to keep CPI inflation within $\pm 1.0\%$ of 2.0% target
USA	Indications from Fed officials that 2.0% for core PCE inflation is "preferred"

Source: Fathom

Market “inflation expectations”



Compensation for future inflation

- In the UK it seemed reasonable in the past to assume inflation of around 2.0% (CPI), that is, 2.5% (RPI). But what about now ?
- In Europe 2.0%
- In USA – Bernanke known to be in favour of inflation targeting
- Will governments be tempted to inflate this debt away in the future ?

Putting it all together

- Putting together an estimate of trend growth and expected inflation gives a neutral policy rate for an economy
- Neutral rate will be close to expected return on cash
- For the UK prior to the credit crunch it might have been:
 - 2.25% for growth
 - 2.5% (RPI) for inflation
 - Giving a grand total of 4.75%
- This gives the mean outlook for the level of interest rates, and inflation
- But what about now ? Has the credit crunch changed any of this?

The 'neutral rate'

- Policy rates will cycle around their 'neutral rates'
- The return on cash will be closely related
- These neutral rates can change themselves if:
 - trend growth changes (productivity improvements, labour migration)
 - monetary policy regime changes
- The return on cash is the basis for future expected returns on all assets
- The risk premium is what distinguishes them

The “inflation risk premium”

- Biggest risk in holding conventional, govt bonds is inflation
- In past governments have arguably “inflated away” their debts – they may be tempted to do this again
- Investors demand an additional return, mainly because future inflation is uncertain (other risks too)
- It will depend upon the:
 - the monetary policy framework and
 - the credibility of monetary authorities

Calculating an “inflation risk premium”

Yield on Conventional government bond (Gilt)

Minus

Yield on index-linked government bond (ILG)

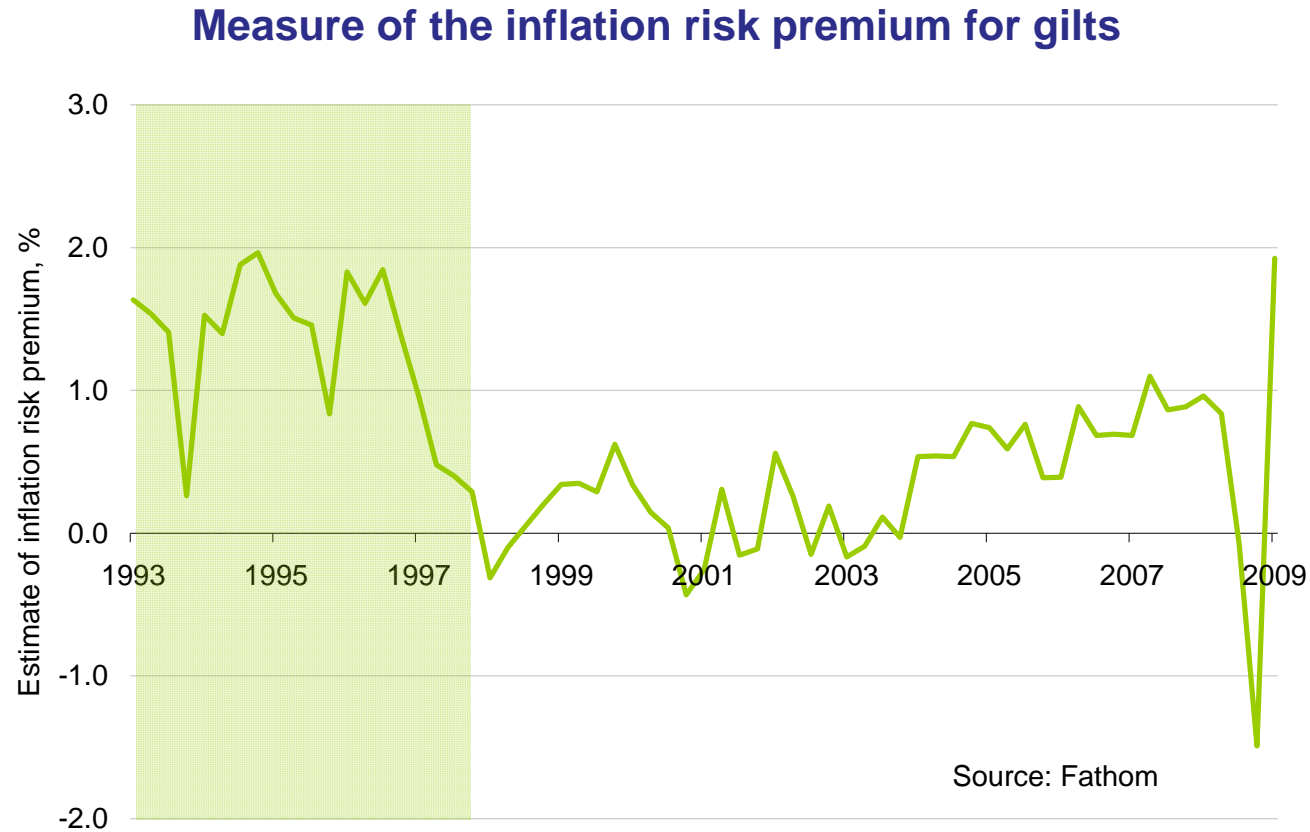
Minus

Estimate of expected inflation (survey based)

Equals

Measure of inflation risk premium

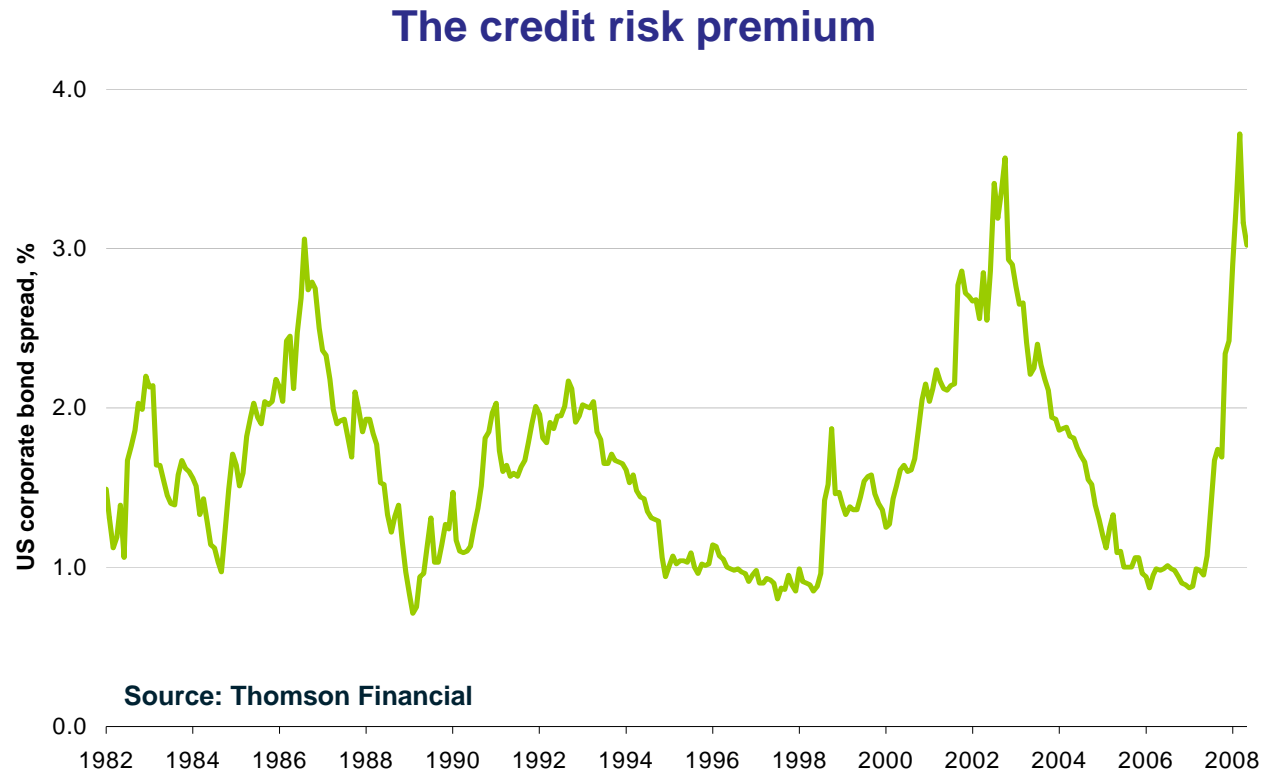
The UK's inflation risk premium



The credit risk premium

- Credit premium additional return over equivalent govt bond to compensate for credit risk
- Varies according to the type of firm (AAA, AA, A, BBB etc)
- Outside US not much history to guide us as to likely future credit risk premium
- It's also very volatile ...

The credit risk premium

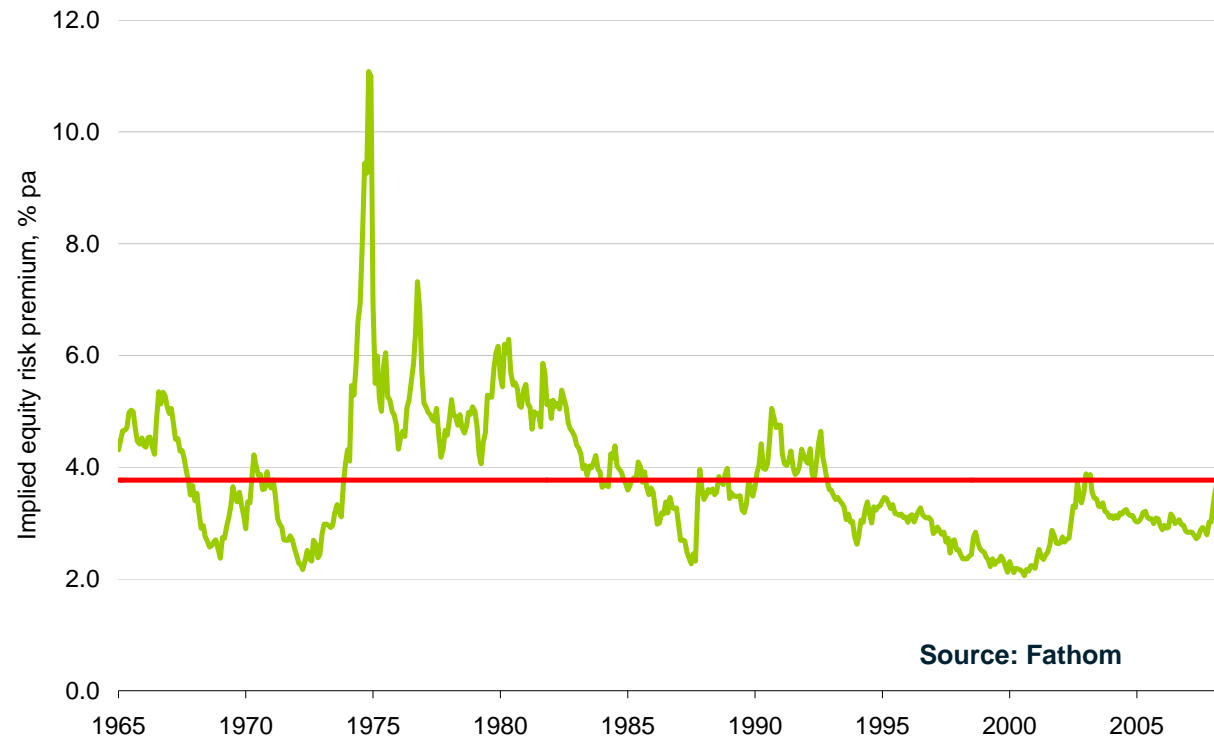


The equity risk premium

- ERP is the additional return required over long-dated government bond for bearing equity risk
- But what is equity risk ?
 - profitability
 - ongoing viability of company

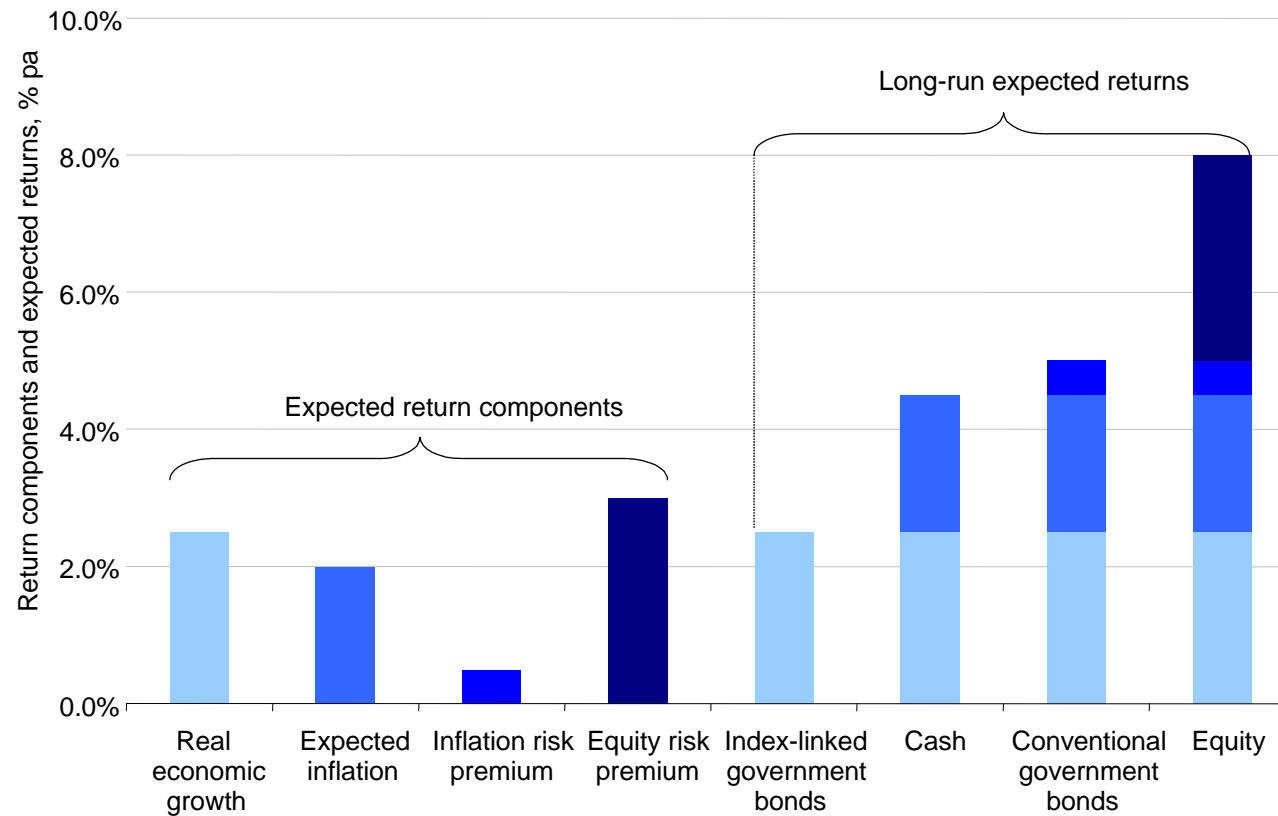
UK's equity risk premium

A measure of the UK's equity risk premium



Putting it all together

Example of “building block approach” to forecasting long-run asset class returns



Source: Fathom

Summary

- An assessment of the economic and policy environment will help to inform views about:
 - wage/salary growth
 - the discount rate applied to liabilities
 - the likely returns on broad asset classes
 - the likely volatility of returns and return correlations on broad asset classes
 - and possibly longevity trends too