FINANCIAL CONDUCT AUTHORITY

# Rates of return for FCA prescribed projections

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# 1 Introduction

## Context and application of FCA projection rates

The FCA prescribes the maximum rates of return that financial services companies must use in their calculations when providing retail customers with projections of future benefits. The rules regarding projection rates can be found in the FCA Conduct of Business Sourcebook ("COBS") in Section 13[1]. The FCA prescribed projection rates can be found in COBS 13 Annex 2.

COBS projection requirements were introduced to enable consumers to see what return they might get on their investments, to compare product charges, and to see how charges could affect returns, before deciding which product is most appropriate for their needs. Charges are specific to the individual firm or product, but the FCA rules set out the maximum rates of investment return a firm must adopt when making deterministic projection calculations for customers. Firms are required to use rates of return in their projections that reflect the performance of the underlying investments, but the ceilings imposed by the FCA aim to prevent consumers being misled by inappropriately high rates.

Examples of the types of products which are currently covered by the COBS projection requirements and for which the intermediate rates of return suggested in this report are appropriate are presented in Box 1 below:

[1] https://www.handbook.fca.org.uk/handbook/COBS/13/

**Box 1: Examples of FCA regulated retail products covered by the rules regarding the use of projections**

**Taxed Investments**

- Endowment policies
- Maximum investment plans
- Single premium onshore capital investment bonds
- Regular premium onshore whole of life policies

**Tax-Advantaged Investments**

- Stocks and shares Individual Savings Accounts (ISAs)
- Junior stocks and shares ISAs
- Help to Buy ISAs
- Lifetime ISAs
- Friendly society tax free savings plans

**Pensions vehicles**

- Personal pension plans
- Trustee investment plans
- Retirement annuity contracts
- S32 buyout policies
- Additional voluntary contribution arrangements
- Trust-based money purchase arrangements (contracted out/in)

## Previous reports for the FCA

The prescribed rates of return were reviewed in 2003, 2007 and 2012 by PwC. The 2012 PwC report focused on the intermediate rate of return assumptions, inflation assumptions (prices and earnings), and the appropriate adjustment for tax-advantaged products. The present report was commissioned internally, and prepared by the FCA Economics Department. The exception is the section on the adjustment for tax-disadvantaged products (Section 6), which was prepared by PwC in order to ensure a high standard of subject matter expertise. The PwC Terms of Reference can be found in Appendix D. The present report was first commissioned in 2016, but work was suspended following the result of the referendum on the United Kingdom (UK) membership of the European Union (EU) in order to assess the implications of this event for our methodology. Work subsequently resumed in January 2017.

## Key principles and underlying assumptions

Under our Terms of Reference (see Appendix A) the overall methodology we apply and the underlying principles closely follow the 2012 PwC report. These are set out below.

- **Use of a range around intermediate return**: The analysis aims to provide an appropriate estimate for the intermediate rate of return for retail investment products.

We have considered the available relevant information and methodological tools when forming an overall opinion on a range for appropriate intermediate rates of return. It is important to stress that this range reflects our view of reasonable return expectations that the FCA should consider when determining the appropriate point estimate for intermediate returns. It does not capture the entire range of returns that could be realised, which would need to consider tail risk and detailed statistical analysis (similar to that undertaken in the 2003 PwC report). Under the Terms of Reference this does not fall within scope of the present report. Therefore, the report does not provide an opinion on the appropriateness of the 3% adjustment to the intermediate rate of return that is used to arrive at the lower and higher rates of return.

- **Investment time horizon:** The 2012 report focused on an investment time horizon of around 10-15 years. This timeframe is also used in the current report.

- **Longevity of projection assumptions:** the FCA does not have a set view on when it may review projection rates again; the FCA considers them to be suitable for a number of years. However the FCA can decide to re-examine the appropriateness of its projection rate assumptions were extreme events affecting macroeconomic or financial market performance to occur.

- **Use of forward looking averages**: In the context of this report, forward looking return expectations across different asset classes represent median estimates. In contrast to mean estimates, investment returns based on the median estimates are typically preferred as they are less distorted by skewed distributions associated with extreme events.

- **Cut-off date for data**: The cut-off date for data used in this report is 28 February 2017, with a number of exceptions, which are noted throughout.

- **Data sources**: The data sources used in this report are explicitly stated.

- **Rounding estimates:** We present data throughout this report at up to two decimal points, but for our final recommendations we round to the nearest decimal point.

- **Methodology**: Our methodology aggregates projections and information from a number of organisations with different standpoints into a generally representative figure. This process necessarily involves a degree of approximation.

# 2 Executive Summary

## Scope of this report

The scope of the present report is very similar to the scope of 2012 PwC report. The report answers the following key questions:

- Whether the current intermediate rate of return continues to represent the appropriate single rate for illustrating potential returns for those products subject to the COBS projection requirements;
- The appropriateness of the 0.5% adjustment for tax-disadvantaged products
- The continuing validity of the long-term inflation assumptions of 2.5% for prices and 4% for earnings

Similar to the 2012 PwC report, in answering these questions, we examine the returns on government bonds, corporate bonds, equities, property, the product asset mix, and several key economic variables: GDP growth, earnings growth and inflation. For the first time, we also directly estimate the return on cash and money markets.

For the full Terms of Reference (ToR) of this report please see Appendix A and Appendix D.

## Key findings

The last report was written during a time of market turmoil, relatively high inflation in the UK and weak demand. In Europe, the sovereign debt crisis was at its most critical point. There was also increased market uncertainty in the United States (US) as the fiscal stimulus implemented by the Bush administration was likely to expire without a replacement (the so-called fiscal cliff). Commodity prices were relatively high and were acting as a drag on GDP growth. This time around, however, economic conditions in the UK are different. External demand is picking up, inflation is currently above but expected to return to the Bank of England's target, the output gap has shrunk considerably and credit conditions are favourable. However, there are still lingering effects from the crisis such as low productivity. Furthermore, the economic outlook remains uncertain as the UK exits the EU.

### GDP

The Office for Budget Responsibility (OBR), in its March 2017 'Economic and Fiscal Outlook', projected annual GDP growth to be 2% or lower for the next five years. This figure is lower than the 2.25% trend GDP growth assumed in the 2012 report. The OBR also expects the economy to operate very close to potential in the next five years (the OBR estimates that the economy was running very marginally above potential by 0.2% in the fourth quarter of 2016). Hence the output gap is estimated to be very close to zero from 2017 to 2021.

## Price inflation

Since the last report, inflation has come down and has stayed below the Bank of England's inflation target of 2% for the last two years. Inflation decreased because of weak demand and commodity-driven disinflationary shocks. However, Consumer Price Inflation (CPI) has recently picked up due to inflationary pressures from exchange rate pass-through as the pound[2] has depreciated between 7% and 17% after the vote to withdraw from the EU (Brexit).The Bank of England continues to target 2% CPI inflation and the base-case scenario for most medium-term forecasts is that the Bank of England will achieve that target. Retail price inflation (RPI) continues to be higher than CPI by about 1 percentage point. Estimates show that the wedge between RPI and CPI is likely to be between 1.3 and 1.5 percentage points in the long run.

In order to keep consistency with the last report, we will use the GDP deflator as our central inflation measure. The 2012 report states that the GDP deflator is a broader measure of inflation which makes it more suitable than the CPI for reflecting economy-wide inflation. For the next 10 to 15 years, we expect CPI to stay close to the Bank of England inflation target of 2% and the GDP deflator to be 0.5% above that. It is also important to note that using the GDP deflator instead of the CPI does not materially affect the intermediate returns.

## Earnings inflation

In the last five years, earnings growth has been weaker than anticipated in the 2012 report and lower than the pre-crisis average growth of 4%. With the current unemployment rate very low (4.7%), the absence of wage inflation points to a lower long-run unemployment rate. The Bank of England has recently estimated that the long-run unemployment rate has decreased from 5% to 4.5%. This and the current unemployment rate suggest that there is little slack in the labour market.

As this slack is absorbed, earnings growth is estimated to pick up. We expect long-run earnings to be around 4.25%. However, we recommend a lower average earnings growth estimate of 3.75% for the next 10-15 years due to anticipated lower earnings growth in the short term.

## Asset mix

There have been slight changes to the mix of asset classes for pension and insurance investment over the past five years. The main asset class for pension fund investment remains equities. However they now comprise on average only 45% of assets, as opposed to 60% at the time of the last report. Within equities held by pension funds and insurance companies, we have seen a sustained trend of diversification into overseas equities, which on average account for 60% of the equity allocation.

Pension funds and insurance products continue to differ in their asset allocations. Insurance products, such as with-profits funds, still invest a significant proportion of their assets in bonds. Unit-linked investments vary significantly in their underlying assets and so we have not attempted to come up with an aggregate allocation for these products.

Our base portfolio allocation used to estimate the intermediate rate of return consists of 60% to equities, 20% to government bonds, 10% to corporate bonds, 7% to property and 3% to cash and money markets. The 60% overall equity allocation in the base portfolio consists of 35% of the total portfolio invested in overseas equity and 25% in UK equity. The 60% overall

[2] As measured by the Bank of England's effective exchange rate index of from June 23 2016 to February 28, 2017.

equity allocation in the base portfolio is in line with the average of the equity allocation of pension funds and that of insurance companies.

### Investment returns

Our analytical framework estimates future real rates of return for government bonds first, as they represent the least risky long-term asset. We then estimate the real returns of other asset classes (except cash and money markets) as a spread over government bond returns.

We project real government bond yields based on the GDP deflator measure of inflation. Overall, our analysis suggests that medium-term real returns on government bonds have fallen from a range of 0.5% to 1% in 2012, to a range of -1% to 0% at present. To be consistent with the previous report and as the allocation of fixed-interest investment to overseas bond markets remains small, we do not adjust our expected government bond rate of return for potentially higher yields in overseas government bond investments. Such higher yields merely reflect compensation for default losses over the medium term.

In relation to equities, our analysis suggests that expected real returns have declined from a range of 4% to 5.5% in 2012, to a range of 3% to 5% at present. The key parts of the return on equity i.e. the risk-free rate and the equity market risk premium (EMRP) have shifted – the former has decreased whereas the latter has increased relative to the 2012 PwC estimates.

We combine forward-looking estimates of investor expectations with historical equity returns to form an overall view on the expected equity returns and the EMRP. Our recommended range for the real EMRP is between 3.5% and 5.5%. The upper bound of this range is 1 percentage point higher than the upper bound in 2012 whereas the lower bound is the same. The higher upper bound of our projected real EMRP reflects the compensation required by investors for the medium-term economic uncertainty and the monetary policy conditions underlying our negative projected risk-free rate. Combining the midpoint (-0.5%) of our assumption on government bond yields (between -1% and 0%) with the EMRP implies a real return on equity that ranges from 3% to 5%. Additionally, and based on our inflation assumption of 2.5%, this also implies a nominal equity return of 5.5% to 7.5%. These nominal returns are lower than those from the 2012 PwC report. We have based our overall expected real equity returns range of 3% to 5% on returns of overseas equity investments, to reflect their growing importance in terms of asset allocation. For UK equity investments we expect a narrow range of real equity returns of 3.5% to 4.5%, which suggests an EMRP of 4% to 5% relative to our midpoint projection of government bond yields. However, the midpoint of expected real returns for both UK and overseas equities is the same at 4%.

Our analysis of corporate bonds suggests an expected return above UK government bonds (gilts) ranging between 0.6% and 1%. This is a decrease relative to the 2012 PwC report where the uplift above government bonds was 1% to 2%. This range is, however, in line with the 2007 report which indicated a return of 1% above gilts. The main reason for this is that the 2012 report incorporated a substantial illiquidity premium for longer-dated bonds in the suggested range. However, given the much flatter gilt yield curve at present, the existence of a substantial illiquidity premium over the 10- to 15-year forecast period is unlikely in our view. Relative to the midpoint of our real government bond expected returns of -0.5%, this implies real expected returns for corporate bonds of 0.1% to 0.5%, which is significantly lower than the 1.5% to 3% range suggested in the 2012 report. However, this difference is primarily due to the significantly lower expected returns on gilts. On a nominal basis, using the 2.5% GDP deflator inflation metric, the expected nominal returns on corporate bonds are 2.6% to 3%.

Our analysis suggests real expected returns on property between 2.5% and 3.5% – a lower overall real return compared to the 3% to 4% suggested in the 2012 report. Property returns are in general expected to lie between returns on corporate bonds and equity. Nominal expected returns on property are in the range of 5% to 6% based on a GDP deflator assumption of 2.5%.

In this report, we also explicitly estimate a rate of return on cash and money market instruments. We do this by reviewing the historic spreads of nominal rates for a number of money market instruments over the Bank of England's base rate. We then apply these nominal rate spreads to forward looking market-based estimates of the Bank of England's base rate to arrive at a range for future nominal returns. We adjust these future nominal returns for inflation using our 2.5% GDP deflator measure to arrive at on overall expected real return for cash and money market instruments in the range of -1.5% to -0.5%, with a midpoint of -1%.

### Tax effects

PwC analysis suggests that for a typical mixed fund according to our 2017 Base Case Allocation, the reductions in respect of tax from the illustration rates of 4%, 5% and 6% in current use might vary from 0.16% for the lower illustration, through 0.30% for the central assumption, to 0.46% for the higher illustration. However, it should be noted that asset allocation, rate of churn, rate of return and proportion of return derived from income all have an effect on the tax payable.

Therefore, we believe the single adjustment figure for tax-disadvantaged products should be changed to 0.3%, from the 0.5% that was proposed in the 2012 PwC report.

## Conclusions and recommendations

Table 1 below presents our central estimates and ranges of projected annual returns for all asset classes and compares them to the central estimates presented in the 2012 PwC report.

***Table 1 Summary of projected annual returns***

| | 2012 PwC Report Range | 2017 Report Range | 2012 PwC Report Midpoint | 2017 Report Midpoint | Change in Midpoint |
|---|---|---|---|---|---|
| Inflation, based on GDP Deflator | 2.50% | 2.50% | 2.50% | 2.50% | 0.00% |
| Real Government Bonds | 0.5% to 1% | -1% to 0% | 0.75% | -0.50% | -1.25% |
| EMRP | 3.5% to 4.5% | 3.5% to 5.5% | 4% | 4.50% | 0.50% |
| Real Equity Returns | 4% to 5.5% | 3% to 5% | 4.75% | 4.00% | -0.75% |
| Real Corporate Bond Returns | 1.5% to 3% | 0.1% to 0.5% | 2.25% | 0.30% | -1.95% |
| Real Property Returns | 3% to 4% | 2.5% to 3.5% | 3.50% | 3% | -0.50% |
| Real Cash and Money Markets Returns | - | -1.5% to -0.5% | - | -1% | - |

| | | | | | |
|---|---|---|---|---|---|
| Nominal Government Bonds | 3% to 3.5% | 1.5% to 2.5% | 3.25% | 2.00% | -1.25% |
| Nominal Equity Returns | 6.5% to 8% | 5.5% to 7.5% | 7.25% | 6.50% | -0.75% |
| Nominal Corporate Bond Returns | 4% to 5.5% | 2.6% to 3% | 4.75% | 2.80% | -1.95% |
| Nominal Property Returns | 5.5% to 6.5% | 5% to 6% | 6.00% | 5.50% | -0.50% |
| Nominal Cash and Money Markets Returns | - | 1% to 2% | - | 1.50% | - |

**Source: PwC 2012 report; Own analysis**

Our base portfolio allocation used to estimate the intermediate rate of return consists of 60% to equities, 20% to government bonds, 10% to corporate bonds, 7% to property and 3% to cash and money markets.

This base portfolio allocation, combined with our return estimates for different asset classes included in typical retail investments, suggests that the intermediate rate of return assumption is between 4.4% and 5.7% with a central estimate of 5% per annum, lower than that suggested in the previous report (6%). This decrease is not due to changes in asset allocation (indeed these have very little impact) or inflation (our estimates of inflation based on the GDP deflator are the same as those in the previous report). The lower return is mainly explained by the lower projected returns on government bonds, which, as a proxy for the risk-free rate, affect the projected returns of other asset classes.

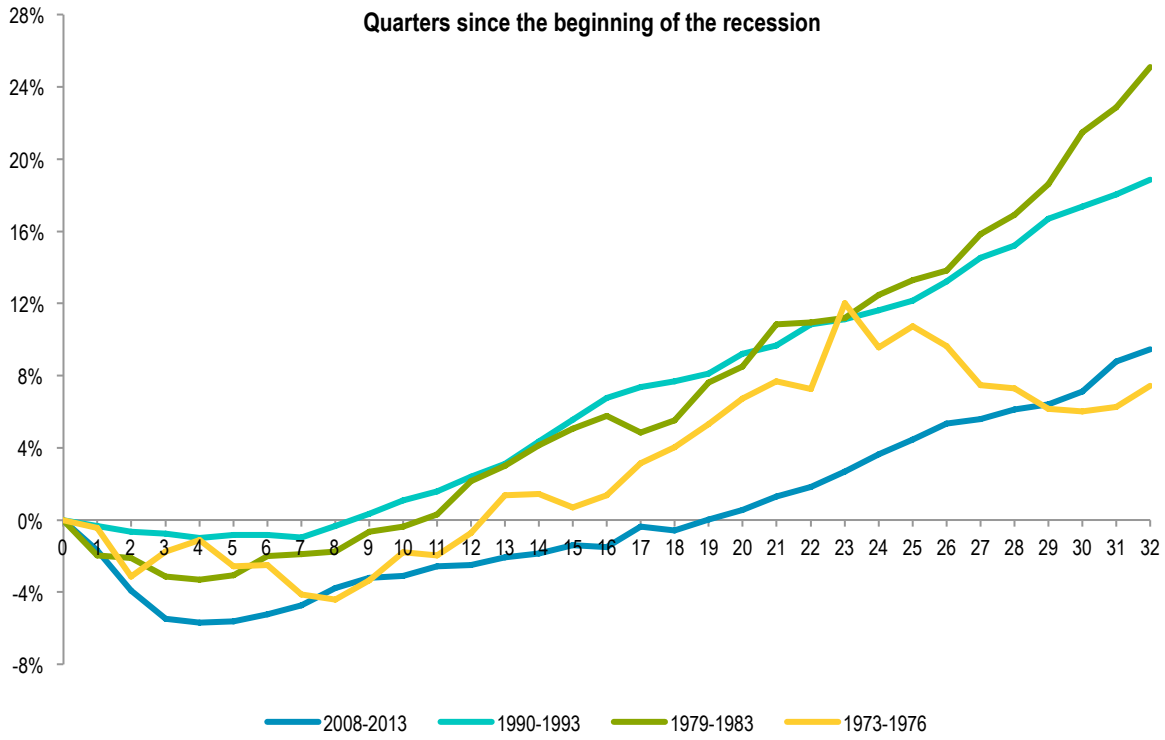
Readers should note that the nominal yield on domestic government bonds is frequently used as a proxy for the nominal risk-free interest rate. The nominal yield on UK government bonds has been around 2% and even lower for short-term maturities since the previous report. This is considerably lower than 4.4%, which represents the bottom of the range of our projection rate for the base portfolio allocation. Achieving the bottom of the projection rate range for the base portfolio allocation still involves taking on a degree of investment risk. Therefore, consumers should be mindful that even the lowest end of the projection rate range does not set a minimum guaranteed return they could expect.

# 3 Macroeconomic assumptions

## Economic background[3]

**Nine years on, the UK and the world have largely recovered from the Great Recession, but some lingering effects still remain.** The Great Recession was unique in that it was a synchronised global phenomenon of unprecedented proportions. It took the UK economy almost 20 quarters since the outset of the recession to return to the pre-crisis level of GDP (Figure 1). Since the beginning of the crisis, the UK economy has faced many internal and external challenges in its path to recovery. Banks and households had to repair their balance sheets and successive governments had to deal with a large stock of public debt and shrinking tax receipts.

***Figure 1: Difference in output growth from pre-recession peaks***




**Source: ONS. First periods of the recessions are: Q3 1973, Q1 1980, Q3 1990, Q2 2008**

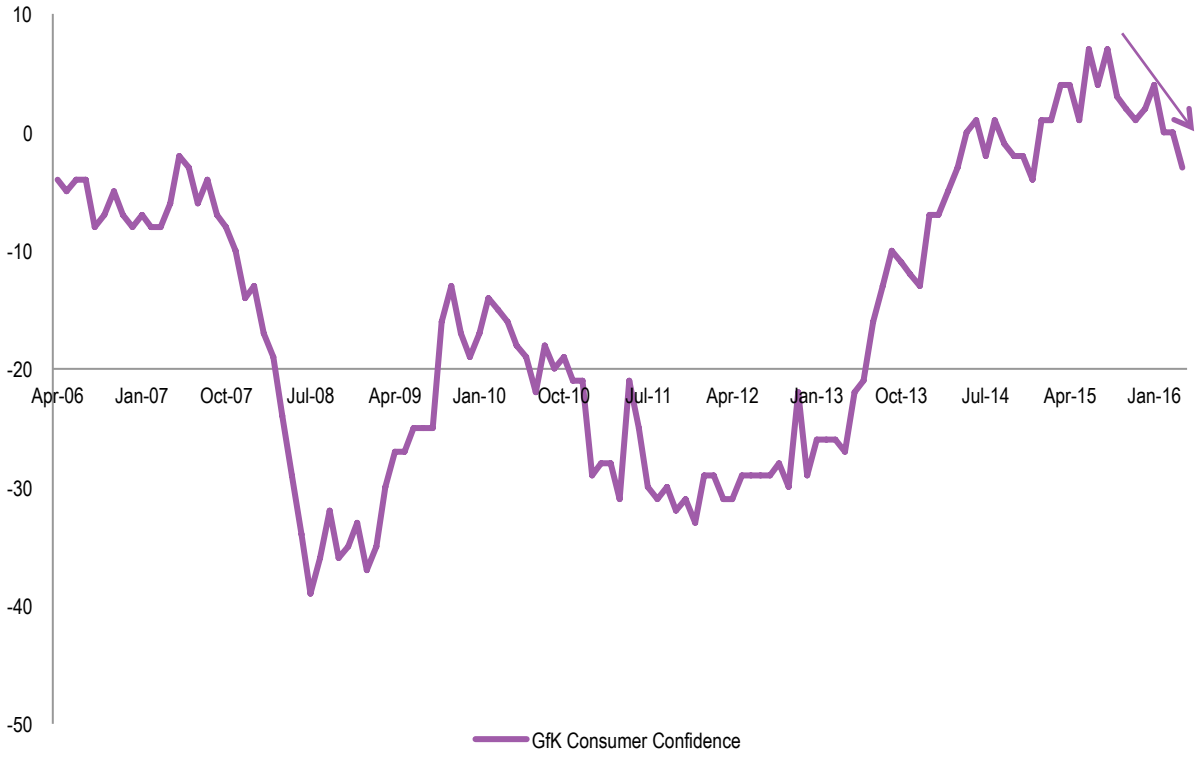
**The UK's decision to leave the EU will be an important factor shaping the mid-term economic outlook for the economy**. Brexit will redefine how the UK trades products and services with the EU and with the rest of the world. This will have a direct effect on productivity growth, inflation, the labour market, consumer confidence, investment and ultimately on GDP growth. The outcome of the Brexit negotiations with the EU and the

[3] All macroeconomic forecasts for the next five years are taken from public sources. We do not carry out any macroeconomic modelling for this time period.

negotiation of free trade agreements with other trading partners represents an important risk to the macroeconomic projections in this report.[4]

**The UK economy is growing close to potential, but some post-crisis problems remain.** The Brexit vote added uncertainty to the economic outlook but its initial impact on economic activity was milder than expected by many forecasters. This was in part due to high consumer spending and favourable credit conditions. However, consumer spending is predicted to slow down in the near future as higher inflation and increased uncertainty have a negative impact on real incomes and consumer confidence (see Figure 2). Moreover some post-crisis problems remain. Business investment remains subdued as chief financial officers (CFOs) focus on defensive balance sheet strategies, due to high levels of uncertainty.[5] This low corporate risk appetite affects spending, hiring, and investment.

***Figure 2: UK consumer confidence[6]***




**Source: Bloomberg**

**Credit conditions continue to improve for households, banks and corporates.**[7] Growth in secured lending to households has stabilised over the past year and the growth rate of individual consumer lending is at its highest since 2005 (Figure 3). This is a result of robust

[4] For a more detailed analysis on the impact of Brexit on the UK economy, please see the Bank of England Inflation report (August 2016) and Financial Stability Report (July 2016).

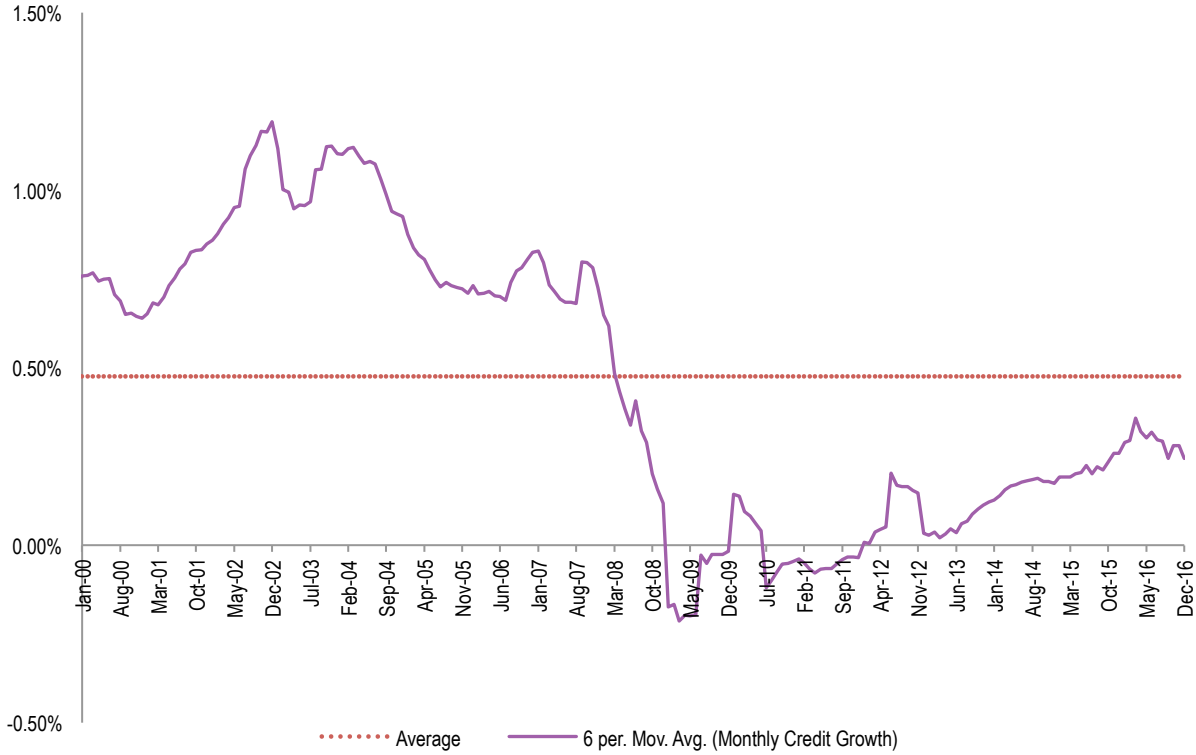
[5] See Deloitte CFO survey.

[6] For more information of the GfK Consumer Confidence Index, please go to: http://www.gfk.com/en-gb/insights/report/uk-confidence/

[7] See Bank of England's Credit Conditions Survey (2016 Q4).

credit demand and competition on price (interest rate) and non-price terms (longer terms). Credit conditions for large corporates remain very favourable and the cost of credit remains low. Additionally, small- and medium-sized enterprise's access to credit has improved in recent years. However, demand for credit has been affected by lower refinancing needs and concerns about the economic outlook.

***Figure 3: Monthly growth of total sterling net lending to individuals (seasonally adjusted)***

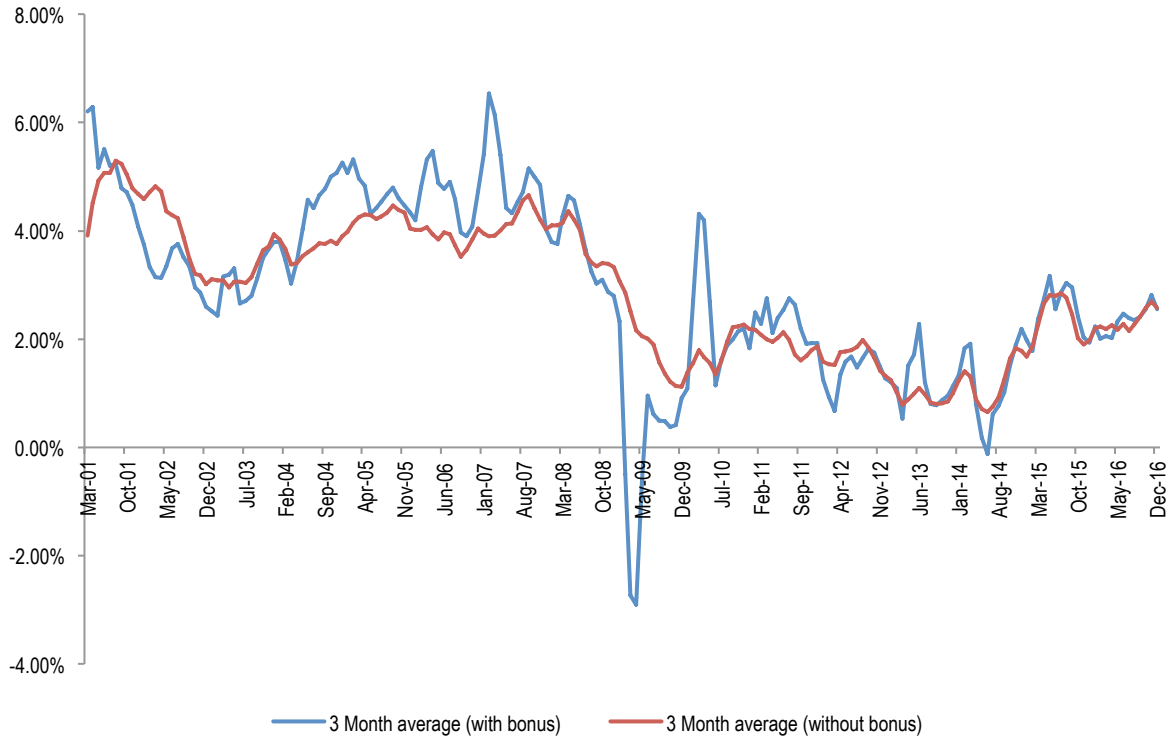



**Source: Bank of England**

**Employment continues to increase but there are no signs of cost pressures in the labour market**. Employment has grown strongly during the past two years but has slowed down in the last six months. Despite the tightening of the labour market, there are no signs of wage inflation. Average weekly earnings are still growing below pre-crisis levels (See Figure 4). This indicates a little amount of slack in the labour market and possibly a lower equilibrium unemployment rate (between 4% and 4.75%), as assessed by the Bank of England.[8]

[8] See Bank of England Inflation Report (Feb 2017).

***Figure 4: Average nominal weekly earnings growth***




**Source: ONS**

**The lack of productivity gains in the developed world continues to puzzle economists.**[9] Productivity is an important determinant of economic output and wage growth. Productivity tends to take time to recover after a crisis as most firms reduce capital and labour at a slower pace than the rate at which demand for their products and services shrinks. This creates spare capacity in the economy. However, this spare capacity has reduced considerably since the peak of the crisis. As the economy runs out of spare capacity, in order to meet increasing demand, either productivity increases or wage inflation starts to materialise. Hence the lack of wage inflation and productivity gains at this stage of the cycle is puzzling.

There are a number of reasons why UK productivity growth has been particularly weak since the onset of the crisis. First and foremost, firms have reduced investment in physical and intangible capital due to a lack of business confidence. This acts as a drag on productivity as old technologies are not replaced by new and more productive ones. Another reason is impaired capital allocation as shown by the high share of loss-making companies. This suggests that a larger than normal proportion of capital is still tied up in unproductive projects, dragging productivity down. Additionally, there has been a shift in the composition of the work force as the share of low-skilled jobs has increased. This trend has dampened productivity growth. Finally, the low level of job-to-job worker mobility may also indicate that employees may face barriers to moving in to more productive jobs.

**Productivity growth is a critical determinant of output growth and inflation.** Over the long run, the vast majority of output growth is driven by productivity growth. Therefore, the path of productivity growth will be critical in determining economic output. Moreover, productivity will also be an important determinant of inflation as gains in productivity tend to keep inflation in check. Without further productivity gains, inflation is likely to rise in the short

[9] The UK productivity puzzle, Quarterly Bulletin (2014 Q2), Bank of England.

term and output growth is likely to decrease in the medium term. With a shrinking spare capacity, a tight labour market, and benign credit conditions, the evolution of labour productivity will be perhaps the most important economic factor to watch as it will have direct implications for inflation and GDP growth.

**External developments will also play an important role in UK growth.** Growth in other developed economies has picked up recently and the disinflationary shocks of 2016 are fading. This is a net positive for global corporate profits, which in turn are spurring capital spending and increased manufacturing output.[10]

**The US economy and its labour market continue to strengthen**. Gains in non-farm payrolls remain solid, the unemployment rate continues to be low and measures of business and consumer sentiment have recently improved. With this positive economic outlook, the expectation is that the Federal Open Market Committee will continue its cycle of monetary tightening as the economy strengthens and inflation picks up. However, there remains considerable uncertainty around the administration's trade and fiscal policies. Furthermore, productivity, as in many other developed economies, remains subdued and will be one of the most important factors determining the strength of the US economy. Overly protectionist trade policies and the lack of productivity growth could act as a drag on US economic growth.

**In Europe, the recovery is gaining pace.** The outlook for growth in Europe is becoming more positive as many growth-supporting conditions are in place. For instance, the Purchasing Managers Index (PMI) for the Eurozone is at a six-year high, capital spending is gaining momentum, borrowing costs are very low, the real effective exchange rate is favourable for exports, and unemployment has fallen sharply.

**Growth in emerging economies is to pick up slowly.** After a very challenging 2016 for emerging market (EM) economies, during which some economies were in recession (e.g. Brazil, Russia), the current outlook for growth in EMs seems to be more benign as commodity prices have picked up and financial conditions are slightly more favourable. Growth in China has stabilised but there are still lingering concerns around credit growth, capital outflows and the fading of policy support in the first half of 2017. Moreover, credit conditions remain tight in EM economies which could negatively impact economic growth.

## Forecast for UK growth

As mentioned before, the largest source of risk to UK GDP growth is the negotiations to exit the EU, and the future relationship with the EU. Before the Brexit vote, the economy was growing at a moderate pace. After the Brexit vote and despite the increased levels of uncertainty, the economy performed better than expected by many forecasters thanks in part to consumer spending. Going forward, consumer spending is likely to deteriorate, since the latest pickup in inflation (due to a weaker pound) will depress real incomes.

Table 2 shows five-year GDP growth forecasts. As can be seen, all estimates tend to converge to a 2% growth rate in the year 2020 and 2021. However, there is a higher degree of uncertainty for shorter term estimates of growth. For instance, for 2017, the average estimate for GDP growth among professional forecasters is 1.4%, while the estimates of the OBR and the National Institute of Economic and Social Research (NIESR) are 2.0% and 1.7% respectively. One can argue that current global economic developments create upside risks for these forecasts as a weak currency and stronger external demand could have a positive effect

[10] Daily Economic Briefing, 28 March 2017, J.P. Morgan.

on net trade and hence growth. However, uncertainty around the UK's trade relationship with the EU and with other countries could dent business confidence and have the opposite effect. We feel that the OBR GDP growth estimates are reasonable for the next five years. In the longer term, the OBR estimates trend real GDP growth to be around 2.4% on average.[11]

***Table 2. Forecasts for UK GDP growth***

| Annual real GDP growth (%) | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Average of Independent Forecasters | 1.4 | 1.4 | 1.7 | 1.9 | 1.9 |
| Range | 0.2 - 2.4 | 0.0 - 2.5 | 0.6 - 3.0 | 0.9 - 3.4 | 1.0 - 3.0 |
| OBR | 2 | 1.6 | 1.7 | 1.9 | 2 |
| NIESR | 1.7 | 1.9 | 2.1 | 2 | 1.9 |

**Source: HM Treasury (February 2017). Forecast for the UK economy: a comparison of independent forecasts; Office for Budget Responsibility (OBR) (March 2017), Economic and Fiscal Outlook, National Institute Economic Review (February 2016)**

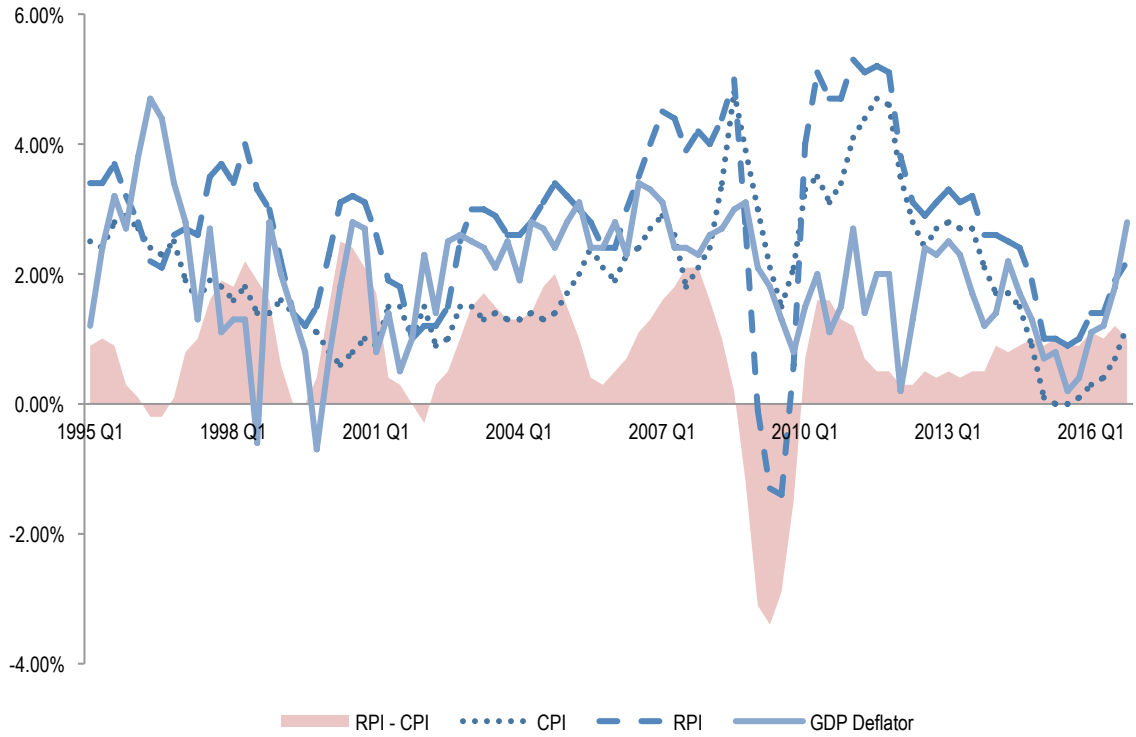
## Price inflation

### Historic trends

CPI, RPI and the GDP deflator are indicators of price levels in the economy, but there are significant differences between these measures. First, while CPI and RPI are both average prices for baskets of consumer goods and services purchased by households, the CPI is a geometric mean whereas the RPI is an arithmetic mean. This means that the RPI measure will tend to be higher than the CPI measure. Second, the basket of consumer goods and services in the RPI includes housing costs whereas the CPI does not. A third measure of inflation introduced in the 2012 projection rates is the GDP deflator. This measure is a much broader price index than the CPI and the RPI as it measures the level of prices of all new, domestically produced, final goods and services in an economy. Figure 1 shows the evolution of inflation based on these price indices since 1995. Table 3 shows averages of these inflation measures during the last five and ten years. CPI inflation has averaged 1.7% over the last five years, undershooting the Bank of England's inflation target due to weak demand, exchange rate movements and disinflationary shocks from commodity prices, but has averaged 2.4% over the past ten years due to an inflation overshoot right after the financial crisis. We also see that the RPI inflation has been higher than the CPI inflation and has averaged 2.9% during the last ten years and 2.4% during the last five years. From Table 3, we can also observe that the GDP deflator has been a more stable index of consumer prices in the last ten years. Similar to the GDP deflator, a less noisy price index that excludes volatile items such as food and energy from the CPI basket is core CPI (Figure 6). Core CPI inflation has averaged close to 2.0% during the last ten years and 1.7% during the last five years.

[11] Long-term economic determinants, OBR (November 2016)

***Figure 5: RPI, CPI and GDP deflator inflation, and the RPI-CPI inflation wedge***




**Source: ONS.**

***Table 3: Historic trends in inflation indices***

| Average Inflation | CPI | RPI | GDP Deflator |
|---|---|---|---|
| Q4 2006 - Q4 2016 | 2.4% | 2.9% | 1.8% |
| Q4 2011 - Q4 2016 | 1.7% | 2.4% | 1.5% |

**Source: ONS.**

***Figure 6: UK Core CPI inflation***


**Source: Bloomberg**

## Projections for CPI and RPI

The devaluation of the pound in the wake of the Brexit vote is starting to have an effect on inflation via increases in prices of imported goods. The consensus amongst forecasters (Table 4) seems to be that CPI will overshoot the Bank of England's inflation target for a couple of years before converging back to 2%. RPI is also projected to increase in the next few years (Table 5). The market-based measures of RPI (Figure 7) point to a long-term estimate of around 3.4%. There are three risks to these forecasts. The first risk is that the pickup in headline CPI leads to an increase in core CPI through second-round effects and/or that it 'un-anchors' inflation expectations. This would create an upside risk for our inflation projections. The second risk is that elevated levels of uncertainty lead to a fall in confidence and hence to a weakening of demand, creating a risk to the downside for the current inflation forecasts. The third risk is the labour market. After the crisis, excess supply of labour kept wage growth moderately low. However, as the economy grows, slack in the labour market will decrease and wage growth will pick up. This can create inflationary pressures if productivity gains do not offset wage growth. As for the RPI, increases in interest rates, other things being equal, would increase mortgage payments which could, in turn, increase the RPI. Hence, the path of interest rates creates a risk to our estimates of RPI in this report.

***Table 4: Independent forecasts of CPI inflation (%)***

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Average of Independent Forecasters | 2.6 | 2.6 | 2.2 | 2.0 | 1.9 |
| Range | 1.5 - 3.3 | 1.6 - 3.4 | 1.6 - 2.9 | 1.5 - 2.7 | 1.4 - 2.6 |
| OBR | 2.4 | 2.3 | 2.0 | 2.0 | 2.0 |
| NIESR | 3.3 | 2.9 | 2.3 | 2.0 | 1.9 |
| IMF | 2.5 | 2.6 | 2.0 | 2.0 | 2.0 |

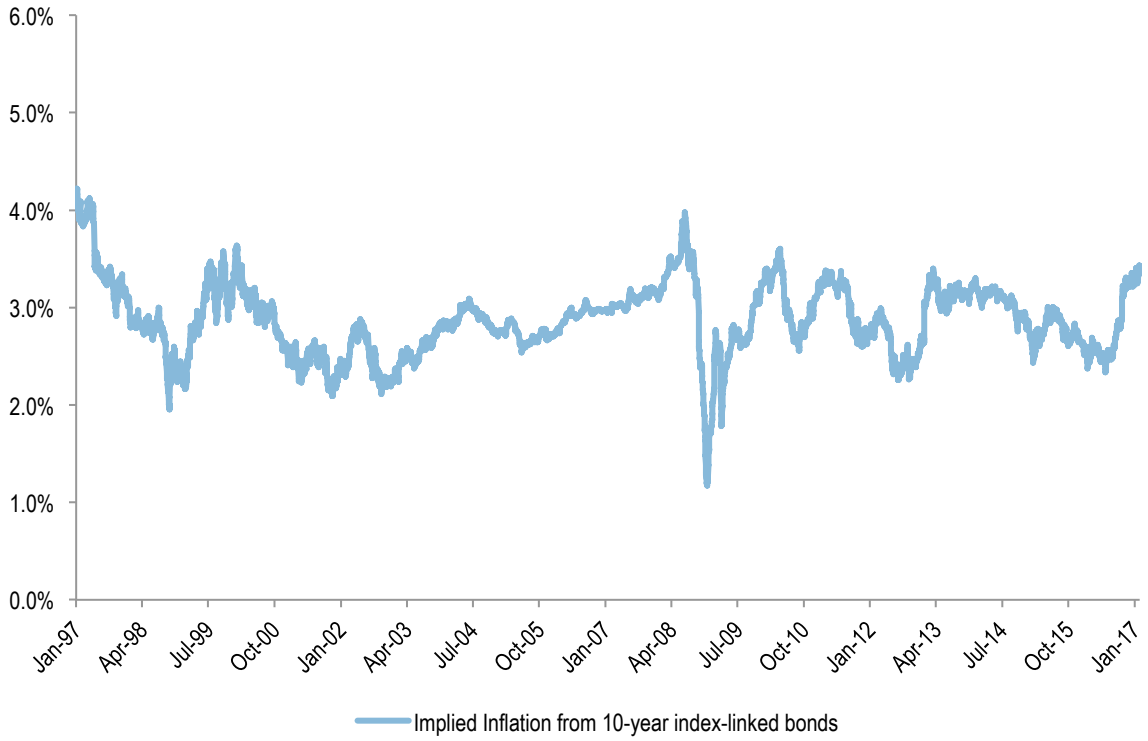
**Source: HM Treasury (February 2017). Forecast for the UK economy: a comparison of independent forecasts; OBR (March 2017), Economic and Fiscal Outlook, National Institute Economic Review (February 2017); IMF (November 2016) World Economic Outlook.**

***Table 5: Independent forecasts of RPI inflation (%)***

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Average of Independent Forecasters | 3.4 | 3.2 | 3.1 | 3.2 | 3.3 |
| Range | 3.1 - 4.6 | 2.7 - 3.8 | 2.5 - 3.6 | 2.4 - 3.6 | 2.7 - 4.1 |
| OBR | 3.7 | 3.6 | 3.1 | 3.1 | 3.2 |
| NIESR | 4 | 3.5 | 3 | 2.7 | 2.6 |

**Source: HM Treasury (February 2017). Forecast for the UK economy: a comparison of independent forecasts; OBR (March 2017), Economic and Fiscal Outlook, National Institute Economic Review (February 2017).**

***Figure 7: Implied RPI inflation from 10-year government bonds***




**Source: Bank of England**

## Wedge between RPI and CPI

As noted in the last report, the 'wedge' (difference) between RPI and CPI is likely to be higher than the historical wedge of 0.7 percentage points due to changes in the formulae, differences in coverage and index weights.[12] It has been argued that, based on the decomposition of the differences between these measures, a plausible range for the long-run difference between RPI and CPI inflation is around 1.3 to 1.5 percentage points. The wedge between RPI and CPI was around 0.2 percentage points in the first quarter of 2012, but it has been increasing steadily and it now stands at 1.2 percentage points.

Independent forecasters predict the wedge between RPI and CPI to be lower than 1.3 percentage points for most of the forecasting horizon (2017-2021). This is in part due to the fact that CPI is likely to be higher than normal due to a weaker currency. Hence, this wedge is likely to be driven by CPI increases in the earlier part of the forecasting horizon that are not fully reflected in the RPI. This wedge is forecast to move closer to its long-run range after in 2021.

***Table 6: RPI-CPI Wedge (percentage points)***

| | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Average of Independent Forecasters | 0.8 | 0.6 | 0.9 | 1.2 | 1.4 |
| OBR | 1.3 | 1.3 | 1.1 | 1.1 | 1.2 |

12 The long-run difference between RPI and CPI inflation, Ruth Miller, November 2011

| | | | | | |
|---|---|---|---|---|---|
| NIESR | 0.7 | 0.6 | 0.7 | 0.7 | 0.7 |

**Source: HM Treasury (February 2017). Forecast for the UK economy: a comparison of independent forecasts; OBR (March 2017), Economic and Fiscal Outlook, National Institute Economic Review (February 2017).**

### GDP deflator forecast

As noted in the previous report, the GDP deflator is a measure of inflation that covers the prices of all new, domestically produced, final goods and services in the economy. Prior to the crisis, the GDP deflator was around 0.5 percentage points higher than the CPI. However, in the last five years, the GDP deflator has been 0.2 percentage points lower than the CPI on average. More recently, the rise of house prices (not included in the CPI) and the disinflationary shock from commodity prices in 2016 have helped restore the positive difference between the GDP deflator and the CPI.

To keep consistency with the 2012 projection rates report, we use the GDP deflator as our measure of inflation. However, we have examined the sensitivity of our projected intermediate rate of return to alternative inflation measures (see Table 27) and the resulting changes are not significant. We also believe that the wedge between GDP and CPI will converge back to the pre-crisis mean of 0.5 percentage points. We adopt the OBR inflation estimates for this report. See Table 7 for a list of all the estimates of inflation measures.

***Table 7: Proposed price inflation assumptions***

| % | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 - 2031 |
|---|---|---|---|---|---|---|
| RPI | 3.7 | 3.6 | 3.1 | 3.1 | 3.2 | 3.25 (2.5 - 4) |
| CPI | 2.4 | 2.3 | 2 | 2 | 2 | 2 (1 - 3) |
| GDP Deflator | 1.8 | 1.6 | 1.6 | 1.9 | 1.9 | 2.5 (1.5 - 3.5) |

**Source: OBR (March 2017), FCA estimates for 2022–31.**

## Earnings growth

Earnings growth in the last five years has been lower than estimated in the 2012 projection rates report. In the last five years, earnings including bonuses grew at 1.82% on average, and earnings excluding bonuses grew at 1.73% on average (see Table 8). These figures are very close to the CPI and GDP deflator for the period, rendering real income growth rates close to zero. This is in contrast to estimates of long-run nominal growth rate of 4.25% and average earnings growth of 3.8% for the 2012 – 2016 period (taken from the last report). The recession created substantial spare capacity and pushed people out of the labour market, lowering the labour market participation rate. As this capacity is taken up, the slack in the labour market will disappear and trend earnings growth will be higher than currently.

***Table 8: Historical annual earnings growth (percentage change from 3-month average compared to same three months in the previous year)***

| Average growth in average weekly earnings (nominal) | Including bonuses | Excluding bonuses |
|---|---|---|

| | | |
|---|---|---|
| March 2005 - December 2010 | 3.08% | 3.09% |
| January 2011 - December 2016 | 1.82% | 1.73% |

**Source: ONS**

## Labour market conditions

The current rate of unemployment is 4.7%, almost four percentage points lower than the estimate made in the 2012 projections rate report. Given the low unemployment rate, it is difficult to explain the very weak earnings growth relative to productivity as the economy approaches full employment. This has led the Monetary Policy Committee (MPC) to conclude that the long-run equilibrium rate of unemployment has fallen from 5% to 4.5%. There are a number of reasons for this decline in long-run unemployment rate such as higher levels of educational attainment, higher life expectancy, and tax and benefits reform (higher incentives to go back to work). It is important to note that there is a high degree of uncertainty around the long-run unemployment rate and the level of slack in the labour market. Hence, it is difficult to predict when lower employment will create inflationary pressures. In the long term, migration may be an important determinant of labour supply, especially as the demographics point to a contraction in the labour force.

## Productivity

Economic openness is an important determinant of productivity. In particular, openness can have an effect on capital accumulation and labour supply, and on how efficiently capital and labour are combined to produce output (known as total factor productivity or TFP). Evidence suggests that one way in which openness matters for productivity is through foreign direct investment (FDI). FDI leads to the adoption of new technologies and processes which boost productivity. Moreover, it is more difficult for a less open economy to specialise and exploit its areas of comparative advantage. As such, productivity growth will be impacted by the new arrangements that come into place after the UK leaves the EU as uncertainty around these agreements is likely to weigh on investments in capital equipment and skills.

### Table 9: Comparison of real earnings and labour productivity growth

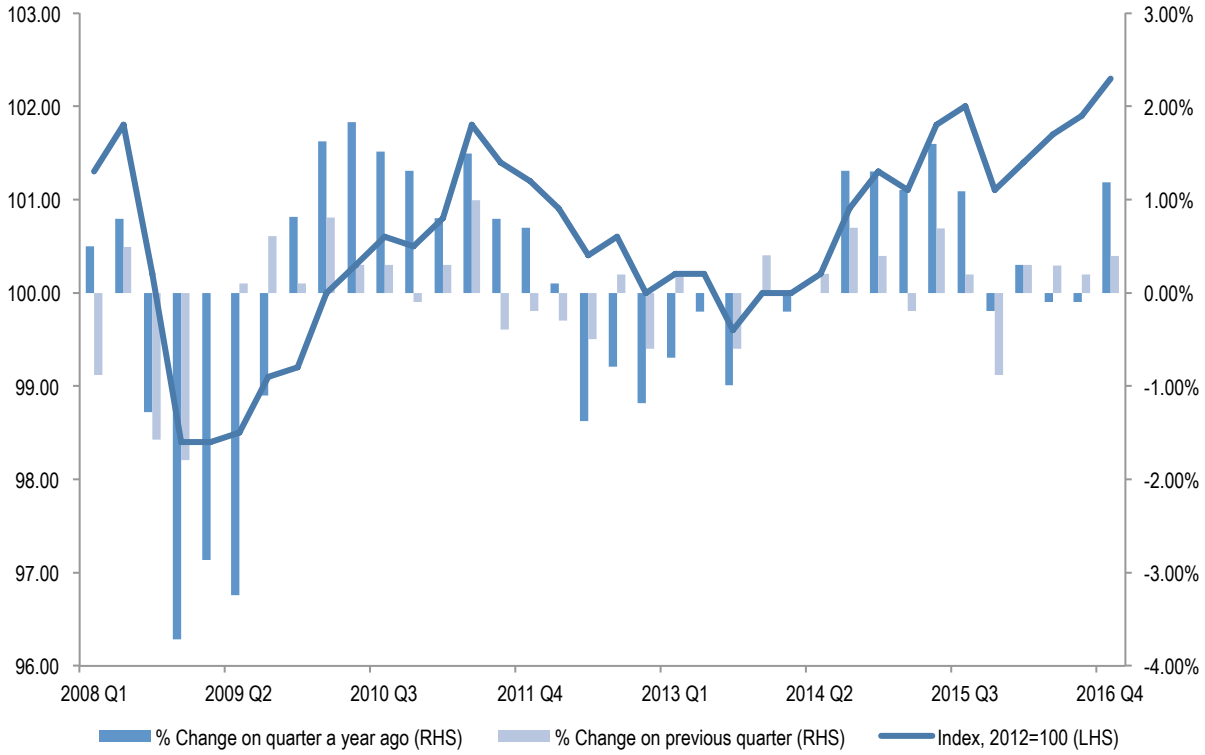
| Annual average growth | Real Earnings | Output per hour | Output per worker |
|---|---|---|---|
| Q3 2000 - Q3 2007 | 2.35% | 1.94% | 1.75% |
| Q4 2007 - Q4 2016 | -0.40% | 0.01% | 0.10% |

**Source: ONS**

Productivity and earnings growth tend to be very similar in the long run. However, Table 9 shows how real earnings have lagged productivity growth in the post-crisis period. Moreover, productivity growth has also been weak after the recession, only returning to pre-crisis level recently (Figure 8 and Figure 9). As mentioned before, the weak UK productivity growth can be partly explained by the after-shocks of the financial crisis; reduced investment in physical and

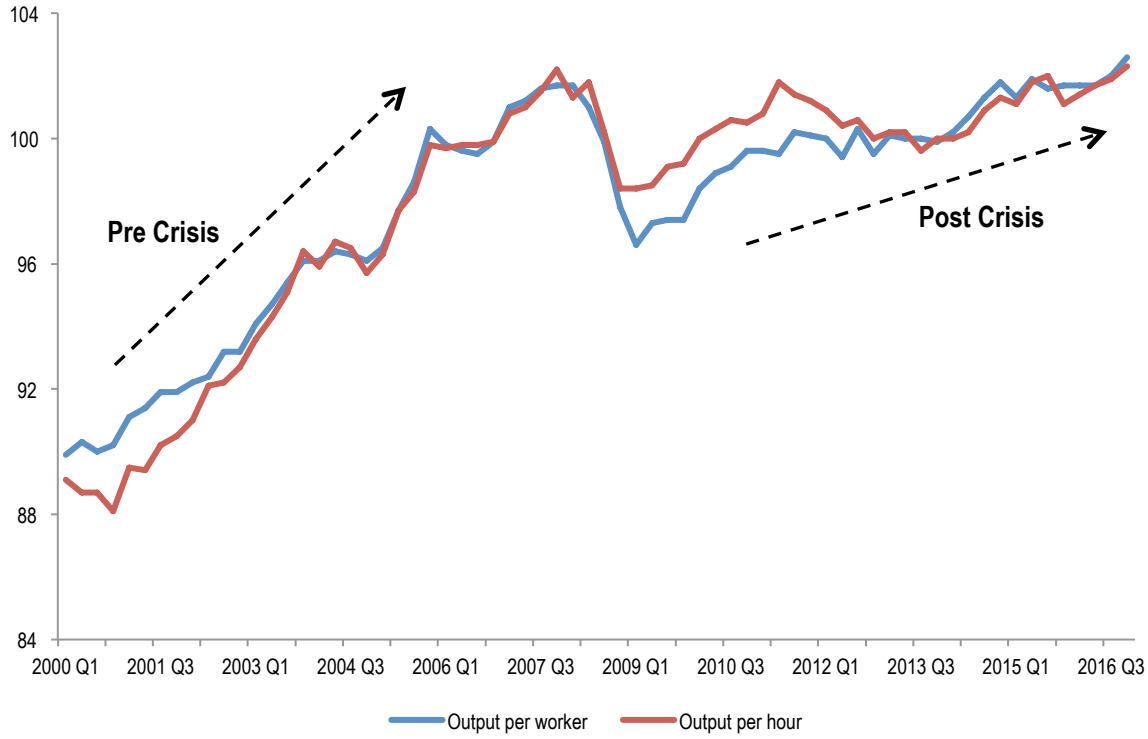
intangible capital due to low business confidence, and sub-optimal capital allocation as a larger than normal share of capital may be tied up in unprofitable businesses.

***Figure 8: Whole economy output per hour (seasonally adjusted)***




**Source: ONS**

***Figure 9: Productivity indices (output per hour and output per worker)***




**Source: ONS**

***Table 10: Recommended assumptions for real and nominal UK average earnings growth***

| % | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 - 2031 |
|---|---|---|---|---|---|---|
| Nominal earnings | 2.6 | 2.7 | 3 | 3.4 | 3.6 | 4.25 (3.5 - 5) |
| Real earnings (relative to CPI) | 0.2 | 0.4 | 1 | 1.4 | 1.6 | 1.75 (1.5 - 2) |

**Source: OBR (March 2017), FCA estimates for 2022-31**

## Conclusion

We summarise our analysis by saying that projected inflation using the broad GDP deflator measure is assumed to be around 2.5% on average over the next 10-15 years and average earnings growth is assumed to be around 3.75% on average over the same 10-15 year projection horizon. These assumptions would correspond to possible values of real earnings growth of 0.75% - 1.75% on average over the next 10-15 years. The 10-15 year average nominal earnings growth in this report (3.75%) is lower than that of the 2012 report since productivity growth is projected to be lower in the next five years. This drags down the 10-15 year average and explains the difference with the long-run productivity growth (4.25%). Our calculations of projected financial returns are set to be consistent with these recommended economic assumptions and ranges.

# 4 Asset allocation

Regulated projections given by firms to customers are intended to be a rough guide to the kind of returns that might be achievable and are relatively conservative by design. As standard projections, they need to reflect typical asset mixes and in particular the general mix of more risky assets (equities, property, etc.) compared to lower risk assets (especially bonds), whilst recognising that this will likely vary considerably from firm to firm. In cases where the projections as determined by the FCA overestimate the investment potential of particular products or fund options, firms are explicitly expected to consider the use of lower, more appropriate returns.

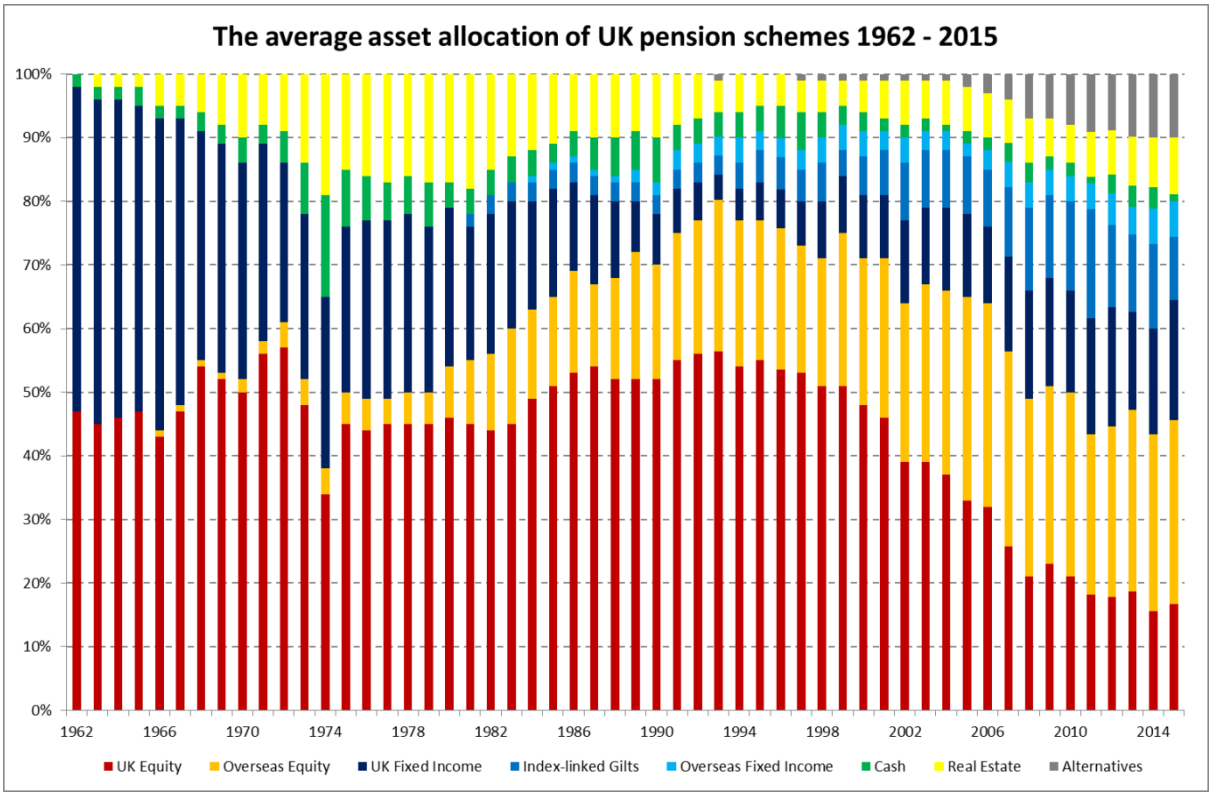
We maintain the approach taken in the 2012 PwC report, which focuses on deriving a generic broad guide to future returns, rather than a more detailed analysis of the individual mix of assets underlying various products. As in the previous report, we have not looked explicitly at unit-linked investments due to the very diverse nature of the underlying asset classes. The projections set out in this report will be used not only for single asset-class products, but also on balanced funds, with-profit policies and ISAs, as noted in Box 1.

Our discussion in this section focuses on the way in which aggregate portfolio distributions have changed over time. This will inform our judgement on the "reasonable" mix of risk-free and risky assets for the purpose of setting assumptions which might be used to inform consumers as to the potential ranges of returns available on an investment product.

## Balanced funds

Data for the asset allocation of retail investors are not readily available, and there is a very wide range of investment styles for balanced managed retail funds. Therefore many funds will have very different asset allocations from any "median" fund we might select. As a result, similar to the 2012 PwC report, we focus on the aggregate asset allocation across UK pension funds. For these data we rely on the UBS Asset Management's Pension Fund Indicators 2016, which provides data back to 1962. Figure 10 below presents these data.

***Figure 10: Average asset allocation of UK pension schemes***




**Source: UBS Pension Fund Indicators 2016**

As we can see from Figure 10, the overall equity allocation of UK pension funds is about 45% of assets. This is lower than the 50% equity allocation in 2011 (the time of the last report) and a continuation of a decreasing trend that began in the 1990s, when equities comprised 75%-80% of assets. Within this equity allocation (45%), funds continue to diversify away from UK equities to a mixture of UK and overseas stock, with over 60% of equity funds comprising overseas investments.

The property allocation has also decreased over the last 25 years. After rising to almost 20% of the average portfolio in the 1980s, property now makes up on average 7% of all UK pension assets, and this has remained stable over the past five years.

Investment in fixed income securities has remained stable over the last five years at around 30%-35% across all bond categories.

Alternative investments, such as commodities and derivatives, have accounted for 9% of assets on average over the past five years, a slight increase compared to the 8% allocation in 2011, mentioned in the previous PwC report.

Since equities are generally expected to outperform other asset classes in the long-run, we think it is likely that over time higher equity asset allocations will return as long-term investments of choice for pension schemes where the majority of members are not in or close to retirement. Further, the low projected returns available in the bond market over the 10-15

year forecast period (see Section 5) are likely to enhance the relative attractiveness of equity assets.

## With-profits funds

The key investment product based on multi-asset returns available to retail investors is a with-profits policy. There are several complicating factors in examining returns from with-profits policies, including the fact that returns are smoothed over time, the extent to which an insurance company's free assets[13] are available to augment returns, the contribution to returns of profits from annuity and other non-profit businesses, and the cost of guarantees. However, over a long time horizon, the underlying return earned by a with-profits policy is primarily determined by the returns on the underlying assets.

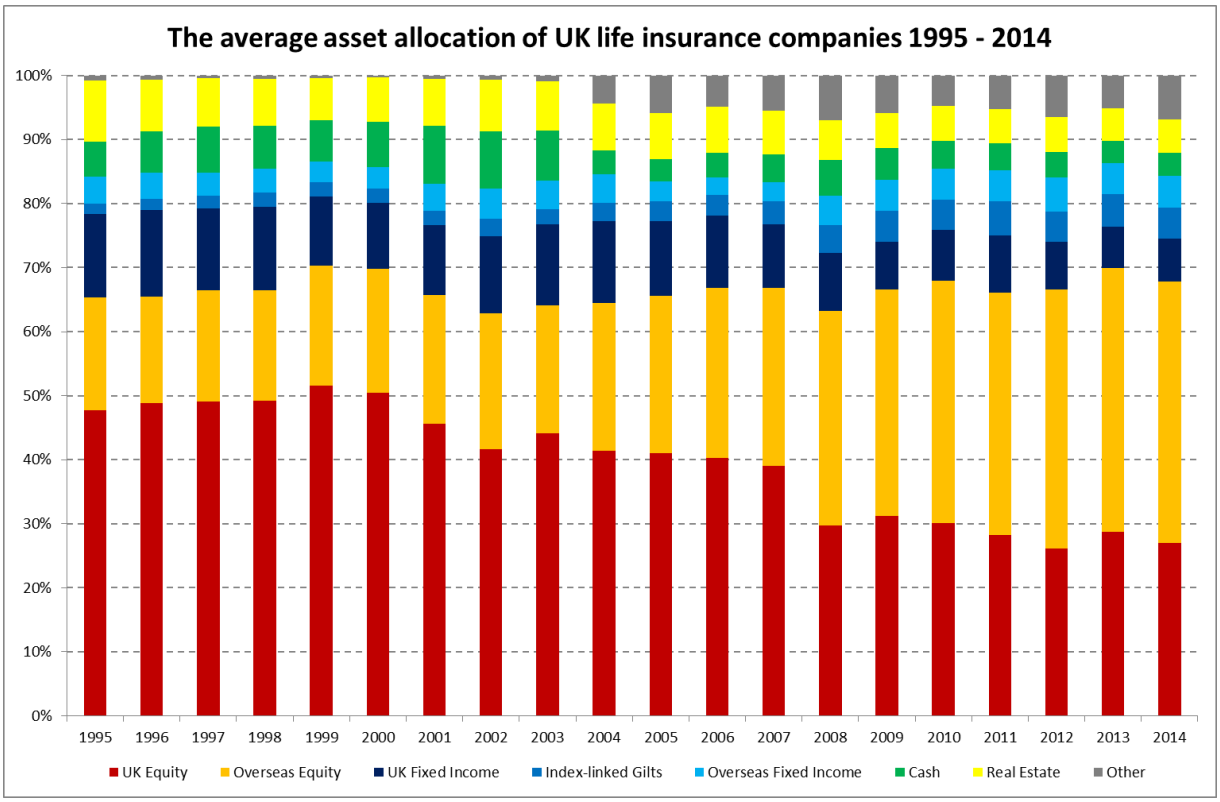
Unlike that of balanced funds, the asset allocation of with-profits funds is determined by factors other than the desire to maximise returns. Expectations of policyholders are that the portfolio would be a mixture of asset classes with, in general, a majority of the investment in equity and property. However, if the level of free assets in the fund is reduced, solvency considerations require a higher proportion of fixed interest investments. Many with-profits funds are now closed to new customers, and these typically rebalance their portfolios to a lower variance allocation to minimise solvency risk. This usually involves selling higher risk assets and buying fixed income assets aligned with an asset-liability matching strategy or attempting to optimise the correlation structure of assets.[14] As in the 2012 projections rate report, these with-profits funds are not explicitly considered in our analysis.

Figure 11 below shows the aggregate asset allocation across UK life insurance companies since 1995. For these data we rely on the ABI Investment Holdings 2014 (the most recent edition available at the time of writing).

[13] These are assets in excess of assets required to meet obligations to policyholders (according to prudential requirements).

[14] See Procyclicality and structural trends in investment allocation by insurance companies and pension funds: A Discussion Paper by the Bank of England and the Procyclicality Working Group (July 2014).

***Figure 11: Average asset allocation of UK life insurance companies***




**Source: ABI Investment Holdings 2014**

Overall equities have consistently accounted for 60-70% of assets; within that, the share of overseas equities has been stable at around 60%. We also acknowledge, in line with the previous report, that historically the allocation of equities in with-profits funds will likely be lower than the aggregate asset allocation for life-insurance companies, in the range of 50%-60%. Note that we have aggregated certain reported categories to make the data comparable with the pension funds data.[15]

## Conclusion: Asset mix

Given relatively small changes in asset allocation since 2011, we make modest adjustments to the base portfolio used for estimating intermediate rates of return. In the current report, we estimate the rates of return on cash and money market instruments. Therefore, we also include an allocation for cash and money market instruments. Our base portfolio allocation used to estimate the intermediate rate of return consists of 60% to equities, 20% to government bonds, 10% to corporate bonds, 7% to property and 3% to cash and money markets. The 60% overall equity allocation in the base portfolio is in line with the average of the equity allocation of pension funds and that of insurance companies. The 60% overall equity allocation in the base portfolio consists of 35% invested in overseas equity and 25% in UK equity, reflecting the trends towards international diversification in equity that we have observed both in UK pension funds and UK life insurance companies.

[15] Further, a number of small asset classes were reported by the ABI along with cash until 2004, when they were separated and reported as “Other”.

In addition to our base blended portfolio, we also explore the returns on the base portfolio allocation used in the 2012 PwC report, consisting of 57% equity, 23% government bonds and 10% each to property and corporate bonds, along with a further six alternative portfolio allocations.

# 5 Investment returns

## Government bonds

Government bonds are frequently thought of as risk free, especially from the perspective of local investors. However, they do carry a range of risks and consequently attract a corresponding rate of return.

As discussed in the previous report (2012), nominal yields on governments bonds factor in compensation to investors for the following:

- **Inflation** – Investors require compensation for price inflation over time, in order to preserve the value of their investments. Returns on nominal bonds incorporate compensation for the expected level of inflation over the life of the bond (index-linked bonds provide compensation for inflation through the indexation of the value of the bond).

- **Inflation risk premium** – This represents the risk that actual inflation might be different from inflation expectations incorporated in the yield on nominal government bonds at the time of purchase.

- **Maturity premium** – In normal market conditions, investors require additional compensation for purchasing longer maturity bonds, because they are more exposed to interest rate risk over a longer period. In general, this suggests an upward sloping yield curve, where the yield on longer maturity debt is greater than that on short-term debt.

- **Liquidity premium** – Investors generally require compensation for the illiquidity of an investment, i.e. the inability to translate investment into cash without facing significant transaction costs. The liquidity premium tends to be low for highly rated government bonds, such as gilts, and hence its contribution to return will be small.

- **Default risk** – Government bonds are usually considered default free, particularly in the case of a highly rated country like the UK. However, for many less credit-worthy countries bond yields incorporate some premium for default risk. In general, from the perspective of a domestic investor, national government debt issued in the local currency can be considered risk free, as the government usually has a way to meet its obligations in nominal terms.

- **Time value of consumption (time premium)** – Under normal conditions investors prefer consumption (capital spending in the case of firms) today as opposed to tomorrow, and they require compensation for delaying such consumption. However, over the last eight years the world has experienced extremely accommodating monetary policy across all major developed economies, coupled with continuing

uncertainty about global economic growth prospects. This has led government bonds of some credit-worthy countries to be issued at negative interest rates along the yield curve for some years. This may be partly due to a temporary negative time premium, a situation where instead of consuming now investors prefer to postpone consumption and their preference is so strong that they are willing to pay governments to look after their funds. A situation like this could arise due to investors waiting for the uncertainty about the economic environment to be resolved before making investment commitments or because they expect deflation (a general fall in prices over time) in the economy.

Yields on index-linked gilt securities (or TIPS in the US) provide guaranteed real returns to investors. To protect investors from cases where the realised inflation is higher than the expected inflation, index-linked bonds offer an inflation-protected real return. Coupon payments on index-linked UK government bonds are indexed to inflation by linking payments to the RPI, and hence the return on these bonds is observable in real terms. As such, they predominantly compensate investors for shifting consumption across time, although depending on the market dynamics at the time there might be additional compensation for liquidity and maturity risk.

Across the term structure of interest rates, the difference between the nominal and real yields on securities is referred to as the break-even inflation rate. In the finance literature, a popular theory holds that if the inflation risk premium is low and there is no significant liquidity risk premium associated with index-linked gilts, the difference between yields on nominal and index-linked gilts provides a reasonable estimate of the market's inflation expectations going forward.

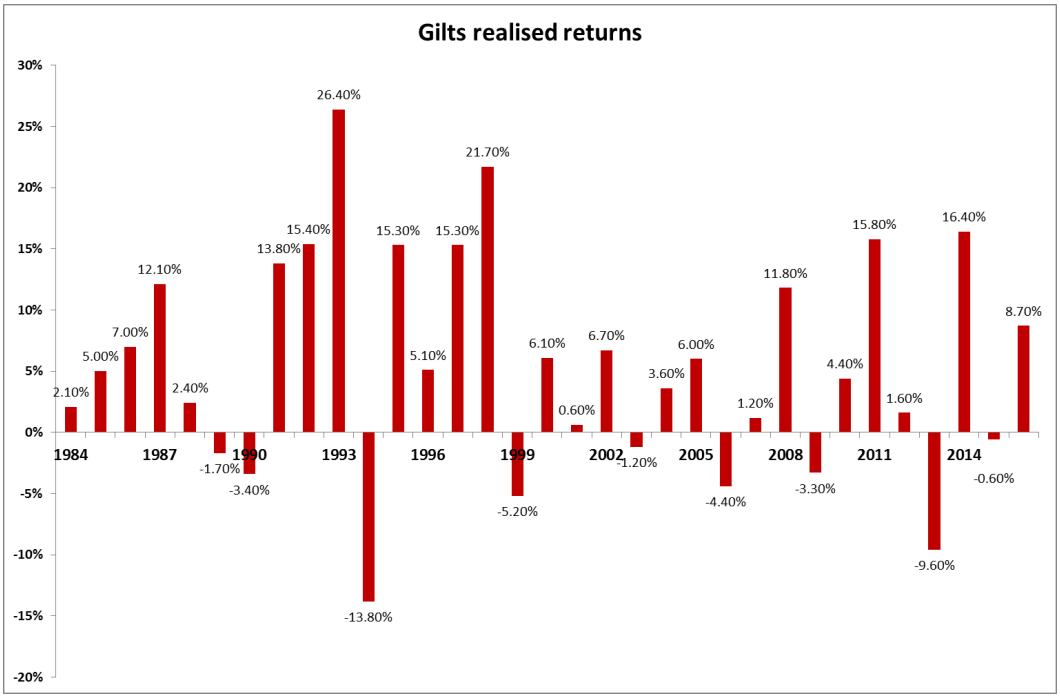
As noted in the 2012 projection rates report, it is crucial to make a distinction between the gross redemption yield and holding period returns – our focus is on the latter for the purpose of making return forecasts. The redemption yield represents the return on the fixed interest security assuming it is held to maturity. However, the actual return might be different if the security is not held to maturity, and will depend on its market value at the end of the holding period.

Keeping in mind our assumptions about inflation outlined in the macroeconomic section, we now focus on real bond investment returns. In the 2012 PwC report the recommended assumption for expected real government bond returns was 0.5% to 1% per annum over the longer-term and the nominal bond return was 3% to 3.5%. In this section we will review the performance of government bond markets in the UK and internationally (with a focus on the US) since the last report. We then provide our view of future government bond market developments and an updated assumption for expected future returns.

## Historic government bond returns

***Historical real returns on government bonds can be estimated using nominal bonds, adjusted for inflation, or alternatively can be interpreted directly from index-linked gilt securities. In this sub-section we refer to returns on the former, with the latter covered in the next sub-section. As in previous reports, the analysis is based on the Barclays Equity Gilts Study, which provides a detailed overview of realised returns.***

***Figure 12 shows UK government bond (gilts) nominal returns based on the Barclays Gilt index. Figure 12: Realised nominal returns on gilts***




**Source: Barclays Equity Gilt Study 2017**

Since the previous report in 2012, UK government bonds generated realised real returns of 3.3% per annum on average over the period from 2012 to 2016. The comparable estimate for the period between 2006 and 2011, quoted in the 2012 report, was around 3.5%. This suggests a relatively strong performance. The performance of US bonds in the 2012-2016 period with has been significantly below the historic average, with annual real returns averaging around -1.5%.

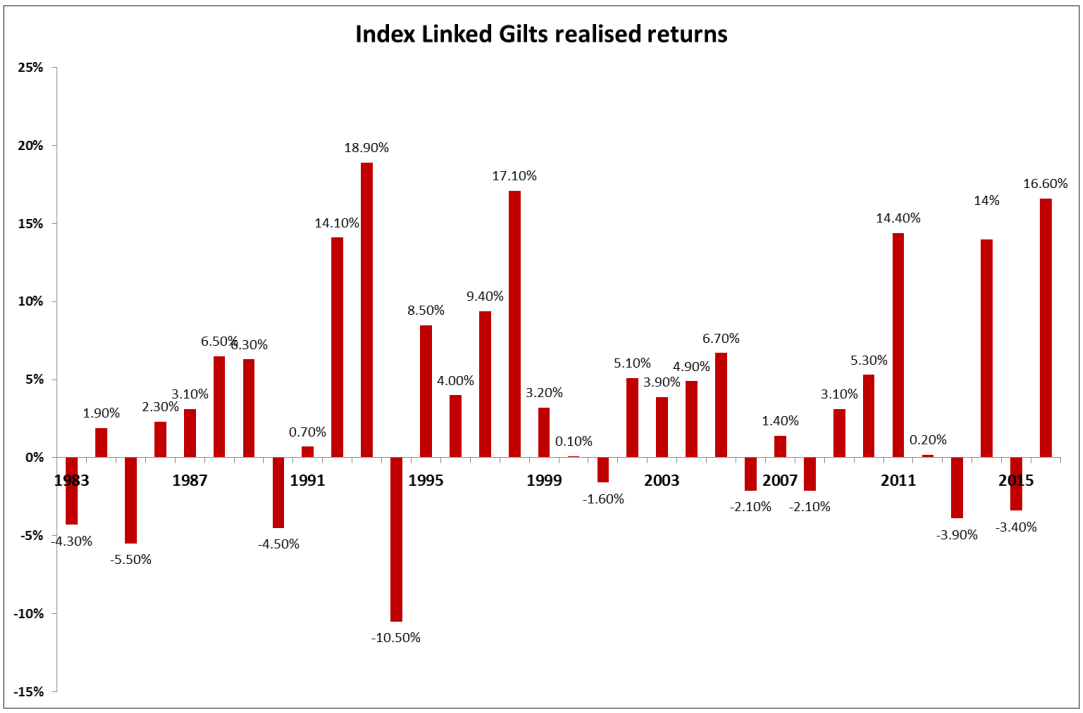
Over the longer term, according to the Barclays Equity Gilt Study, the real return on UK government bonds, from 1900 to 2016, has been 1.8% per annum. In the Credit Suisse Annual Return Yearbook (2017), the authors Dimson, March and Staunton calculate that US average real returns on US treasuries were 2% annually over the same period.

## Historic index-linked government bond returns

Index-linked government bonds provide the best indication of the real risk-free rate, because they are relatively liquid and largely free of default risk and inflation risk.

However, some of the other factors identified above, such as maturity risk and liquidity risk might also be relevant for index-linked government bonds. Index-linked government bonds were launched by the UK government in 1981 and therefore lack the same performance history as nominal government bonds. Nonetheless, the realised returns on UK index-linked government bonds reported by Barclays and replicated in Figure 13 provide a useful cross-check on real returns estimated in the previous sub-section.

***Figure 13: Index-linked gilt realised returns***




**Source: Barclays Equity Gilt Study 2017**

Over the period 2012 to 2016, index-linked government bonds achieved an average real annual return of 4.7%. This return was primarily due to a strong performance in 2014 and 2016. The comparable estimate for the period between 2007 and 2010, was around 1.9%. The variability in index-linked government bond returns results from changes in capital values[16], which are sensitive to the market rate of interest.

However, from 2012 to the middle of 2016 both UK inflation and inflation expectations have been very low by historical standards and therefore index-linked gilt prices were driven primarily by market yields.

The real return on UK index-linked gilts, from 1983 to 2016, has been 4% which is close to the 3.9% return for the most recent 15-year time period (2001 to 2016). However the future real returns on UK index-linked gilts are difficult to estimate. Current forecasts and recent inflation figures indicate that inflation may continue to pick up, which will likely lead to increased demand for index-linked securities. On the other hand, one also needs to account for other factors such as monetary policy. On balance, future index-linked returns in the next 10-15 years appear likely to be lower than their long-run historical average.

## Past and current yields

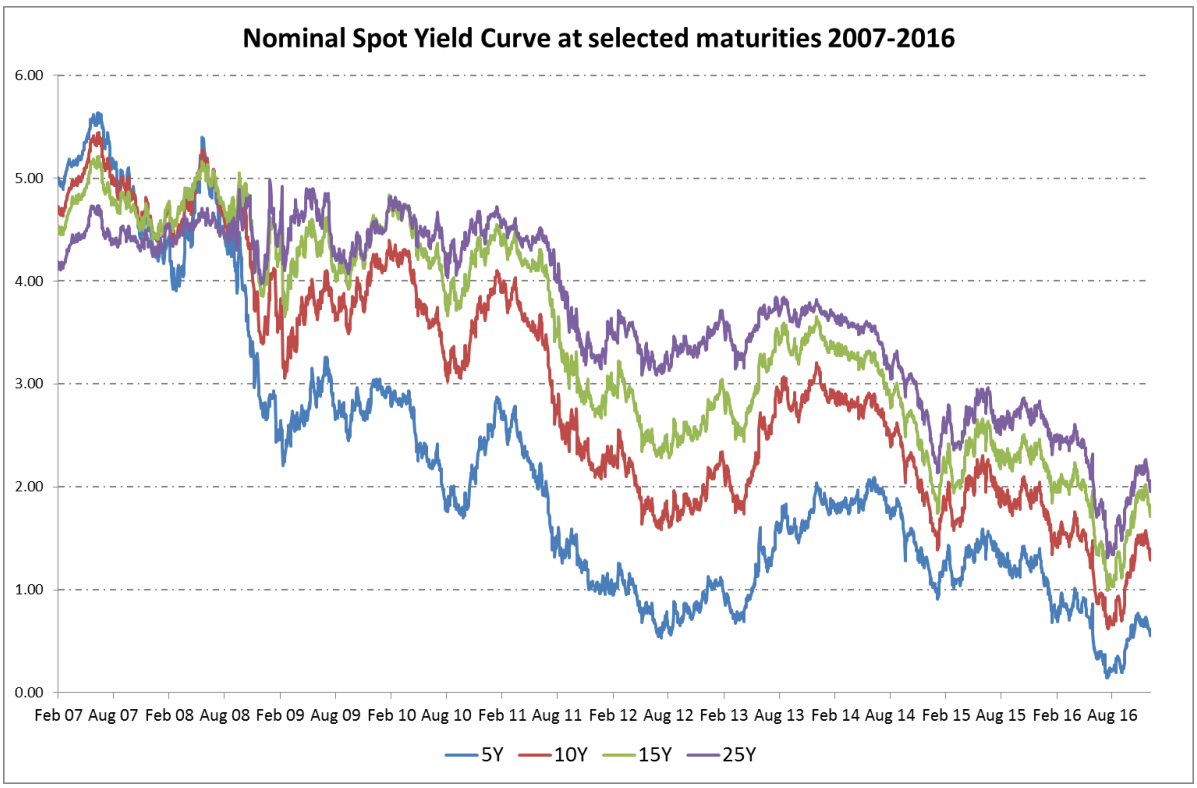
Central banks across the world reacted to the crisis by cutting interest rates and launching quantitative easing programmes that pushed rates down on government securities.

[16] The bond principal which is adjusted for inflation over time.

Unemployment across the developed world had increased rapidly and GDP growth in the US, UK and Europe had dropped significantly below trend, as have inflation expectations.

In this context, the return projections in the last report were made with a high degree of uncertainty and with a warning that risks lay on the downside. Nevertheless, the short-term assumption was that monetary conditions in UK and abroad would return to normal (PwC Report 2012, p.3).

***Figure 14: Nominal spot UK yields at selected maturities from 2007 to 2016***

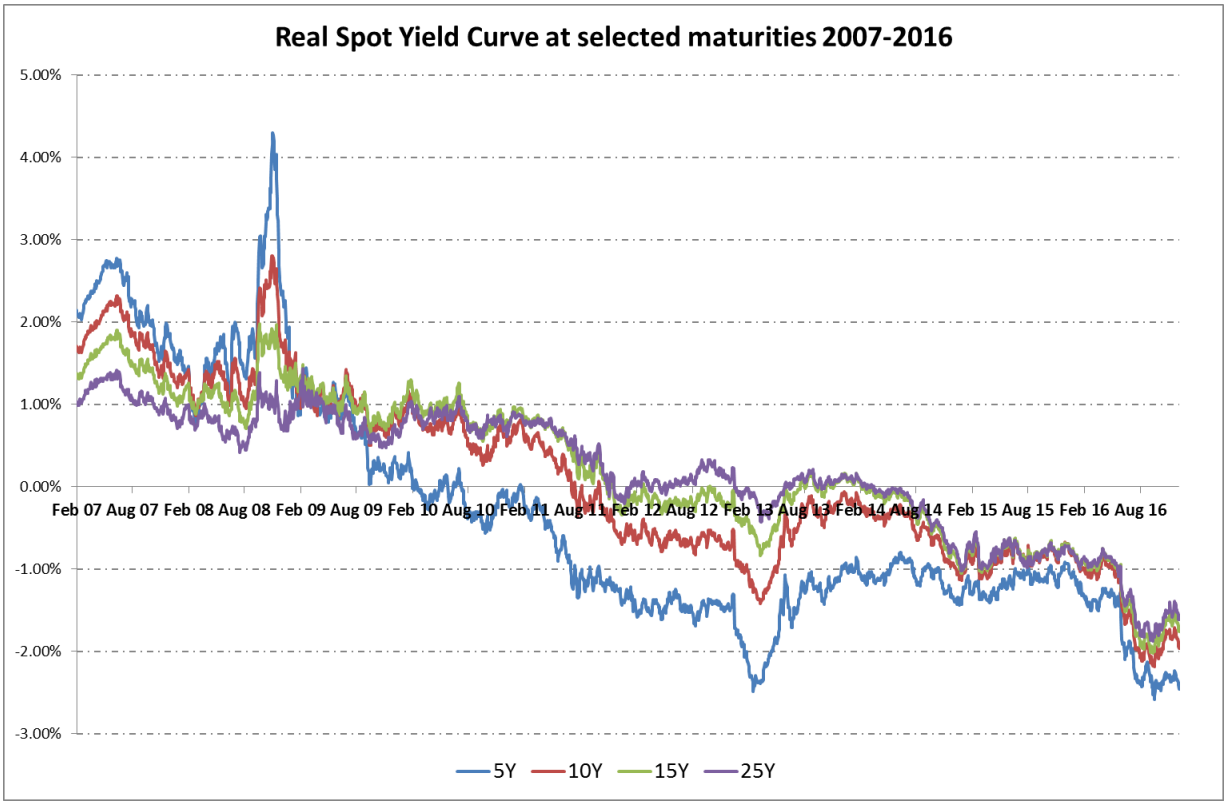



**Source: Bank of England**

Yields on non-indexed gilts (nominal yields) have been on a downward trend since 2013. We can see that nominal yields moved upwards following the referendum on the UK exit from the EU in June 2016, and in that context it is even more difficult to ascertain the long-term direction of nominal yields. From Figure 14 we can also observe that since the 2012 report the nominal spot yield curve has flattened further, especially at the medium-term maturities.

When the previous report examined real gilt yields, they had been on a downwards trend since before the financial crisis. However, as Figure 15 below illustrates, on 24 February 2012, the date of the last data point included in the previous report, ultra-long-term real yields had just entered negative territory. The report listed a number of explanations for this unprecedented state of the market and considered that it was unlikely to last. As of the end of December 2016 many of these explanations still appear reasonable, however real yields across maturities are spread around -2% as indicated in Figure 15 below. While a return to long-run average real yields is the most likely long-run outcome, predicting the timing of this event is by no means easy. Therefore, even at present a degree of downside risk remains.

***Figure 15: Real spot yield curve at selected maturities***




**Source: Bank of England**

## Future expected returns on UK government bonds

Historic realised government bond returns are a useful indicator of the range of future returns. However, to obtain an estimate of the future expected returns we focus on the market yields of traded bonds.

The focus of this sub-section is to assess the future expected real returns for UK gilts. Consistent with the previous PwC report, we estimate expected real returns in two ways:

- Focusing on the redemption yields on nominal gilts and subsequently adjusting for expected long-term inflation, in line with the conclusions we draw from our assessment of inflation in the earlier price inflation section.

- Reviewing the yields and underlying trends in the index-linked[17] gilts market.

[17] The return on index-linked gilts is technically not totally risk-free, as the inflation adjusted principal is based on the retail prices index (RPI) value three or eight months prior to the interest payment date, resulting in a very small residual inflation risk. The gross redemption yield calculation also assumes that coupons are reinvested at the gross redemption yield rate.

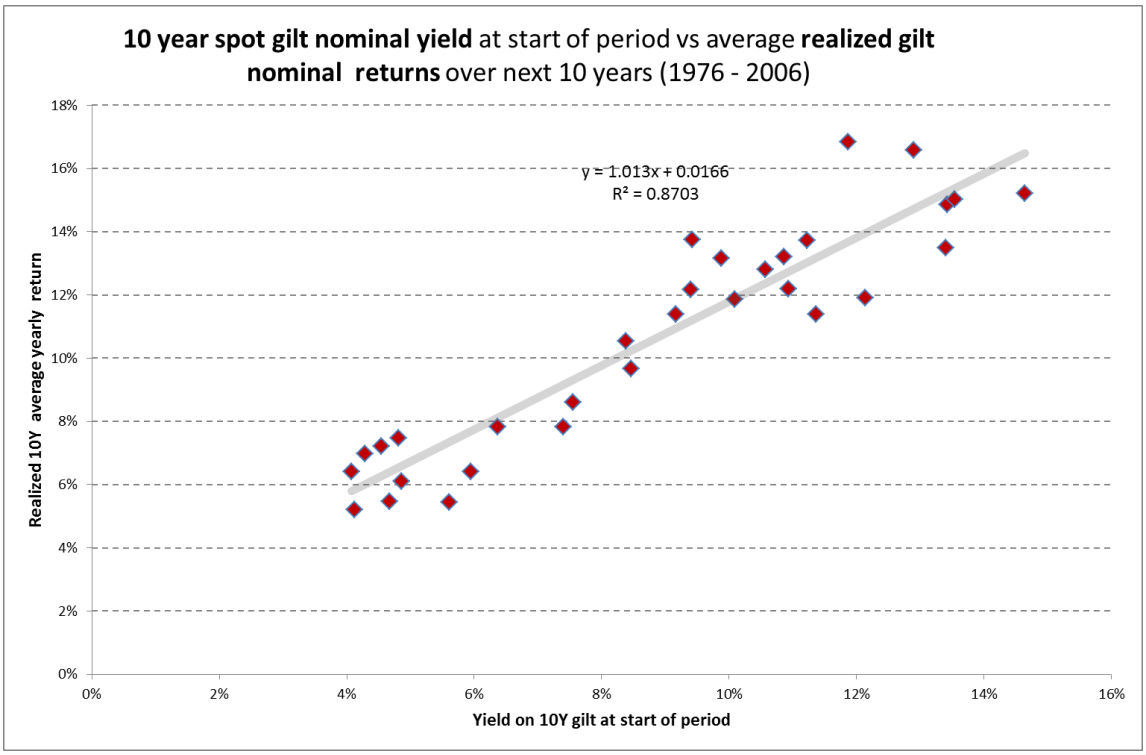
### *Nominal UK government bonds*

At the end of December 2016, the spot estimates of yields on nominal gilts of 10-year (1.30%) and 15-year maturities (1.73%) were lower than their historical five year averages of 2.04% and 2.56% respectively (with a mid-point of the historical averages around 2.3%). If we look at historical five year median values instead of average values, we arrive at a very similar number for the 10-year and the 15-year maturities. They are 1.99% and 2.54% respectively (with a mid-point of the historical medians of 2.26%).

Long-term gilt yields have provided a good predictor of average yearly realised nominal gilt returns in the past, provided they match the average duration of the nominal gilt market. The average modified duration of the nominal gilt market has swiftly increased over time from around 7.3 years in 2004 to slightly less than 10 years, where it has remained for the majority of the period 2004-2016, according to Debt Management Office (DMO) data. . Therefore, we explore the relationship between the yield on 10-year gilts in a given year and the realized return of UK nominal gilts in the following ten years.

Figure 16 plots the nominal yields on 10-year gilts at the start of a 10-year period versus the average annual realised nominal return on the whole gilt market over the period. Up to the last full 10-year period for which we have data and which starts in 2006, the 10-year nominal gilts yields have proven a good predictor, with a slight downward bias (of about 1%), of average annual realised nominal returns on UK government debt.

***Figure 16: Spot 10-year gilt yield at start of period vs. realised gilt nominal returns over the next 10 years***




**Source: Barclays Equity Gilt Study 2017, Bank of England, Own analysis**

However, when forming our future estimates we interpret this with caution, as the historical data are based on a much higher level of nominal 10-year yields (on average about 3% since

1976). It is quite possible that the relationship can be very different in a period of record low nominal and negative real yields, such as the present one.

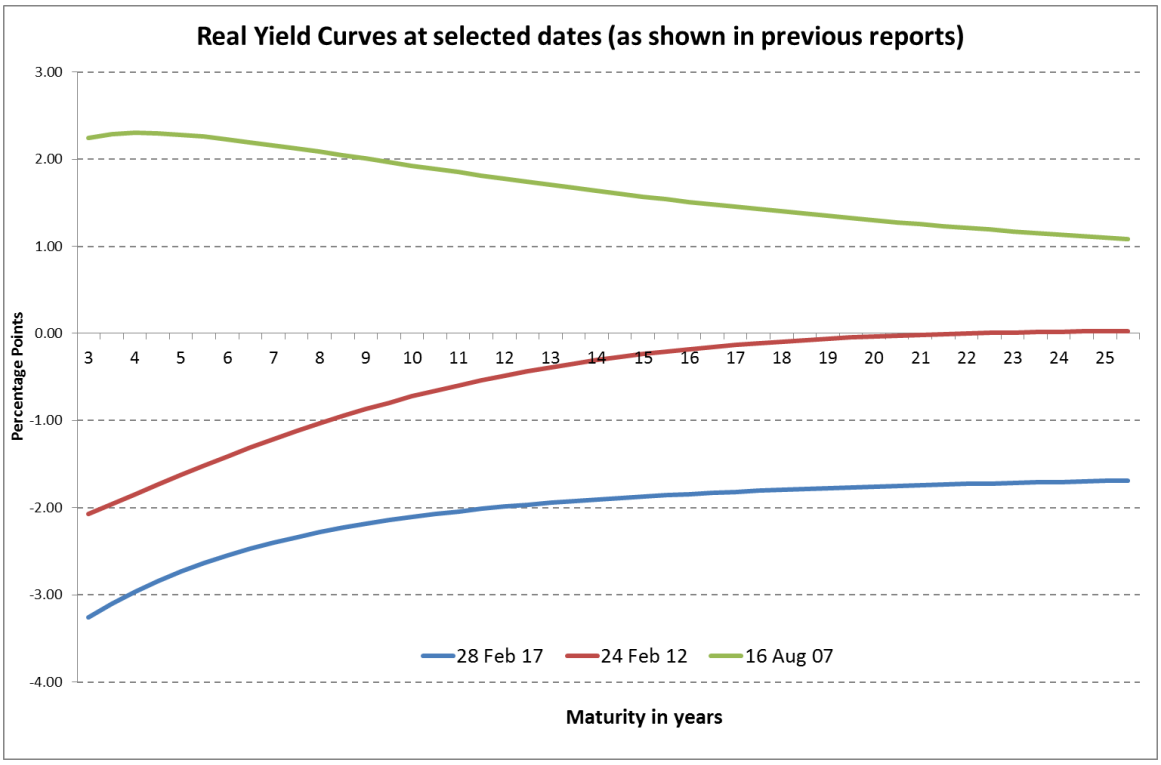
We now adjust the nominal returns, our estimate of annual inflation over the next 10 to 15 years which is based on the GDP deflator. Based on an inflation estimate of 2.5% over the period and nominal yields from 1.45% to 1.9% we arrive at an inflation-adjusted estimate of gilts returns of -1% to -0.6%.

### *Index-linked UK government bonds*

As of the end of December 2016, 10-to-15-year real yields on gilts were at historic lows (with the exception of the Eurozone crisis period). In addition, the yield curve while still upwards sloping has flattened considerably since the previous report, as illustrated in Figure 17. As of the end of December 2016 the spot yield on 25-year index-linked government bonds was -1.61% which was slightly higher than the 10-year index-linked government bond yield of -1.96%. This indicates that the market does not expect yields to change significantly in the future.

Given the expected holding period of 10 to 15 years on which our projections are based, the flattening beyond the 10-year maturity is of particular interest. We keep in mind that market expectations can be revised swiftly and some economic commentators expect the Bank of England to begin raising rates at some point in the near future. Any resulting upward adjustment in yields will likely steepen the real curve; however in our view this adjustment is likely to be very gradual. Further, longer-term rates tend not to be too sensitive to changes in the base rate.

***Figure 17: Real yields curves at selected dates***

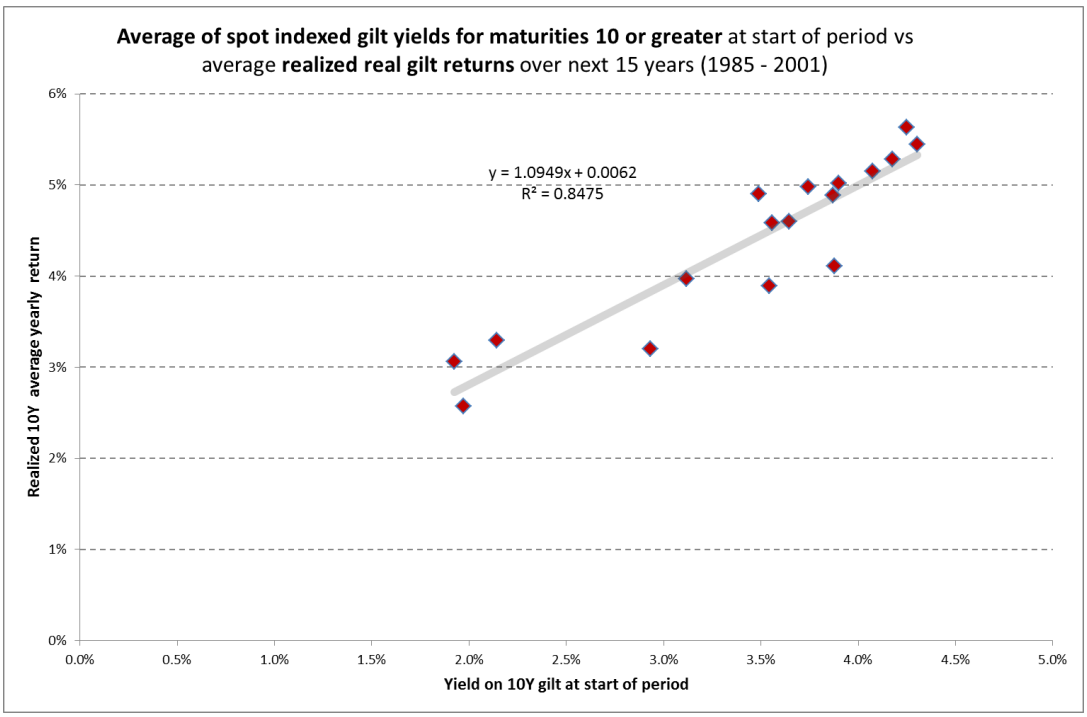


**Source: Bank of England**

As is the case with nominal gilt yields, indexed gilt yields can be a good predictor of average yearly realised real returns for the UK bond market, provided one controls for the average duration of the indexed gilt market. The average modified duration of the indexed gilt market has steadily increased over time from around 11 years in 2004 to slightly above 21 years in 2016 according to Debt Management Office (DMO) data. The increase in duration has been gradual and evenly spread across the time period.

The high market duration and the fact indexed gilts have been issued only since 1983 leaves us with limited data points to work with. Because longer maturity indexed gilts are not issued consistently and the issuance amount at each of the longer individual maturities is relatively small, in Figure 18 we use the unweighted average yield of index-linked gilts across maturities of ten years and above. The chart plots this yield at the start of a 15-year period against the average annual realised real return on the whole gilt market over the period. While our sample is limited, up to the last full 15-year period which starts in 2001, the 15-year indexed gilts yields have proven a good predictor of average annual realised real returns on UK government debt.

***Figure 18: Spot indexed-linked gilt yields for maturities greater than 10 years at start of period vs. realised index-linked gilt returns over the next 15 years***




**Source: Barclays Equity Gilt Study 2017, Bank of England, Own analysis**

We note again that inferences based on the historical data should be viewed with caution, as past data do not include periods of negative real rates.

The previous PwC report discussed (PwC Report 2012, Section 3.3.1) how inflation expectations based on the RPI are distorted due to the calculation methodology. We believe

the previous analysis was correct. Therefore, to maintain consistency with the previous report, we will base our return estimates for the next 10 to 15 years on the GDP deflator.

Just as in the last report, we adjust current spot yield estimates upwards by the difference between our estimates for the RPI and GDP deflator, which is currently 3.25% less 2.5%, equal to 0.75%.

The spot yield estimates as of December 2016 on 10-year and 15-year index-linked government bonds are around -1.82% and -1.62% respectively. These yields are also significantly lower than their 5-year averages of -0.81% and -0.56% respectively (with a mid-point around -0.69%), and their 5-year median values of -0.74% and -0.46% respectively (with a mid-point around -0.60%).

We adjust spot yield estimates as of December 2016 on 10-year and 15-year index-linked government debt of -1.82% and -1.62% respectively for inflation based on the GDP deflator, instead of RPI. This positive adjustment of 0.75% results in adjusted yields of -1.07% and -0.87% for the 10-year and 15-year maturities respectively.

At present, considering the very low term premium of the current yield curve, looking at the forward curve provides little additional guidance.

### Selection of real UK government bond assumptions

The 2012 PwC report took the view that the market for gilts was being depressed by short-term factors (such as a flight to quality and negative real yields) that were temporary in nature. Since then, however, yields have gone even lower. This has had a positive effect on real holding period returns as gilt prices have edged higher. However, it has also highlighted the difficulty of unwinding extraordinary monetary policy measures. In our view, this has increased the timescale over which a rise in yields back to the historical range is likely to occur. In the next 10 to 15 years the prospects for gilt prices are stacked chiefly to the downside, as in practice there's likely to be a limit to how far real yields can fall.

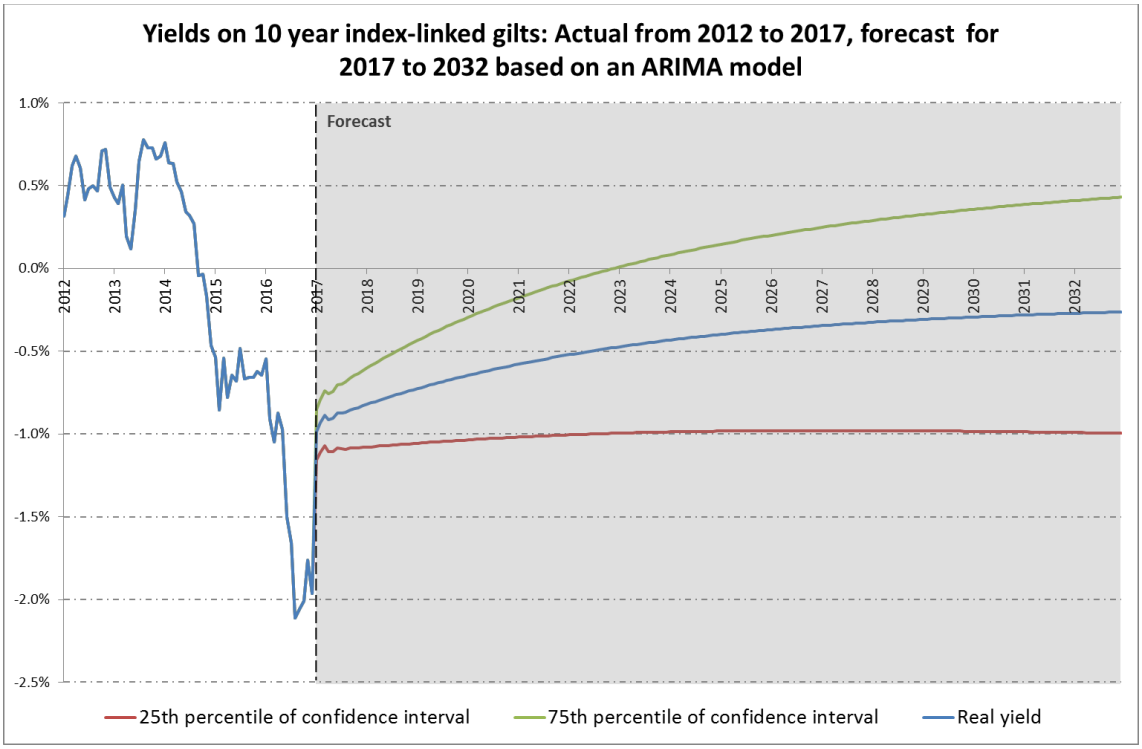
Using the GDP deflator as a measure of expected inflation, the real index-linked bond yields for 10-year and 15-year maturities are -1.07% and -0.87% respectively. This range is largely in agreement with the current spot estimate of inflation-adjusted yields on nominal gilts of 10-15 year maturity (-1% to -0.6 %).

Taking the adjusted yield estimates from index-linked gilts into account, we consider an overall range of -1% to 0% (with a mid-point of -0.5%) as appropriate for expected medium-term real return on UK government bonds.

There is still considerable uncertainty associated with the likely medium-term movement of index-linked gilt yields. While predicting real yields with any degree of certainty over the short and medium term is very challenging, we have illustrated what we believe to be a credible

base case in Figure 19. This chart shows a forecast for the spot yield on 10 year index–linked gilts from 2017 to 2032 (covering our time horizon for projections of 10-15 years) where the mean forecast is derived using an ARIMA model[18] and the 25th and 75th percentiles are derived using quartile regressions of the error term from the ARIMA model.

***Figure 19: Yields on 10 year index-linked gilts: actual up to 2017 and forecasts thereafter***




**Source: Bank of England, Own analysis**

## Foreign government bonds

From the section on asset allocation we can see that both pension funds (Figure 10) and insurance companies (Figure 11) allocate around 5% of their assets to overseas fixed income securities. Such a small allocation is unlikely to shift the overall projected return rates, and therefore, in keeping with the 2012 PwC report, we do not separately estimate projected returns for overseas fixed income.

However, as overseas fixed income represents a major investment asset class, it is worth discussing the merits of investing in overseas government debt relative to domestic government debt.

[18] Based on actual yields data up to December 2016.

Overseas debt offers a much wider range of yields to investors due to the wide range of credit quality. These yields also come with currency risk for UK investors, as bonds are issued in foreign currencies. However, bonds issued in liquid global reserve currencies such as the US dollar, the yen and the euro can be currency hedged at relatively low cost through currency swaps and forwards. Over the long term, sovereign credit risk is the key determinant of sovereign bond yields. The bonds that offer high yields also carry a high risk of capital loss due to a default by the bonds issuer. This is risk is higher for sovereign bonds issued in a currency different from the sovereign's domestic currency.

Because we are interested in estimating risk-adjusted expected returns for our projections, we need to rely on a model for the expected losses on overseas government debt and then adjust current yields based on the estimate. A number of such models are available and in essence we have employed this technique in estimating the returns of UK corporate bonds.

However, the investable universe of assets is significantly larger in overseas government debt relative to UK corporate bonds and therefore requires a significantly larger number of estimates. Because of the high number of necessary estimates, combined with the low allocation to overseas bonds, we do not explicitly estimate an expected rate of return for overseas investments.

Moreover, an additional consideration is the significant uncertainty surrounding exchange rate expectations for the pound over our forecast period of 10-15 years, due to the UK exit from the EU. Overall, as in the PwC 2012 report, we use UK government bond yields, both nominal and real, to also reflect the expected returns for UK investors from investing in a diversified portfolio of foreign government bonds.

### Importance of the risk-free rate in calculations

The nominal yield on domestic government bonds is frequently used as a proxy for the nominal risk-free interest rate. The nominal yield on UK government bonds has been around 2% and even lower for short-term maturities since the previous report. This is considerably lower than 4.37%, which represents the bottom of the range of our projection rate for the base portfolio allocation. Therefore, we reiterate the suggestion, also given in the 2012 PwC report, that consumers must be informed that even the lowest end of the projection rate range does not set the minimum return they could expect, as achieving this rate still involves taking on a degree of investment risk.

## Corporate bonds

The majority of corporate bond yields trade at a premium to the yield on government bonds of comparable maturity, reflecting compensation that corporate debt investors require for the following key factors: systematic risk, expected default risk and liquidity risk.

Corporate bonds make up a small (but growing) part of the portfolio of a typical pension fund. This section explores the expected returns for corporate bonds in comparison to government bonds and equities, focusing particularly on the UK corporate debt market.

## Historic corporate bonds returns

As highlighted in the 2012 report, the Barclays Equity Gilt Study at the time gave an average real realised return for UK corporate bonds over the previous decade (from 2002 to 2012) of 2.1%, compared to the average real realised return for UK government bonds over the same period of 2.4%, implying on average no or even a negative premium over gilts. This likely resulted from investors in UK corporate bonds over the period expecting lower credit losses than the credit losses that were realised in practice. In other words, investors in UK corporate bonds did not demand yields sufficient to offset the losses they incurred on average over the period.

The 2017 Barclays Equity Gilt Study provides an estimate for real annualised returns on UK corporate bonds over the last ten years (from 2006 to 2016) of 3.1%, again lower than gilts returns (4.3%) over the same period. Note that the performance of UK corporate bonds was heavily driven by gains in 2016, when corporate bonds returned 9.5% in real terms. Looking at the real annualised returns for the ten years prior to 2016, UK corporate bonds returned 1.8%.

A likely explanation for this negative premium over gilts is that over a full credit cycle, on average the extra premium demanded for investing in corporate bonds is more than offset by the reduction of principal and interest experienced in cases of default.

In the US, corporate bonds returns averaged 5% over the last 10 years and 4.9% over the last 20 years. This is slightly higher than the annualised returns on US government bonds over the 10- year horizon, which stood at 4.6% and identical to the annualised 4.9% US government bonds achieved over 20 years. Again, this was heavily influenced by returns in 2016 when US corporate bonds returned 8.7% versus -0.6% for US Government bonds. Excluding 2016, the returns on US corporate bonds over the last ten years are slightly below the returns on US government bonds.

## Future corporate bond returns

The historic performance of corporate bond returns is an approximation of the returns that have been achieved in the past. However, we are interested in the expected returns that can be obtained today. The best estimate of these returns is reflected in the prices of traded corporate bond investments.

Corporate bonds are rated by ratings agencies (such as Standard & Poor's (S&P), Fitch or Moody's) from investment grade to junk grade, where the rating provides an indication of the expected probability of default. The yield to maturity for corporate bonds varies by rating, with higher rated investment grade bonds trading at a lower spread relative to government bonds.

A typical UK corporate bond is rated at the lower end of the investment grade threshold at BBB, based on S&P long-term issuer ratings.[19]

The previous PwC report calculated the expected future return for corporate bonds using two separate approaches – an implied market-pricing approach and a premium decomposition approach. Under the former, the future expected returns are based on the promised yields adjusted for expected default losses. The latter estimates the debt premium as the product of the debt beta and the EMRP. The debt beta represents the systematic risk of a debt security, i.e. the correlation of its returns with broader market movements, whereas the EMRP (as discussed in the Equity return section) captures the premium investors require for investing in the equity market.

In this report we also provide an assessment using the two approaches.

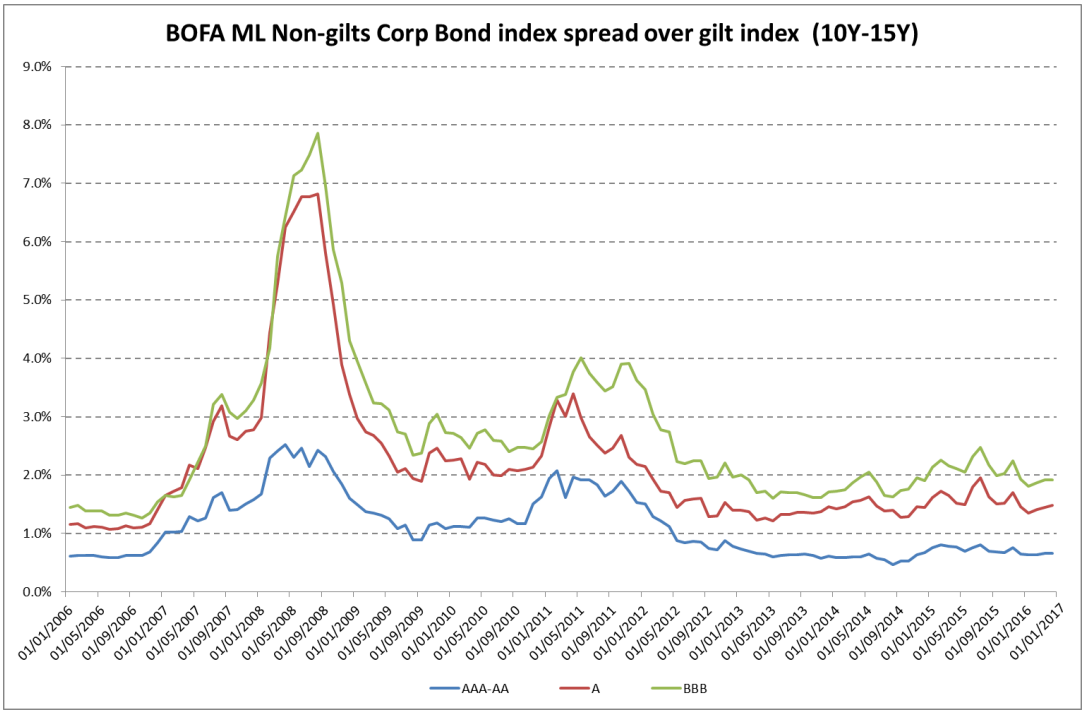
### *Implied market pricing*

In this sub-section the spread on a corporate bond refers to the extra yield the bond provides compared to a gilt of comparable maturity. As illustrated in Figure 20, the current spread on a BBB-rated UK corporate bond with a maturity of 10 to 15 years as of December 2016 was around 1.9%, lower than the ten year average (2.6%). Similar spot estimates on A-rated and AA-rated bonds are lower at 1.5% and 0.7% respectively.

In the last report, PwC used a two year historical average for the purposes of implied market pricing of expected returns, as in their view this gave a reasonable weight to both the spot estimates and the recent trends at the time. For consistency we maintain this approach, and note that currently there is very little difference between the spot estimates and the two year averages. The two year average spreads from January 2015 to December 2016 for bonds rated BBB, A and AA were 2%, 1.5% and 0.7% respectively.

19 Based on Bloomberg data for bonds issued by UK parent companies and outstanding as of 31 December 2016.

***Figure 20: BOAM ML corporate bond indices spreads over the gilt index***




**Source: Datastream**

Compared to government bonds, corporate bonds are more exposed to default risk. This means that the calculated yield is in fact a "gross" expected yield, rather than a true expected yield, which must also account for default risk, because any defaults will reduce the actual return below the gross yield.

To estimate a future expected return, the expected default risk premium must be deducted from the spread on corporate bonds. As discussed in the 2012 report, the most direct estimate of this premium can be observed in the credit default swap (CDS) market. Credit default swaps entail a payment from the seller of the swap to the buyer in case the company named in the swap defaults on the bonds it has issued. CDSs are priced in basis points (bp), which represent one hundredth of one per cent, and these prices reflect the amount of principal that must be paid by the buyer to the seller each year to maintain protection under the contract, much like an insurance premium.

We could adjust both current (spot) debt spreads and historical average credit spreads for default risk by using CDS premia. Considering the minimal difference between the spot and historical credit spreads, we only adjust the current spreads. For our CDS premium adjustment we use the average CDS premium in March 2017[20] on the 29 firms in the FTSE 100 at that time that had traded CDS contracts with observable prices. Considering the time horizon of 10 to 15 years for our return assumptions we use annual credit premium for the CDS contract with a 10 year (the longest) maturity. We split the 29 firms into two broad credit rating categories A (A- to AA-) and BBB (BB+ to BBB+) based on the long-term issuer ratings from Moody's, Fitch and S&P (where ratings are available).[21] We are left with ten firms in the A sample, where the average annual credit premium is 64bp, and 19 firms in the BBB sample, where the average annual credit premium is 93bp. There were insufficient UK issuers with

[20] Procuring a historical series of CDS prices was not practical.

[21] Data Source: Bloomberg.

ratings of AA and above to compute a sample, however this is not a cause for concern as these ratings are not representative of the UK corporate bond market.

Reducing the current spreads over government bonds for a BBB-rated long-term corporate bond of 1.9% by a CDS spread of 93bps, we can estimate the expected future return for a BBB-rated corporate bond at around 1% above government bond returns. A-rated corporate bonds with a lower current spread of 1.5% over government bonds can be reduced by the respective CDS spread of 64bps to give a figure of 0.86%.

We slightly round the figures to provide a corporate debt spread range of between 0.8% and 1% above real government bond returns[22], which is decisively on the low side of the debt spread range of 1.0% to 2.0% suggested in the 2012 report.

### *Decomposition*

The alternative decomposition approach calculates the debt premium as a product of the debt beta and the EMRP. The empirical studies referenced in Appendix F in the 2012 report remain valid and our review of the literature since 2012 has not indicated that any change in estimates for the debt beta is necessary. Therefore, as in the last report, we use a debt beta in the range 0.1 to 0.2.[23]

Applying the debt betas to our projected EMRP of 3.5% to 5.5% (see the Equities sub-section) results in an expected debt premium ranging from 0.35% to 1.1%. This range is broadly in line with that of the implied market pricing approach.

### Conclusion on the expected return on corporate bonds

The estimates from the implied and the decomposition approaches, along with the historic returns to bonds, suggest an expected real spread for corporate bonds above UK gilts ranging between 0.6% and 1%. Our projected spread over real gilt returns is a decrease relative to the 2012 report, which suggested a range of 1% to 2%. However our spread is in line with the 2007 report which indicated a return of 1% above gilts. Moreover, the 2012 report incorporated a substantial illiquidity premium for longer dated bonds in the suggested range. However, given the much flatter yield curve at present, the existence of a substantial illiquidity premium over the forecast period is unlikely in our view.

Relative to the midpoint of our real government bond expected returns (-0.5%), the corporate bond spread between 0.6% and 1% implies real expected returns for corporate bonds of 0.1% to 0.5%.

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[22] We assume the corporate spread will remain constant over the forecast horizon of 10 -15 years.

[23] We assume the debt beta will remain constant over the forecast horizon of 10 -15 years.

# Equities

Equities attract a rate of return commensurate with their level of risk. Returns to equity holders can be decomposed into dividends paid by the company during the holding period and/or realised capital gains (or losses) at the end of the holding period. Equity holders are the owners of a company and therefore usually bear the greatest share of the company business risk. In terms of cashflows, this risk can be decomposed into the following risks for which equity holders are compensated:

- **Dividend uncertainty**: Dividend payments on ordinary shares are not contractually guaranteed and are made at the discretion of the company. The value of dividend payments made to shareholders can change over time and there could be periods without any dividends payments.
- **Price uncertainty:** Equity prices vary significantly over time, driven by both changes in expectations about the performance of the business and by the relative value of other financial assets. Therefore there is uncertainty over the value of any potential capital gains the investors can realise.
- **Liquidation value:** Equity holders are subordinate to debt holders in the creditor hierarchy. This means that, in the event of bankruptcy, shareholders can claim any residual value only after other senior creditors (debt holders) have been paid off.

Unlike bond yields, investor expectations about equity returns are not directly observable; therefore they need to be modelled. The cost of equity, or the required returns by equity investors, is usually estimated using the sum of the risk-free rate and the EMRP. The risk-free rate represents the returns on riskless investments and is usually proxied by reference to yield on government bonds, whereas the EMRP represents the compensation required by equity holders for investing in the broader equity market over and above the risk-free rate (i.e. return on equity less the risk-free rate).

In the 2012 PwC report, the estimate for the EMRP was 3.5% to 4.5%, which implied a real return on equities of 4% to 5.5% (assuming a risk-free rate of 0.5% to 1.0%). This corresponded to a nominal return of 6.5% to 8% (assuming a 2.5% rate of inflation based on the GDP deflator).

In this section we review recent equity returns, developments in equity capital markets and trends in the global economy, and provide an updated assumption for historical and expected future equity returns. The focus in our report is primarily on the UK market. However, considering the important role of international diversification in equities portfolios, we incorporate our view on international equity returns (primarily US) into the overall estimate for projected future equity returns and the EMRP.

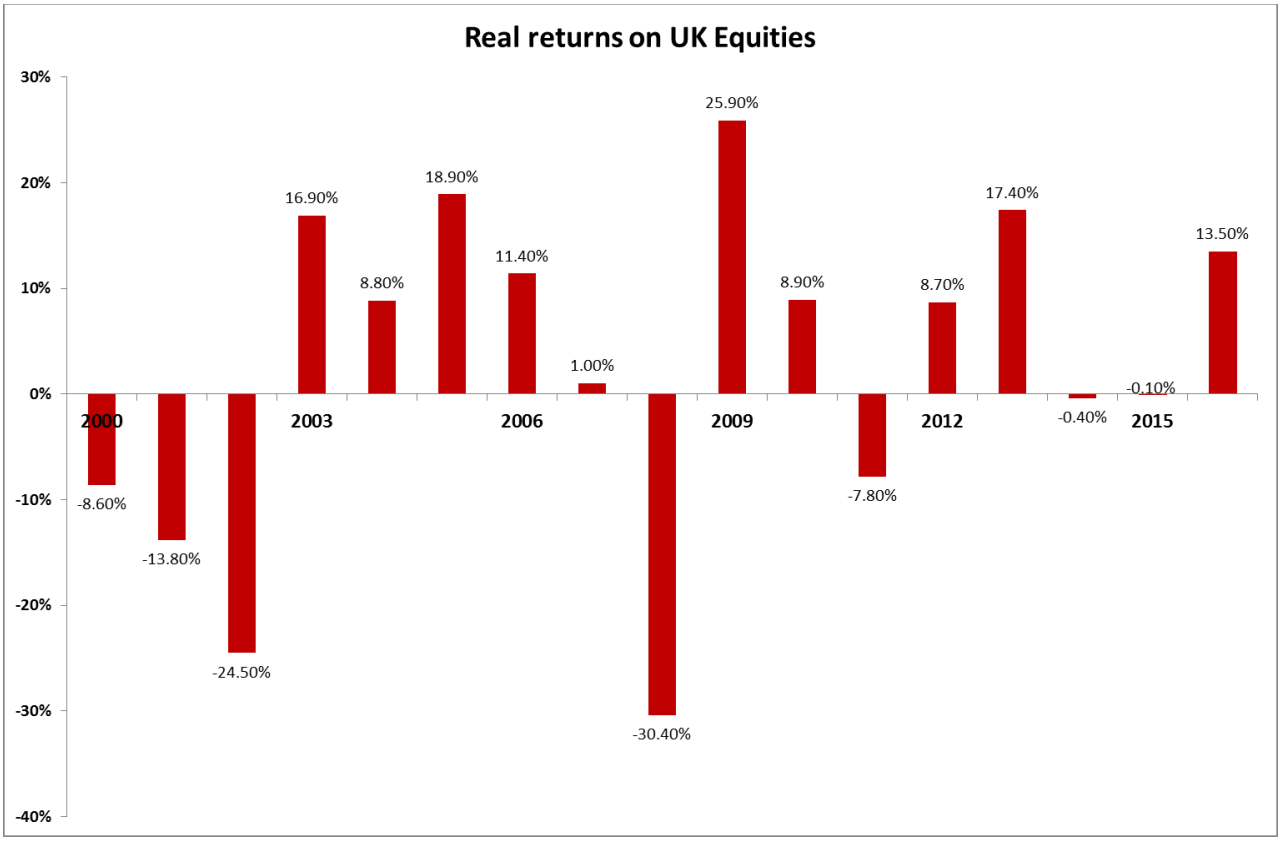
## Recent historical equity returns

The average annual real return on UK equities in the period 2012-2016 was 7.8%, according to the Barclays Equity Gilt Study 2017. The comparable estimate for the return on UK equities for the period between 2007 and 2011, quoted in the 2012 report, was a significantly lower

average annual real return of -1.5%, driven by a -30% real return during the financial crisis in 2008.

The real return on US equities in 2016 was 10.4%, significantly above the 2006-2016 period average of 4.6%. Recent real realised UK equity returns are illustrated in Figure 21.

***Figure 21: Real realised returns on UK equities***




**Source: Barclays Equity Gilt Study 2017**

## Methodology for estimating future equity returns

Estimating future equity returns is more uncertain than estimating future bond returns as unlike bond yields, investor expectations about equity returns are not directly observable.

Historically, academic research focused on the estimation of the EMRP, which can be combined with an estimate of the risk-free rate to produce an expected equity return. There are two main approaches to estimating the EMRP: ex-post and ex-ante approaches. The ex-post approach is based on long-term historical returns which may then be adjusted to serve as an estimate of the future EMRP. Ex-ante approaches make predictions about the future EMRP based only on current information such as surveys and forecasts of key economic variables. Both approaches have their drawbacks. For example, there is an inherent inconsistency in combining historical studies of equity risk premia with current figures for the risk-free rate, and survey evidence is difficult to interpret if there is no indication of the underlying risk-free rate on which investors are basing their response.

For an in-depth review of the literature on this topic, see Appendix C of the 2012 PwC report. We have also conducted a review of the recent literature on the EMRP which is summarised in Appendix B.

Following the PwC 2012 report, we use a mix of approaches, combined with expert judgement to estimate equity returns.

## Long-run historic equity returns

Series of long-run equity returns are by necessity subjective, as the figures are sensitive to a number of inputs. These include the method of averaging used, the relevant time period of application, the risk-free rate and in the case of real returns, the inflation measure used.

In Table 11 below, we present annualised equity returns for the UK and US over a selection of time periods.

***Table 11: Annualised equity returns for the UK and US across periods***

| Source | UK | | | US | | |
|---|---|---|---|---|---|---|
| | 1996-2016 | 1967-2016 | 1900-2016 | 1996-2016 | 1967-2016 | 1900-2016 |
| Barclays EGS 2017 - Real | 3.7% | 5.6% | 5% | 6% | 5.4% | 6.6%* |
| Credit Suisse Yearbook 2017 - Real | - | 6.9% | 5.5% | - | 5.8% | 6.4% |
| Own calculations, CRSP Data - Nominal[24] | - | - | - | 7.9% | 9.8% | 9.6%* |

**Note: *CRSP equity return data starts in 1925; therefore calculations for the longest period are based on the 90 year period 1926-2016. Barclays EGS 2017 data for the US also is for the period 1926-2016.**

Long-run real average equity returns have declined very slightly, compared to the estimates used in our previous report, across both the UK and US equity markets. Based on Barclays data, the real return on UK and US equities, from 1900 to 2016, was 5% and 6.6% respectively, which is little changed compared to the 5.1% and 6.7% return between 1900-2010 quoted in the 2012 report. DMS Credit Suisse Yearbook 2017 figures paint a similar picture when compared to the DMS estimates in the 2012 report. That said, long-term returns on equities tend to be stable around the mean of the historical returns, as the addition of a few years of data has limited impact on a long data series.

We also would like to point out a number of factors that need to be taken into account when determining the relevance of historical data with respect to the returns equity investors will be able to realise over the next 10 to 15 years.

## Estimating the EMRP: Ex-post estimation

Table 12 represents the ex-post estimates of the annualised EMRP across different sources and time periods. As previously noted the outcomes are sensitive to the timescales and averaging methods used and require separate assumptions on values for the risk-free rate. The EMRP can be estimated relative to government bonds or bills (as measures of the risk-free rate), using either a geometric or an arithmetic average over time. For the purpose of this report, as in 2012, the focus is on EMRP estimates relative to bonds, because they are easier to compare to our government bond return assumptions. Geometric averages are used as they are more appropriate over medium-term time periods.

***Table 12: EMRP for the UK and US across periods***

| Source | Basis | UK | | US | |
|---|---|---|---|---|---|
| | | 1967-2016 | 1900-2016 | 1967-2016 | 1900-2016 |
| CS Returns Yearbook 2017 | Bills | 5.1% | 4.4% | 5.0% | 5.5% |
| | Bonds | 2.9% | 3.6% | 2.4% | 4.3% |
| A. Damodaran Calculation [25] [26] | Bills | - | - | 5.3% | 6.1%* |
| | Bonds | - | - | 3.4% | 4.6%* |
| Own Calculation CRSP Data [27] | Bills | - | - | 4.3% | 5.7%* |
| | Bonds | - | - | 1.8% | 4.8%** |

**Note: *EMRP for the period 1928-2016 / **EMRP for the period 1941-2016 / Periods differ due to data availability**

Based on the data, the current estimate for the ex-post EMRP in the UK ranges from 2.9% to 5.1%. Similarly in the US the relevant range is 1.8% to 6.1%. We note that across all sources, the EMRP relative to bills is higher than relative to bonds, as the return on bonds is higher because it incorporates a maturity premium. Focusing only on EMRP relative to bonds the range for the UK is 2.9% to 3.6%, and for the US the range is 1.8% to 4.8%.[28]

Overall, estimates of the EMRP vary significantly across various data sources and academic authors, indicating the inevitable uncertainty associated with estimating an appropriate EMRP over the long run.

Given the increasing importance of overseas equity in pension fund portfolios (see the asset allocation section), and the proportion of revenues and costs of FTSE 100 companies derived from overseas, global returns are an important component of UK equity allocation returns. It is unfortunately difficult to find aggregate information on the detailed breakdown of pension fund and life insurance equity holdings.

As seen from the asset allocation section, according to UBS Pension Fund Indicators 2016, UK pension funds held on average 16% of their portfolio in domestic equities and 26% in overseas

25 Data available at: http://people.stern.nyu.edu/adamodar/New_Home_Page/data.html

26 Method: nominal geometric average.

27 Method: nominal geometric average.

28 Note that these figures are not independent, as the 1967-2016 time period is a subset of the 1900-2016 time period.

equities from 2011 to 2015. UK life insurance companies held on average 28% of their portfolio in domestic equities and 40% in overseas equities from 2010 to 2014. Therefore, within their equity allocation, for both UK pension funds and UK life insurance companies, the share of UK equity is approximately 40% and the share of overseas equity approximately 60%.

Unfortunately, it has not been possible to find a detailed breakdown of which equities fall within the overseas category. However, a reasonable assumption in our view is that the aggregate overseas equity holding of UK pension funds over the next 10 to 15 years will roughly follow the country weights in the MSCI All Country World Index, designed to capture the investable equity markets globally. More specifically, we assume that UK pension funds invest a proportion of their equity holdings in a country equal to the weight in the MSCI All Country World Index the country would have if the UK were excluded. Table 13 below presents the country allocation derived from this assumption, based on MSCI All Country World Index weights as of 31st December 2016.

***Table 13: Forecast equity allocation***

| Country / Group | MSCI All Country World Index Weight | MSCI ACWI Ex-UK Weight | Forecast equity allocation |
|---|---|---|---|
| Australia | 2.4% | 2.6% | 1.6% |
| Canada | 3.3% | 3.5% | 2.2% |
| United Kingdom | 5.9% | 0.0% | 38.1% |
| Japan | 7.8% | 8.3% | 5.1% |
| Europe (Ex-UK) | 15.3% | 16.3% | 10.1% |
| United States | 53.8% | 57.2% | 35.4% |
| Other | 11.5% | 12.2% | 7.6% |
| Total | 100% | 100% | 100% |

**Source: Bloomberg, Own analysis**

From Table 13, we can see that the most significant UK pension fund allocation to overseas equities goes to the US, driven by the size of the US market relative to global market capitalization. The US allocation represents about 35% of equity holding, which is close to the 38% dedicated to UK equities. Therefore, it can meaningfully impact overall returns for equity and that is why we have paid special attention to the US in this section. The next most important allocation is for Europe as a whole, which adds up to about 10% of equity assets.

An overwhelming proportion of equity exposure is to developed market equities, with emerging market equities falling in the "Other" category (see Table 13). It is worth noting that this category also includes many smaller developed markets. A useful cross-check of this assertion comes from the Mercer European Asset Allocation Survey 2016. The majority of the respondents to the survey by assets are UK pension funds. Among respondents to the survey, the average equity allocation dedicated to emerging market equities was 5%, which squares well with our assumptions. A number of industry publications argue that emerging market equity allocations across developed market institutional investors will grow in the future. However, considering the low starting base, we do not believe that if these predictions come true that they would meaningfully impact returns over the next 10 to 15 years.

Table 14 presents average annual real returns and EMRP for the selected countries relative to the UK, based on the Credit Suisse Return Yearbook 2017.

***Table 14: EMRP across countries relative to the UK***

| Country / Group | Forecast equity allocation | 1967- 2016 | | | 1900-2016 | | |
|---|---|---|---|---|---|---|---|
| | | Return | EMRP Bonds | EMRP Bills | Return | EMRP Bonds | EMRP Bills |
| United Kingdom | **38.1%** | **6.9%** | **2.9%** | **5.1%** | **5.5%** | **3.6%** | **4.4%** |
| United States | 35.4% | -1.1% | -0.5% | -0.1% | 0.9% | 0.7% | 1.1% |
| Europe[29] | 10.1% | -0.8% | -1.6% | 0.2% | -1.3% | -0.5% | -1.1% |
| Other[30] | 7.6% | -1.4% | -2.1% | -0.4% | -1.2% | -0.8% | -0.9% |
| Japan | 5.1% | -2.7% | -2.4% | -1.2% | -1.3% | 1.4% | 1.7% |
| Canada | 2.2% | -1.8% | -1.9% | -2.1% | 0.2% | -0.2% | -0.2% |
| Australia | 1.6% | -1.0% | 0.3% | -1.4% | 1.3% | 1.4% | 1.6% |

**Source: Credit Suisse Return Yearbook 2017**

Note that, the returns presented here are predominantly in local currency[31] and do not incorporate currency movements. However, over the time frame considered, the volatility of currency movements would be much lower than the one experienced by an investor with a horizon of 10 to 15 years. Therefore, combined with the sensitivity of the EMRP to a number of methodological assumptions, as discussed previously, the relative returns presented here should be interpreted largely as a qualitative piece of evidence.

A key insight emerges from this relative comparison. No country or region, apart from the US, has either a significant portfolio allocation or a long-run EMRP consistently different from the UK to merit explicit consideration when formulating our expected equity returns using the EMRP methodology.

## Estimating the EMRP: Ex-ante approaches

In this sub-section we review ex-ante (or forward looking) approaches for estimating the EMRP.

### *Forward looking surveys*

As in the 2012 report, in addition to reviewing historical estimates and realised returns, we attempt to capture the forward looking nature of EMRP. One way of doing this is through the

29 Returns and EMRP based on the Europe region.

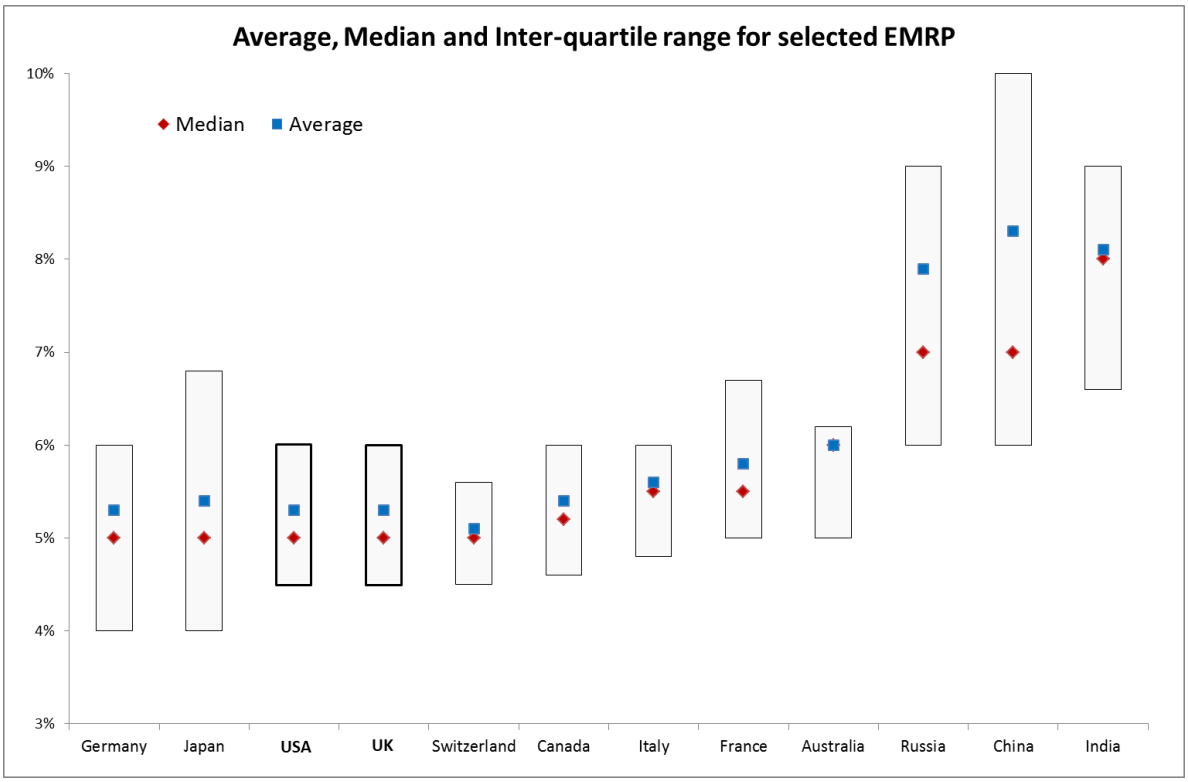
30 Returns and EMRP based on the World-Ex US region.

31 The returns and EMRP presented for each country are calculated in local currency. To allow aggregation, the returns for "Europe" and "Other" are calculated in US dollars.

use of surveys. Similar to ex-post approaches, there are differences in underlying estimates, both in time and across different sources.

A comprehensive source of survey evidence on the EMRP is the Fernandez et al. survey.[32] The latest survey published in May 2016 (based on an April 2016 survey) covers 71 countries. We set out the data for a selection of countries in Figure 22 below.

***Figure 22: EMRP survey evidence across countries***




**Source: Fernandez et al. survey 2016**

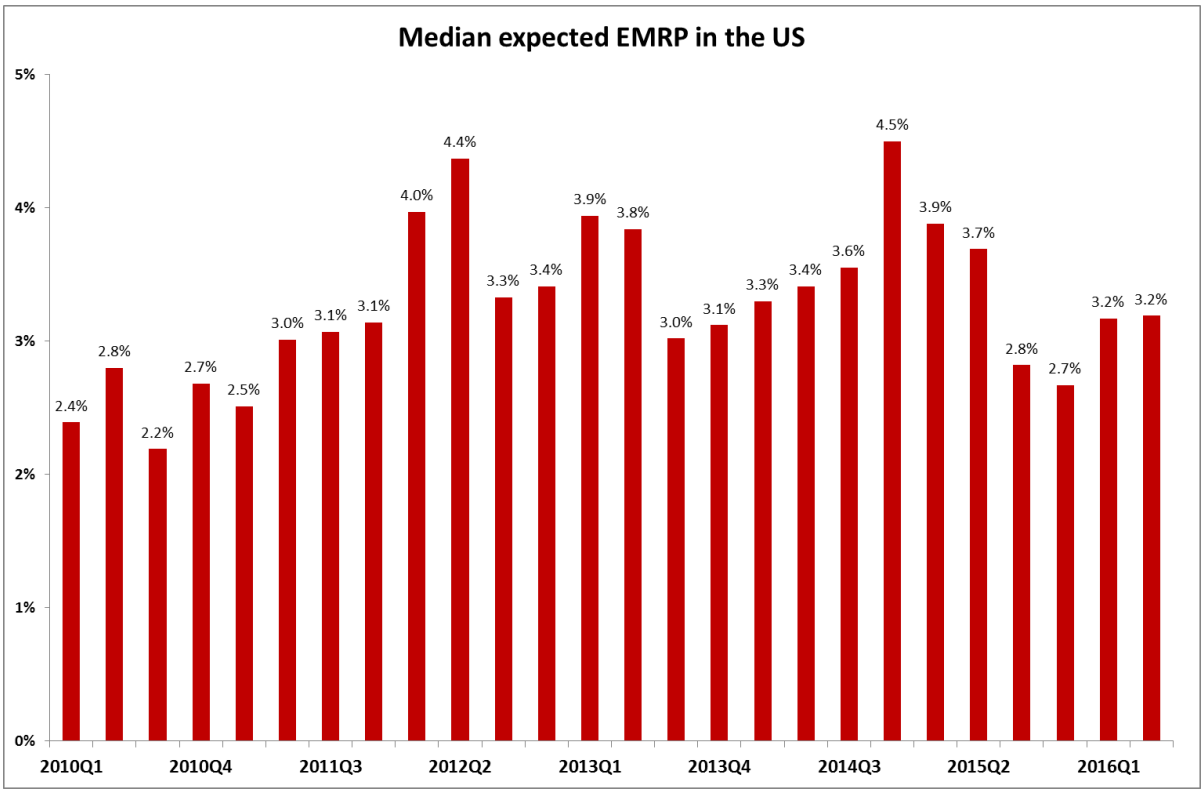
According to the responses to this survey, the EMRP expected by investors in the US and the UK is identical. In both countries the average expected EMRP is 5.3% and the median is 5%, within an interquartile range of 3.5% to 6%. The survey also shows how the average and the median EMRP are clustered between 5% and 6% across the developed markets that fall within the forecast equity allocation of UK pension funds.

Another long-running survey on the EMRP, also used in the last report, is the Duke University Fuqua Business School quarterly survey of CFOs.[33] It focuses only on the US and has been running since 1996. In Figure 23 below we set out the results from the most recent survey published in 2016. The data for the most recent four quarters available suggests that the expected EMRP for the US is around 3%.

32 Fernandez et al. (2016) Market Risk Premium used in 71 countries in 2016: a survey with 6,932 answers.

33 Graham and Harvey (2016), The Equity Risk Premium in 2016.

***Figure 23: EMRP survey evidence from the US***




**Source: Duke University Fuqua Business School CFO survey Q2 2016**

As with any survey, the results are highly dependent upon the survey participants, the selection bias in those who respond and the questions used. The 2012 PwC report concluded that forward-looking survey estimates suggested that equity investors required a 3.0% to 4.5% EMRP. The Duke CFO survey evidence is consistent with this conclusion, though the data it presents are currently lagging more than a year. The Fernandez et al. survey suggests that the forward looking equity premium has increased to around 5%. We note that in the last report the Fernandez et al survey also indicated a higher expected EMRP than the Duke survey. We believe a reasonable estimate for the ex-ante EMRP that investors expect in the US and the UK is around 3% to 5%.

However, we caution that the EMRP investors expect may differ from the one available in the market. To assess the EMRP implied by current equity valuations, in other words the EMRP at this point in time, we must employ a theoretical model.

### *The Discount Model approach*

A different way to arrive at an estimate of the ex-ante EMRP is to estimate it using a model grounded in financial valuation theory.

A widely accepted method of assessing equity market valuations is the Dividend Discount Model (DDM), used in the previous report.

The DDM assumes that the current share price reflects the present value of all future expected dividends discounted to the present time. Assuming constant dividend growth, an equilibrium dividend yield can be estimated as:

$$D(t+1)/P(t)=r+EMRP-gD$$

From this equation, we derive an equity market risk premium as:

$$EMRP = D(t+1)/Pt + gD - r$$

Where:

D/P = Prospective dividend yield

r = Nominal risk free rate

EMRP = Equity market risk premium

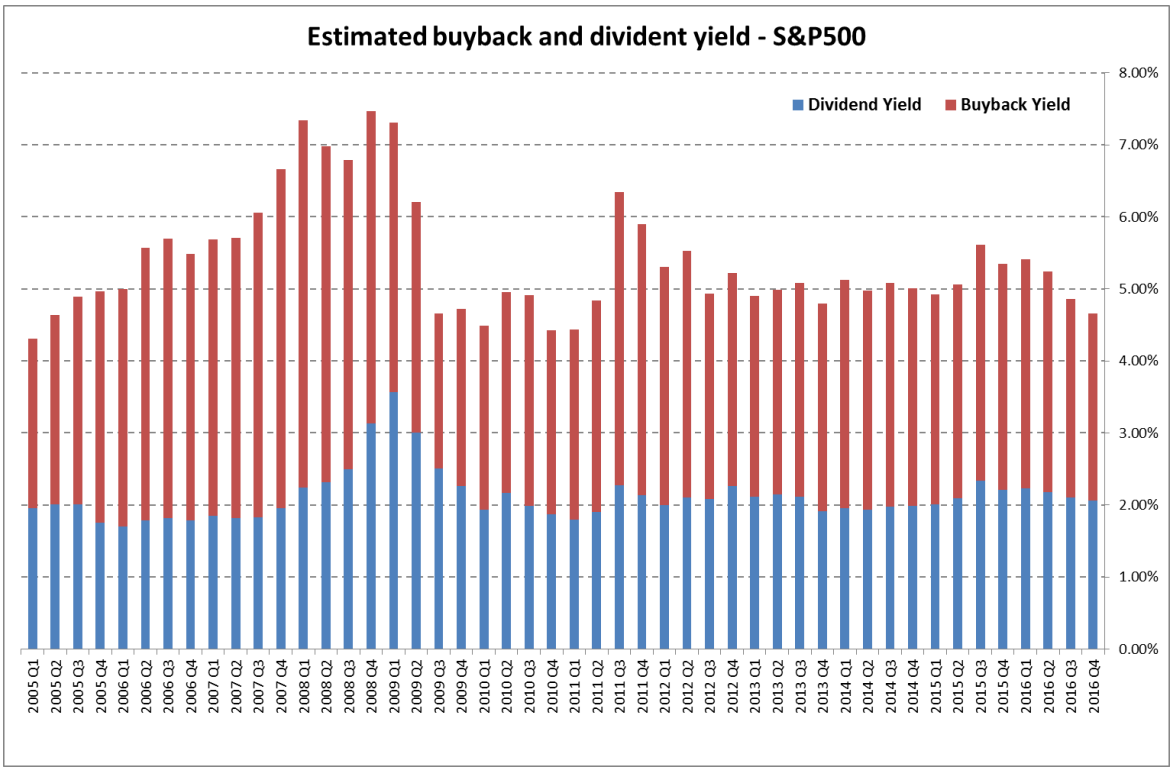
gD = Expected nominal dividend growth rate

However, when we employ the DDM to estimate the EMRP in the UK and US we run into a comparison problem. In addition to dividends, companies have another option to return capital to shareholders – purchasing their own shares. This transaction is known as a share buyback. Share buybacks reduce the cash available to the company, as well as the shares outstanding in the market, thereby increasing forward earnings per share all things being equal. Theoretically, if the tax rate of dividends and capital gains is the same, the information derived by investors from dividend payments and share buybacks is the same and buybacks are carried out at a price reflecting the fair value of the company, then dividends and share buybacks are equivalent.

Over the last decade or so, share buybacks have become an increasingly important mechanism of returning capital to shareholders in the US, diminishing the capital returned through dividends.[34] This change has been present to a much lesser extent in the UK. Figure 24 and Figure 25, based on Bloomberg data and estimates, illustrate this point. If we were to estimate EMRP on the basis of the DDM alone it would appear much lower in the US than in the UK.

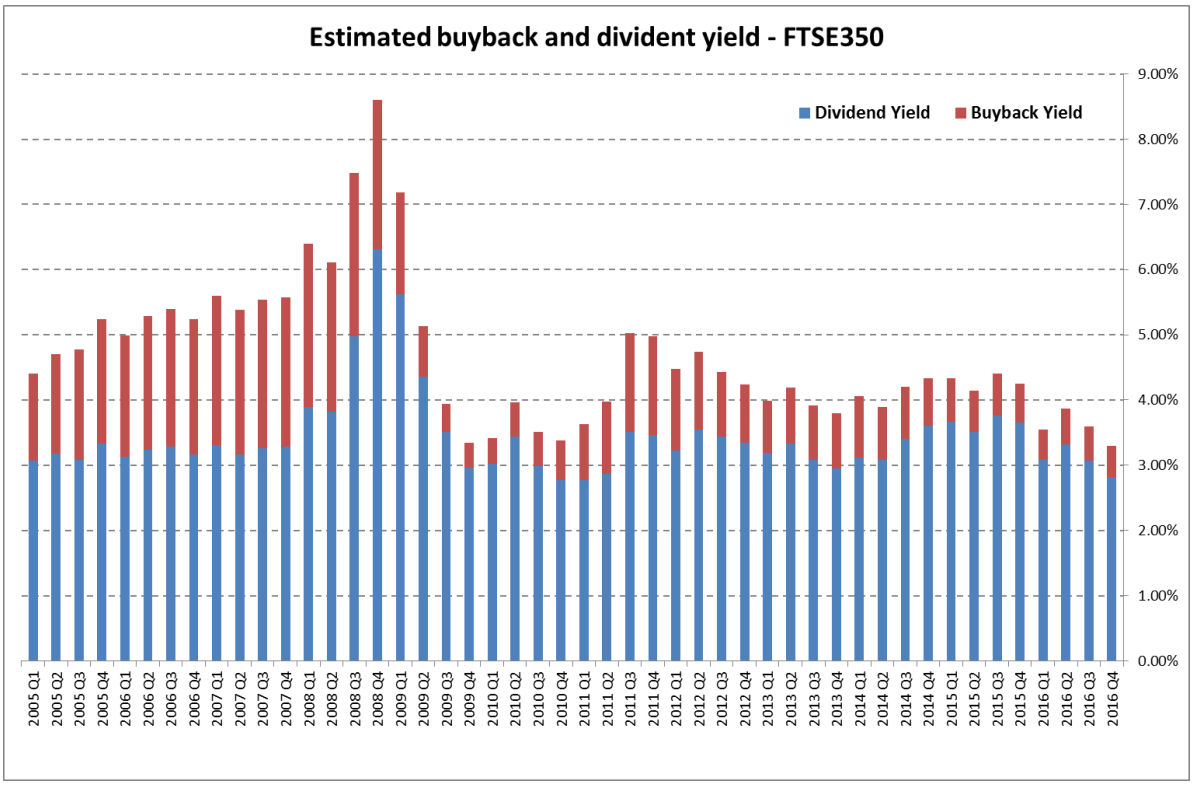
34 See Factset Buyback Quarterly 19.12.2016 for a more detailed historical overview.

***Figure 24: Estimated buyback and dividend yield – S&P500***




**Source: Bloomberg**

***Figure 25: Estimated buyback and dividend yield – FTSE 350***




**Source: Bloomberg**

Therefore we also review a Capital Return Discount Model (CRDM), which is similar to the DDM. The CRDM replaces the prospective dividend yield with the prospective combined yield of dividends and buybacks, and replaces the expected nominal dividend growth rate with the expected growth rate of the combined yield.

A further model that is useful as a cross-check in our analysis is the Earnings Discount Model (EDM). The EDM assumes that the current share price reflects the present value of all future expected earnings discounted to the present time. It differs from the DDM, in that it assumes investors do not only value the returns from the stock that are distributed to them as cash (the dividends) but also those returns that are retained within the company. The EDM generally shows higher returns than the DDM and the CRDM. However, in practice a significant portion of earnings would have to be reinvested in the business (for maintenance and generating future growth) and as such it would not available to investors. Adjusting for this proportion, which we have not attempted here, would bring the EDM results more closely in line with those of other models.

Assuming constant earnings growth, an equilibrium earnings yield can be estimated as:

$$E(t+1)/P(t)=r+EMRP-gE$$

From this equation, we derive an equity market risk premium as:

$$EMRP = E(t+1)/Pt + gE - r$$

Where:

E/P = Prospective earnings yield

r = Nominal risk free rate

EMRP = Equity market risk premium

gE = Expected nominal earnings growth rate

In the basic EDM model we base gE, the expected nominal earnings growth rate, on the analyst forecasts available at the present time. However, these will vary considerably over time and are likely to be tied to the current phase of the business cycle. Over our medium term forecast horizon of 10 to 15 years, a useful cross-check for gE is GDP growth, because theoretically growth in earnings should not exceed growth in the economy over long periods of time[35]. Therefore, we review two EDM models: one where growth in earnings is based on analyst projections and one where it is based on GDP growth forecasts.

The discussion on earnings growth leads us to a wider point about the use of models in forecasting. All the discount models we have reviewed so far constitute a theoretical relationship between theoretical concepts. When we apply them in practice, even when the relationship remains valid, the theoretical concepts are not directly observable and so must be approximated using observable substitutes. Therefore, all the discount models discussed are

35 This is theoretically possible in a small open economy if the world economy is growing faster than the national economy.

very sensitive to their inputs and over time they provide volatile results. The models should be interpreted relative to each other and within the context of the broader analysis.[36]

The table below presents the results of the models reviewed for the UK and the US equity markets, as represented by the FTSE 350 and S&P 500 indices respectively as of December 2016. As a sensitivity check, we show a base case scenario and scenarios where the nominal earnings growth rate is one percentage point lower (Low) or one percentage point higher (High) respectively. We vary the nominal earnings growth rate, because it feeds into all models (albeit with a different weight on the final output) and is generally estimated with a high degree of uncertainty.

***Table 15: Model-based EMRP estimates for the UK and the US***

| Model | UK | | | US | | |
|---|---|---|---|---|---|---|
| | Low | **Base** | High | Low | **Base** | High |
| Dividend Discount Model | 5.21% | **5.86%** | 6.51% | 2.44% | **2.89%** | 3.34% |
| Earnings Discount Model (GDP Constraint) | 5.69% | **6.69%** | 7.69% | 3.99% | **4.99%** | 5.99% |
| Capital Return Discount Model | 6.58% | **7.38%** | 8.18% | 7.75% | **8.60%** | 9.45% |
| Earnings Discount Model | 10.81% | **11.81%** | 12.81% | 9.09% | **10.09%** | 11.09% |

**Source: Own analysis**

For the inputs to the models presented above please see Appendix C.

## Conclusion on the expected return on equity and the EMRP

We have reviewed a wide range of available estimates for assessing expected returns on equity and the EMRP. We have also conducted a review of the recent literature on the EMRP which is summarised in Appendix B.

We now need to implicitly weight this information in order to project future returns on equities. Rather than determining an overall appropriate figure for equity returns, Table 16 sets out the plausible ranges suggested by the various approaches that we have considered.

***Table 16: EMRP estimates according to different approaches the UK and the US***

| Method | UK | | US | |
|---|---|---|---|---|
| | Low | High | Low | High |
| Long run historic equity returns | 3.7% | 6.9% | 5.4% | 6.6% |
| Historical EMRP relative to bonds | 2.9% | 3.6% | 1.8% | 4.8% |
| Forward-looking EMRP based on surveys | 3% | 5% | 3% | 5% |
| Forward-looking EMRP based on dividend models | 5.9% | 7.4% | 2.9% | 8.6% |

36 For an excellent further discussion of the theory behind EMRP models, including some not presented here, along with their current and historical results see Norges Bank Discussion Note 1/2016: The Equity Risk Premium.

Since the 2012 PwC report, global equity markets including those in the UK and US have performed very well, with high realised real returns. Therefore in interpreting EMRP estimates based on historical market data we should focus on the long run and incorporate a degree of mean reversion. Over a long period of measurement the average real return on equities for the UK has been around 3.7% to 6.9%, with an EMRP relative to bonds of 2.9% to 3.6%. For the US the average real return on equities has been around 5.4% to 6.6%, with an EMRP relative to bonds of 1.8% to 4.8%.

Due to the high recent realised returns in the UK and the US, estimates based on models that rely on current forecasts as inputs, in particular earnings-based models, are challenging to interpret correctly. On the one hand, a high price level reduces current yields; on the other hand, long-run forecasts may be influenced by positive short-term views. As discussed, the resulting EMRP is very sensitive to the model inputs. Therefore, model estimates of the EMRP should be interpreted as a broad range and with a degree of caution. The EMRP based on dividend models in the UK ranges from 5.9% to 7.4% and in the US from 2.9% to 8.6%. Survey evidence for the expected EMRP indicates a range from 3% to 5% for both the UK and the US.

We select an overall range for expected real equity returns for the UK of 3.5% to 4.5%, which suggests an EMRP of 4% to 5% relative to our midpoint projection for real government bond yields of -0.5%. We note that our estimate for the UK EMRP is below the range suggested by dividend models; however, as discussed previously, model-derived estimates of the EMRP are very sensitive to inputs and tend to vary considerably over time. For the US and other overseas equities the degree of uncertainty is wider, and this should be reflected in the range. For the US and other overseas equities we select an overall range for expected real equity return of 3% to 5%, which suggests an EMRP of 3.5% to 5.5% relative to our real government bond yield assumption. We do not explicitly adjust for exchange rate effects on returns. Considering the UK exit from the EU, estimating the exchange rate effects from the perspective of a UK investor is particularly challenging at this point in time. As in the PwC 2012 report, we consider that over the 10 to 15 year forecast horizon the range of returns we selected incorporates the expectations of exchange rate volatility going forward.

To reflect the increased share of non-UK equities in the portfolio asset allocation of both pension funds and life insurers since the last report, we place increased importance on non-UK return in estimating the overall real return on equities. Our forecasts of the EMRP and the real return on equities as whole are those for US and other overseas equities. Our projected real annual return on equities as a whole is 3% to 5% (with a mid-point of 4%), which suggests an EMRP of 3.5% to 5.5% relative to our real government bond yield assumption. The 2012 report suggested an overall range for expected real equity returns of 4.0% to 5.5%, which implied an EMRP of 3.5% to 4.5% relative to the midpoint of the real government bond yield assumption. While our real equity return assumption is lower than the 2012 report, the upper bound of our projected EMRP is 1% higher. The higher upper bound of our projected real EMRP reflects the compensation required by investors for the medium-term economic uncertainty and the monetary policy conditions underlying our negative projected risk-free rate. Overall, our projection implies nominal annual equity returns of 5.5 % to 7.5%, based on expected inflation of 2.5% using the GDP deflator.

## Property

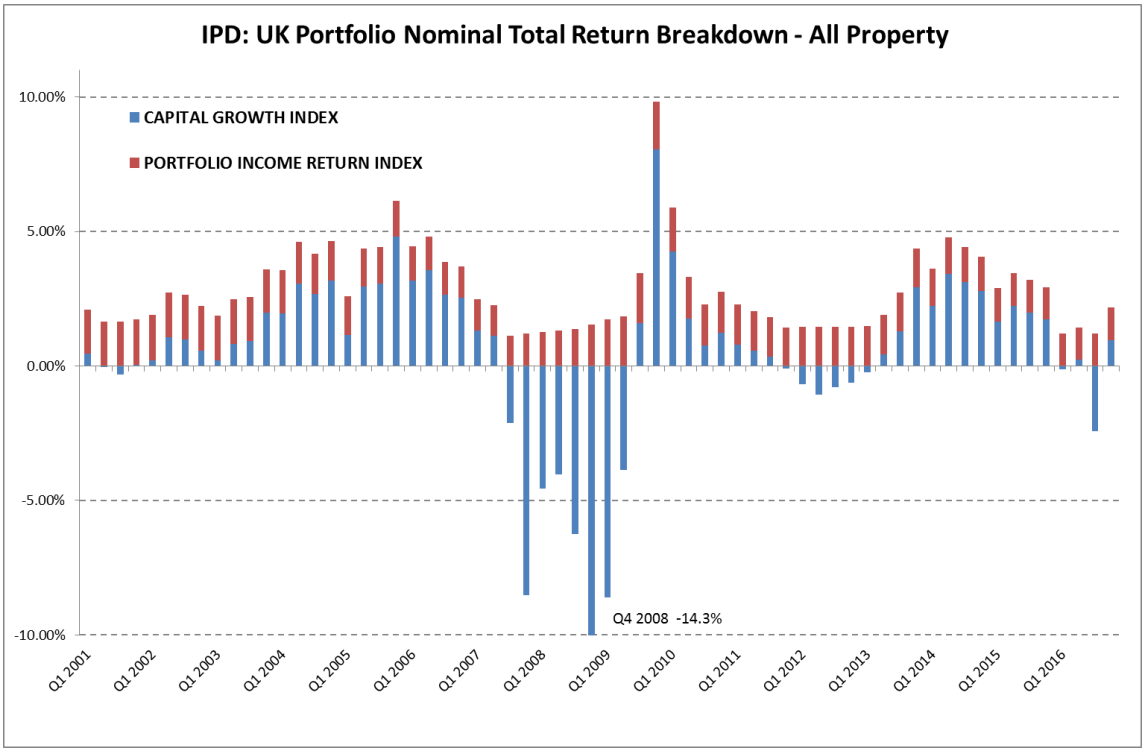
Property makes up approximately 8% of aggregate pension fund assets and 5% of aggregate life insurance assets. In this sub-section we present historical and expected future returns on property investment.

## Historic returns

As with other asset classes, particularly equity and corporate bonds, property returns are subject to significant volatility. Furthermore, property attracts a large liquidity premium which makes direct comparison with equities difficult.

The 2012 PwC report examined the nominal total return on UK property based on data on commercial, industrial and retail properties tracked by Investment Property Databank (IPD) UK All Property Index. Here we do the same, with a particular focus on how total return on UK property is divided between capital and income returns on a nominal basis. In Figure 26, we show the breakdown using quarterly data going back to 2001.

***Figure 26: IPD: UK Portfolio Nominal Total Return Breakdown - All Property***



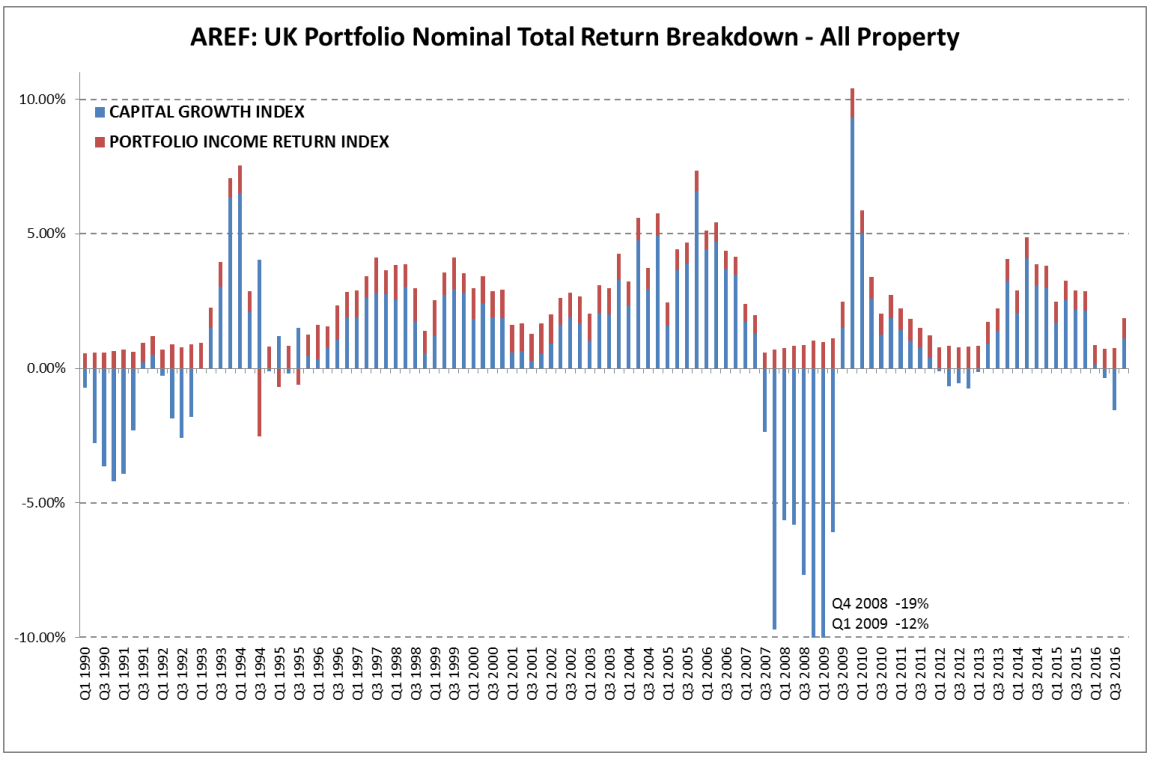

**Source: Datastream**

As reflected in Figure 26, the total return on property assets fell significantly from 2007 to the first quarter of 2009 as capital growth dipped significantly following the turmoil in financial markets. However, over time the income return from property assets has remained stable and has formed the major part of the total cumulative return. The average annual nominal total return for property based on IDP data in the period 2001 to 2016 was 7.7%, while the median annual nominal return was 9.9%.

However, the IDP UK All Property Index measures the performance of direct property market investments only and excludes the impact of development costs and transactions on returns. The property allocation of life assets and pension funds will likely include both direct and indirect investments, i.e. shares of residential or commercial buildings and shares of property investment funds. Both of these direct and indirect property investments would incur development and transaction costs over time.

Therefore, we also present historical returns for the AREF/IPD UK Property Fund Index, which is based on the performance of members of the UK Association of Real Estate Funds (AREF) and published by IDP. Returns to the AREF/IPD UK Property Fund Index include the impact of both development costs and transactions as well as the returns from other assets (such as cash and indirect property investments), the impact of leverage, fund-level management fees and other non-property outgoings. The nominal returns since 1990 are presented in Figure 27 below, split by capital and income.

***Figure 27: AREF: UK Portfolio Nominal Total Return Breakdown - All Property***




**Source: Datastream**

Due to the presence of charges and costs over time, the income return from property assets in the AREF/IDP index accounts for a much smaller part of the total cumulative return relative to the IDP index. Average total returns are lower, again due to the treatment of costs, but median returns are broadly similar to the IDP index. The average yearly nominal total return for property based on the AREF/IDP index in the period 2001 to 2016 was 6.3%, while the median yearly nominal return was 9.4%. Over the longer period 1990 -2016, the average and the median were respectively 6.5% and 10.1%.

Another way to examine the historic returns of invested assets is to look at performance of listed investments, in particular the FTSE 350 REIT Index. The index tracks the performance of listed Real Estate Investment Trusts (REITs) that are part of the FTSE 350 index. Summary information for the nominal returns of the index is presented in the table below.

***Table 17: Returns of the FTSE 350 REIT index***

| Holding Period | Cumulative Total Return | Cumulative Capital Return | Cumulative Income Return | Average Total Return | Total Return Standard Deviation |
|---|---|---|---|---|---|
| **Start of 2005** | 31% | 5.90% | 25.17% | 2.82% | 25.3% |
| **Start of 2010** | 72% | 47.10% | 24.92% | 6.55% | 14.4% |

**Source: Bloomberg**

The FTSE 350 REIT Index was introduced in 2007 and has been calculated since 2005. We can see that returns are heavily affected by significant capital losses suffered during the financial crisis in 2007 and 2008, which have wiped away most of the capital return. Over a holding period from the start of 2010 to 2016, average annual total returns are in line with other property indices we examined. However, we see that over either (relatively short) holding period, returns are very volatile.

## Future returns

The 2012 PwC report relied on retail house price forecasts as an indicator of future returns, as residential house price growth may be related to trends in the broader property market. We present selected nominal residential house price forecasts in Table 18.

***Table 18: Selected nominal residential house price forecasts***

| Source | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| OBR: Residential Property Prices [37] | 6.5% | 4.0% | 4.5% | 4.5% | 4.7% |
| Oxford Economics: House Price Index | 4.6% | -0.2% | 0.5% | 2.8% | 4.0% |
| Savills: UK Mainstream Market Forecast | 0% | 2% | 5.50% | 3% | 2% |
| IFS: House Prices | 3% | -0.5% | 1% | 3% | 3% |

The average of the forecast for residential house price growth in 2017 is 3.3% and in 2018 is 1.3%, essentially indicating a reduction in price growth next year. However, as in the previous report, there is considerable disagreement between forecasts. Further, note that most forecasts have a short horizon, relative to our forecast holding period of 10 to 15 years. From our chosen sources, the only forecast series with a long horizon was supplied by Oxford Economics. They forecast prices up to 2045, with a forecast annual nominal average return of 3.6%.

We are grateful to our academic reviewers for pointing out that the strength of the relationship between residential and commercial property prices is subject to debate. Therefore, we also review a selection of commercial property price forecasts, though these are more difficult to obtain. We present selected nominal commercial price forecasts in Table 19.

[37] As of March 2017.

***Table 19: Selected nominal commercial house price forecasts***

| Source | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| OBR: Commercial Property Prices [38] | -2.8% | 1.6% | 1.7% | 1.9% | 1.9% |
| CBRE: UK Real Estate Market | 1.10% | 3.8% | 6.50% | 6.50% | 6.50% |
| Aviva Investors: UK Real Estate Total Return | 4.5% | 4.5% | 4.5% | 4.5% | 4.5% |

The average of the forecasts for commercial price growth is 0.9% in 2017, and 3.3% and in 2018.

Another indicator of future returns is the investment analyst forecasts for the FTSE 350 REIT index. From the forecasts of Earnings Per Share (EPS) and the Price/Earnings Ratio (P/E) we can derive a forecast for the capital and income return of the index. Consensus analyst estimates, sourced from Bloomberg, and the implied forecasts are presented in the table below.

***Table 20: Analyst forecasts and implied returns for the FTSE 350 REIT index***

| Item | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|
| Forecast Index EPS | 192p | 136p | 143p | 158p |
| Forecast P/E | 16 | 22 | 21 | 20 |
| Implied Price Level | 3072 | 2992 | 3003 | 3160 |
| Implied Dividend Yield[39] | 3.55% | 3.70% | 3.90% | 4.10% |
| Implied Capital Gain | 5.13% | -2.60% | 0.37% | 5.23% |
| Implied Total Return | 8.68% | 1.10% | 4.27% | 9.33% |

**Source: Bloomberg**

The average annual nominal total return for the FTSE 350 REIT index over the forecast period 2017-2020 is 5.8%.

## Conclusion on the expected return on property

Property has very volatile capital returns and stable income returns, combing characteristics of both equities and bonds. Further, in terms of risk factors, property is likely to attract a substantial illiquidity premium. We follow the 2012 PwC report in estimating the likely future returns on property assets by assessing where property, as an asset class, is located in the risk spectrum relative to equities and bonds, while being guided by the characteristics of the asset class reflected in historic returns.

We therefore recommend an expected real return on property between the expected returns from equities and from bonds. We assume a spread over government bonds of 3% to 4%, over a 10 to 15 year time period. This implies a real return on property of 2.5% to 3.5%, based on the midpoint of real government bond returns of -0.5% and nominal returns of 5%

38 As of March 2017.

39 Assuming a 100% payout ratio.

to 6% based on a GDP deflator assumption of 2.5%. The real and nominal returns on property are lower than the estimates in the 2012 report, reflecting similar inflation estimates but significantly lower projected real returns on government bonds.

## Cash and money markets

Cash and money markets is a new sub-section we have been asked to introduce and is not covered in the 2012 PwC report. While in practice cash management is conducted in the currencies of all frequently traded assets, for the purposes of this report we focus exclusively on sterling money markets, as the majority of relevant portfolios are invested primarily in sterling assets. In this sub-section we present historical and expected future returns on cash and money market instruments.

Investment portfolios keep part of their assets in cash in order to avoid selling or buying other assets in response to routine demands for liquidity. Cash and equivalents are generally the least risky assets available and facilitate rebalancing between other asset classes. However, the rate of return on cash and money market instruments is very low. Indeed the real rate of return on these instruments recently has been negative. Therefore portfolios face a trade-off between the extra flexibility cash allows and the reduction in returns it brings.

Cash and equivalents over the last four years made up on average approximately 3% of aggregate pension fund assets and 4% of aggregate life insurance assets.

Perhaps the most intuitive way to earn interest on cash is to place it on deposit in a bank. However, cash in investment portfolios is not necessarily held in the form of bank deposits. It can be invested in a range of financial instruments which have very low exposure to risk factors, and therefore have very stable prices and can be sold very quickly when funds are needed. Some of these instruments are listed below.

- **Short-term UK Treasury bills**: Bills are zero-coupon eligible debt securities issued by the UK Treasury with maturities of one, three or six months. Because they are issued by the Government and with short maturities they have a very low default risk. The short maturity also means they have little exposure to interest rate risk.

- **Commercial paper:** These are short-term unsecured debt, similar to bills, but issued by private corporations. Similar to bills these are generally zero-coupon instruments. Maturities can be up to a year; however one, two or three month maturities are the most popular.

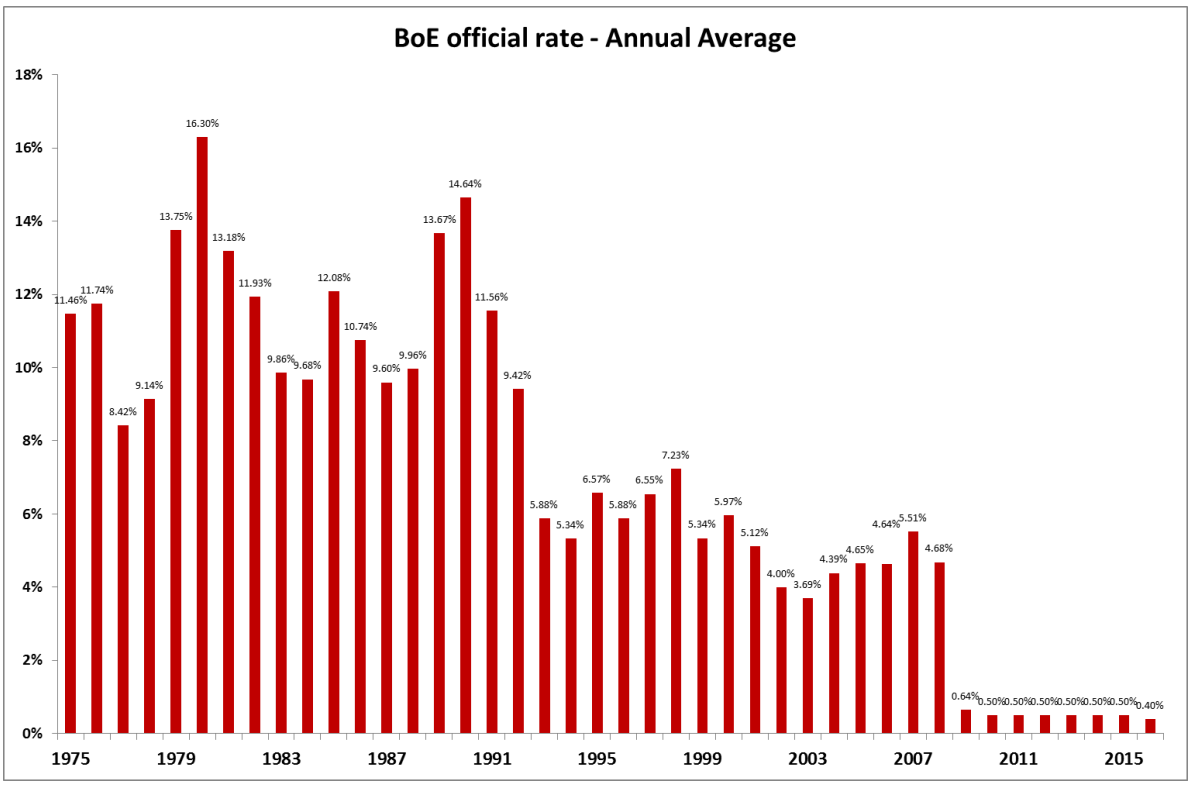
- **Short-term re-purchase transactions (repos):** In a repo transaction one side borrows money from the other, by selling and committing to re-purchase a particular asset (for example a gilt) at a later date for a certain price (representing the effective interest). Short-term repo with a private corporation is similar to commercial paper in that it effectively exposes the lender to credit risk. However, this lending is collateralised, because the lender retains ownership of the repo asset and can sell it to recover his funds in case of default. Therefore, repos attract a lower rate of interest.

## Historic returns

We now review the historic returns in sterling money markets. Nominal rates of return in money markets are fundamentally driven by the demand for short-term liquidity. The provider of short-term liquidity of last resort is the Bank of England, which targets the price of liquidity through its official bank rate (and other tools). The official bank rate (or base rate) is the rate that the Bank of England charges banks and financial institutions for loans with a maturity of one day. Decisions regarding the level of the interest rate are made by the MPC.

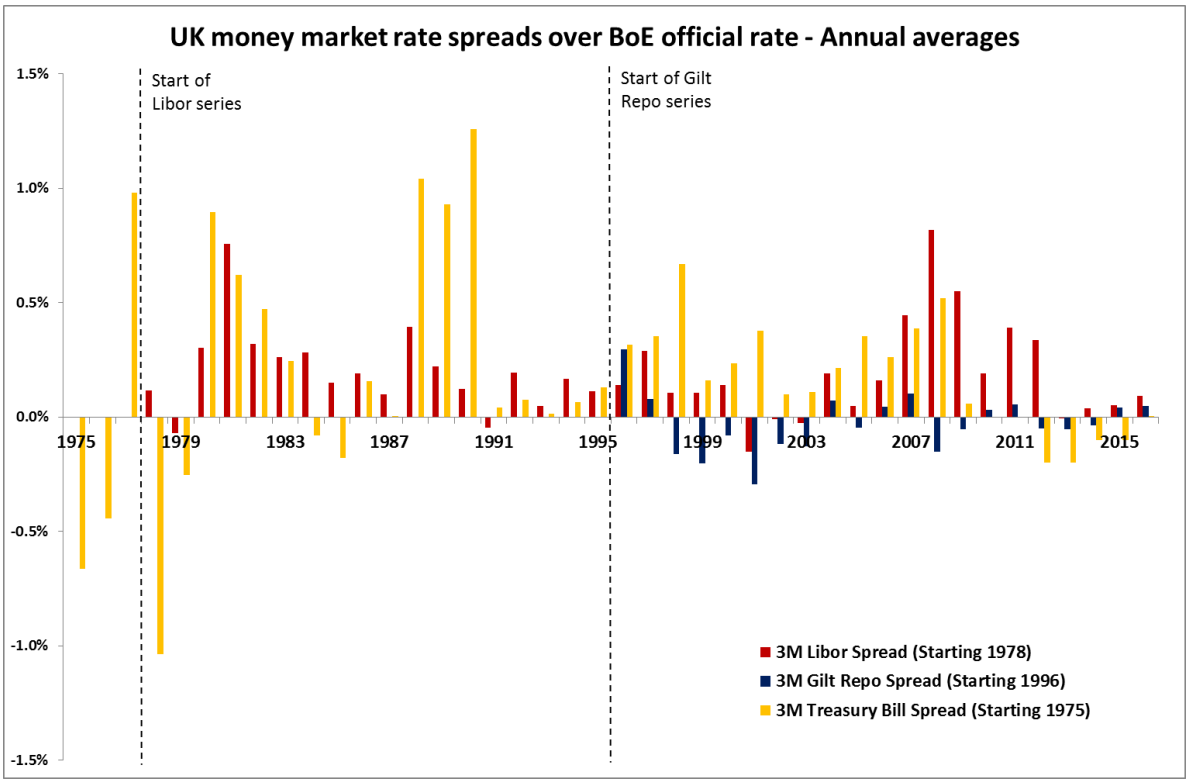
The Bank of England's official rate is a key component of short-term market liquidity across UK money market instruments. Therefore, when examining the historic nominal returns of different instruments a good starting point to is to evaluate them in relation to the Bank of England's official rate. Figure 28 below presents the annual average Bank of England's official rate since 1975. Figure 29 below presents the nominal return of 3 month Libor (as a proxy for bank short-term deposit rates), 3-month gilt repos (as a proxy for secured lending rates) and 3-month UK bills over the Bank of England's official rate, averaged annually. Note that the 3-month Libor spreads also serve as a measure of stress in the financial system, as well as a measure of liquidity and perceived credit risk in the banking system. The 3-month Libor spreads widen in periods of high systemic risk, such as the financial crisis and as such should be interpreted with caution.

***Figure 28: Bank of England's official rate***




**Source: Bank of England**

***Figure 29: UK money market rate spreads over BoE official rate - annual averages***

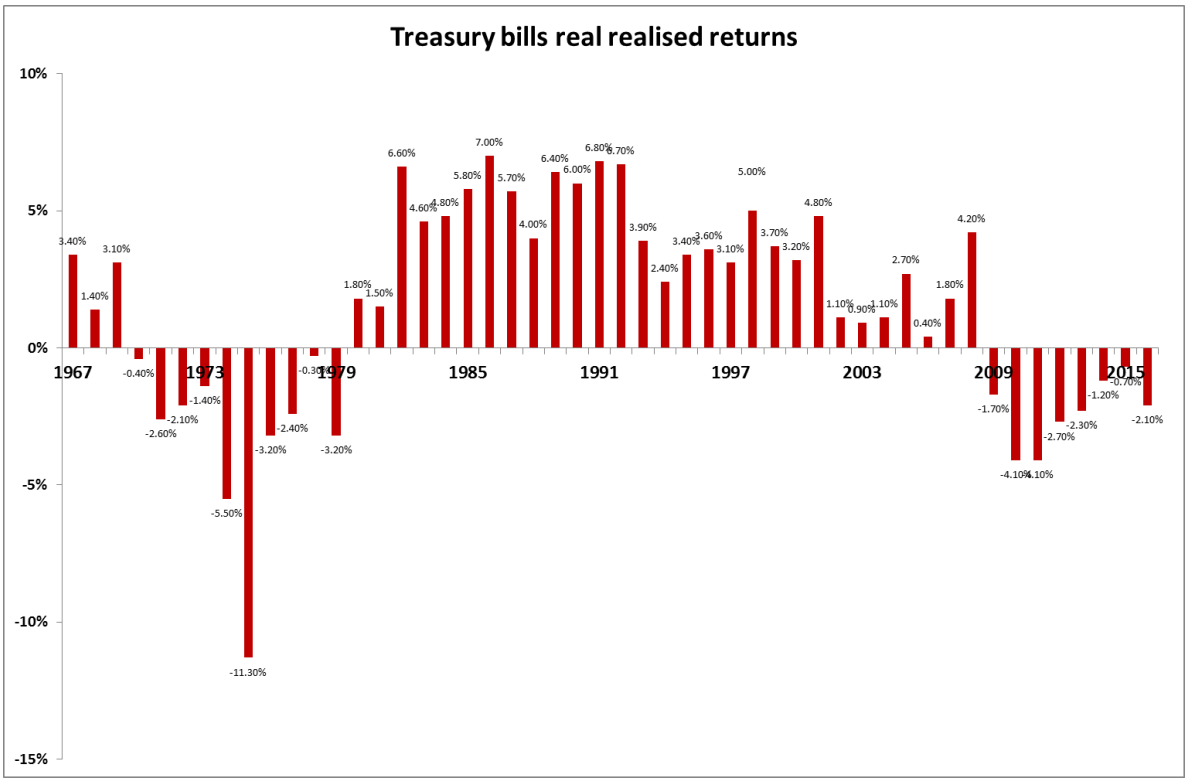



**Source: Bank of England**

Since the year 2000 the average annual spread of over the Bank of England's base rate has been 0.19% for 3-month Libor, -0.04% for 3-month gilt repos and 0.12% for 3-month bills.

Considering the normally low returns achieved by cash and money market instruments, inflation is of critical importance for the real returns of these instruments. In particular, when expected inflation—which is priced in the rates of return offered by the market—is higher than realised inflation, real returns are positive, and when it is lower returns are negative. Figure 30 presents the historic annual real returns for 3-month bills, sourced from the Barclays Equity Gilt Study 2017.

***Figure 30: UK 90 days Treasury bills real realised returns***




**Source: Barclays Equity Gilt Study 2017**

We can see that in the 1970s, a period in which inflation rapidly accelerated, returns were significantly negative. In the period since the financial crisis returns have also been negative, not because of high inflation, but rather due to the very low level of nominal rates as seen in Figure 28.

According to Barclays Equity Gilt Study 2017 data the average annual real return for UK Treasury bills has been 1.4% since 1967 and 0.1% since 2000. Using Credit Suisse Annual Return Yearbook (2017) figures, annual real return for UK Treasury bills has been 1.7% since 1967 and 0.7% since 2000.

## Future returns

Because most money market instruments have maturities substantially lower than a year and their yields are thus driven primarily by the short-term demand for liquidity, our approach of forecasting returns as a premium over real gilt returns is not suitable for this asset class. We therefore examine future returns as a spread over the Bank of England's official rate, which better reflects the economic factors relevant for the yields of money market instruments.

Table 21 below presents the Bank of England's official rate implied by sterling rate futures prices, according to Bloomberg, and the forecast nominal returns for money market instruments using historical spreads relative the Bank of England's official rate.

***Table 21: Bank of England's official rate implied by sterling rate futures prices and forecast nominal returns on money market instruments***

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Implied Bank of England's official rate** | **0.41%** | **0.52%** | **0.70%** | **0.89%** | **1.08%** | **1.31%** |
| 3-Month Libor Forecast Nominal Return[40] | 0.60% | 0.71% | 0.89% | 1.08% | 1.27% | 1.50% |
| 3-Month Gilt Forecast Nominal Return[41] | 0.37% | 0.48% | 0.66% | 0.85% | 1.04% | 1.27% |
| 3-Month Treasury Forecast Nominal Return[42] | 0.53% | 0.64% | 0.82% | 1.01% | 1.20% | 1.43% |

**Source: Bloomberg, Own analysis**

Based on the nominal rates, we can forecast real rates of return by adjusting for inflation. Table 22 presents the forecast real rates of return by adjusting for inflation using the GDP deflator according to the OBR forecasts as of March 2017.

***Table 22 Inflation based on the GDP Deflator and forecast real returns on money market instruments***

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| **Inflation based on the GDP Deflator[43]** | **1.80%** | **1.60%** | **1.60%** | **1.90%** | **1.90%** | **2.50%** |
| 3-Month Libor Forecast Real Return | -1.20% | -0.89% | -0.71% | -0.82% | -0.63% | -1.00% |
| 3-Month Gilt Forecast Real Return | -1.43% | -1.12% | -0.94% | -1.05% | -0.86% | -1.23% |
| 3-Month Treasury Forecast Real Return | -1.27% | -0.96% | -0.78% | -0.89% | -0.70% | -1.07% |

**Source: OBR, Own analysis**

Note that our real return on money market instruments forecast does not cover the full time period of our forecast horizon of 10-15 years. This is because long-run forecasts of the equilibrium level of real short term interest rates have very low accuracy. As highlighted by Beyer and Wieland (2017)[44] estimates of equilibrium real interest rates have wide confidence intervals and are extremely sensitive to key inputs. Indeed, there is no general agreement on the drivers of the natural interest rate level. However, despite being of little use as forecasting tools, such estimates remain useful in revealing possible explanations for the paths that interest rates have followed in the past. For example, Holsten, Laubach and Williams (2017)[45] suggest that the natural real interest rate has declined over time and, depending on the estimation methodology, may have been significantly below zero since the financial crisis. Much of the long-term reduction in the natural rate prior to the crisis is ascribed to lower

40 Using a historical spread of 0.19%.

41 Using a historical spread of -0.04%.

42 Using a historical spread of 0.12%.

43 Based on OBR forecasts (March 2017) up to 2021, FCA forecast for 2022.

44 Beyer and Wieland (2017) "Instability, Imprecision and Inconsistent Use of Equilibrium Real Interest Rate Estimates" *CEPR Discussion Paper No. DP11927.*

45 Holsten, K., T. Laubach and J. Williams, (2017), "Measuring the natural rate of interest: international trends and determinants", *Journal of International Economics*, (forthcoming).

equilibrium GDP growth. On the other hand, Goldby, Laureys and Reinold (2015)[46], present one model estimate that indicates the natural rate is now no longer negative, but is around zero.

### Conclusion on the expected return on cash and money markets

Based on our view of the likely level of nominal rates and inflation, over our forecast period of 10 to 15 years we believe the expected return on cash and money markets will fail to keep up with inflation. Therefore, we project a real annual return on cash and money market instruments over the forecast period of -1.5% to -0.5% (midpoint -1%) which is consistent with both recent historical returns and current market Bank of England's base rate expectations.

[46] Goldby, M., L. Laureys and K. Reinold, (2015), "An estimate of the UK's natural rate of interest", *Bank Underground*, August.

# 6 Adjustment for tax

Here, we assess for each asset class the likely effect of UK taxation of income and capital gains on investment returns. In practice, the actual tax effect may differ from the assumptions set out below due to company and fund-specific circumstances. The calculations set out here are best estimates based on current UK tax law and practice.

We consider the impact of tax on gross returns from those products where tax applies. We consider this in the context of current rates for tax advantaged business. Additionally, for completeness we also review the 4%, 5% and 6% rates when analysing likely tax implications[47] for portfolio returns. If the rates were to change following our report, it might be necessary to reconsider the impact of tax.

## Overview

Pensions and ISAs are tax advantaged and although the underlying investments may have suffered a variety of withholding taxes on dividends, for example, no further taxes are payable on the products themselves until, in the case of pensions, income tax is paid on the pension. Projections, however, show the full income that a pension provides, as the individual subsequent income tax is then for the customer to assess.

The main taxed product to consider, therefore, is the tax position of a net life fund, which currently pays 20% tax on capital and income, apart from dividends received from equity investments, which are generally exempt from UK tax.

The mix of assets will vary hugely between differing companies and funds. A large degree of equity investment is a common feature of many products but the same projection rates apply whether the funds are fully equities or a mixture of assets. To show the impact of tax we have considered a balanced fund consisting of 55% equities (25% UK, 35% overseas), 30% bonds (20% government bonds, 10% corporate bonds), with the remainder invested in property and in cash.

In the analysis below, we look at the effect of the various tax regimes on the rates of return. The gross nominal rates vary by asset class and we have adopted rates for the purpose of this analysis that are consistent with our projected rates of return in the rest of the paper. For government bonds, we use a rate of 2% per annum in the central scenarios, with upper and lower bounds of 2.5% and 1.5% respectively. The assumed rates for corporate bonds are slightly higher at 1.6% - 3%. Similarly for UK equities, we use a central assumption of 6% per annum with upper and lower bounds of 7% and 5% respectively (and 0.5% higher than those assumptions on average for overseas equities). Finally, we have assumed rates of return between 5% and 6% for properties. When aggregated to give the portfolio returns, the average returns are close to the assumptions used in Table 24 below.

[47] The 4%, 5% and 6% is based on the expected gross return for each asset class in the notional fund, as described above.

Where an assumption for price inflation is needed for tax purposes, we have used an RPI rate of 3.25% and a GDP deflator rate of 2.5%. Where different rates apply to equity capital gains and income, a dividend yield of 3% is assumed for UK equities and 2% for overseas equities, whilst a rental yield of 3.5% is assumed. These rates are the same for all three scenarios, meaning that the real capital gains range from negative rates to around 5% per annum.

## Taxed business

Investment return on life business (such as endowments and high income bonds) is taxed during the life of the policy. The tax rate applied depends upon the type of return (we assume here that all life business investments are held directly – the treatment of holdings via unit trusts or OEICs can be more complex):

- All income from portfolio equity investments is exempt from UK tax, and no overseas withholding taxes are assumed to arise on the overseas dividends (we have sensitivity tested this latter assumption and are comfortable it will have no significant impact on the numbers disclosed in Table 23 below);

- Total returns on bonds (UK and overseas, including corporate bonds) are taxed at a rate of 20% per annum. No allowance is made for indexation relief, which may be due in respect of any index-linked gilts owned by the fund.

- Capital gains on UK equity, overseas equity and property are currently taxed at a rate of 20%, less an allowance for indexation which is based upon the movement in the RPI between acquisition and disposal of the equity holding. The process of calculating the chargeable gains in the model is described below.

- Rental income from properties is taxed at a rate of 20% per annum, whilst capital gains on property are taxed at a rate of 20% less an allowance for indexation as with equities described above. We have assumed no relief for capital allowances or other expenses in calculating the tax due on rental income.

- No allowance is made for any transaction taxes incurred (stamp taxes in the UK, or their overseas equivalents) and nor are any overseas taxes taken into account.

- Finally, no tax has been assumed to arise on the return from cash and money market funds, the tax on this income being insignificant for the purposes of the modelling.

The calculation for capital gains tax on UK equity, overseas equity and property in a life fund can be rather involved. Gains are taxed at a rate of 20% less an allowance for indexation which is based upon the movement in the RPI between acquisition and disposal of the equity holding. Therefore, the longer these assets are held by a life company, the greater the tax allowance against the gain and the lower the actual rate of tax paid (assuming that inflation is positive).

In order to determine an average rate of tax on chargeable gains, it is necessary to assume a rate of equity churn (i.e. a rate of trading of equity). We have assumed in our calculations that equities within the portfolio will be held for an average of seven years, but we would note that the rate of equity churn can vary significantly between providers and this should always be assessed by reference to the investment strategy of the particular fund. The period of seven years was selected in our modelling, so as to be consistent with the spreading period used in

tax legislation for gains on unit trusts and other collectives[48], as a proxy to the average period of ownership of assets in these funds.

We have used the following approach in our modelling to determine the adjustment that should be made to gross returns to allow for capital gains tax:

- A notional portfolio of equities and properties is projected forward over a seven-year period, increasing in line with the appropriate return assumption.

- The value of these assets is projected to grow each year by the amount of the gross return on the assets in each scenario, which is then split between income (calculated with reference to the expected dividend/rental yield on these assets) and capital growth.

- One-seventh of the portfolio is then assumed to be sold each year and immediately reinvested, together with the re-investment of any income received from those assets. A gross chargeable gain is calculated on the disposal of these assets, being the acquisition proceeds (one-seventh of the expected value of the portfolio at the end of each year) less the one seventh of the total acquisition costs for the assets (the original cost, adjusted for the reinvestment of the proceeds realised in prior years and for dividends/rent).

- All of the remaining equities and properties are assumed to be sold at the end of the seven year churn period, with a gross chargeable gain or loss computed on this final disposal as above.

- The gross chargeable gain in each year is then reduced to allow for indexation (i.e. the assumed increase in RPI). This is calculated by applying an appropriate indexation factor (calculated with reference to RPI inflation) to the acquisition costs used in the calculation of the gross chargeable gain in each year of the model (so a two year indexation factor in year two etc.). This gives the net chargeable gain that is subject to tax each year.

- Tax is calculated as 20% of this amount in each year of the model.

- The total amount of tax over the seven-year period is calculated as the sum of the tax due in each of the seven years, and this total is divided by the total capital gain over the period to give an average annual rate of tax.

- This average tax rate is then multiplied by the assumed annual capital growth to give the reduction from the gross return in respect of capital gains.

On UK equities, the purchase of equities gives rise to a 0.5% stamp duty charge, whilst similar taxes may apply on the sale of overseas equities and stamp duty land tax of up to 5% may be due on acquisitions of commercial property. For modelling the impact of this, we assumed that these stamp duty costs are implicitly allowed in the gross rate set for projections and so no additional deduction is made when arriving at the net rate.

This leads to the following analysis of the impact of tax for different portfolios:

[48] S213 TCGA 1992

***Table 23: Effective tax rates for life funds in excess of those allowed for in tax advantaged business***

| UK equities | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 5.00% | 6.00% | 7.00% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 3.00% | 3.00% | 3.00% |
| Additional deduction for tax in life fund | 0.00% | 0.00% | 0.20% |

| Government bond income and growth | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 1.50% | 2.00% | 2.50% |
| Additional deduction for tax in life fund | 0.30% | 0.40% | 0.50% |

| Corporate bond income and growth | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 1.60% | 2.80% | 3.00% |
| Additional deduction for tax in life fund | 0.30% | 0.40% | 0.50% |

| Cash and money markets | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 1.00% | 1.50% | 2.00% |
| Additional deduction for tax in life fund | 0.00% | 0.00% | 0.00% |

| Overseas equities | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 5.00% | 5.50% | 6.00% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 2.00% | 2.00% | 2.00% |
| Additional deduction for tax in life fund | 0.07% | 0.33% | 0.59% |

| Property income and growth | Low | Mid | High |
|---|---|---|---|
| Assumed gross rate of return | 5.50% | 6.00% | 6.50% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 3.50% | 3.50% | 3.50% |
| Additional deduction for tax in life fund | 0.70% | 0.70% | 0.70% |

***Table 24: Impact of tax on sample life funds***

| Approximate gross return | 4.0% | 5.0% | 6.0% |
|---|---|---|---|
| Additional deduction tax on UK equities | 0.00% | 0.00% | 0.05% |
| Additional deduction tax on government bonds | 0.06% | 0.08% | 0.10% |
| Additional deduction | 0.02% | 0.12% | 0.21% |

| | | | |
|---|---|---|---|
| tax on overseas equities | | | |
| Additional deduction tax on corporate bonds | 0.03% | 0.06% | 0.06% |
| Additional deduction tax on properties | 0.05% | 0.05% | 0.05% |
| Total tax impact | 0.16% | 0.30% | 0.46% |

## Conclusion: Tax effects

Life funds bear tax on income and capital gains. Our analysis suggests that for a typical mixed fund, the reductions in respect of tax from the illustration rates of 4%, 5% and 6% in current use might vary from 0.16% for the lower illustration through 0.30% for the central assumption to 0.46% for the higher illustration. However, it should be noted that asset allocation, rate of churn, rate of return and proportion of return derived from income all have an effect on the tax payable.

# 7 Conclusion on investment returns

The analysis of historic and forward looking returns has led us to project the following returns over the next 10 to 15 years.

Table 25 below presents our central estimates and ranges of projected annual returns for all asset classes and compares them to the central estimates presented in the 2012 PwC report.

***Table 25: Summary of projected annual returns***

| | 2012 PwC Report Range | 2017 Report Range | 2012 PwC Report Midpoint | 2017 Report Midpoint | Change in Midpoint |
|---|---|---|---|---|---|
| Inflation, based on GDP Deflator | 2.50% | 2.50% | 2.50% | 2.50% | 0.00% |
| Real Government Bonds | 0.5% to 1% | -1% to 0% | 0.75% | -0.50% | -1.25% |
| EMRP | 3.5% to 4.5% | 3.5% to 5.5% | 4% | 4.50% | 0.50% |
| Real Equity Returns | 4% to 5.5% | 3% to 5% | 4.75% | 4.00% | -0.75% |
| Real Corporate Bond Returns | 1.5% to 3% | 0.1% to 0.5% | 2.25% | 0.30% | -1.95% |
| Real Property Returns | 3% to 4% | 2.5% to 3.5% | 3.50% | 3% | -0.50% |
| Real Cash and Money Markets Returns | - | -1.5% to -0.5% | - | -1% | - |
| Nominal Government Bonds | 3% to 3.5% | 1.5% to 2.5% | 3.25% | 2.00% | -1.25% |
| Nominal Equity Returns | 6.5% to 8% | 5.5% to 7.5% | 7.25% | 6.50% | -0.75% |
| Nominal Corporate Bond Returns | 4% to 5.5% | 2.6% to 3% | 4.75% | 2.80% | -1.95% |
| Nominal Property Returns | 5.5% to 6.5% | 5% to 6% | 6.00% | 5.50% | -0.50% |
| Nominal Cash and Money Markets Returns | - | 1% to 2% | - | 1.50% | - |

**Source: PwC 2012 report, Own analysis**

To produce an overall projected return we must combine these asset investment return forecasts into overall portfolio returns, using a number of portfolio allocations. In preparing our

central estimate portfolio allocation and our alternative allocations, we relied on the data and trends discussed in the asset allocation section. Alternative allocations have been constructed with the aim of providing a broad range of realistic counterfactuals to the base allocation.

The table below presents our portfolio allocation assumptions that underline our estimated portfolio returns.

***Table 26: Base and alternative asset allocations for the composite portfolio***

| Asset Class | 2017 Report Base Allocation | 2012 Report Base Allocation | Alternative Allocation 1 | Alternative Allocation 2 | Alternative Allocation 3 | Alternative Allocation 4 | Alternative Allocation 5 | Alternative Allocation 6 |
|---|---|---|---|---|---|---|---|---|
| Overseas Equity | **35.0%** | 28.5% | 30.0% | 30.0% | 40.0% | 26.0% | 25.0% | 35.0% |
| UK Equity | **25.0%** | 28.5% | 30.0% | 25.0% | 28.0% | 20.0% | 30.0% | 25.0% |
| Government Bonds | **20.0%** | 23.0% | 15.0% | 25.0% | 10.0% | 25.0% | 20.0% | 10.0% |
| Corporate Bonds | **10.0%** | 10.0% | 15.0% | 10.0% | 8.0% | 18.0% | 15.0% | 15.0% |
| Property | **7.0%** | 10.0% | 10.0% | 10.0% | 10.0% | 8.0% | 5.0% | 15.0% |
| Cash and Money Markets | **3.0%** | 0.0% | 0.0% | 0.0% | 4.0% | 3.0% | 5.0% | 0.0% |

**Source: PwC 2012 report, Own analysis**

We have prepared this report using our overarching assumption that over our forecast period of 10 to 15 years the GDP deflator is the most appropriate measure of inflation. However, in order to verify the robustness of our forecasts, it is useful to explore the impact of alternative inflation levels.

We therefore present in the table below our forecast nominal composite portfolio returns under our central assumption of inflation over our 10 to 15 year forecast period equal to the forecast GDP deflator (2.5%), and under the alternative measures of inflation equal to the forecast CPI (2%) and the forecast RPI (3.25%).

***Table 27: Inflation base case (GDP deflator) and alternatives for the projected nominal composite portfolio return***

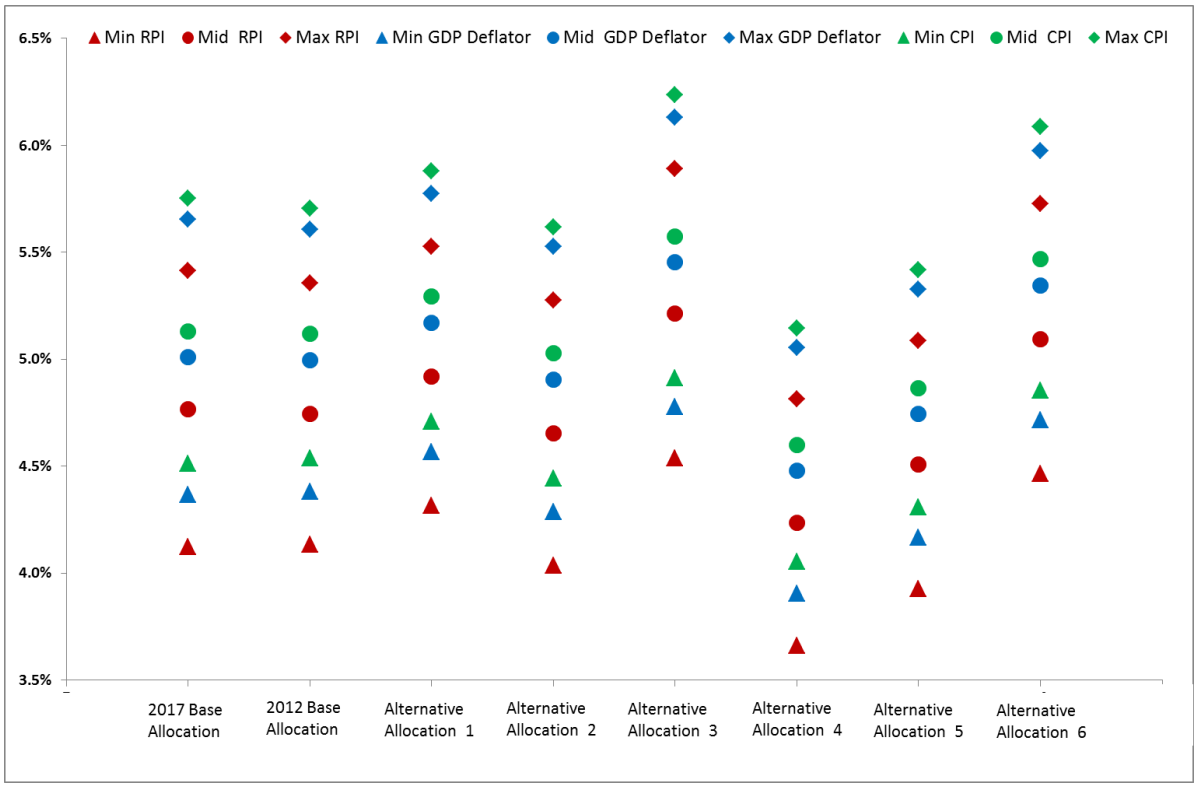
| Inflation Assumption | RPI (3.25%) | | | GDP deflator (2.5%) | | | CPI (2%) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Projected Return Range** | **Min** | **Mid** | **Max** | **Min** | **Mid** | **Max** | **Min** | **Mid** | **Max** |
| 2017 Report Base Allocation | 4.12% | 4.77% | 5.41% | 4.37% | 5.01% | 5.66% | 4.51% | 5.13% | 5.75% |
| 2012 Report Base Allocation | 4.13% | 4.75% | 5.36% | 4.38% | 5.00% | 5.61% | 4.54% | 5.12% | 5.70% |
| Alternative Allocation 1 | 4.32% | 4.92% | 5.53% | 4.57% | 5.17% | 5.78% | 4.71% | 5.30% | 5.88% |
| Alternative Allocation 2 | 4.04% | 4.66% | 5.28% | 4.29% | 4.91% | 5.53% | 4.44% | 5.03% | 5.62% |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Alternative Allocation 3 | 4.54% | 5.21% | 5.89% | 4.78% | 5.45% | 6.13% | 4.91% | 5.57% | 6.24% |
| Alternative Allocation 4 | 3.66% | 4.24% | 4.81% | 3.90% | 4.48% | 5.06% | 4.06% | 4.60% | 5.15% |
| Alternative Allocation 5 | 3.93% | 4.51% | 5.09% | 4.17% | 4.75% | 5.33% | 4.31% | 4.86% | 5.42% |
| Alternative Allocation 6 | 4.47% | 5.10% | 5.73% | 4.72% | 5.35% | 5.98% | 4.85% | 5.47% | 6.09% |

**Source: Own analysis**

We also present the information contained in Table 27 graphically. Figure 31 presents the returns under various inflation assumptions across our Base and Alternative allocations. We can see that there is a significant overlap in the return ranges across both inflation assumptions and asset allocations.

***Figure 31: Inflation base case (GDP deflator) and alternatives for the projected nominal composite portfolio return***




**Source: Own analysis**

Under our central GDP deflator assumption, our base case portfolio allocation of 60% equity, 20% government bonds, 10% corporate bonds, 7% property and 3% cash and equivalents delivers a projected annual nominal return ranging from 4.4% to 5.7% (rounded), with a central estimate of 5%. Our central estimate for the range of projected nominal returns of 5% is one percentage point lower than the comparable estimate of 6% in the PwC 2012 report. As can be seen from the negligible difference in returns on the 2017 report base allocation and the 2012 report base allocation, this is not due to changes in asset allocation (these have very little impact). It is also not due to inflation (our estimates of inflation based on the GDP deflator are the same as those in the previous report). The lower return is mainly explained by the lower projected real returns on government bonds, which then affect the projected returns

of other asset classes. Further, it is notable that the central return of our Base Allocation is 0.5% higher than the central return on Alternative Allocation 4, which closely follows the aggregate asset allocation of UK pension funds. This difference can be explained by the higher allocation to equities in our base allocation, relative to Alternative Allocation 4. This in turn is due to the high equity allocation of UK insurance companies which is taken into account when constructing the 2017 base allocation.

# 8 Conclusion on key questions

In this Section we review the three questions asked under our Terms of Reference.

## Does the current intermediate rate of return continue to represent the appropriate single rate for illustrating potential returns for those products subject to the COBS projection requirements?

Based on our updated research, market information and broader economic developments, we believe the best estimate for the single intermediate rate of return is 5%, in nominal terms, with a range around this figure of 4.4% to 5.7%. We therefore consider the 6% intermediate figure, suggested in the 2012 report, to be too high and suggest bringing this figure down to within the range of 4.4% to 5.7%.

In this report we have not reviewed the high or low rates of return around the intermediate rate of return.

## Is there reason to doubt the appropriateness of the 0.5% adjustment for tax-disadvantaged products?

PwC analysis suggests that for a typical mixed fund according to our 2017 Base Case Allocation, the reductions in respect of tax from the illustration rates of 4%, 5% and 6% in current use might vary from 0.16% for the lower illustration through 0.30% for the central assumption to 0.46% for the higher illustration. However, it should be noted that asset allocation, rate of churn, rate of return and proportion of return derived from income all have an effect on the tax payable.

Therefore, we believe the single adjustment figure for tax-disadvantaged products should be changed to 0.3%, from the 0.5% that was proposed in the 2012 PwC report.

## Do the long-term inflation assumptions of 2.5% for prices and 4% for earnings continue to be valid?

As in the 2012 report, we use a figure of 2.5% for the GDP deflator as a measure of price inflation. This is the figure in our assumptions for different asset classes' expected returns. For the purpose of preparing retail projections, we recommend a rate of 2% and 3.25% for long-run CPI and RPI growth respectively. We continue to believe that nominal wages will growth at a 4.25% rate annually in the long-run. However, we recommend a lower average earnings growth estimate of 3.75% for the next 10-15 years due to anticipated lower earnings growth in the short term.

# 9 Appendix A: Economics Department Terms of Reference

**Introduction**

The purpose of this document is to provide formal Terms of Reference (ToR) for the 2016 Projection Rate Review, which the Chief Economist's Department (CED) has agreed to undertake on behalf of the Policy Department.

Our requirements for CED are broadly in line with -though not identical to- the previous requirements for PricewaterhouseCoopers (PwC) who undertook the last rate review in 2012. This is reflective of our belief, in addition to the view expressed by CED, that the PwC methodology is fundamentally sound and is suitable for this rate review.

**Independent peer review**

In line with previous rate reviews, the work will be peer reviewed by independent academics: two economists and one actuary. These will be appointed by Policy and will provide independent analysis and constructive challenge to the work undertaken by CED. The peer review will take place primarily on the interim and final reports. The lead-contact in Policy should be copied-in to any exchanges or discussions between the peer reviewers and CED, in order to preserve transparency.

**Specification**

The present ToR are aimed at establishing:

- Whether the current intermediate rate of return continues to represent the appropriate single rate for illustrating potential returns for those products subject to the projection rules;
- The appropriateness of the 0.5% adjustment for tax disadvantaged products
- The continuing validity of the long-term inflation assumptions of 2.5% for prices and 4% for earnings

Any recommendations should comment on the continuing appropriateness of the following factors, and any resultant departure from these factors should be accompanied by a detailed explanation. Hence the report should provide the following:

- a central estimate and distribution information for annualised real and nominal returns for UK equities, international equities, property, cash and money market, gilts and corporate bonds, over the next 10 and 15 years;
- decomposition of these returns into capital and income;

- details of the assumptions that have been made in deriving the above and an explanation of the methodology used;
- price and earnings assumptions;
- opinion and analysis of the main influences on total returns from the various asset classes over the different time periods; and
- a summary and analysis of recent relevant research.

Note that all analysis must be conducted with an understanding of the degrees of approximation which are appropriate. The intermediate rates of return which the FCA prescribes need principally to be appropriate for the broad asset classes as typically constitute UK retail investment business with a 10-15 year investment horizon. The review of these rates needs to be proportionate to the inevitable approximations this entails.

We reserve the right to call for more detailed exposure within the report of the supporting rationale, assumptions made, and methodology applied.

Whilst we expect the report to be as concise as possible, it is important that any recommendations are supported with an appropriate rationale, and details of the scope of any proposed changes must be made clear.

**Deliverables and Timeline**

The Policy department requires the following deliverables:

- A draft report which includes (although is not necessarily restricted to) coverage of: methodology, assumptions, analysis, results and any limitations to these
- A final report in a form suitable for publication as a standalone document, the structure of which is to be agreed with the Policy department

The final report is to be delivered by early September 2016.

**Note:** *The present report was fist commissioned in 2016, but work was suspended following the result of the referendum on the UK exit from the EU to assess the implications of this event for our methodology. Work subsequently resumed in January 2017.*

# 10 Appendix B: Updated literature review on the EMRP

Most of the contributions to the estimation of the market risk premia since the last report have concentrated on the predictability of its time-varying conditional mean. Some of these contributions focus on addressing well-known problems of previous methods (e.g. predictive regressions using price ratios) while exploiting new time-series and cross-sectional information.

On the methodology side, Pastor and Stambaugh (2009) develop a predictive system for estimating expected returns that allows predictors to be imperfectly correlated to the conditional return. Compared to standard predictive regressions, predictive systems deliver different expected returns with higher estimated precision. Additionally, Lettau and Van Nieuwerburgh (2008) explain that parameter instability and poor out-of-sample performance of predictive regressions of expected returns can be explained if the steady-state mean of the economy is not fixed (which is the usual assumption). They find strong empirical evidence in support of shifts in the steady state and propose simple methods to adjust financial ratios for such shifts. Bollerslev Tauchen George, and Zhou (2009) show that the difference between implied and realised variation, or the variance risk premium, is able to explain a nontrivial fraction of the time-series variation in post-1990 aggregate stock market returns. The results also show that the volatility premium is a much stronger predictor than other popular variables. Van Binsbergen and Koijen (2011) develop a framework based on the present-value model to estimate expected returns and find that returns and dividend growth rates are predictable with a large R-squared. They also document that expected returns have a persistent component. Ferreira and Santa-Clara (2011) propose to forecast the three components of stock market returns separately (dividend yield, earnings growth, and price-earnings ratio growth). They obtain out-of-sample R-square coefficients (relative to the historical mean) of nearly 1.6% with monthly data and 16.7% with annual data using the most common predictors suggested in the literature. This compares with typically negative R-square coefficients obtained in a similar experiment by Goyal and Welch (2008).

Other studies also address previous methodological shortfalls while exploiting new time-series and cross-sectional information to predict expected returns. Avdis and Watcher (2016) develop a new methodology to estimate the equity premium based on maximum likelihood that takes into account information contained in dividends and prices. Their results show an economically significant reduction of the risk premium from 6.4% to 5.1%. Li, Ng, and Swaminathan (2013) find that aggregate implied cost of capita (ICC) strongly predicts future excess market returns at horizons ranging from one month to four years. Cooper and Priestley (2009) document that the output gap, measured as the deviations of the log of industrial production from a trend, predicts expected returns, linking the variation in risk premium to business cycle variables (economic fundamentals).

In an effort to quantitatively analyse all the available evidence, Van Ewijk and De Groot (2012) conduct a meta-analysis. They identify how the size of the equity premium depends on the way it is measured, along with its evolution over time and its variation across regions in the

world. They also find that the equity premium is significantly lower if measured by ex-ante rather than ex-post methods, in more recent periods, and for more developed countries.

Lastly, van Binsbergen Hueskes Koijen, and Vrugt (2013) exploit data on dividend futures to construct equity yields (analogous to bond yields) and decompose the equity yields to obtain a term structure of expected dividend growth rates and a term structure of risk premia (by maturity). They find that the slope of the term structure of risk premia steepens during recessions, whereas the slope of the term structure of expected dividend growth rates flattens.

Dimson Marsh and Staunton (2011) update their estimates for global risk premia around the world. For their 19-country World index, over the entire 111 years, geometric mean real returns were an annualized 5.5%; the equity premium relative to Treasury bills was an annualized 4.5%; and the equity premium relative to long-term government bonds was an annualized 3.8%. The expected equity premium is lower, around 3% to 3.5% on an annualized basis. Fernandez Ortiz and Fernandez (2015) update their survey on discount rates around the world. In 2015, they find that the average risk-free (RF) rate used in 2015 was smaller than the one used in 2013 in 26 countries (in 11 of them the difference was more than 1%). In eight countries the average risk-free rate used in 2015 was more than one percentage point higher than the one used in 2013. The change between 2013 and 2015 of the average market risk premium used was higher than one percentage point for 13 countries.

Avdis, Efstathios, and Jessica A. Wachter. Maximum likelihood estimation of the equity premium. No. w19684. National Bureau of Economic Research, 2013.

Bollerslev, Tim, Tauchen George, and Zhou Hao. "Expected Stock Returns and Variance Risk Premia." The Review of Financial Studies 22, no. 11 (2009): 4463-492.

Cooper, Ilan, and Priestley Richard. "Time-Varying Risk Premiums and the Output Gap." The Review of Financial Studies 22, no. 7 (2009): 2801-833.

Dimson, Elroy and Marsh, Paul and Staunton, Mike, Equity Premia Around the World (October 7, 2011).

Fernandez, Pablo and Ortiz Pizarro, Alberto and Fernández Acín, Isabel, Discount Rate (Risk-Free Rate and Market Risk Premium) Used for 41 Countries in 2015: A Survey (November 19, 2015). Available at SSRN.

Ferreira, Miguel A., and Pedro Santa-Clara. "Forecasting stock market returns: The sum of the parts is more than the whole." Journal of Financial Economics 100, no. 3 (2011): 514-537.

Lettau, Martin, and Van Nieuwerburgh Stijn. "Reconciling the Return Predictability Evidence." The Review of Financial Studies 21, no. 4 (2008): 1607-1652.

Li, Yan, David T. Ng, and Bhaskaran Swaminathan. "Predicting market returns using aggregate implied cost of capital." Journal of Financial Economics 110, no. 2 (2013): 419-436

Pástor, Ľuboš, and Stambaugh Robert F. "Predictive Systems: Living with Imperfect Predictors." The Journal of Finance 64, no. 4 (2009): 1583-628.

Van Binsbergen, H. Jules, and Ralph SJ Koijen. "Predictive regressions: A present-value approach." The Journal of Finance 65, no. 4 (2010): 1439-1471.

van Binsbergen, Jules, Wouter Hueskes, Ralph Koijen, and Evert Vrugt. "Equity yields." Journal of Financial Economics 110, no. 3 (2013): 503-519.

Van Ewijk, Casper, and Henri LF De Groot. "A meta-analysis of the equity premium." Journal of Empirical Finance 19, no. 5 (2012): 819-830.

# 1 Appendix C: Assumptions underlying our model-based EMRP estimates

In our Discount Model approach sub-section we estimate the EMRP using four models, based on either the dividend or earnings modelling approaches. In this appendix we present the inputs to these models.

The Dividend Discount Model (DDM) assumes that the current share price reflects the present value of all future expected dividends discounted to the present time. Assuming constant dividend growth, an equilibrium dividend yield can be estimated as:

$$D(t+1)/P(t)=r+EMRP-gD$$

From this equation, we derive an equity market risk premium as:

$$EMRP = D(t+1)/Pt + gD - r$$

Where:

D/P = Prospective dividend yield

r = Nominal risk free rate

EMRP = Equity market risk premium

gD = Expected nominal dividend growth rate

The Capital Return Discount Model (CRDM) is similar to the DDM. The CRDM replaces the prospective dividend yield with the prospective combined yield of dividends and buybacks, and replaces the expected nominal dividend growth rate with the expected growth rate of the combined yield.

A further model that is useful as a cross-check in our analysis is the Earnings Discount Model (EDM). The EDM assumes that the current share price reflects the present value of all future expected earnings discounted to the present time. It differs from DDM, in that it assumes investors do not only value the returns from the stock that are distributed to them as cash (the dividends) but also those returns that are retained within the company. Assuming constant earnings growth, an equilibrium earnings yield can be estimated as:

$$E(t+1)/P(t)=r+EMRP-gE$$

From this equation, we derive an equity market risk premium as:

$$EMRP = E(t+1)/Pt + gE - r$$

Where:

E/P = Prospective earnings yield

r = Nominal risk free rate

EMRP = Equity market risk premium

gE = Expected nominal earnings growth rate

We also examine a version of the EDM where the expected nominal earnings growth rate is equal to the long term GDP growth rate.

Table 28 below presents the value and source of the various model inputs we have used for the central case in our models.

***Table 28: Sources and values for the EMRP model inputs***

| Item Number | Item | UK | | US | |
|---|---|---|---|---|---|
| | | Value | Source | Value | Source |
| **1** | Total Distribution Payout ratio | 80% | FTSE 350 Historical Average since 1990 -(Bloomberg) | 85% | S&P 500 Historical Average since 2002 -(Bloomberg) |
| **2** | Dividend Payout ratio | 65% | FTSE 350 Historical Average since 1990 -Bloomberg | 45% | S&P 500 Historical Average since 2002 -(Bloomberg) |
| **3** | Earnings Growth rate (nominal) | 6.780% | FTSE 350 Long Term Expected Earnings Growth Rate (Bloomberg) | 7.02% | S&P 500 Long Term Expected Earnings Growth Rate (Bloomberg) |
| **4** | Earnings yield (E/P) | 6.67% | FTSE 350 forward earnings yield (Bloomberg) | 5.49% | S&P 500 forward earnings yield (Bloomberg) |
| **5** | Risk free rate (nominal) | 1.64% | Dec 2016 10y Gilt (Bank of England) | 2.42% | Dec 2016 10y US Treasury (Bloomberg) |
| **6** | Total Distribution Growth Rate (nominal) | 5.42% | **1 * 3** | 5.97% | **1 * 3** |
| **7** | Dividend Growth rate (nominal) | 4.41% | **2 * 3** | 3.16% | **2 * 3** |
| **8** | Buyback Yield | 0.50% | FTSE 350 forward buyback yield (Bloomberg) 2016Q1-Q4 Average | 2.90% | S&P500 forward buyback yield (Bloomberg) 2016Q1-Q4 Average |
| **9** | Dividend yield (D/P) | 3.09% | FTSE 350 forward div yield (Bloomberg) 2016Q1-Q4 Average | 2.15% | S&P500 forward div yield (Bloomberg) 2016Q1-Q4 Average |
| **10** | Long Term GDP Growth Rate | 1.66% | IMF World Outlook January 2017 Update | 1.91% | IMF World Outlook January 2017 Update |

Table 29 below presents the calculation underlying our models and central case results. In the Discount Model approach sub-section we show the base case and, as a sensitivity check, the cases where the nominal earnings growth rate is one percentage point lower or one percentage point higher. We vary the nominal earnings growth rate, because it feeds into all models (albeit with a different weight on the final output) and is generally estimated with a high degree of uncertainty.

***Table 29 EMRP model calculation and base case results***

| Model | Calculation (see Table 28 ) | UK | US |
|---|---|---|---|
| Dividend Discount Model | **7 + 9 - 5** | 5.86% | 2.89% |
| Earnings Discount Model (GDP Constraint) | **4 + 10 - 5** | 6.69% | 4.99% |
| Capital Return Discount Model | **6 + 8 + 9 - 5** | 7.38% | 8.60% |
| Earnings Discount Model | **4 + 3 - 5** | 11.81% | 10.09% |

# L2 Appendix D: PwC Terms of Reference

The Financial Conduct Authority
25 The North Colonnade
London
E14 5HS

4 July 2017

Dear Sirs

**Review of FCA projection rates – analysis of tax effects**

In this short letter, I set out a summary of our findings on the impact of tax on the sample life funds.

In addition to these findings, I have set out below the scope of our work and the key assumptions we have made in modelling the tax effects in the sample fund in each of the return scenarios.

Scope of our work

The FCA periodically reviews the appropriate projection rates of return for use in benefit illustrations. As part of its 2017 review, we have been commissioned by the Financial Conduct Authority ('FCA') to consider the appropriateness of the adjustment for tax disadvantaged products. As agreed with the FCA, we have completed this work by modelling the policyholder tax due in a sample unit linked life fund ('the sample life fund'). This work is based on illustrative rates of return for each asset class within the sample life fund provided by the FCA (which we have not reviewed) and certain other assumptions agreed with the FCA. This letter summarises the findings of our work and the basis on which we have completed our modelling work.

Any party reading this letter should not that this work was prepared solely for the FCA under the terms of our engagement letter with them dated 15 June 2017. We have given the FCA permission under the terms of our engagement letter with them to publish this letter.

However, any other party reading this letter should note that this letter has been prepared to provide illustrative numbers on the tax effects for a sample life fund only, and does not constitute professional advice that anyone should rely upon.

In particular, no party should not act upon the information contained in this publication without obtaining specific professional advice that is specific to the particular fund under consideration. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law,

PricewaterhouseCoopers LLP, its members, employees and agents do not accept or assume any liability, responsibility or duty of care for any consequences to any party acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it.

Key assumptions made in our work

Our work is based upon a sample life fund, which has invested in a mixture of assets in the following proportions:

| Asset class | Proportion of assets in fund (%) |
|---|---|
| | |
| UK equities | 25 |
| Overseas equities | 35 |
| Government bonds | 20 |
| Corporate bonds | 10 |
| Properties | 7 |
| Cash and money markets | 3 |
| | |
| Total | 100 |

These asset proportions within the sample life fund were provided by the FCA to be consistent with the assumptions used in the remainder of their modelling. Please note that we have not reviewed the appropriateness of these asset proportions by reference to the investment strategies of unit liked life funds observed in the market. Any party reading this letter should therefore note that these proportions are intended to be purely illustrative for the purposes of our modelling work, and may well not reflect the actual investment strategies of a real unit liked life fund.

The FCA then provided us with illustrative rates of return for each of these assets classes, split between high, medium and low rates of return for each asset class. These rates have been used in our modelling and are summarised in Table 1 below. Please note though that we have not reviewed or commented upon the appropriateness of these rates of return for each asset class, but have purely used these in our analysis of the taxation impacts.

Finally, these projections of tax have been calculated based on the following key assumptions which were all agreed with the FCA:

- We have assumed that all of the assets are directly held by the fund, rather than via unit trusts or other forms of collective for which the tax treatment may be different.

- All income from portfolio equity investments is exempt from UK tax, and no overseas withholding taxes are assumed to arise on the overseas dividends (we have sensitivity tested this latter assumption and are comfortable it will have no significant impact on the numbers disclosed in the findings section below);

- Total returns on bonds (UK and overseas, including corporate bonds) are taxed at a rate of 20% per annum. No allowance is made for indexation relief, which may be due in respect of any index-linked gilts owned by the fund.

- Capital gains on UK equity, overseas equity and property are currently taxed at a rate of 20% less an allowance for indexation which is based upon the movement in the Retail Prices Index (RPI) between acquisition and disposal of the equity holding. The process of calculating the chargeable gains in the model is described below.

- Rental income from properties is taxed at a rate of 20% per annum, whilst capital gains on property are taxed at a rate of 20% less an allowance for indexation as with equities described above. We have assumed no relief for capital allowances or other expenses in calculating the tax due on rental income.

- No allowance is made for any transaction taxes incurred (stamp taxes in the UK including stamp duty land tax, or their overseas equivalents) and nor are any overseas taxes taken into account.

- Finally, no tax has been assumed to arise on the return from cash and money market funds, the tax on this income being insignificant for the purposes of the modelling.

- Summary of findings

- Based on the above assumptions, the deduction for tax for each asset class and then the overall sample life fund in each scenario is as follows:

***Table 1: Tax deductions for life funds in excess of those allowed for in tax advantaged business***

| UK equities | Low | Medium | High |
|---|---|---|---|
| Assumed gross rate of return | 5.00% | 6.00% | 7.00% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 3.00% | 3.00% | 3.00% |
| Additional deduction for tax in life fund | 0.00% | 0.00% | 0.20% |

| Government bond income and growth | Low | Medium | High |
|---|---|---|---|
| Assumed gross rate of return | 1.50% | 2.00% | 2.50% |
| Additional deduction for tax in life fund | 0.30% | 0.40% | 0.50% |

| Corporate bond income and growth | Low | Medium | High |
|---|---|---|---|
| Assumed gross rate of return | 1.60% | 2.80% | 3.00% |
| Additional deduction for tax in life fund | 0.30% | 0.40% | 0.50% |

| Cash and money markets | Low | Medium | High |
|---|---|---|---|
| Assumed gross rate of return | 1.00% | 1.50% | 2.00% |
| Additional deduction for tax in life fund | 0.00% | 0.00% | 0.00% |

| Overseas equities | Low | Medium | High |
|---|---|---|---|

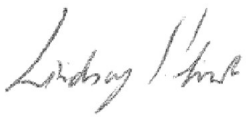
| | | | |
|---|---|---|---|
| Assumed gross rate of return | 5.00% | 5.50% | 6.00% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 2.00% | 2.00% | 2.00% |
| Additional deduction for tax in life fund | 0.07% | 0.33% | 0.59% |

| **Property income and growth** | **Low** | **Medium** | **High** |
|---|---|---|---|
| Assumed gross rate of return | 5.50% | 6.00% | 6.50% |
| Assumed inflation | 2.50% | 2.50% | 2.50% |
| Assumed income | 3.50% | 3.50% | 3.50% |
| Additional deduction for tax in life fund | 0.70% | 0.70% | 0.70% |

***Table 2: Impact of tax in the sample life fund***

*The aggregated impact of tax on the sample life fund is then as follows:*

| **Scenario** | **Low** | **Medium** | **High** |
|---|---|---|---|
| Additional deduction tax on UK equities | 0.00% | 0.00% | 0.05% |
| Additional deduction tax on government bonds | 0.06% | 0.08% | 0.10% |
| Additional deduction tax on overseas equities | 0.02% | 0.12% | 0.21% |
| Additional deduction tax on corporate bonds | 0.03% | 0.06% | 0.06% |



| | | | |
|---|---|---|---|
| Additional deduction tax on properties | 0.05% | 0.05% | 0.05% |
| **Total tax impact** | **0.16%** | **0.30%** | **0.46%** |

In summary, our analysis suggests that for the sample life fund, the reductions in respect of tax from the illustration rates provided by the FCA (and based on the above assumptions) might vary from 0.16% for the low return assumption through 0.30% for the medium return assumption to 0.46% for the high return assumption. However, it should be noted that asset allocation, rate of churn, rate of return and proportion of return derived from income all have an effect on the tax payable.

Yours Sincerely

PricewaterhouseCoopers LLP

# 13 Appendix E: Peer reviewers Letters of Comment

## Professor Robert Hudson, University of Hull

**Comments on the Projection Rate Review undertaken by the FCA's Chief Economist's Department.**

**Professor Robert Hudson BSc, MA, PhD, AFIMA, FIA,**
**University of Hull**

**10 June 2017**

**Introduction**

I have been asked by the Financial Conduct Authority (FCA) to provide independent scrutiny and challenge to the Projection Rate Review undertaken by the FCA's Chief Economist's Department. In particular, I was asked to address the following:

- Is the methodology adopted suitable?
- Are the data sources and research accessed reliable and appropriate?
- Is the analysis of the data relevant and appropriate?
- Are the conclusions fair and the opinions reached reasonable, in light of the methodology adopted, the data accessed and the analysis undertaken?

I have provided substantive comments on both the proposed methodology of the report and earlier drafts of the report. I am satisfied that my comments and suggestions have been addressed in the final version. My overall conclusions are that the methodology used in the final version of the report and the underlying assumptions are reasonable. The data sources and research accessed are reliable and appropriate and are of the most suitable type. The analysis of the data is relevant and appropriate, makes use of suitable techniques and is well-grounded in the academic and actuarial literature. The conclusions and fair and the opinions reached are reasonable, in light of the methodology adopted, the data accessed and the analysis undertaken.

The review has been carried out using broadly similar methodology to that used by PricewaterhouseCoopers (PwC) who undertook the last rate review in 2012 this is in accordance with the Terms of Reference for the review and also, in my view, appropriate as the PwC methodology is soundly based. The report has satisfactorily provided the appropriate outputs necessary for rates of return calculations as required in the Terms of References. The report provides clear, reasoned and appropriate justifications for the values it recommends for the various output figures and also carefully justifies changes made since the last rate review.

In conclusion, I am happy that the Report has adequately met its objectives.

## Professor Khelifa Mazouz , University of Cardiff

**Comments of Professor Khelifa Mazouz (University of Cardiff) – June 2017**

**Review of FCA Projection Rates**

I was asked by the Financial Conduct Authority (FCA) to undertake an independent review of the *FCA's Projection Rate Review* produced by the FCA's Chief Economist's Department. My role in this project is to provide comments and suggestions on both the interim draft and the final draft of the report. In particular, I was requested to address the following questions:

- Is the methodology adopted suitable?
- Are the data sources and research accessed reliable and appropriate?
- Is the analysis of the data relevant and appropriate?
- Are the conclusions fair and the opinions researched reasonable given the methodology adopted, data accessed and analysis conducted?

I have had the opportunity to comment on the earlier drafts of the report and I am satisfied that my comments and suggestions have been addressed. On the whole, I believe that the report is based on appropriate methods and reliable data sources. The analysis is rigorous and thorough and the conclusions are reasonable and supported by the data. Below I provide further details on some of the general issues, which the readers of this report may find useful.

The report documents that the appropriate single rate for illustrating returns for those products subject to the COBS projection requirements is 5%, in normal terms, with the range being 4.4% to 5.7%. Although these projections are based on reliable data and appropriate methods, producing a single rate that can be applied to all products that are subject to the COBS projection requirements is extremely challenging, particularly given the uncertainty surrounding the British economy as the country prepares to leave the EU. While the UK economy remains strong after the Brexit vote, the economic outlook is likely to depend on the outcome of the Brexit negotiations.

The outcome of the Brexit negations is likely to impact the various factors affecting the projection of returns, such as inflation, currency value and the asset mix of retail investment products. For example, the current projections are based on certain assumptions about the proportions of the foreign assets in the asset mix. These proportions are likely to be affected by the future value of GBP, which, in turn, is likely to be influenced by the outcome of Brexit negotiations. Thus, while the authors have conducted several other robustness checks, there are still significant uncertainties associated with estimating a fixed intermediate rate over the next 10 to 15 years.

Overall, I believe that the report is based on appropriate methods, reliable data sources and relevant literature. The authors have conducted a thorough analysis, provided a balanced view of returns and discussed the various uncertainties surrounding the accuracy of their projections. Nevertheless, investors must clearly understand the assumptions behind the projections and the sensitivity of the results to changes in these assumptions.

K. Mazouz

## Professor Peter N Smith, University of York

**Comments on the "Rates of return for FCA prescribed projections"**

**Professor Peter N Smith (University of York)**

**13th June 2017**

I have been asked by the Financial Conduct Authority (FCA) to offer an independent review of the 2017 projection rate report. Specifically, I have been asked to respond to the following questions:

- Is the methodology adopted suitable?
- Are the data sources and research accessed reliable and appropriate?
- Is the analysis of the data relevant and appropriate?
- Are the conclusions fair and the opinions reached reasonable, in the light of the methodology adopted, the data accessed and the analysis undertaken?

Overall, I think that the report provides a robustly good performance against all of these questions. The authors have responded positively to my comments on earlier drafts of the review. Throughout the report, the authors have used up-to-date reliable data and well-understood methods to make sensible projections. Given the approaches taken and the data employed, the authors have come to conclusions which are well-supported and fair and reasonable.

These are, compared even with the previous decade, difficult times in which to make longer term projections for the UK economy in general and investment returns in particular. The increased uncertainty in the macroeconomic and financial environments since the last review in 2012 is correctly reflected in a wider range for individual projections than presented in 2012. Compared with 2012, this uncertainty is concentrated more around the medium and longer term prospects for the UK economy, rather than around the more immediate consequences of the financial crisis. The range of possible consequences of the exit of the UK from the EU has introduced a further level of uncertainty for both those providing projections and those whose behaviour is being projected.

In terms of the macroeconomic background to the review, the wider external environment has improved somewhat from 2012 with improved growth first in the US and more recently in Europe. The process of unwinding the extraordinary monetary policy in the US has begun and the risks associated with European sovereign debt have receded. Having said that, growth around the world has remained modest compared with that following earlier recessions. Similarly for the UK, GDP has only recently returned to pre-crisis levels. Strong growth in consumer spending and increased borrowing by households have served to support growth in the short term, especially following the EU referendum. There are, however, already signs that this support is beginning to wane. The slow growth in productivity identified in the review in 2012 remains an impediment to faster growth over the next few years. It also is expected to act as a drag on earnings growth. These projections which are widely agreed are consistent also with those of the Bank of England that CPI inflation settles down over the next few years towards the target of 2% implying GDP deflator inflation of 2.5%. In the short term volatility in the exchange rate following the EU referendum has served to raise inflation but I agree with the review that it is expected that the central projection for inflation over this longer period should be consistent with that of the monetary authorities.

Given the macroeconomic background, the projections for investment returns are especially challenging. Careful analysis of recent data and the predictions of models employed in the 2012 review has informed the choice of a somewhat wider range of projected equity returns. Equity and other markets have been supported over recent years by the expansionary monetary policies of central banks around the world. As these policies are unwound over the

next few years and interest rates move towards their long term averages, we can expect that equity and other asset returns will also revert downwards from current levels. The consequence of this is that the projected mid-point of both equity and bond returns is somewhat lower than in the 2012 review. These more secular trends may, of course, be dominated in the short term by volatility associated with a range of political and economic events. Whilst the review does not project volatility or attempt to quantify tail risk, the uncertainty associated with the relative strength of these forces has informed the choice of a wider range for projections than in previous reviews. The broadening in the asset mix of UK pension funds and life insurance companies is recognised in the review by more extensive analysis of the returns to a wider range of assets.

One of the new features of the current review compared with 2007 and 2012 is the inclusion of projections of cash and money market rates. The data and analysis of these rates reflects the ultra-low official interest rates introduced following the financial crisis. Given the path of price inflation since 2008 negative real short term rates have and continue to be experienced. The projection of these real rates in GDP-deflator inflation terms continues to be negative for the next five years. Wisely, I think, a projection is not made for years beyond 2022 due to the uncertainty over the path of the equilibrium or natural real short–term interest rate. As many analysts and academics see forces that will keep these rates down dominating as those that see other causes that will see real rates rise. The five year projection of real short term rates at -1% in terms of the GDP deflator is broadly in line with the view of the Bank of England and is one I agree with.

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