The outlook for debt interest spending

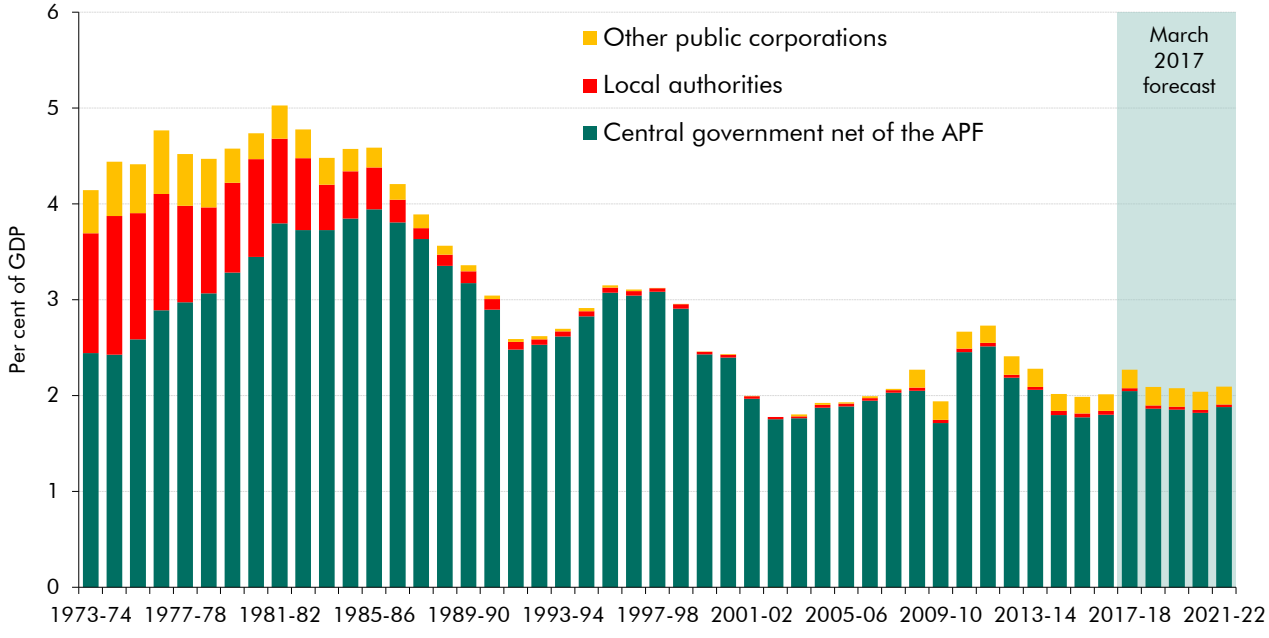
Introduction

1.1 Debt interest is one of the largest elements of public spending not under the direct control of government. It is determined by the stock of government debt – mostly the legacy of past budget deficits – and the interest rates that the government has to pay on it.

1.2 Economic or fiscal developments that raise future budget deficits, or the debt stock directly, would increase future debt interest spending. But increases in the cost of new borrowing are an important additional risk, not just because they would make it more expensive to service a given debt, but also because they could push the debt-to-GDP ratio towards an unsustainable trajectory if they rise relative to the rate of growth of nominal GDP.

1.3 The UK public sector paid £39.4 billion of debt interest to the private and overseas sectors in 2016-17, comprising £35.2 billion from central government, £3.4 billion from public corporations and £0.7 billion from local authorities. At 2 per cent of GDP, this is relatively modest by the standards of recent decades (Chart 1.1). The public sector, in its turn, received £5.8 billion of interest payments from the private and overseas sectors, including accrued interest on student loans and interest on its foreign exchange reserves.

Chart 1.1: Total debt interest spending by government sector



Source: ONS, OBR

1.4 Most outstanding public debt in the UK is the liability of central government. So in this paper we focus on interest spending on central government gross debt (bearing in mind that some factors that might affect it would have partly offsetting effects on interest payments the government receives). An important complication is that the Bank of England – also part of the public sector – has bought a substantial quantity of central government debt, financed by the creation of reserves on which it currently pays just a 0.25 per cent rate of interest – an interest rate (Bank Rate) set by the Bank's Monetary Policy Committee (MPC). In effect, this has allowed the government to refinance some of its past fixed interest borrowing at a lower floating rate, reducing interest payments for now but leaving it more exposed to the risk of higher debt servicing costs if the MPC chooses to raise Bank Rate in the future.

1.5 Potential changes to the interest rate at which the government can borrow pose both positive and negative risks to the outlook for the public finances, but these need to be considered alongside the risks to the outlook for economic growth. Changes in the debt-to-GDP ratio depend on the relationship between the effective interest rate on the debt stock and the rate of nominal GDP growth – increases in the former push it up and increases in the latter push it down. The difference between these is known as the 'growth-corrected interest rate'. When the effective interest rate and growth rate are affected to the same extent, the growth-corrected interest rate is left unchanged, with little implication for fiscal sustainability. It is shocks that push the effective interest rate up relative to GDP growth that increase spending and debt faster than GDP, threatening fiscal sustainability.

1.6 Before concluding, the rest of the paper[1] discusses:

- the **current size and composition of central government debt** and the interest rates paid on different types of debt and at different maturities;
- the **medium-term forecast for debt interest** set out in our March 2017 *Economic and fiscal outlook (EFO)* and the risks around it; and
- **long-term risks to debt interest spending** and the importance for sustainability of those that affect the 'growth-corrected interest rate'.

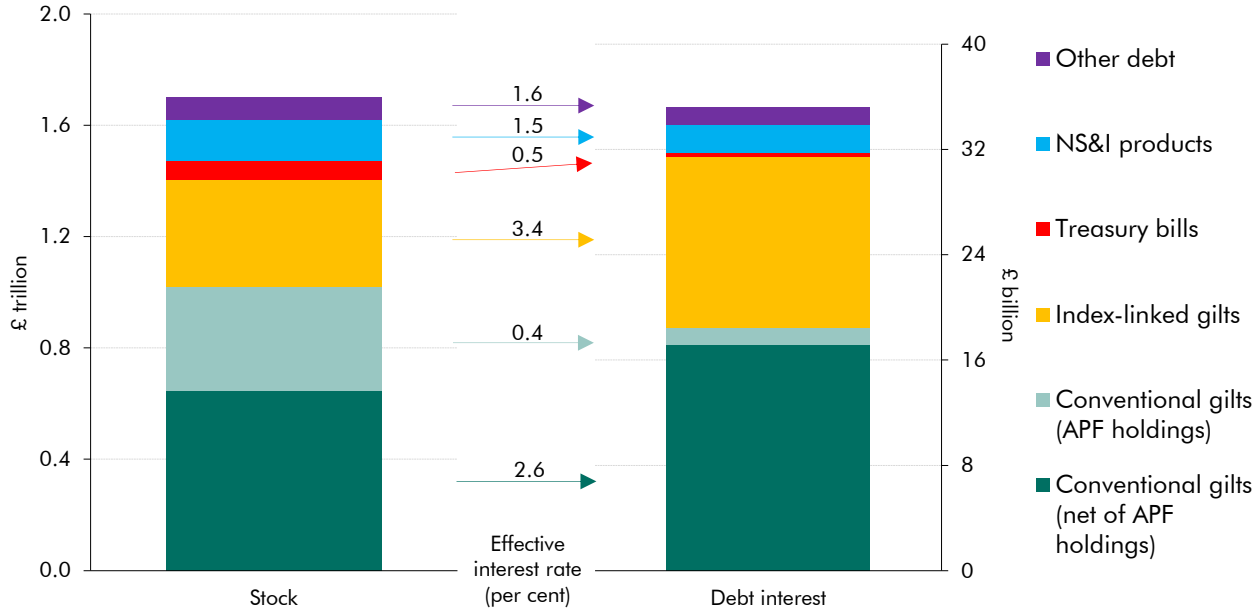
[1] This paper is a slightly modified standalone version of Chapter 8 of our July 2017 *Fiscal risks report*.

Central government gross debt

Types of debt

1.7 The government borrows from investors and savers in a variety of ways. Chart 1.2 shows the breakdown of central government gross debt at the end of 2016-17. At this point it totalled £1,700 billion (87 per cent of GDP), up from £622 billion (40 per cent of GDP) at the end of 2007-08 – before the impact of the financial crisis was felt. Interest payments totalled £35.2 billion during the year, giving an effective interest rate – i.e. the level of annual spending divided by the stock at the end of the year – of 2.1 per cent.[2]

Chart 1.2: Composition of the debt stock and associated interest payments



Source: Bank of England, DMO, ONS, OBR

1.8 In terms of the components and the associated interest payments, the main ones are:

- **Conventional gilts held by the private and overseas sector**: These are government bonds, currently with maturities up to 51 years. The interest has two components: the coupon (which is fixed in cash terms when each gilt is issued) and the discount or premium to the redemption (or 'face') value paid when the gilt is issued. As both coupon and premium are fixed at issuance the effective interest rate on the stock only changes gradually as new gilts are issued to finance additional borrowing and to 'roll over' maturing stock. Gilts are recorded at their face value in public sector net debt (PSND). At the end of 2016-17 market holdings were £648 billion, on which £17 billion of interest was paid during the year, at an effective rate of 2.6 per cent. The average rate on new borrowing in 2017-18 is expected to be 1.6 percentage points below the average rate on outstanding gilts.

[2] This method of calculating effective interest rate is illustrative. Where stocks have changed greatly through the year or the stock is valued at face rather than market values the true effective interest rate paid by government will differ.

- **Conventional gilts held by the APF**: The cost of servicing conventional gilts has been partly offset by the Bank of England's quantitative easing programme. The Bank's Asset Purchase Facility (APF) has bought just over a third of the outstanding stock of conventional gilts, £371 billion at the end of 2016-17,[3] financed by creating electronic reserves that are held by financial institutions and on which it pays Bank Rate. Bank Rate averaged 0.4 per cent in 2016-17, so the Government in effect paid that rate on the conventional gilts held by the APF, saving it over £10 billion. When Bank Rate changes, the interest paid on outstanding reserves changes in line, so that the effective interest rate on the stock adjusts immediately rather than with a lag.

- **Index-linked gilts:** These are bonds on which interest is expressed in real terms by linking it to the retail prices index (RPI). The real element is fixed when each gilt is issued, but the inflation element (both coupon and final redemption payment) varies with RPI inflation. By accepting the inflation risk, government should on average pay a lower rate on index-linked than conventional gilts. At the end of 2016-17 there were £386 billion of index-linked gilts outstanding on which £13 billion of interest was paid during the year, an average effective interest rate of 3.4 per cent. In 2016-17, the real component averaged 1.4 percentage points and the RPI inflation component 2.0 percentage points. Real rates on new issuance are currently negative and our March forecast assumed that they would remain negative over the forecast.

- **Treasury bills**: These are, in effect, conventional gilts with much shorter maturities ranging from 1 to 12 months. They pay no coupon, so interest is determined solely by the discount to face value when issued. Changes to the rate paid on new issues feeds through to the effective rate on the total stock within a year. The interest rate tends to be linked closely to near-term prospects for Bank Rate. At the end of 2016-17 there were £67 billion of Treasury bills outstanding, on which the Government paid £0.3 billion of interest during the year, an effective rate of 0.5 per cent.

- **NS&I products**: The interest paid on NS&I products varies across them, but each product tends to be benchmarked relatively closely to rates offered on comparable products by commercial banks and building societies. The stock also includes premium bonds, which pay prizes that act like interest on the whole stock but distributed to individual bond holders by lottery. Occasionally, the Government uses NS&I to subsidise certain types of savings or saver – e.g. the '65+ Guaranteed Growth Bonds' issued in 2015 that were only available to older savers. At the end of 2016-17 savers held £146.2 billion in NS&I products, on which the Government paid £2.2 billion of interest during the year, at an effective rate of 1.5 per cent. The average current rate on new borrowing through NS&I is similar to that on the stock.

- **Other central government debt:** This added a further £81.5 billion of gross debt at the end of 2016-17. The largest single element is the £27.8 billion of remaining debt

[3] This figure represents the nominal value (or 'face value') of the gilts purchased, which is lower than the market values at which they were purchased and that is the subject of the MPC's monetary policy decisions – hence the figure being lower than the total stock of quantitative easing undertaken by purchasing gilts by the end of 2016-17 of £435 billion.

(around £6 billion of which is denominated in foreign currency) that was issued by Network Rail before it was classified to the public sector in 2014 and the Government started to finance its operations through gilt issuance. Other significant elements are the liabilities of the government's cash management accounts.

The maturity structure of the debt stock

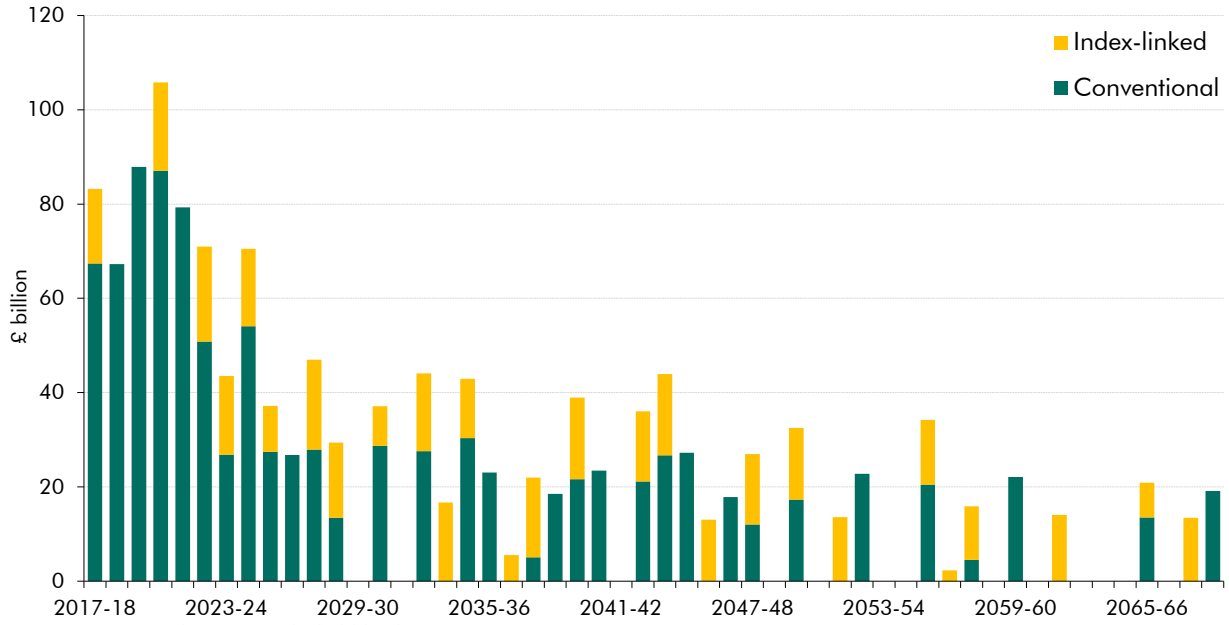
1.9 The Government's exposure to interest rate risk depends in part on how quickly a change in the rate on new borrowing feeds through to the effective rate on the outstanding stock. This depends on the maturity mix of the new borrowing and the existing stock. Typically governments have to pay a higher interest rate to borrow long-term, relative to the expected cost of financing through a sequence of short-term bonds. But by doing so it makes itself less immediately vulnerable to rises in borrowing costs or other refinancing risks.

1.10 These considerations underpin the Government's debt management objective: "*to minimise, over the long term, the costs of meeting the government's financing needs, taking into account risk, while ensuring that debt management policy is consistent with the aims of monetary policy*." As well as interest rate risk, the Debt Management Office (DMO) takes into account four other sources of potential risk: refinancing, inflation, liquidity and execution.[4] In practice, this means that it issues debt across a range of maturities.

1.11 By the end of 2016-17 the Government had issued £1,405 billion of gilts with relatively long maturities at issuance, on which the effective interest rate therefore responds only gradually to changes in market interest rates. Chart 1.3 shows the redemption profile for conventional and index-linked gilts at the end of March 2017. The average maturity was just under 14 years,[5] with 31 per cent of the stock set to mature by 2021-22. The average maturity of the index-linked stock was around 21 years, giving an average across all gilts of around 16 years. As Chart 1.4 shows, as of 2016 the average maturity of government bonds issued in the UK was around twice that in the other 'G7' major advanced economies.

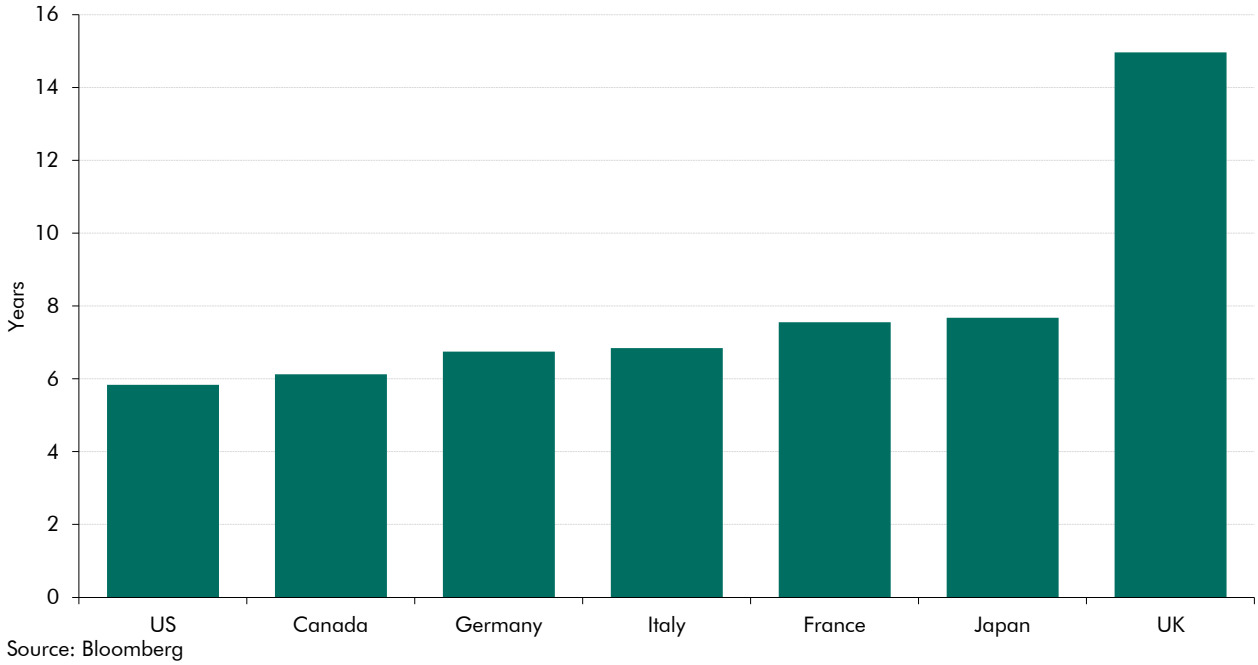
[4] See Chapter 2 of HM Treasury, *Debt management report 2017-18*, March 2017.
[5] These average maturities are calculated using nominal values of the instruments purchased.

Chart 1.3: Gilt redemption profile in March 2017



Note: Conventional contains gilts held by the APF.
Source: DMO

Chart 1.4: Average maturity of the debt stock in G7 countries in 2016

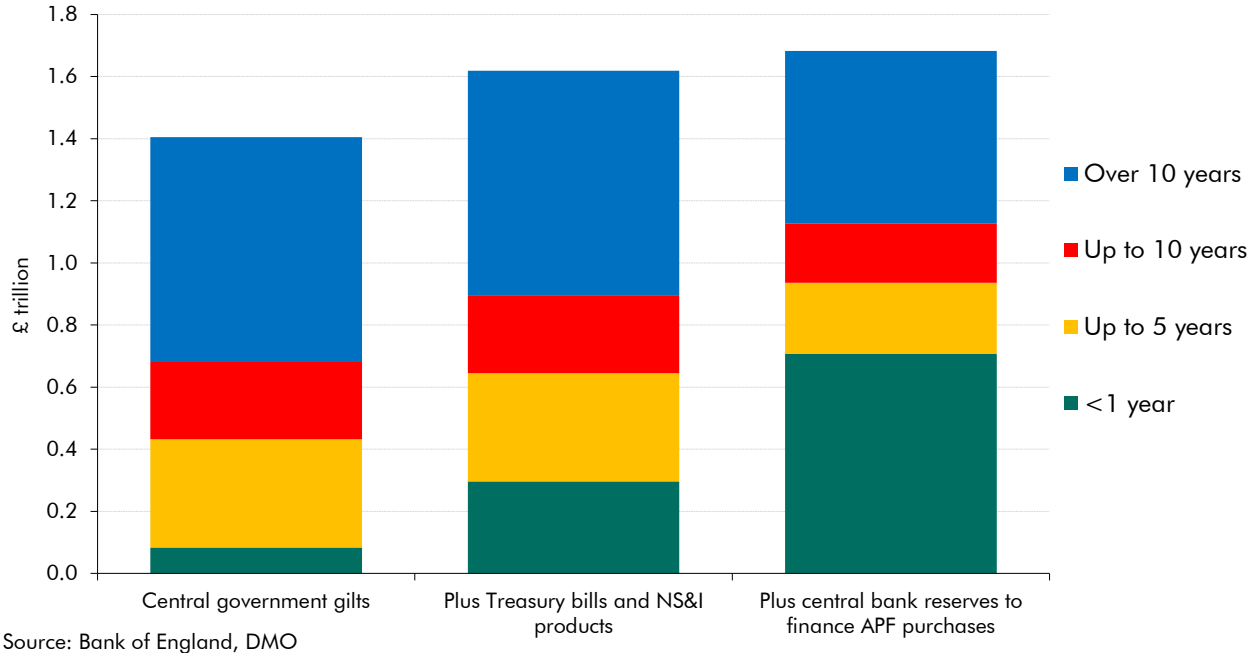


Source: Bloomberg

1.12 However, as Chart 1.5 shows, the maturity of the debt held is significantly shorter when Treasury bills, NS&I products and the APF's holdings of conventional gilts (and the associated Bank of England funding) are factored in. Only 6 per cent of outstanding gilts held outside the public sector are set to mature within a year, but that rises to 18 per cent of debt when Treasury bills and NS&I products are included and to 42 per cent when APF funding is added too. This figure better represents the public sector's exposure to changes in

short-term interest rates. On this basis, the average maturity of central government gross debt falls to around 11 years.

Chart 1.5: Maturity structure of outstanding debt



Source: Bank of England, DMO

The medium-term outlook for debt interest spending

Our March 2017 forecast

1.13 Table 1 summarises our March 2017 debt interest forecast. It shows that:

- **Interest rates** are assumed to remain low throughout the forecast, based on market expectations in early February. Bank Rate is assumed to rise from its current rate of 0.25 per cent to an average of just 1.0 per cent in 2021-22, and a weighted-average of short-, medium- and long-dated gilt yields is assumed to rise from an average of 1.5 per cent in 2017-18 to an average of 2.2 per cent in 2021-22.

- **RPI inflation** is expected to pick up in 2017-18, as the depreciation of sterling over the past year feeds through to inflation via higher import prices. It falls back a little thereafter to settle at just above 3 per cent a year.

- **The stock of central government debt instruments** (equivalent to all the named categories in Chart 1.2) rises in cash terms in every year of the forecast but it falls as a share of GDP from 84.5 per cent of GDP in 2017-18 to 80.5 per cent in 2021-22.

- **Central government debt interest payments (net of APF effects)** jump in 2017-18, due to the effect of RPI inflation on index-linked debt, then fall in 2018-19 before rising

steadily thereafter. This leaves spending slightly lower as a share of GDP in 2021-22 (at 1.9 per cent) than in 2017-18 (2.0 per cent).

Table 1.1: March 2017 debt interest spending forecast and determinants

	Per cent, unless otherwise stated				
	2017-18	2018-19	2019-20	2020-21	2021-22
Determinants of the debt interest forecast					
RPI inflation (percentage change on a year earlier)	3.9	3.4	3.1	3.1	3.2
Bank Rate	0.3	0.4	0.6	0.8	1.0
Weighted-average gilt rate	1.5	1.7	1.9	2.0	2.2
Stock of APF holdings (market value, £ billion)	435	435	435	435	435
Central government debt instruments (£ billion)	1714	1772	1807	1839	1884
Central government debt instruments (per cent of GDP)	84.5	84.6	83.4	81.7	80.5
	£ billion				
Debt interest spending					
Central government gross debt interest (a)	55.8	52.3	52.2	51.9	53.7
of which:					
Interest paid to the APF (b)	15.4	15.1	14.7	14.5	14.2
Interest on reserves created for APF purchases (c)	1.2	1.8	2.7	3.5	4.5
Central government net of the APF (a-b+c)	41.5	39.1	40.1	40.9	44.0
Central government net of the APF (per cent of GDP)	2.0	1.9	1.9	1.8	1.9

1.14 Our latest medium-term forecast embodies a favourable differential between interest rates and economic growth. Over the five years from 2017-18 to 2021-22, our central forecast is for annual nominal GDP growth to average 3.6 per cent, while the effective net interest rate on public debt is expected to average just 2.0 per cent. This reduces the debt-to-GDP ratio over the five years to 2021-22 by 6.7 percentage points.

Sensitivity analysis

1.15 Table 2 shows the sensitivity of our March forecast for debt interest spending to changes in its underlying drivers. Changes in short rates and RPI inflation act swiftly on short-dated debt and index-linked gilts respectively, with the full effect feeding through to spending almost immediately. Changes to gilt rates only affect new and maturing gilts and so take effect more slowly and build up over time. A persistent increase in the central government net cash requirement – the relevant measure of borrowing for these debt interest payments – also builds over time as the stock of debt increases.

1.16 These ready reckoners are consistent with the assumptions about the composition of debt by maturity and between conventional and index-linked debt in our March forecast. They would themselves be sensitive to changes in those assumptions.

Table 1.2: March 2017 debt interest ready reckoner

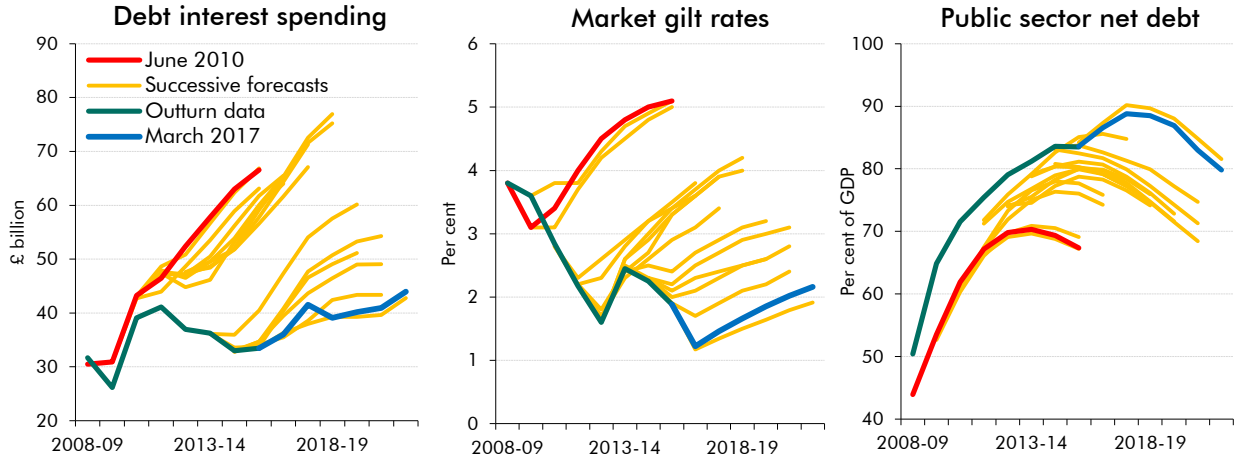
	£ billion				
	2017-18	2018-19	2019-20	2020-21	2021-22
1 percentage point increase in gilt rates	0.4	1.3	2.2	3.1	4.1
1 percentage point increase in short rates	5.5	5.5	5.5	5.5	5.5
1 percentage point increase in inflation	4.1	4.6	5.3	5.8	6.6
£5 billion increase in CGNCR	0.0	0.1	0.2	0.3	0.4

Note: All increases are assumed to take effect at the beginning of 2017-18 and continue throughout the forecast.

Evidence from differences between past forecasts and outturns

1.17 Chart 1.6 shows that we have revised our forecasts for debt interest spending down in most of our *EFOs* since 2010. In December 2014 that reflected a change to the statistical treatment of APF flows,[6] but otherwise it has been due to real-world factors. In our March 2012 *EFO* we forecast that central government would pay £64 billion in debt interest in 2016-17 (an effective rate of 3.7 per cent on a stock of £1,720 billion); in fact it ended up paying £35 billion (an effective rate of 2.1 per cent on a stock of £1,700 billion). Of the £29 billion difference, £13 billion reflected the change in the statistical treatment of APF flows with the remaining £16 billion almost entirely due to lower-than-expected interest rates.

Chart 1.6: Successive forecasts for debt interest, interest rates and the stock of debt



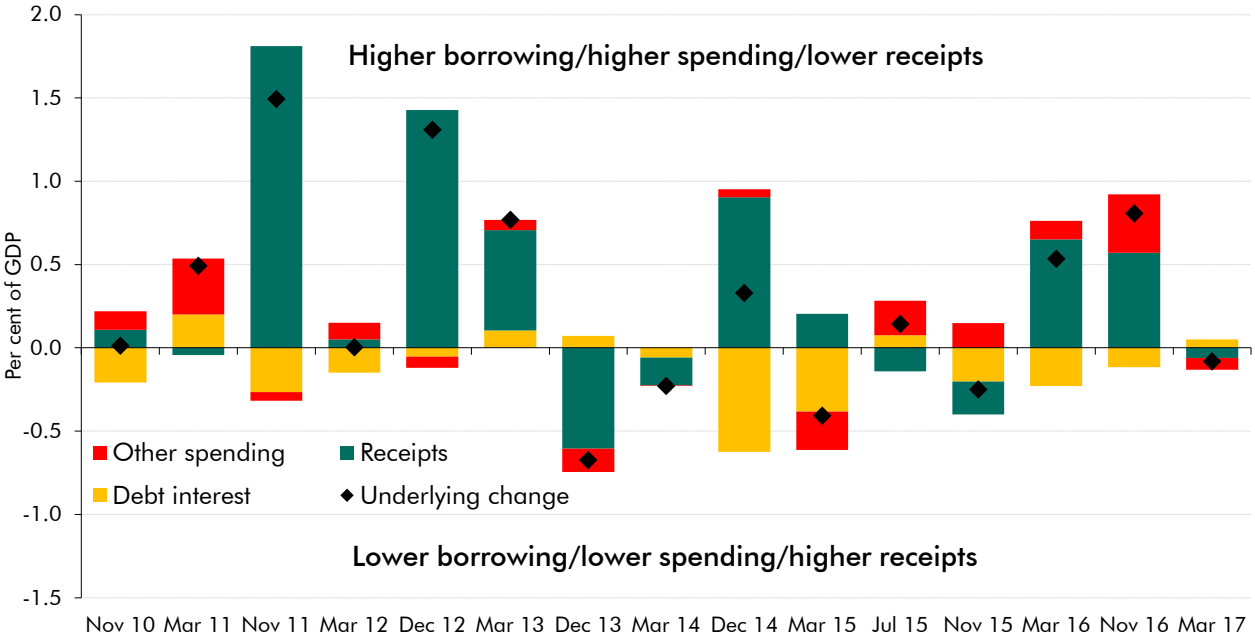
Note: Between our March and December 2014 forecasts, the statistical treatment of debt interest flows related to the APF was changed. Forecasts before and after these points are therefore not on a consistent basis.
Source: ONS, OBR

1.18 Taken in isolation, the downward revisions to our debt interest forecasts have improved the outlook for the public finances. But in most cases they have only partly offset downward revisions to our receipts forecasts that took place at the same time (Chart 1.7). Indeed, in only three forecasts out of our last 15 have our revisions to receipts and debt interest contributed in the same direction to our forecast for borrowing, rather than offsetting each

[6] See Annex B of our March 2014 *Economic and fiscal outlook* for more details.

other. This should come as no surprise, since market expectations of future interest rates tend to fall/rise when expectations of future GDP growth are lowered/raised.

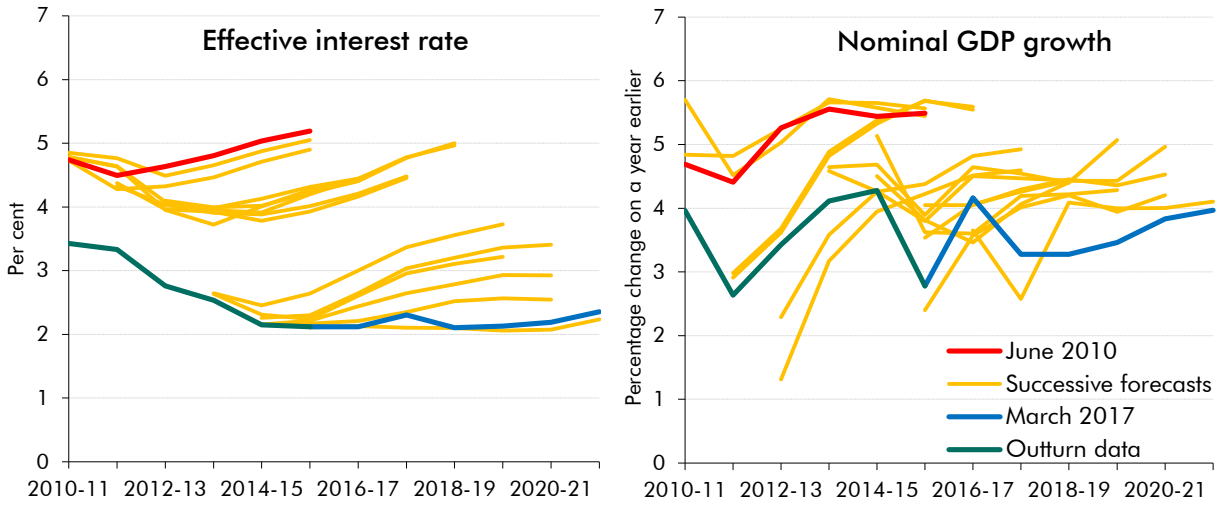
Chart 1.7: Sources of change in borrowing forecasts



Source: OBR

1.19 Changes in our forecasts for the effective interest rate on the debt stock and in the growth of nominal GDP also tend to offset each other in their impact on the outlook for the debt-to-GDP ratio. But the changes are not always of the same size and the long average maturity of the outstanding debt means that only a fraction of any change in market rates feeds through to the effective rate paid each year. As Chart 1.8 shows, nominal GDP growth has fluctuated more than the effective interest rate. On average, our forecasts for the effective interest rate have been revised down more than those for nominal GDP growth, generating more favourable debt dynamics. In part that reflects the reduction in the effective interest rate that comes with some debt in effect being financed through the APF (Chart 1.2).

Chart 1.8: Effective interest rate and nominal GDP growth: forecasts and outturns



Source: ONS, OBR

1.20 Index-linked gilts strengthen the link between changes in the effective interest rate and nominal GDP growth. To the extent that RPI inflation moves in step with whole economy inflation, index-linked issuance means that effective rates move more closely with nominal GDP growth because the associated interest cost is accrued with only a short lag.

Risks to the forecast

1.21 There are a variety of factors that could lead to higher debt interest spending. Shocks that increase the stock of debt on which the public sector would have to pay interest would obviously do so, but here we focus on factors that could raise the effective interest rate - especially those that would also lead to a higher growth-corrected interest rate.

Interest rate risks

1.22 There are a number of risks that could drive the interest rates on government debt higher:

- **A faster-than-expected increase in global real long-term interest rates**: At a global level, real long-term interest rates have been on a declining trend for many years. Many factors have contributed to this trend, including the prospective ageing of populations in many advanced and emerging countries (with saving boosted by those approaching retirement), the integration of China into global financial markets (allowing Chinese capital to flow into global bond markets), and, since the crisis, a decline in investment (reducing other uses of savers' capital) and greater demand for safe assets (lowering risk-free rates relative to others).[7] Any of these factors could ease or reverse, leading to higher global real interest rates. For example, many populations are reaching the stage where dissaving by retirees will outweigh saving by those approaching retirement, while the development of China's own financial markets could reduce the extent to which Chinese capital flows into global bond markets. To

[7] See also *Low for Long? Causes and Consequences of Persistently Low Interest Rates*, Geneva Reports on the World Economy 17, 2015.

the extent that these factors were independent of growth prospects in the UK, they would affect the growth-corrected interest rate too.

- **Earlier sales of the Bank of England's gilt holdings**: The most likely reason for APF gilt sales to take place earlier would be as a result of monetary policy tightening, prompted by expectations that stronger growth would push inflation above target. But, even then, the growth-corrected interest rate would probably rise because the average maturity of the stock would increase. If the sales were prompted by an external shock to inflation, or if they had a bigger-than-expected effect on interest rates, the impact would be more unfavourable.

- **A risk premium in UK interest rates**: The most unfavourable risk to the growth-corrected interest rate would be a risk premium that raised UK interest rates relative to global interest rates. As well as resulting in higher interest rates, it would be expected to weigh on UK growth prospects by making it more expensive for firms to borrow for investment and households to borrow for spending or house purchases.

1.23 It is not unusual for favourable debt dynamics to persist for some years – and they could become even more favourable. But a movement in the opposite direction does seem the greater risk given current low borrowing costs and the extraordinary effect of the APF. History suggests that sustained movements of a few percentage points are relatively common. Given the long average maturity of government debt, these changes are usually manageable, especially if they coincide with stronger GDP growth.

1.24 Future policy towards the APF is a complicating factor. MPC guidance is that the stock of gilts in the APF will be kept unchanged until Bank Rate reaches a level from which it can be cut materially, which the MPC currently judges to be around 2 per cent. Depending on how markets react, there could be a step change in debt servicing costs if and when Bank Rate approaches that level. On the market expectations underpinning our March forecast this is well beyond our five-year forecast horizon and so our central expectation is for no reductions in the holdings of the APF. Financial market options prices suggest there is a very low probability that Bank Rate will be higher than 2 per cent in 2020.

RPI-specific inflation risks

1.25 With the stock of index-linked gilts amounting to 20 per cent of GDP by the end of 2016-17, and set to rise to 24 per cent by 2021-22 in our latest forecast, RPI inflation risks are an important driver of overall effective interest rate risks. Holding our forecast for the primary (i.e. non-interest) budget balance unchanged, a 1 percentage point increase in RPI inflation sustained over the five years to 2021-22 would raise the debt-to-GDP ratio by 1.2 percentage points.

1.26 Where an underlying shock raises inflation on the RPI, CPI and GDP deflator measures by similar amounts – for example, due to a positive demand shock affecting wages and prices – higher debt interest spending would probably be more than offset by the boost to receipts and nominal GDP (as was apparent in Chart 1.7). But where a shock raises RPI and CPI

inflation relative to the GDP deflator – for example, when import prices rise due to higher commodity prices or a fall in the pound – the offset from receipts and the effect on nominal GDP would be smaller.

1.27 There are also risks that could raise RPI relative to CPI inflation, limiting the offsetting increase in receipts from taxes still linked to RPI inflation (mostly excise duties). For example:

- **Higher mortgage interest rates**: the RPI includes mortgage interest payments, so would rise by more than CPI inflation if market interest rate were to increase and those movements fed through to mortgage costs.

- **Other coverage and measurement differences**: the RPI covers more items, and in different ways, than the CPI, which can affect the wedge between the two. This was illustrated in our March 2017 forecast, where higher car insurance premiums (due to a policy change affecting expected lump sum damages payments) had an effect on our RPI inflation forecast that was four times larger than on our CPI inflation forecast.

Risks from the sensitivity to changes in the effective interest rate

1.28 Holding our forecast for the primary budget balance unchanged, each 1 percentage point increase in the growth-corrected interest rate sustained over the five years to 2021-22 would raise the debt-to-GDP ratio by 4.1 percentage points relative to our March 2017 forecast. As Chart 1.10 in the next section shows, the growth-corrected interest rate has been negative so far in the 2010s, and 2.4 percentage points below the average in the 2000s, entirely due to lower interest rates. So merely returning to the 2000s average for the next five years would, all else equal, increase the debt-to-GDP ratio by 10.1 percentage points relative to our baseline forecast.

1.29 Debt servicing costs have become more sensitive to changes in the effective interest rate and more exposed to inflation. Comparing pre-crisis levels to last year, this reflects:

- **The higher level of gross debt**: up from 40 per cent of GDP in 2007-08 to 87 per cent in 2016-17.

- **The shorter maturity of the debt stock**: Around 38 per cent of the stock in 2007-08 was set to redeem within the next five years or paid a floating rate that would respond quickly to interest rate changes. By 2016-17, largely due to APF purchases, this had risen to 56 per cent.

- **The higher proportion of index-linked securities**. Index-linked gilts make up 23 per cent of central government gross debt now, up from 20 per cent in 2007-08.

Partly offsetting this, cash borrowing to finance deficits over the five years of our March 2017 forecast (equal to 1.9 per cent of the sum of nominal GDP from 2017-18 to 2021-22) is lower than outturn new issuance of 8.7 per cent of total nominal GDP in the five years from 2008-09.

Inconsistent growth and interest rate forecasts

1.30 Overlaying the real-world risks described in the preceding sections is a methodological one. Our nominal GDP forecast reflects our own view of economic prospects, but we use market expectations as the basis for our interest rate forecasts (considering them to be the best available information). This means that one risk to the growth-corrected interest rate is that the market view of growth prospects might be inconsistent with ours, which would leave our growth forecast too high relative to our interest rate forecast for methodological reasons.

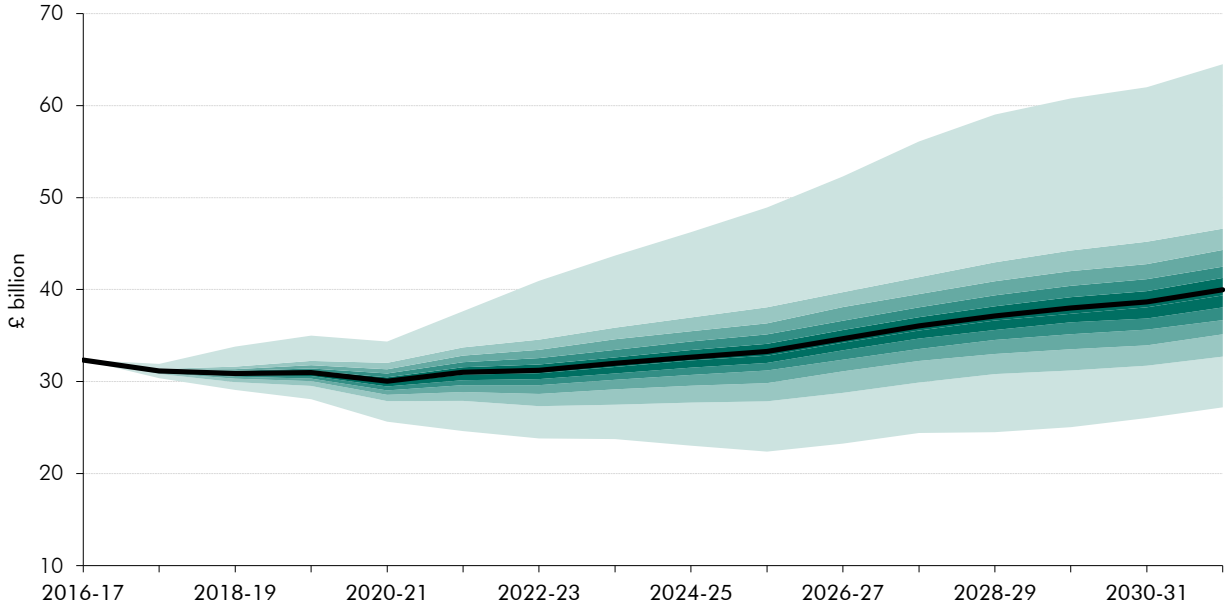
1.31 Unfortunately, we cannot observe market participants' expectations for GDP growth directly, in the way that we can their interest rate expectations. That said, the average medium-term growth forecasts submitted to the Treasury by outside forecasters are broadly consistent with our own, between 1½ and 2 per cent a year, so methodology does not appear to be a major source of risk. Of course, there is every chance that both sets of forecasts will be proved wrong by developments over the next five years. Both market expectations for gilt yields and our forecasts for nominal GDP have been revised down progressively over the past due to the persistent and surprising weakness of productivity growth since the crisis.[8]

A debt interest fan chart

1.32 In each *Debt management report*, the DMO presents a probabilistic fan chart around a forecast for debt interest spending over 15 years – approximately equal to the average maturity of the debt stock. The central forecast is consistent with our latest forecast over the first five years and a simple assumption of a zero net cash requirement over the next ten. The DMO then runs 1,000 iterations of its 'portfolio simulation tool' drawing possible future yield curves from different distributions – one an imposed statistical distribution and the other an estimated distribution.[9] The result of the March 2017 exercise, based on the estimated distribution, is shown in Chart 1.9. Each band either side of the central forecast represents a 10 per cent probability band. On the basis of the DMO's assumptions, in 2021-22, at 90 per cent probability debt interest costs could vary by as much as £10 billion.

[8] See Chapter 3 of our March 2016 *Economic and fiscal outlook* for a discussion of the similar relationship between market expectations of Bank Rate and our forecasts for productivity growth.
[9] See Annex B of HM Treasury, *Debt management report 2017-18*, March 2017.

Chart 1.9: DMO debt interest spending fan chart



Source: DMO

The long-term outlook for debt interest spending

1.33 Over the long term, the key fiscal risks associated with debt interest spending are those that would make the growth-corrected interest rate less favourable. This section therefore focuses on risks to interest rates *relative to* GDP growth.

What determines the interest rates paid on government debt?

1.34 Given the importance of the difference between interest rates and economic growth for the path of the debt-to-GDP ratio, it is worth considering the role played by economic growth in determining the level of interest rates.

1.35 Nominal interest rates can be decomposed into a 'real' rate and a component that compensates for expected inflation. The theoretical link between growth and interest rates is at the real level.[10] But this is only true under a number of simplifying assumptions, so in reality other factors will play a role. And in any case we would not expect the relationship to hold in any given year, since the concept of growth it refers to is closer to that of potential growth rather than one affected by the economic cycle.

1.36 In reality, domestic rates of economic growth are one – but only one – determinant of the level of domestic interest rates. Empirical estimates suggest that for a globally integrated economy like the UK, domestic GDP growth is not the most important driver of domestic interest rates, with a high degree of correlation between UK and US government bond

[10] This is consistent with the Ramsey-Cass-Koopmans growth model with logarithmic preferences.

yields.[11] Global interest rates are another important driver of domestic interest rates, which in turn reflect a variety of global influences, including GDP growth in other countries.

1.37 But alongside these global drivers, domestic factors do also play a role. For example, longer-term domestic interest rates are sensitive to domestic monetary conditions and expected inflation rates, which in turn reflect a combination of factors including the current rate of inflation, the cyclical position of the economy and the monetary policy target.[12] In the UK, lower inflation has helped to reduce effective interest rates in recent decades.

1.38 Government debt and borrowing can also affect domestic interest rates over time, with higher borrowing and the accumulation of public debt likely to put upward pressure on domestic interest rates, especially over the long term. In an open economy like the UK, capital inflows could finance domestic investment despite high government borrowing, but future national income would be reduced as the proceeds of that investment accrue to those financing it from overseas.[13]

1.39 Risk premia can be generated by many factors. For example, high levels of public debt could be perceived to create vulnerability to future shocks, with the risk that each incremental fiscal shock could be the one that pushes debt to levels that markets would view as unsustainable. Large implicit contingent liabilities associated with a large financial sector could also be a source of risk premia (see Chapter 4 of our July 2017 *Fiscal risks report*).

1.40 Unconventional monetary policy can directly affect interest rates on government bonds.[14] In the UK, there is now a body of empirical evidence to suggest that the Bank of England's quantitative easing since 2009 has reduced gilt yields. For example, the Bank's own assessment was that the first round of asset purchases (of £200 billion in 2009) initially reduced gilt yields by a little under 1 percentage point.[15] The Bank has also noted that the effectiveness of quantitative easing policies does vary, both across countries and time. For example, interventions appear to be more effective when financial markets are disturbed.[16]

The growth-corrected interest rate over the long term

Historical evidence in the UK

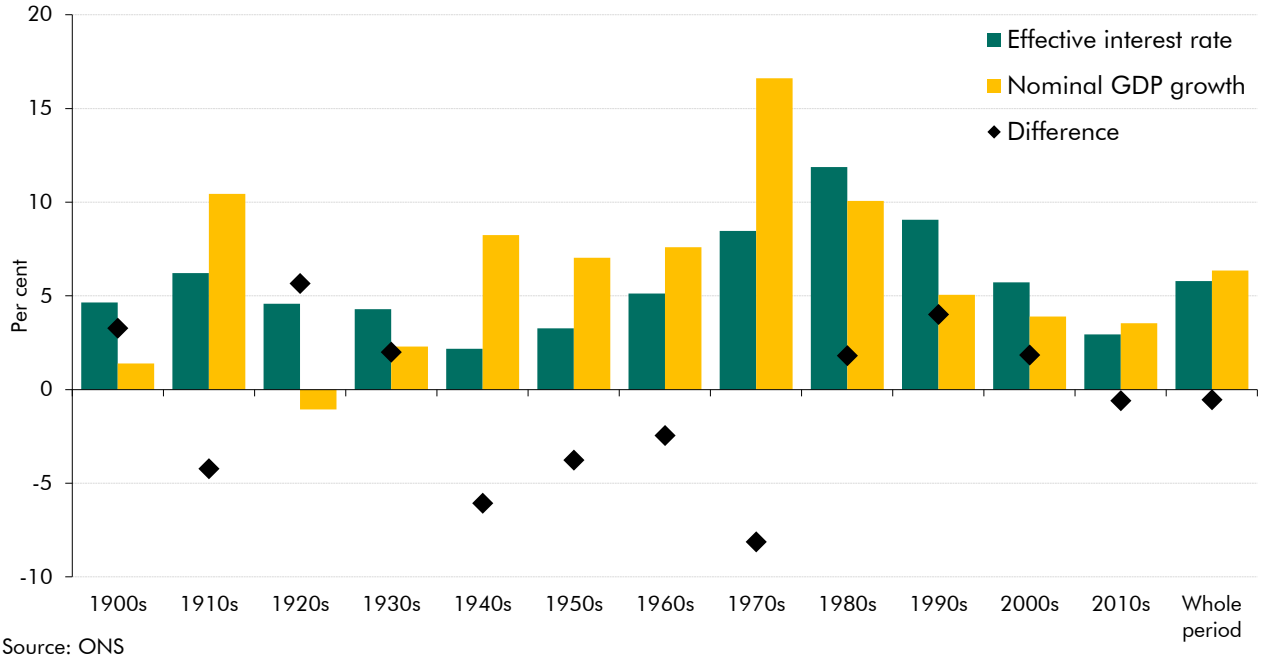
1.41 As one would expect with many possible drivers of the effective rate of interest on government debt, the past century has seen extended periods where growth in the UK has averaged more or less than the effective interest rate. For example, as Chart 1.10 shows,

[11] For example, Chinn & Frankel, *Debt and Interest Rates: The US and the Euro Area*, Kiel Institute Economics Discussion Paper, 2007-11.
[12] Several empirical studies have highlighted that inflation and growth expectations are important drivers of long-term interest rates. See for example, Warnock and Warnock, *International Capital Flows and US interest Rates*, International Finance Discussion Paper Number 840, 2005 and Kitchen and Chinn, *Financing U.S. Debt: Is There Enough Money in the World – and At What Cost?*, 2011.
[13] Baldacci and Kumar, *Fiscal Deficits, Public Debt, and Sovereign Bond Yields*, IMF Working Paper 2010/184, Congressional Budget Office, *Federal Debt and the Risk of a Federal Crisis*, 2010, and Gale and Orszag, *The Economic Effects of Long-Term Fiscal Discipline*, The Urban-Brookings Tax Policy Centre Discussion Paper No 8, 2003.
[14] For a summary of the estimated effects of quantitative easing on 10-year bond yields see CEPR, *What Else Can Central Banks Do?*, Geneva Report 18, 2016.
[15] Joyce, Tong and Woods, *The United Kingdom's quantitative easing policy: design, operation and impact*, Bank of England Quarterly Bulletin Q3, 2011.
[16] Haldane, Roberts-Sklar, Wieladek and Young, *QE: the story so far*, Bank of England Staff Working Paper No.624, 2016.

the effective interest rate exceeded GDP growth in the 1920s and 1930s, and again from the 1980s to the 2000s. The opposite was true from the 1940s to the 1970s.

1.42 Growth has slightly exceeded the effective interest rate on average since 1900 – by 0.6 percentage points. However, that average is influenced by very large differences during the first and second world wars, when wartime spending raised GDP growth while interest rates were held down by the issuance of war bonds and concessional lending from other countries' governments (notably the US). Excluding the war years, it is the effective interest rate that on average slightly exceeds nominal GDP growth– by 0.3 percentage points. Even this may be lower than a 'normal' difference, given the unusual factors described below that pushed the growth-corrected interest rate into negative territory in the 1950s and 1970s.

Chart 1.10: Effective interest rates and nominal GDP growth by decade



Source: ONS

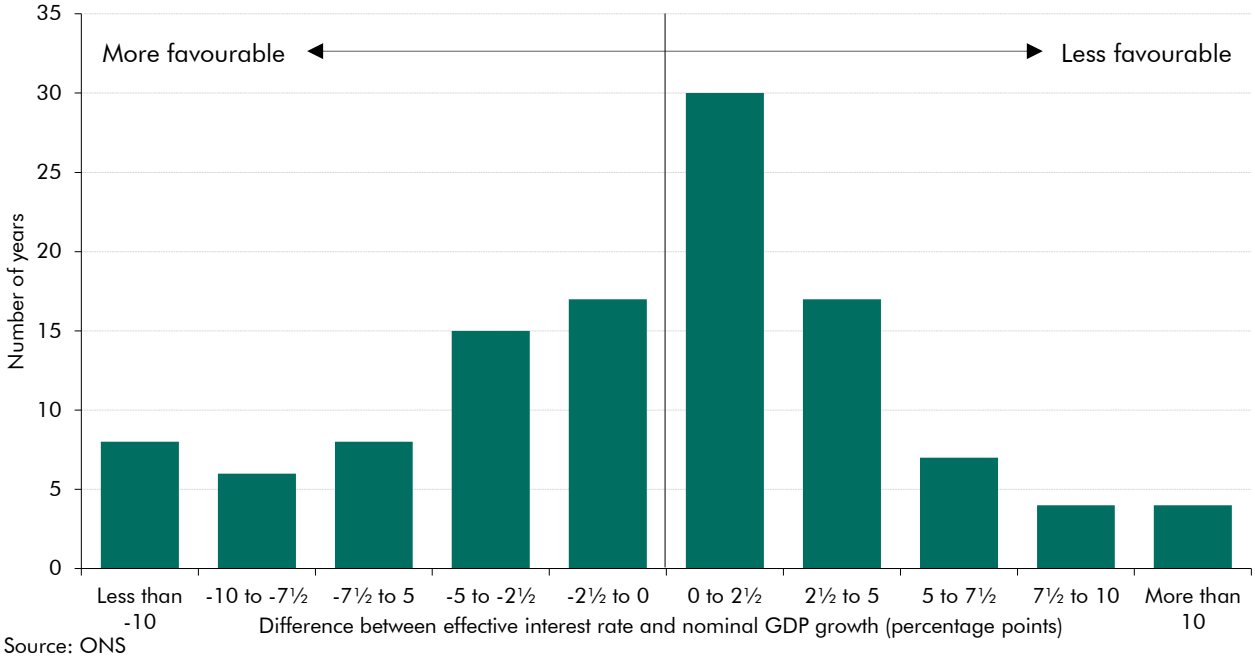
1.43 Looking at the distribution of outcomes across individual years rather than decade averages, Chart 1.11 shows that in around a quarter of all years the effective interest rate exceeded nominal GDP growth by a small margin – the median margin is 0.3 percentage points. Two-thirds of the years see a difference between -5 and +5 percentage points. That said, it would be a mistake to assume that future outturns will be drawn from a distribution that matches this historical one given the factors that have influenced it.

1.44 At the extremes of the distribution, there have been twice as many years in which growth exceeded the effective interest rate by more than 10 percentage points than years in which the interest rate exceeded growth by that margin:

- of **the eight instances when growth far exceeded the effective interest rate**, six occur during the world wars and two in the mid-1970s, when the oil price shock pushed inflation far above the expected rate embodied in the effective interest rate; whereas

- of **the four instances when growth fell far short of the effective interest rate**, three were in the early 1920s when nominal GDP was shrinking due to deflation.

Chart 1.11: Distribution of differences between the effective interest rate and nominal GDP growth



Source: ONS

Risks to our growth-corrected interest rate assumption

1.45 In our 2017 *Fiscal sustainability report (FSR)*, we assumed that the difference between the long-term nominal interest rate and nominal output growth would normalise at +0.2 percentage points. This provides a close-to-neutral setting for debt dynamics in our long-term fiscal projections, which means the focus of our conclusions is the primary spending over which policymakers have greater control.

1.46 A difference of +0.2 percentage points is consistent with the UK average since 1990. But given our long-term assumptions about GDP growth, it takes interest rates up to 4.9 per cent in steady state, much higher than current market expectations. For example, Bank Rate expectations at the time that our *FSR* was published did not exceed 2.3 per cent at any point in the next 20 years. So while there are reasons one might expect interest rates to rise relative to GDP growth – for example the factors influencing global real interest rates described in paragraph 1.24 – there is considerable uncertainty around this assumption.

1.47 Other international institutions, such as the US Congressional Budget Office and the European Commission, also base their long-term fiscal projections on positive growth-corrected interest rates. For example, the CBO recently used a projection of long-term government bond yields rising to 4.5 per cent on average between 2038 and 2047. This compares with a nominal growth rate of 4.0 per cent on average over the same period.[17]

[17] CBO, *The 2017 Long Term Budget Outlook*, March 2017.

1.48 The IMF has recently argued that the persistence of low interest rates in part reflects the slow downward adjustment of nominal growth expectations to the lower rates seen in the 1990s and 2000s, alongside a global reduction in safe assets or decreasing global risk appetite.[18] Given the structural nature of these factors, it expected interest-growth differentials to remain lower than they were on average in recent decades, allowing governments to sustain higher levels of public debt.

1.49 The IMF concluded that a *permanent* decline of 1 percentage point in the interest-growth differential would increase the maximum sustainable level of public debt in advanced economies by an average of 25 per cent of GDP by 2022. Or it could allow governments to reduce public debt-to-GDP ratios from their post-crisis levels while running less stringent primary balances. But if the decline in the interest-growth differential proves *transitory*, the current favourable level would imply little change in a government's ability to sustain permanently higher levels of public debt.

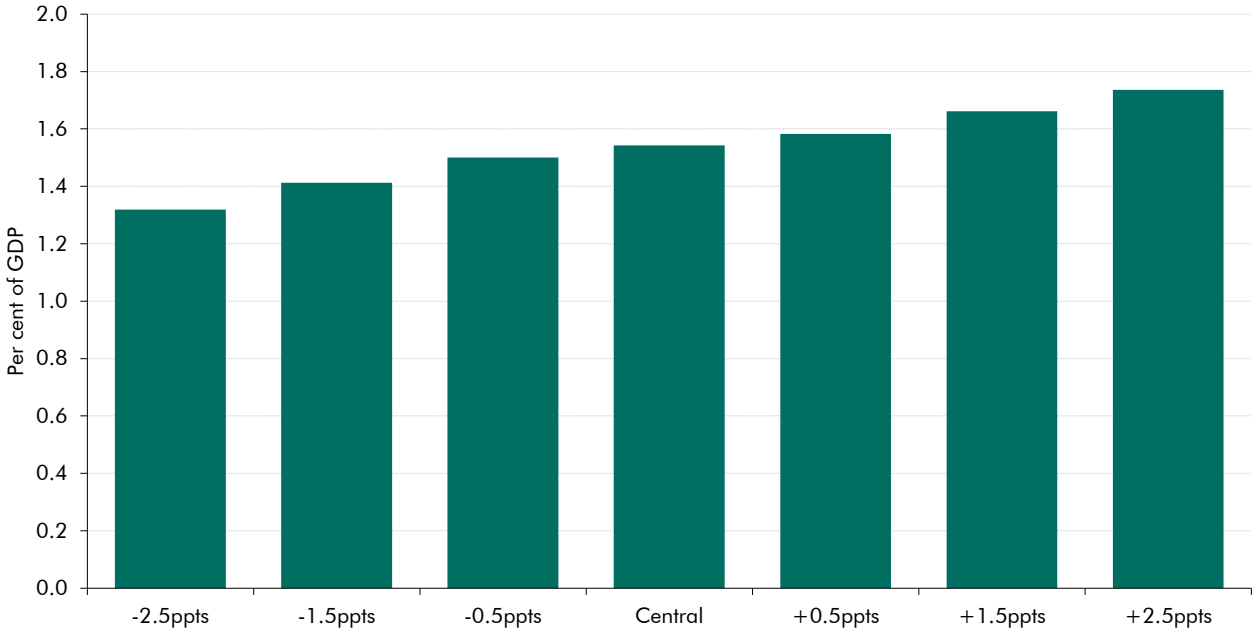
Sensitivity analysis

1.50 In our *FSRs*, we illustrate the sensitivity of our central projections to different assumptions about the effective interest rate relative to GDP growth. Based on our most recent central projections, we showed that the necessary decade-by-decade fiscal tightening required for debt to fall back to 40 per cent of GDP in 50 years' time would be 1.5 per cent of GDP. Chart 1.12 shows how that number would change if the gap between the effective interest rate and GDP growth was higher or lower by different margins (with lower gaps implying growth exceeding the interest rate).

1.51 The latest market expectations for interest rates are consistent with a more favourable gap than in our central projection – by around 2.5 percentage points. This would reduce the necessary decade-by-decade fiscal tightening by around 0.2 per cent of GDP. But the same difference in the opposite direction, which would take the gap between interest rates and growth back to the average over the 1980s to 2000s, would increase the necessary adjustment by 0.2 per cent of GDP.

[18] IMF, *Fiscal Monitor*, April 2017 – see Box 1.4: Can Countries Sustain Higher Levels of Public Debt?

Chart 1.12: Fiscal adjustment required under different growth-corrected interest rates



Source: OBR

Conclusions

1.52 This paper has illustrated the sensitivity of debt interest spending to a number of factors, notably the interest rate on new borrowing that feeds through to the effective interest rate on the outstanding stock of debt – in some cases quickly, in others over many years. The most important downside fiscal risks are those that would push interest rates up relative to economic growth, thereby raising debt interest spending proportionately more than GDP.

1.53 Over the medium term, there are many factors that could raise debt interest spending relative to our latest forecast. Higher Bank Rate or RPI inflation would affect spending quickly; higher gilt yields or borrowing would affect it more slowly. The risk of RPI inflation being higher than our March forecast is very high in the short term, but a medium likelihood beyond that. The risk of interest rates – either Bank Rate or gilt yields – being higher looks to be of medium likelihood, with market expectations little changed since March.

1.54 Over the longer term, the key risk to fiscal sustainability is that the growth-corrected interest rate reverts to a historically more normal average. The *minus* 1.6 percentage point average assumed in our latest medium-term forecast sits at around the 30th percentile of outturns since 1900 and around 2 percentage points below the median peacetime outturn. But even that may understate a 'normal' rate given the unusual drivers of negative outturns in the 1970s (due to the oil shocks) and the post-war decades (due to financial repression). For every percentage point increase, our latest long-term projections show debt would be higher at the 50-year horizon by around 25 per cent of GDP. The longer the time horizon one considers, the greater the likelihood that historical norms will reassert themselves.