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Economic assumptions for PR14 risk analysis

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Contents

1. Introduction

Risk analysis forms a key part of Ofwat's final methodology for PR14, and in particular for the risk based review. A critical requirement for the risk analysis for PR14 is consistency across companies, both in terms of approach, and also of UK wide assumptions which should not vary across companies.

Ofwat has specified up to 9 scenarios for water companies to prepare in their business plans (in Table A20 of the business planning data table for appointees). The first four of these scenarios relate to economic risks, with additional scenarios covering weather and company-specified risks, as well as risks relating to incentive performance. The specification of these scenarios, and the outputs required, will support consistent preparation of scenarios and allow cross company comparisons on a consistent basis, so that Ofwat can satisfy itself that customer's interests are protected. It is also important that companies prepare their scenarios using the same high-level macroeconomic assumptions, as customer bills should not vary on account of different assumptions of the performance of the national economy.

As part of our work supporting Ofwat on developing the PR14 methodology, we (PricewaterhouseCoopers LLP) are providing nationwide economic assumptions which we consider appropriate for use in the PR14 risk analysis. We provide water companies with the base case economic assumptions to support the preparation of their business plans, and four separate economic scenarios with both upside case and downside case assumptions for a range of nationwide economic variables.

This report sets out our views and is produced in accordance with our service order dated 6 February 2013.

Water companies will retain discretion over how their economic regions may or may not differ in relation to national trends and they will also have flexibility on how regional economic conditions impact their individual businesses. This means that nationwide macroeconomic assumptions are only a starting point for the preparation of business plans. Where water companies have a different view of nationwide tends, or a different regional perspective, they can use different figures provided they can explain the rationale for any changes.

We have selected a number of key economic variables to include in the base case economic assumptions and additional scenarios. These are:

- GDP growth;
- Inflation (Retail Price Index);
- Industrial production;
- The number of households;
- The unemployment rate (International Labour Organisation measure);
- Industrial electricity retail prices; and
- Construction input cost inflation.

We do not include financial market variables in our analysis, such as the Bank of England base rate, long-term government borrowing rate, or generic corporate borrowing costs. Water companies will be expected to derive reasonable assumptions for these variables in building up their assessment of an efficient borrowing cost. Such assumptions can be based upon financial market information (e.g. forward rates) and reputable independent forecasts. For example, the HM Treasury publishes a comparison of independent forecasts for Bank of England base rates, currently available up to 2017, which provides a mean view. Ofwat has indicated it would expect companies to set out clearly the sources of their interest rate projections, alongside their other projections, in their plans.

This report includes assumptions for base case forecasts and scenarios for the economic variables listed above. We have provided a presentational precision in our point estimates. This has been done to provide a clear view to assist water companies with business planning. However by their very nature, the creation of forward looking projections cannot be regarded as an exact science and the conclusions arrived at in many cases will of necessity be subjective and dependent on the exercise of individual judgement. We further note that any forecast of

future outcomes depends on the methodologies and/or input assumptions applied. The range of outcomes in our report should not be considered to be the only possible range of potential future outcomes. It will remain possible that actual experience in the future will fall outside the possible outcomes presented. We present point forecasts for each year in this report, however we note that the apparent accuracy when looking at individual years in the future is spurious. We have provided precise numbers on the basis that water companies need these to input into their plans.

Most macroeconomic data and forecasts are prepared on a calendar year basis, so the forecasts in this report are initially presented on a calendar year basis. We have then converted them to a financial year basis (year to March 31) to be consistent with the business planning tables[1].

The remainder of this report is structured as follows:

- Section 2 contains the base case economic assumptions and presents the base case assumptions for each of the above variables in turn.
- Section 3 contains our assumptions for four economic scenarios (A – households, B – industrial production, C – input costs and D – combined economic scenario).
- Appendix 1 contains data tables for all of the economic assumptions (presented on a financial year basis).
- Appendix 2 provides additional historical GDP analysis.

[1] Conversion to financial year basis using 75% of one calendar year and 25% of the next.

2. Base case assumptions

The base case assumptions presented in this report are sourced from third-party independent forecasters of the UK economy where available. Taken together, the base case economic indicators are consistent with a modest economic recovery.

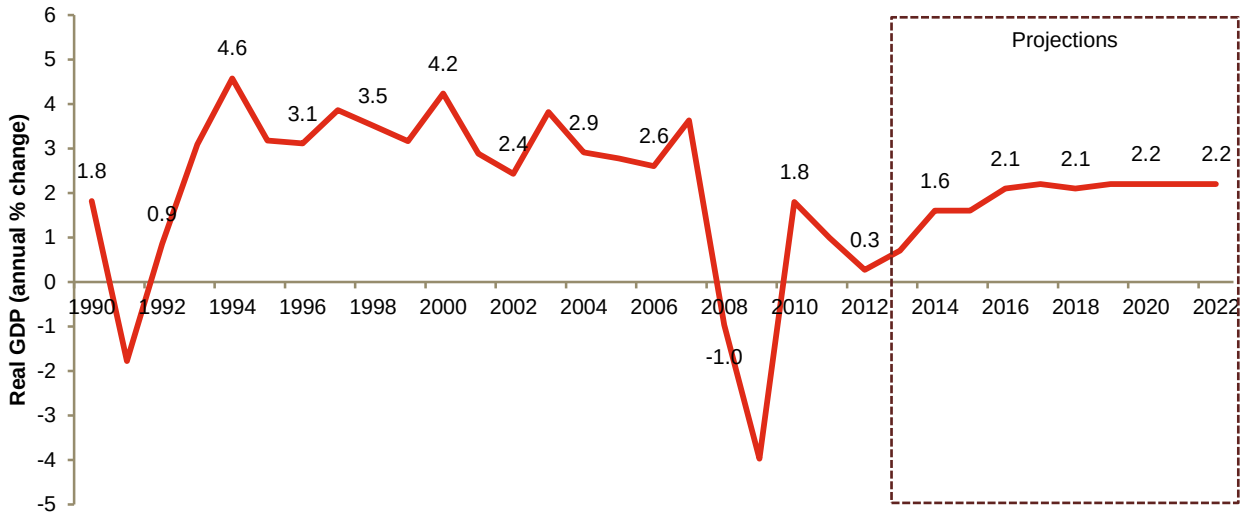
GDP growth

The base case GDP growth values are sourced from Consensus Economics who provide a mean figure for the growth prospects for the UK economy by surveying 25 independent forecasters and calculating the average value of the forecasts[2]. The Consensus Economics forecasts were chosen as they cover the whole period relevant to business planning for the price control and are based on a range of different views resulting in a balanced picture for the base case.

The forecasts are shown in Figure 1 below. It is assumed that the UK economy will go through a period of modest recovery with the rate of GDP growth just above 2% for all but one year from 2015 to 2022. This pace of growth is weaker than the average growth achieved between 1994 and 2008, and slightly below the long term average since 1970 (which is 2.4%).

There are several reasons why it may be expected that growth will be below long term trends in the near future. First, household incomes have been declining in real terms as inflation has exceeded wage growth since the onset of the 2008 recession. This has dampened consumer spending growth and will affect future growth if the trend continues. Second, business investment has been weak and this may continue as a result of low confidence in the prospects for the economy and weak net lending from the financial sector which is in a process of deleveraging and de-risking which is likely to continue into the medium term. Third, government spending cuts mean that the public sector will not make as strong a contribution to growth as in the past. Given the size of the deficit and public debt, this trend may be expected to continue until 2022 (and potentially beyond).

Figure 1 UK GDP growth



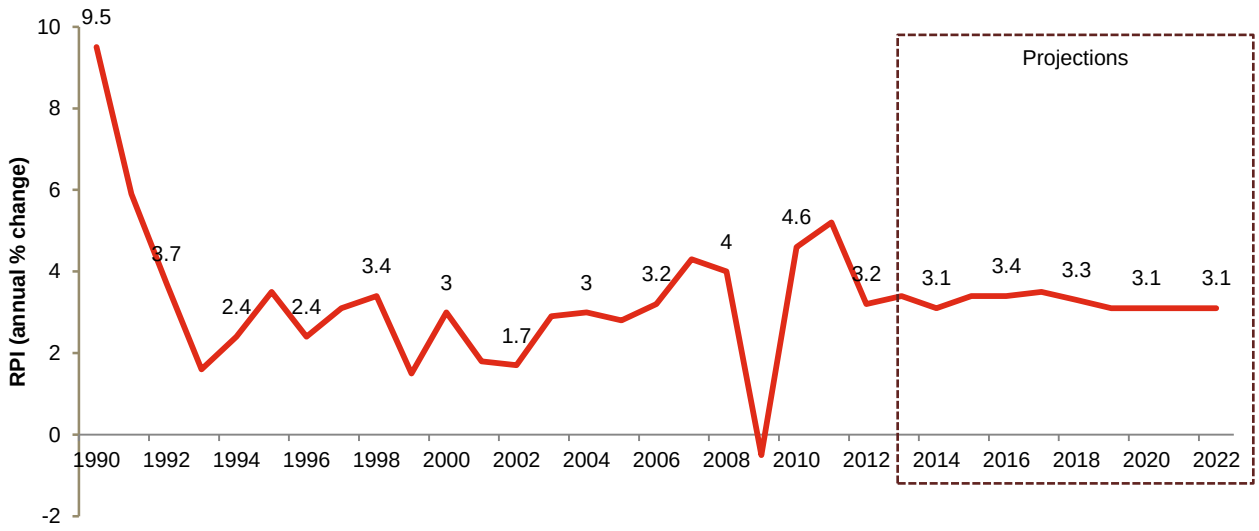
Sources: Datastream, Consensus Economics (Apr 2013)

[2] Organisations surveyed include banks such as Goldman Sachs and JP Morgan; think tanks such as NIESR; and economic consultancies such as Capital Economics and Oxford Economics.

RPI inflation

Consensus Economics is also the source for the base case RPI inflation numbers and was chosen for the same reasons described in the GDP growth section. The Consensus Economics number is for RPIX, not RPI, but the historical movements of the two numbers are very similar[3]. Consistent with the base case projection of stable GDP growth, it is assumed that the RPI rate of inflation will also remain fairly stable at around 3% during the forecast period. Assuming a wedge of around a 0.8% difference between RPI and CPI, this suggests that CPI will, on average, remain slightly above the Bank of England's target of 2%. There are several contributory factors to this inflation outlook. Relatively modest GDP growth and low levels of wage growth will limit the extent of domestic pressures on inflation. However, this may not be the case for external drivers of inflation. There is an expectation that energy costs and the prices of other raw materials may rise faster than the rate of inflation (see the following forecasts for electricity prices for an example of this). Furthermore the weakness in sterling has increased the costs of imports and dollar denominated commodities. Whilst it is not known whether the depreciation will continue, it will take a period of years for the effects of the existing changes to fully feed through into the economy.

Figure 2 Retail price index inflation



Sources: ONS, Consensus Economics (Apr 2013)

Industrial production

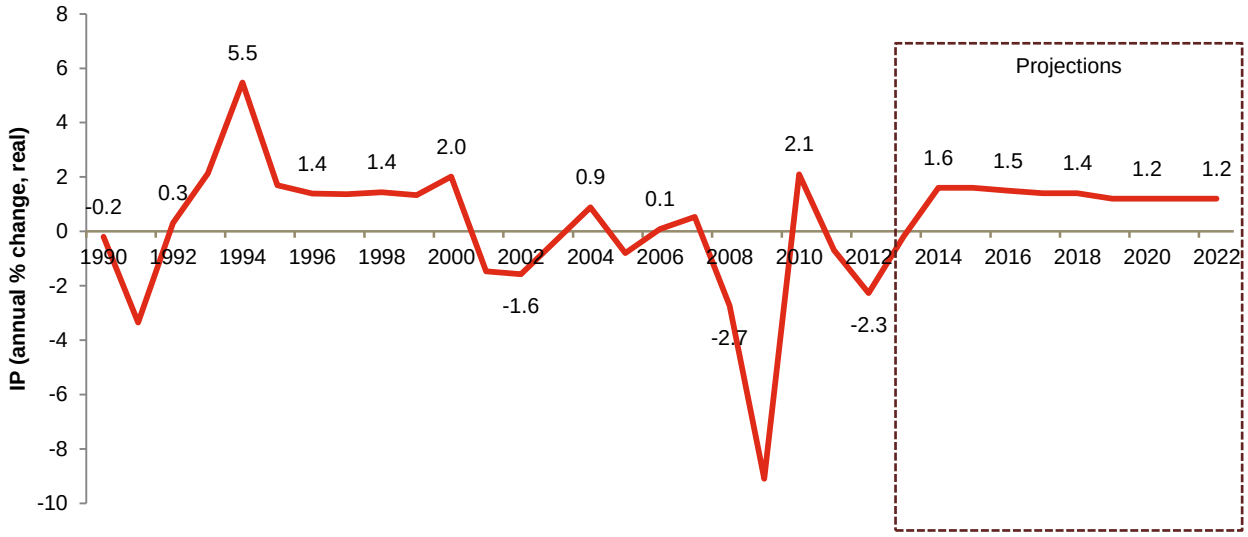
For industrial production, forecasts are also consistently sourced from Consensus Economics for the reasons described above, and are shown below in Figure 3. The Consensus Economics metric is for manufacturing production, not total industrial production, but again the historical average growth rates for the two measures are similar. Growth in industrial production (IP) has historically been strongly correlated with GDP[4], and in the base case forecast, the profile of growth broadly follows the expected path of GDP.

However IP is forecast to grow in future at a slower rate than the economy as a whole which implies that the industrial sector will decline as a share of GDP (which is consistent with the long term trend). The industrial sector is more export focussed than the service sector and is particularly exposed to weaknesses in the UK's key export markets, including the Eurozone.

[3] The correlation between annual growth the two measures since 1990 is 90%.

[4] Manufacturing production makes up 70% of total industrial production and the correlation between growth in the measures since 1971 is over 90%

Figure 3 Industrial production growth

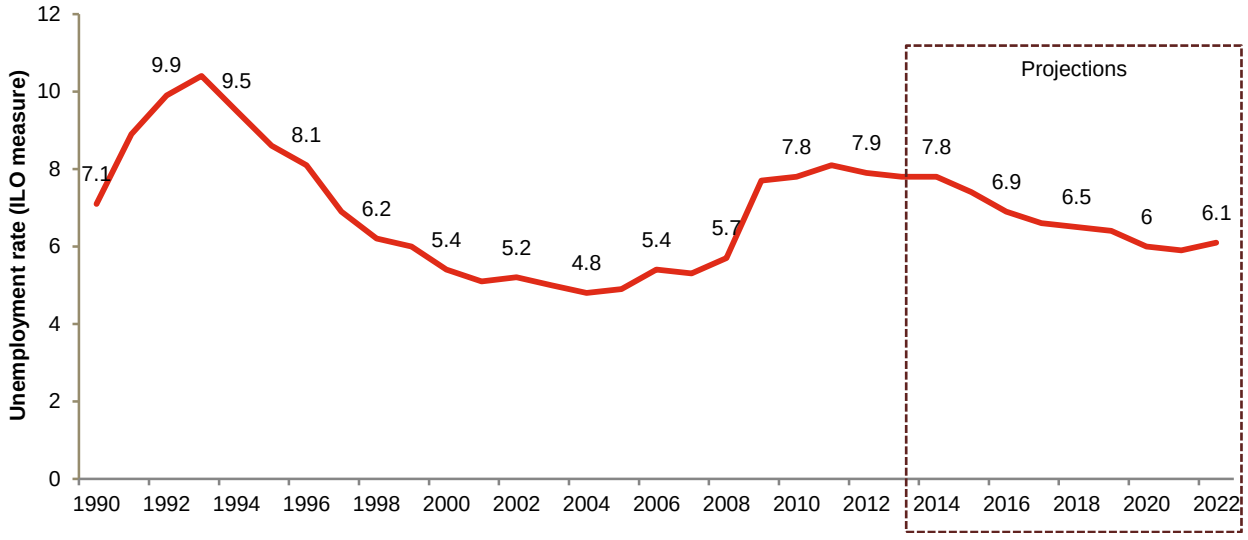


Sources: Datastream, Consensus Economics (Apr 2013)

Unemployment

The base case unemployment[5] forecasts are sourced from the International Monetary Fund[6] as these forecasts cover a greater proportion of the projection time period than the other sources. The base case assumption is that the unemployment rate will fall steadily as the economy recovers and businesses begin hiring more workers. Since the 2008/2009 recession ended, employment has risen despite minimal levels of economic growth in the UK. This implies a sustained fall in labour productivity, which is at odds with long term trends in the UK (and elsewhere), where labour productivity has risen over time.

Figure 4 Unemployment rate (% economically active population)



Sources: LMS Labour Market Statistics, IMF WEO (Apr 2013), PwC analysis using NiGEM

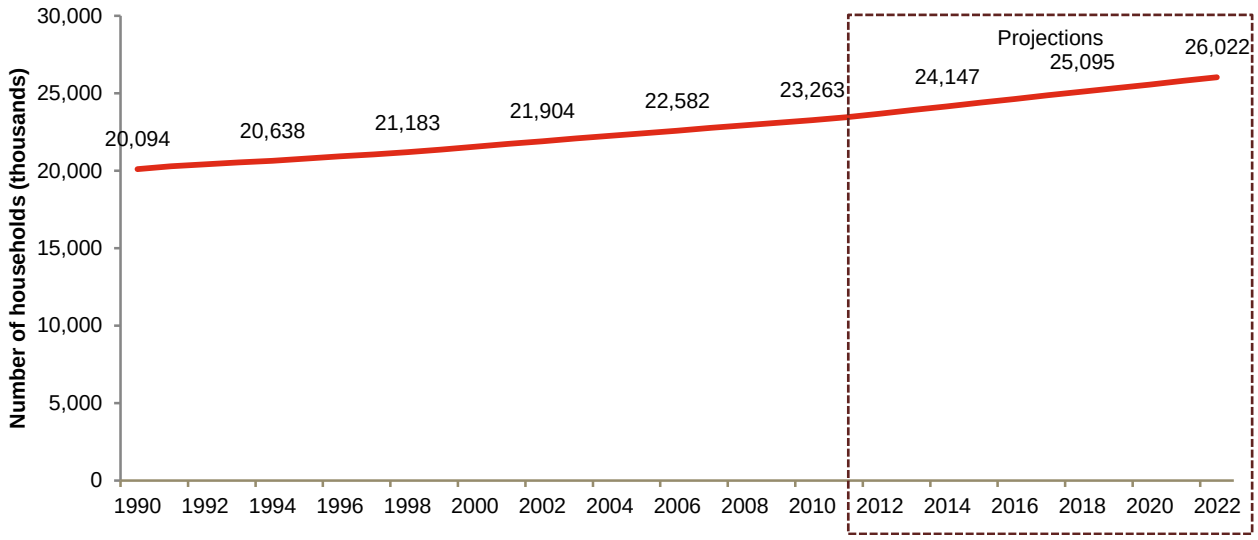
[5] We use the broader International Labour Organisation measure of unemployment rather than the claimant count definition. The ILO measure captures those who are classified as available for work but who are not claiming jobless benefits.

[6] Forecasts are extended beyond 2018 consistent with a profile generated using NIESR's NiGEM model.

Number of households in England and Wales

The base case forecasts for the number of households in England and Wales are sourced from the Department for Communities and Local Government as they cover the whole of the time period and are readily available. It is assumed that during the forecast period the number of households will continue to grow at a slightly faster rate than historic trends, partly as a consequence of the policy actions to stimulate the UK housing sector in the face of sluggish general economic performance. Household growth rates expected to be are relatively consistent, as can be seen from Figure 5.

Figure 5 Number of households in England and Wales

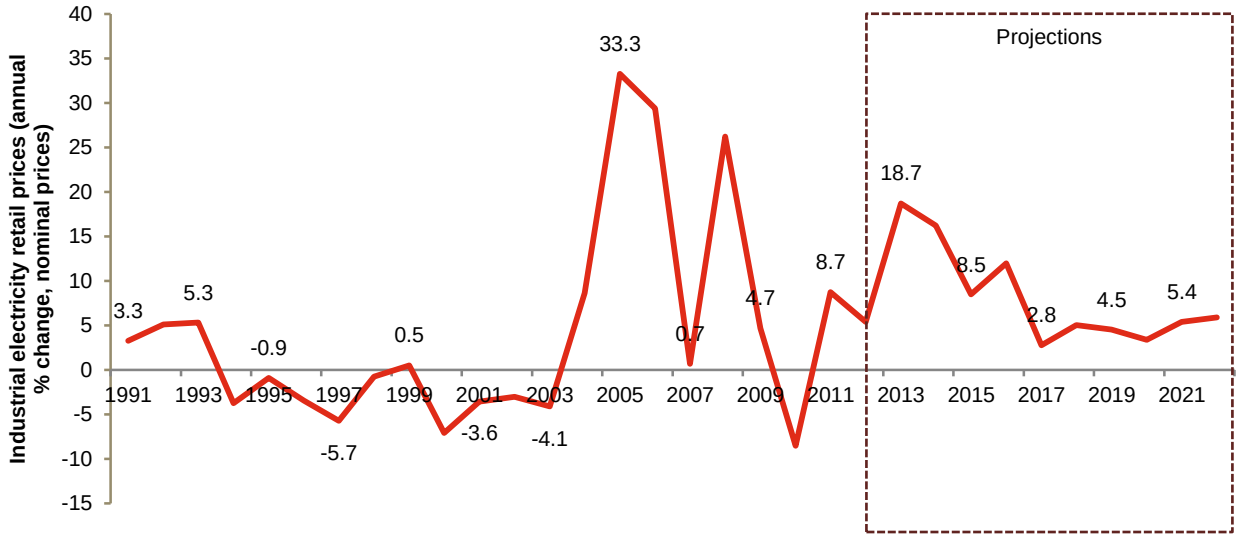


Sources: DCLG (April 2013)

Industrial electricity retail prices

Industrial electricity retail prices forecasts are sourced from the Department for Energy and Climate Change as they are readily available. As Figure 6 shows, industrial electricity retail prices were historically volatile. In the base case assumption, significant volatility is expected to continue. The increase in economic activity and tight reserve margin on the supply side expected during the period may increase the price of electricity but other factors such as wholesale electricity costs and investment by electricity companies in new energy can also drive growth in industrial retail prices.

Figure 6 Industrial electricity retail prices

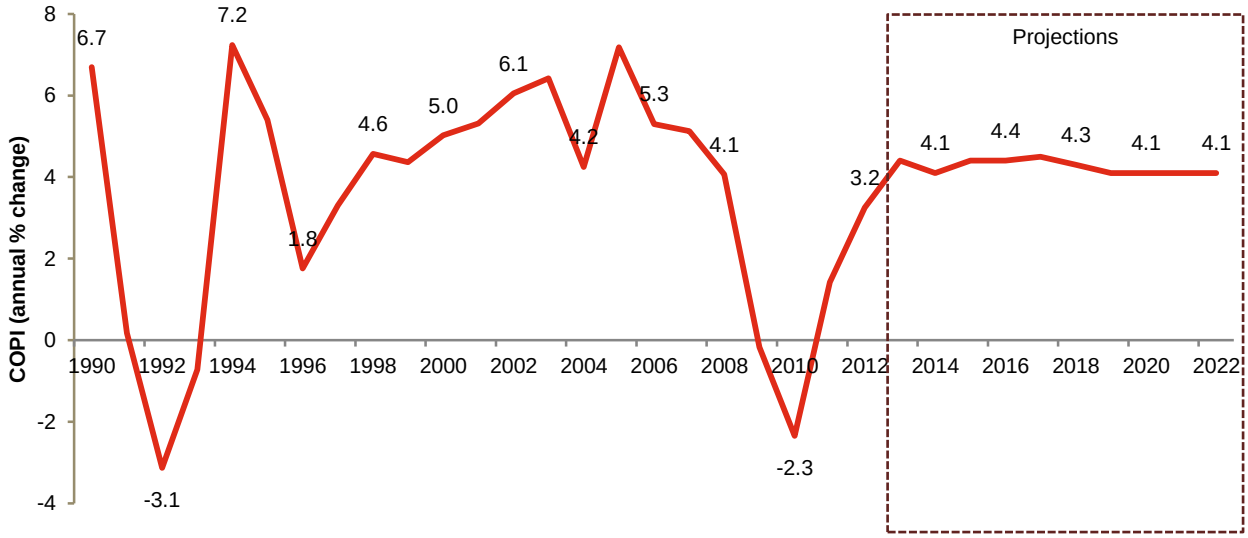


Sources: DECC, Quarterly Energy Prices, December 2012 , DECC, Updated Energy & Emissions Projections - October 2012, Central Scenario for retail industrial electricity costs , ONS, Consensus Economics (Apr 2013), PwC analysis.

Construction output price index (COPI)

No third party forecasts for COPI were identified, so to produce the base case assumptions we used a simple historic relationship with the Retail Price Index (RPI). Historically, the rate of COPI growth has, on average, been one percentage point higher than growth in the RPI. We have applied this uplift to the base RPI assumptions presented earlier in this section.

Figure 7 Construction output price index growth



Sources: BIS, BCIS, Consensus Economics (Apr 2013), ONS, PwC analysis

3. Scenarios

In this section we set out the upside and downside cases for the four scenarios relating to economic risks Ofwat has specified in its business planning table templates.

Our first step was to assess appropriate ranges for GDP growth. We reviewed the distribution in the rate of growth over the period 1970 to 2012, as well as the rate of growth in periods of both expansion and decline. These analyses are shown in Appendix 2. These were used to set GDP growth in the upside and downside case. The scenarios are not symmetrical in either timing or severity. Historically, strong periods of growth tend to last longer than recessions – the latter tend to be more severe departures from trend, but are shorter in duration. In the upside scenarios, we assume a stronger period of growth than the base case, lasting for five years from 2016-2020. In the downside or recession scenarios, the posited periods of weak growth last only two years (applied in 2016 and 2017).

We provide scenarios which cover the broad range of likely economic risks. They are not extreme scenarios. This means that there are possible scenarios which are more extreme. Our range is intended to reflect the 90th and 10th percentile – i.e. there is only intended to be a 10% chance of more extreme outcomes in either direction.

Given the current challenges facing the UK economy (household indebtedness, fiscal deficit reduction, weak trading partners), we reduced the upside GDP case to below the historic P90 figure, which is more consistent with the 2003 to 2007 period of expansion.

We then set out economic assumptions for Scenario A (households), Scenario B (industrial production) and Scenario C (input costs). For these scenarios, only specific economic variables are flexed individually in order to test water company financial exposure to individual risks.

The household, industrial demand and input cost scenarios are calibrated based on variations in historic data and are designed to be consistent with the GDP growth figures set out above. Movements in some of the values such as industrial production are highly correlated with movements in GDP. This means that periods of higher (lower) economic growth will be consistent with higher (lower) industrial output growth. However, there is less linkage between input costs and GDP and there may be a number of alternative combinations for GDP growth and input prices. We have selected upside and downside cases for input costs which are most consistent with the GDP growth figures set out above, based upon historic relationships.

The combined economic scenario uses the same inputs drawn from Scenarios A to C and incorporates additional economic variables to provide a fuller economic scenario.

Ofwat will be able to test combinations of individual economic scenarios (Scenario A to C) to test whether the overall combined economic scenario is overly prudent or omits key economic risks.

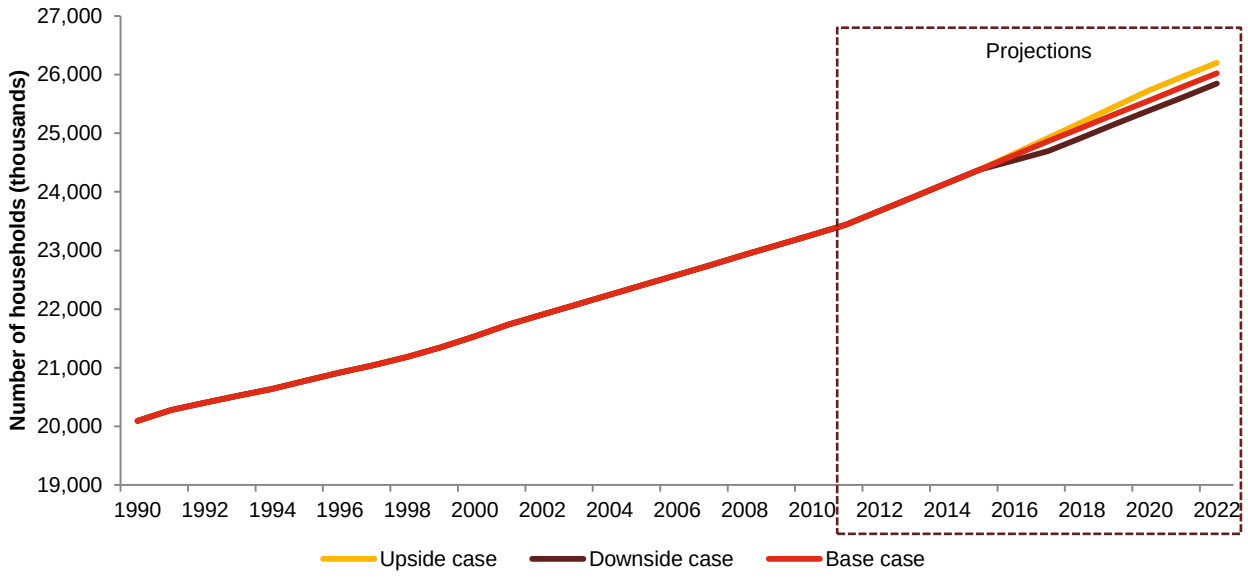
Scenario A: Households scenario

The households scenario varies the number of households in England and Wales in each year from 2015 to 2022. In this scenario there is change in the number of households that water companies can bill and therefore the revenues earned from households and costs incurred supplying households.

The stock of housing grows on a reasonably steady basis, because the annual growth in households is small relative to the overall stock. The pace of growth is also driven by steady demographic factors. However, there is a link between economic growth and household growth: in stronger economic periods the demand for housing and the supply of housing both tend to be higher. We use the historical variation in household growth to create our upside and downside scenarios, which are shown in Figure 8 (a data table is included in the appendix). The scenarios are asymmetric because that is what has been observed in the historic data. We would also expect

regional variation around this nationwide growth, with more buoyant demand for housing in the South East of the country.

Figure 8 Number of households in England and Wales

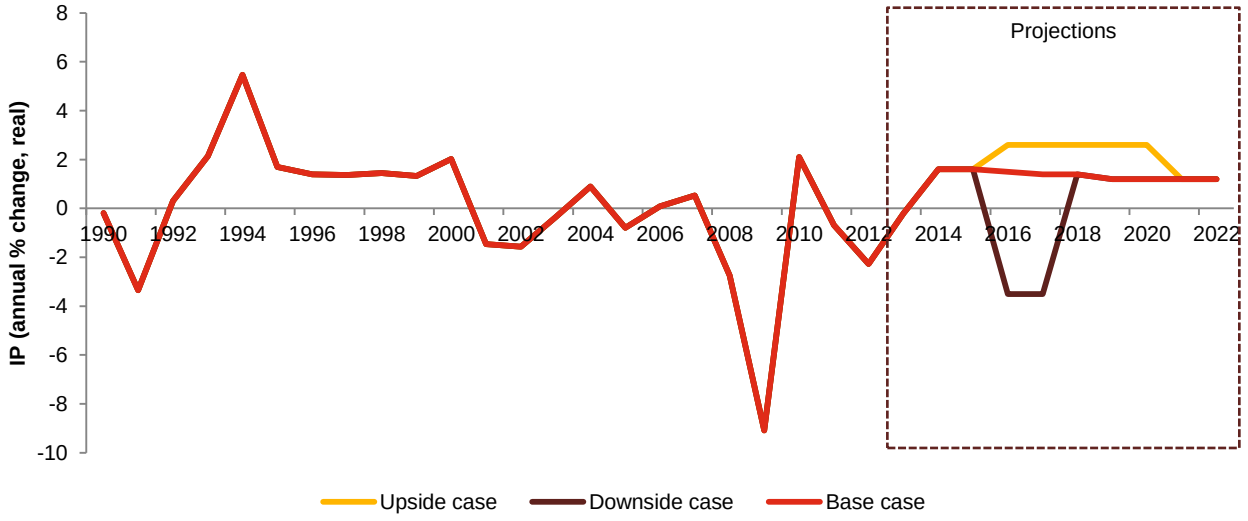


Sources: DCLG (April 2013), PwC analysis

Scenario B: Industrial demand scenario

The industrial demand scenario varies the annual percentage change in industrial production (IP). In the upside case, growth in IP is expected to be only slightly higher than in the base case. It can be seen in Figure 9 that even during the very strong growth period from 2002 to 2008, the industrial sector struggled to expand, and its share of GDP declined significantly. The growth in 1994 was somewhat exceptional and driven by a recovering economy and the benefit from the devaluation of sterling following exit from the ERM. This peak is outside the range of our statistical analysis. In the downside scenario a short contraction of a similar magnitude to that in the early 1990s recession is assumed, but not as extreme as the 2007/8 recession.

Figure 9 Industrial production growth



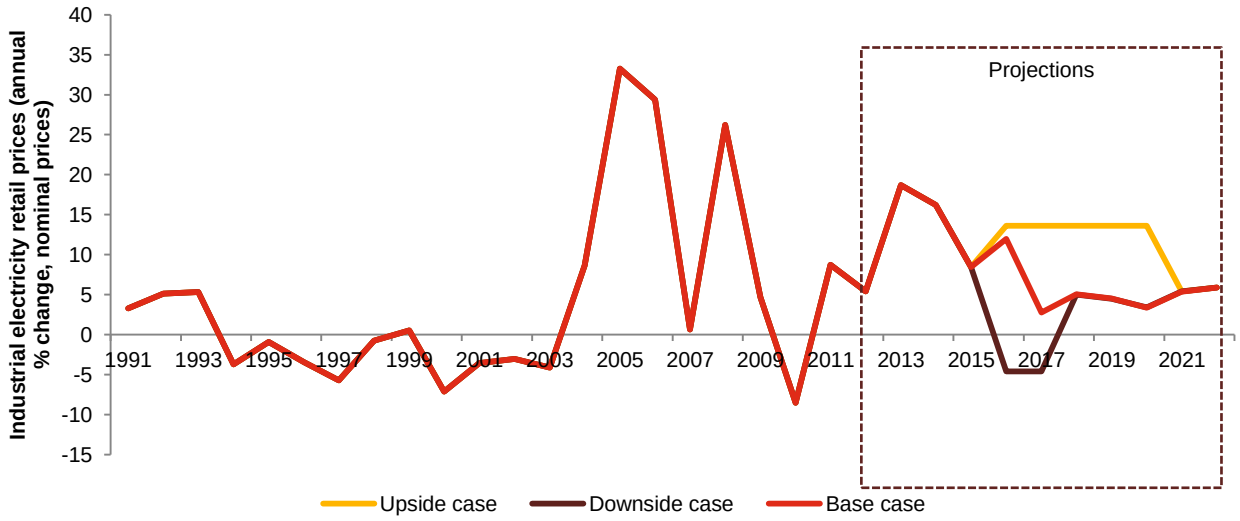
Sources: Datastream, Consensus Economics (Apr 2013), PwC analysis

Scenario C: Input cost scenario

The input cost scenario incorporates two economic variables: (i) the annual percentage change in industrial electricity retail prices and (ii) the annual percentage change in the construction output price index (COPI). This scenario is included to allow for consideration of the impact of input cost inflation.

Industrial electricity prices have experienced high volatility since 2003, as illustrated in Figure 10. This was driven by step changes in global energy prices. In our scenario there is significant volatility assumed, but not to the extent of volatility from earlier periods. The downside case includes a significant price decline which is of a comparable scale to the price decline in 1991, but not as severe as the decline in 2009/10. The upside case is of comparable scale to the growth experienced in the mid-1990s.

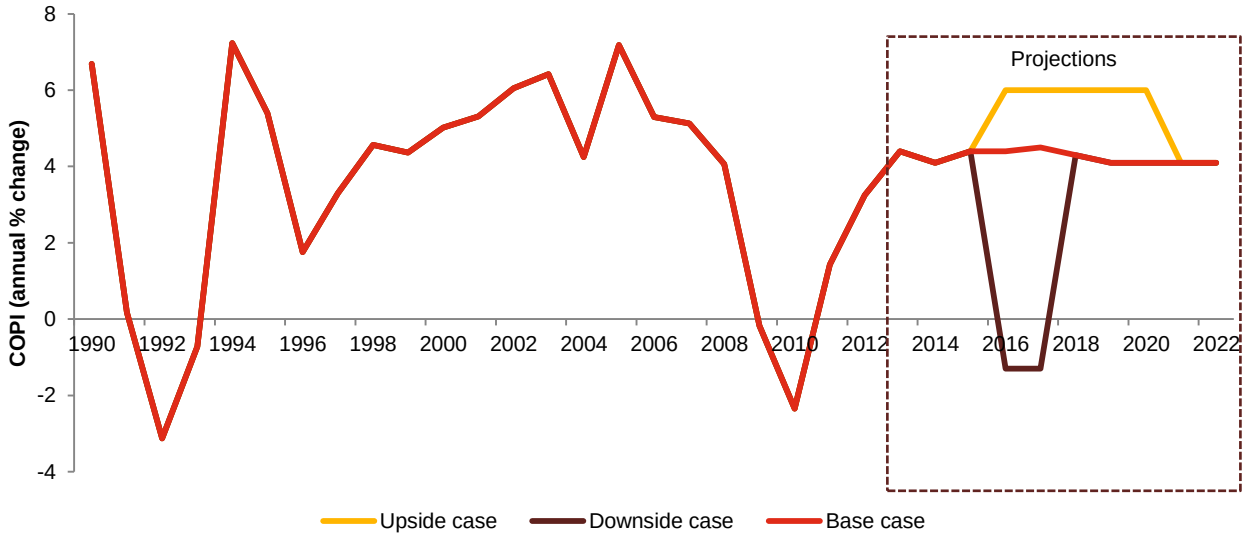
Figure 10 Industrial electricity retail prices



Sources: DECC, International Energy Agency publication, Energy Prices and Taxes Q3 2005, ONS, Consensus Economics (Apr 2013), PwC analysis

With regards to the annual percentage change in COPI, in the base case it is expected that construction output prices will grow at the rate of RPI+1%. In the upside case, the stronger domestic economic environment may increase construction output price growth slightly, both because RPI inflation is higher and because the difference between COPI and RPI is also greater. The construction sector tends to be pro-cyclical and it can be seen in Figure 11 that COPI also follows a cyclical pattern, tending to record price falls during recessions. The rate COPI inflation typically falls below that of the RPI in such situations. The downside case broadly mirrors the historic performance seen in previous recessions, but is less severe than in the 2007/8 recession.

Figure 11 Construction output price index growth



Sources: BIS, BCIS, Consensus Economics (Apr 2013), ONS, PwC analysis

Scenario D: Combined economic scenario

The combined economic scenario is designed to provide a consistent upside and downside case across a range of macroeconomic variables. They include the four variables in scenarios A to C and the other three macroeconomic variables discussed for the base case in Section 2: GDP growth, RPI inflation, and the unemployment rate. Like the other scenarios, the upside and downside values are calibrated based on variations in historic data.

Macroeconomic risks can be combined in a number of ways. Typically a strong economy will result in higher household growth and industrial production and hence growing revenues, but this benefit to water companies may be mitigated by construction and other input costs rising at a greater rate than the RPI increases automatically allowed for in price controls. There is, therefore, a natural hedge in the way that nominal costs and revenues tend to move together, but this is not always the case and other combinations of economic risks are possible. We have sought to prepare a combined economic scenario which combines economic risks on an internally consistent basis. Full details are set out in Appendix 1. However, there will be possibilities of economic scenarios which may be more detrimental to water companies, e.g. a weak economic environment combined with a positive cost shock. Water companies and Ofwat will be able to use Scenarios A to C to assess the probability and impact of such adverse economic scenarios on particular water company businesses, given the form of incentives developed for price limits.

The upside case for the combined scenarios contains stronger values than the base case assumptions for the remaining economic data not previously discussed in this section, as well as the upside and downside cases for the variables already discussed in Scenarios A to C. GDP growth is projected to be stronger, exceeding 3% per annum between 2016 and 2020. It is assumed that RPI will grow more quickly, consistent with a stronger growth profile and greater domestic pressure on inflation. Consistent with the stronger pace of growth, unemployment is also projected to decline at a faster pace than in the base case, declining to below 5% by 2020.

In the downside case, GDP is projected to contract in 2016 and 2017 as the UK is posited to experience another recession of similar magnitude to those of the mid 1970s and the early 1990s. The recession eases pressure on price growth and RPI moderates accordingly. Consistent with the weaker pace of growth, unemployment rises to above 8% in 2017, 2018 and 2019.

Appendices

Appendix 1: Detailed tables

The forecasts presented in the main part of this report, and on which our analysis was based, were prepared on a calendar year basis. However, for this appendix, the tables have been converted to a financial year basis to be consistent with the business planning tables. This conversion has been done with the first calendar year value assigned a weight of 0.75 and the second calendar year value assigned a weight of 0.25.

Base Case assumptions

Variable	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
GDP (annual % change, real)	1.7	2.1	2.2	2.1	2.2	2.2	2.2
Retail price index (annual % change, nominal)	3.4	3.4	3.5	3.3	3.1	3.1	3.1
Industrial production (annual % change, real)	1.6	1.5	1.4	1.4	1.2	1.2	1.2
Unemployment rate (ILO measure)	7.3	6.8	6.6	6.5	6.3	6.0	6.0
Number of households in England and Wales (thousands)	24,446	24,685	24,920	25,154	25,387	25,618	25,848
Industrial electricity retail prices (annual % change, nominal prices)	9.4	9.7	3.4	4.9	4.2	3.9	5.5
Industrial electricity retail prices (annual % change, real prices)	6.0	6.3	-0.1	1.6	1.1	0.8	2.4
Construction output price index (annual % change, nominal)	4.4	4.4	4.5	4.3	4.1	4.1	4.1
Construction output price index (annual % change, real)	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Sources: Consensus Economics (Apr 2013) HM Treasury comparison of independent forecasts, IMF WEO (Apr 2013), NiGEM, Department for Communities and Local Government, Department of Energy & Climate Change, International Energy Agency publication, Energy Prices and Taxes Q3 2005, Department for Business, Innovation & Skills, Building Cost Information Service, ONS, PwC analysis

Scenario A – Households

Number of households in England and Wales (thousands)	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Base case	24,446	24,685	24,920	25,154	25,387	25,618	25,848
Upside case, *percentage deviation from base*	24,452 *(0.0)*	24,716 *(0.1)*	24,984 *(0.3)*	25,254 *(0.4)*	25,528 *(0.6)*	25,792 *(0.7)*	26,024 *(0.7)*
Downside case, *percentage deviation from base*	24,424 *(-0.1)*	24,577 (-0.4)	24,751 *(-0.7)*	24,983 *(-0.7)*	25,214 *(-0.7)*	25,443 *(-0.7)*	25,672 *(-0.7)*

Sources: Department for Communities and Local Government, PwC analysis
Note: Numbers in parenthesis represent the percentage difference from the base case

Scenario B – Industrial demand

Industrial production (annual % change, real)	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Base case	1.6	1.5	1.4	1.4	1.2	1.2	1.2
Upside case, *percentage point difference from base*	1.9 *(0.3)*	2.6 *(1.2)*	2.6 *(1.2)*	2.6 *(1.3)*	2.6 *(1.4)*	2.3 *(1.1)*	1.2 *(0.0)*
Downside case, *percentage point difference from base*	0.3 *(-1.2)*	-3.5 *(-5.0)*	-2.3 *(-3.7)*	1.4 *(0.0)*	1.2 *(0.0)*	1.2 *(0.0)*	1.2 *(0.0)*

Sources: Consensus Economics (Apr 2013), Datastream, PwC analysis
Note: Numbers in parenthesis are the difference from the base case in percentage points.

Scenario C – Input cost scenario

Industrial electricity retail prices (annual % change, nominal prices)	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Base case	9.4	9.7	3.4	4.9	4.2	3.9	5.5
Upside case, *percentage point difference from base*	9.8 *(0.4)*	13.6 *(3.9)*	13.6 *(10.2)*	13.6 *(8.7)*	13.6 (9.3)	11.5 *(7.6)*	5.5 *(0.0)*
Downside case, *percentage point difference from base*	5.2 *(-4.1)*	-4.6 *(-14.3)*	-2.2 *(-5.5)*	4.9 *(0.0)*	4.2 *(0.0)*	3.9 *(0.0)*	5.5 *(0.0)*

Sources: Department of Energy & Climate Change, International Energy Agency publication, Energy Prices and Taxes Q3 2005, PwC analysis
Note: Numbers in parenthesis are the difference from the base case in percentage points

Construction output price index (annual % change, nominal)	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Base case	4.4	4.4	4.5	4.3	4.1	4.1	4.1
Upside case, *percentage point difference from base*	4.8 *(0.4)*	6.0 *(1.6)*	6.0 *(1.5)*	6.0 *(1.7)*	6.0 *(1.9)*	5.5 *(1.4)*	4.1 *(0.0)*
Downside case, *percentage point difference from base*	3.0 *(-1.4)*	-1.3 *(-5.7)*	0.1 *(-4.3)*	4.3 *(0.0)*	4.1 *(0.0)*	4.1 *(0.0)*	4.1 *(0.0)*

Sources: Consensus Economics (Apr 2013), ONS, Department for Business, Innovation & Skills, Building Cost Information Service, PwC analysis
Note: Numbers in parenthesis are the difference from the base case in percentage points.

Scenario D – Combined economic scenarios

Upside case, percentage point difference from base in parenthesis

Variable	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
GDP (annual % change, real), *percentage point difference from base*	2.0 *(0.3)*	3.1 *(1.0)*	3.1 *(0.9)*	3.1 *(1.0)*	3.1 *(0.9)*	2.9 *(0.7)*	2.2 *(0.0)*
Retail price index (annual % change, nominal), *percentage point difference from base*	3.5 *(0.1)*	3.9 *(0.5)*	4.0 *(0.5)*	3.8 *(0.5)*	3.6 *(0.5)*	3.5 *(0.4)*	3.1 *(0.0)*
Industrial production (annual % change, real), *percentage point difference from base*	1.9 *(0.3)*	2.6 *(1.2)*	2.6 *(1.2)*	2.6 *(1.3)*	2.6 *(1.4)*	2.3 *(1.1)*	1.2 *(0.0)*
Unemployment rate (ILO measure), *percentage point difference from base*	7.2 *(-0.1)*	6.5 *(-0.4)*	5.9 *(-0.6)*	5.6 *(-0.9)*	5.1 *(-1.2)*	4.6 *(-1.4)*	4.6 *(-1.4)*
Number of households in England and Wales (thousands), *percentage deviation from base*	24,452 *(0.0)*	24,716 *(0.1)*	24,984 *(0.3)*	25,254 *(0.4)*	25,528 *(0.6)*	25,792 *(0.7)*	26,024 *(0.7)*
Industrial electricity retail prices (annual % change, nominal prices), *percentage point difference from base*	9.8 *(0.4)*	13.6 *(3.9)*	13.6 *(10.2)*	13.6 *(8.7)*	13.6 (9.3)	11.5 *(7.6)*	5.5 *(0.0)*
Industrial electricity retail prices (annual % change, real prices), *percentage point difference from base*	6.2 *(0.3)*	9.6 *(3.4)*	9.6 *(9.7)*	9.8 *(8.2)*	10.0 *(8.8)*	8.0 *(7.2)*	2.4 *(0.0)*
Construction output price index (annual % change, nominal), *percentage point difference from base*	4.8 *(0.4)*	6.0 *(1.6)*	6.0 *(1.5)*	6.0 *(1.7)*	6.0 *(1.9)*	5.5 *(1.4)*	4.1 *(0.0)*
Construction output price index (annual % change, real), *percentage point difference from base*	1.3 *(0.3)*	2.1 *(1.1)*	2.0 *(1.0)*	2.2 *(1.2)*	2.4 *(1.4)*	2.0 *(1.0)*	1.0 *(0.0)*

Sources: Datastream, ONS, Consensus Economics (Apr 2013), HM Treasury comparison of independent forecasts, NiGEM, IMF WEO (Apr 2013, LMS Labour Market Statistics, Department for Communities and Local Government, Department of Energy & Climate Change, International Energy Agency publication, Energy Prices and Taxes Q3 2005, Department for Business, Innovation & Skills, Building Cost Information Service, PwC analysis

Note: Numbers in parenthesis are the difference from the base case in percentage points except for the number of households, which is a level term, where the number represents the percentage difference from the base case.

Downside case, percentage point difference from base in parenthesis

Variable	FY 15/16	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
GDP (annual % change, real), *percentage point difference from base*	1.0 *(-0.7)*	-0.8 *(-2.9)*	-0.1 *(-2.3)*	2.1 *(0.0)*	2.2 *(0.0)*	2.2 *(0.0)*	2.2 *(0.0)*
Retail price index (annual % change, nominal), *percentage point difference from base*	3.0 *(-0.4)*	1.8 *(-1.6)*	2.2 *(-1.3)*	3.3 *(0.0)*	3.1 *(0.0)*	3.1 *(0.0)*	3.1 *(0.0)*
Industrial production (annual % change, real), *percentage point difference from base*	0.3 *(-1.2)*	-3.5 *(-5.0)*	-2.3 *(-3.7)*	1.4 *(0.0)*	1.2 *(0.0)*	1.2 *(0.0)*	1.2 *(0.0)*
Unemployment rate (ILO measure), *percentage point difference from base*	7.5 *(0.2)*	7.9 *(1.1)*	8.3 *(1.7)*	8.2 *(1.7)*	8.0 *(1.7)*	7.7 *(1.7)*	7.7 *(1.7)*
Number of households in England and Wales (thousands), *percentage deviation from base*	24,424 *(-0.1)*	24,577 (-0.4)	24,751 *(-0.7)*	24,983 *(-0.7)*	25,214 *(-0.7)*	25,443 *(-0.7)*	25,672 *(-0.7)*
Industrial electricity retail prices (annual % change, nominal prices), *percentage point difference from base*	5.2 *(-4.1)*	-4.6 *(-14.3)*	-2.2 *(-5.5)*	4.9 *(0.0)*	4.2 *(0.0)*	3.9 *(0.0)*	5.5 *(0.0)*
Industrial electricity retail prices (annual % change, real prices), *percentage point difference from base*	2.2 *(-3.7)*	-6.4 *(-12.7)*	-4.4 *(-4.3)*	1.6 *(0.0)*	1.1 *(0.0)*	0.8 *(0.0)*	2.4 *(0.0)*
Construction output price index (annual % change, nominal), *percentage point difference from base*	3.0 *(-1.4)*	-1.3 *(-5.7)*	0.1 *(-4.3)*	4.3 *(0.0)*	4.1 *(0.0)*	4.1 *(0.0)*	4.1 *(0.0)*
Construction output price index (annual % change, real), *percentage point difference from base*	0.0 *(-1.0)*	-3.1 *(-4.1)*	-2.0 *(-3.0)*	1.0 *(0.0)*	1.0 *(0.0)*	1.0 *(0.0)*	1.0 *(0.0)*

Sources: Datastream, Consensus Economics (Apr 2013), ONS, HM Treasury comparison of independent forecasts, NiGEM, IMF WEO (Apr 2013) LMS Labour Market Statistics, Department for Communities and Local Government, Department of Energy & Climate Change, International Energy Agency publication, Energy Prices and Taxes Q3 2005, Department for Business, Innovation & Skills, Building Cost Information Service, PwC analysis

Note: Numbers in parenthesis are the difference from the base case in percentage points except for the number of households, which is a level term, where the number represents the percentage difference from the base case.

Appendix 2: GDP analysis

This appendix sets out analysis of UK historical GDP growth during sample periods for 5 years of economic expansion and 2 years of recession (historically recessions have not lasted more than 2 years). We include analysis of annual GDP growth, average GDP growth over the benchmark periods. We also include a P10 and P90 probabilistic measure for 5 year growth periods and 2 year recession periods over the period 1970-2012. The P90 measure provides the growth rate where there is a 10% probability that average growth was higher over the cumulative five years, based upon historic data.

Historic periods of GDP expansion

Variable	Y1	Y2	Y3	Y4	Y5	Annual Average over 5 years
1983-1987 benchmark	3.8%	2.9%	3.9%	4.3%	5.2%	**4.0%**
1997-2001 benchmark	3.9%	3.5%	3.2%	4.2%	2.9%	**3.5%**
2003-2007 benchmark	3.8%	2.9%	2.8%	2.6%	3.6%	**3.1%**
One-in-ten event approach (P90)	n/a	n/a	n/a	n/a	n/a	**3.6%**

Historic periods of GDP recession

Variable	Y1	Y2	Annual Average over 2 years
1974-1975 benchmark	-1.1%	-0.5%	**-0.8%**
1980-1981 benchmark	-2.0%	-1.3%	**-1.6%**
1991-1992 benchmark	-1.8%	0.9%	**-0.5%**
2008-2009 benchmark	-1.0%	-4.0%	**-2.5%**
One-in-ten event approach (P10)	n/a	n/a	**-0.8%**

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