What is the forecast difference between RPI and CPI?

Note prepared for Vodafone

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1 Introduction

Following the autumn consultation on the future fees for spectrum, Ofcom has opened to consultation a proposal for how the consumer price index (CPI) should be applied in practice to calculate annual licence fees (ALFs), if it is applied as an alternative to the retail price index (RPI).

Ofcom had indicated that it might read across from the cost of capital applied within the mobile termination rates (MTRs), which were set relative to RPI in 2011. The approach of setting a real cost of capital linked to RPI has been the case in Ofcom's decisions more generally to date. The two inflation indices differ in a number of ways, and typically, although not always, RPI is larger than CPI—i.e. a higher rate of inflation is implied by RPI than by CPI.

Oxera can understand why Ofcom is attracted by the merits of moving to using CPI. However, based on our assessment, our view is that there are superior options available for the appropriate treatment of inflation that adequately, or better, meet Ofcom's objectives.

In its consultation document, Ofcom states that, in the case of switching to CPI to calculate ALFs, it will use the Bank of England's estimate of the difference between the two rates—i.e. RPI–CPI, equal to 1.3%.[1] This is based on the assumption that the CPI rate of inflation will meet the Bank of England's inflation target of 2%, implying an RPI inflation rate of 3.3% for ALF calculations. However, while we address this question in section 4 below, it is not clear that a 'wedge' is required at all.

In this note we review Ofcom's approach, in the following stages.

[1] Ofcom (2014), 'Annual licence fees for 900 MHz and 1800MHz: methodology to derive a discount rate consistent with CPI inflation', Consultation, 17 April, p. 1.

- **How should CPI inflation be reflected in a discount rate?** Ofcom's approach applies a 'wedge' between RPI and CPI. However, such a wedge can only then be translated into a discount rate if the approach to defining the inflation wedge is consistent with Ofcom's approach to setting the discount rate more generally.

- **Under Ofcom's approach, what is a point estimate for the differential between RPI and CPI?** In response to the specific question addressed by the consultation, we compare options for a point estimate and conclude that, at this stage, 1.3% is a reasonable starting point for the analysis, but is at the top of the range, and it is more probable that the actual wedge over a 20-year period will be lower than 1.3%, ie. around 1.0-1.1%. It also appears likely that average CPI will be higher than 2%. Ofcom has not demonstrated that its approach results in an unbiased estimate for a 20-year period. An alternative approach of setting a fixed inflator of 2% should therefore be considered.

It is not clear (until Ofcom explains its approach to determining the discount rate) that the approach of applying a wedge will be effective in practice. In the example given in Table 1 of Ofcom's consultation, there is a time-inconsistency between the inflation stated in Mobile Call Termination (MCT) and the inflation used in the wedge. In that context, our analysis suggests:

The effect is material and needs proper consideration. Industry costs would be over higher £500m under Ofcom's approach to deriving the CPI-linked discount rate, than if it had recalculated its own example according to the alternative approach identified in its consultation.

There are a number of timing considerations in applying a discount rate from another context in determining the ALF. Ofcom's example of the using the 2011 MCT decision as the basis illustrates that there are a number of potential time-consistency problems between the level of the cost of capital for MCT, and the derivation of a discount rate for the ALF.

The more appropriate approach would be to apply a discount rate based on the current nominal cost of debt, deflated at CPI. Our previous report for Vodafone recommended a cost of debt, rather than the weighted average cost of capital (WACC). On the basis that a cost of debt would be the most appropriate choice of discount rate, the most practical approach to implementing the CPI adjustment would be to deflate the current nominal cost of debt at CPI.

Applying a spot market view of forward-looking implied market rates for inflation, by using current nominal debt yields, would take into account the market's view on inflation. These rates could then be deflated by an unbiased forecast for CPI. This would ensure a more comparable approach to the treatment of inflation between the choice of discount rate and the approach to setting the ALF more generally.

We also discuss below an alternative, and arguably even more simple and transparent, option of applying a fixed assumption for inflation, such as 2%, together with a nominal discount rate, which would further reduce the need for judgment within the assumptions applied in calculating the ALF.

2 Application of the wedge in the ALF calculation

This section considers Ofcom's proposed approach, of applying a CPI-RPI wedge to a real discount rate derived by reference to RPI. Ofcom's consultation

focuses on the level of that CPI–RPI wedge, and provides examples of how the wedge would be applied, drawing on the 2011 MCT WACC decision. The consultation states:[2]

> We have not taken any decisions yet on any of the proposals set out in the October 2013 consultation, including on the specific issues of: the choice of inflation index (CPI or RPI) to be used to calculate ALF: which discount rate to use; or whether to update other discount rate parameters (aside from the updates that relate specifically to the inflation assumptions). For the avoidance of doubt, this consultation does not cover these issues.

While it is understandable that Ofcom wishes to focus its consultation on one point, the difficult involved in applying a 'wedge' to an RPI-linked discount rate is demonstrated by Ofcom's example, which illustrates the complexities of applying the wedge as indicated. Some of these issues are as considered below.

- **Choice of nominal or real discount rate as the basis.** Ofcom's example shows the complexity of applying a real discount rate as the basis. It indicates that the choice of a nominal or real (RPI-linked rate) as the basis should make no difference, but its own example shows that this may make a difference, if the inflation assumed within the RPI-linked bond rates is different to the inflation assumed over the charge control period, which is the case in the 2011 MCT example.

- **Timing differences in inflation**. If Ofcom were to calculate the discount rate (before adjustment) using the same approach as applied in calculating the WACC for its regulatory reviews (such as the MCT example given in the consultation), there would potentially be a differential between the level of inflation in the discount rate and the level of inflation within the calculation of the wedge. Specifically, it may not be the case that the inflation used for a 3 year charge control would be appropriate for a 20 year ALF calculation.

- **Timing differences in the discount rate assumptions more generally**. Ofcom's example is based converting an RPI-based discount rate applied in a 3 year charge control to a CPI-based discount rate. In practice, it is not clear that it is appropriate to identify a discount rate calculated for the purposes of a 3 year charge control, and convert that to a rate to apply for the 20 year period relevant to the ALF.

Given the importance of the ALF, the scale of the impact on the market participants, and the difference in the relevant period, it would be better not to apply a wedge at all, but to derive a discount rate based on prevailing values for the nominal cost of debt, adjusted for CPI forecasts.

2.1 Ofcom's example of conversion into a CPI-based discount rate is not internally consistent

Ofcom's consultation begins by stating a proposed approach for a CPI-based discount rate (the 'first approach') and then an alternative approach which should produce the same result (the 'second approach'):[3]

> Our proposed approach for deriving the real discount rate would be to deflate the nominal discount rate by CPI inflation, using the formula ((1+ nominal discount rate)/(1+inflation rate))-1.

[2] Ofcom (2014), 'Annual licence fees for 900 MHz and 1800MHz: methodology to derive a discount rate consistent with CPI inflation', Consultation, 17 April, para. 1.4.

[3] Ofcom (2014), 'Annual licence fees for 900 MHz and 1800MHz: methodology to derive a discount rate consistent with CPI inflation', Consultation, 17 April, paras 4.1–4.2.

> This should produce the same result as starting from the real discount rate derived from nominal components deflated by RPI inflation expectations, then applying a RPI to CPI conversion factor. This RPI to CPI conversion factor would reflect the expected long run difference in RPI and CPI and is derived as (1+RPI)/(1+CPI).

In practice, in Ofcom's own example, these two calculations do have not the same result. Ofcom estimates the discount rate for ALF based on the anchor point of the MCT cost of capital (post-tax WACC). In applying the second approach, Ofcom converts the RPI-adjusted cost of capital of 4.2% into a CPI-adjusted cost of capital of 5.5%. However, if it had taken the first approach, of a nominal cost of capital deflated by CPI inflation, it would have found a significantly lower discount rate of 4.7% (6.7–2%).

This is a material difference in the context of the ALF. An extra 0.8% on the discount rate would be likely to increase costs for the industry by over £500m over the ALF period.

Whether the first or the second approach is more appropriate would depend on the source of the underlying discount rate and the extent to which that underlying discount rate was based on real, or nominal, market yields, and if so how derived, as well as the time-consistency between the implied inflation within that discount rate and the 20-year period for the ALF. This is discussed further in section 2.2 below.

Until Ofcom decides on the choice of discount rate, it is not possible to respond on the most appropriate choice of CPI conversion in that specific context. However, as discussed below, this can be most readily resolved through Ofcom ensuring that it is using a directly comparable discount rate—specifically, a current market rate for the cost of debt.

2.2 Ofcom should apply inflation consistently between the real cost of capital, and the ALF 'inflation'

The previous section highlighted that the impact of the alternative approaches for converting to a CPI-linked discount rate may have a material effect on the level of the ALF. The difference results from the use of two different inflation bases:

- within the Bank of England inflation forecasts, a long-term RPI inflation forecast of 3.3%;
- within the MCT WACC, an in-period RPI inflation estimate of 2.5%.

The way to avoid this inconsistency would be to ensure that a similar period is applied for the discount rate and for the inflation assumption. As highlighted in our original submission, the use of a discount rate based on 2011 market rates for a three-year period would not be consistent with the 'one-off' long-term impact of the ALF decisions.

The use of updated 2014 market rates for a three-year period (i.e. the 2014 MCT WACC) would reduce the distortion, but the differential between an appropriate short-term inflation assumption and the long-term inflation assumption could still be material. The approach to setting the WACC in a regulatory period tends to give more weight to a range of data, including real risk-free rates over time, rather than the current spot rate. This can be shown by the Business

Connectivity Market Review 2013 charge control determination, which applied a real risk-free rate of 1.3% when the actual risk-free rate was well below zero.[4]

Therefore, our view is that Ofcom's consultation is adding more unnecessary complications to the calculation of the discount rate for the ALF. Currently, Ofcom's stated approach includes five stages:

- choose the reference RPI-linked discount rate from another decision;
- update the RPI inflation assumption within that discount rate to reflect changes in market conditions;
- calculate the wedge between forecast RPI and CPI, on a like-for-like (time-consistent) basis;
- apply that wedge to the discount rate, to convert from an RPI-linked rate to a CPI-linked rate;
- make any other amendments (e.g. tax), to bring these onto a like-for-like basis.

This assumes that Ofcom does not also make amendments to the choice of discount rate to reflect the circumstances of the ALF, which would be likely to be appropriate, but which is not explicitly stated in the consultation.

Ofcom's approach is unnecessarily complex, and brings the risk of error. A simpler approach would be easier, more transparent, require require less judgment, and would also be more consistent with Ofcom's stated objectives of ensuring indifference between the ALF payments, and Ofcom's assessment of an equivalent upfront lump sum payment.

The best way to ensure time consistency in the context of ALF linked to CPI is to use a long-term market rate for the nominal cost of debt, deflated by CPI, or to have ALF linked to a simple nominal cost inflation rate, eg 2%, and to apply a nominal discount rate in calculating the level of ALF

3 Recommendations for a CPI-linked discount rate

In our January paper, we highlighted that the discount rate that is consistent with both corporate finance principles and the way in which Ofcom proposes to determine the ALF, would be the cost of debt.

In practice, therefore, the complexity in determining a wedge between RPI and CPI does not need to affect Ofcom's decision. If Ofcom approaches the ALF in a more consistent way, the discount rate can be set without a need to consider the relevance of RPI, CPI and different levels of RPI over different periods.

In practice, nominal market yields include the current market view on implied RPI. This will be a better and more consistent approach to defining the wedge than a point estimate from the Bank of England, and will ensure that Ofcom meets its objective of ensuring indifference between the ALF and an upfront payment.

Oxera would recommend, consistent with our original report, that:

[4] Risk-free rates in February and March 2013, when Ofcom came to its Decision, were between -1% and -1.3% for ten-year government bonds, and between -2% and -2.3% for five-year government bonds.

- **the right discount rate is the cost of debt**. The cost of debt is observable in the market, and is appropriate for a fixed series of payments such as the ALF;
- **the right approach for ALF is to give the greatest weight to spot market yields, as the decision is 'one-off' in nature**. If Ofcom is to set a fixed rate for 20 years, this is a different basis to the approaches taken in MCT or its regulation of BT, which involve using longer-term averages, and are therefore not directly comparable. The spot market rate should be used, as otherwise the mobile operators will not be indifferent between the ALF and an upfront payment. This would remain the case even if Ofcom were to use the WACC or the risk-free rate in its Decision as the appropriate discount rate;
- **in that context, a nominal market yield, can be applied, discounted by long-term CPI forecasts of 2%**. If Ofcom accepts the approach of using a spot market rate, the need for an RPI to CPI conversion falls away. Ofcom can use direct market evidence on the implied inflation by using nominal market yields deflated by 2%.

Oxera's January report proposed an RPI-linked cost of debt rate, based on a post-tax, nominal discount rate of 3.4% for the telecoms industry, or a lower rate for Vodafone. Applying the CPI-linked discount rate to the industry cost of debt, and assuming that 2% is an unbiased forecast for CPI, this equates to a CPI-linked cost of debt of 1.4% (post-tax, real).[5] The equivalent figure for Vodafone, based on our January report, would be a cost of debt of 0.5% (post-tax, real).

Alternatively, and even more simply, a nominal industry discount rate of 3.4% (post-tax) could be applied, with a fixed forecast of inflation of 2%. The equivalent rate for Vodafone would be 2.5% (post-tax, nominal).

4 Estimating the difference between RPI and CPI

There are four key differences between RPI and CPI that result the wedge between the two metrics ('the wedge').

- **Formula effect**—RPI and CPI are calculated using somewhat different formulas. Most importantly, RPI calculations involve taking an arithmetic mean of relevant prices, while CPI uses a geometric mean of relevant prices. This effect will always have a positive effect on RPI, relative to CPI, although this could be offset by the factors below.
- **Housing effect**—RPI includes changes in mortgage costs, council tax and other housing costs, while CPI does not.
- **Weighting effect**—purchases included in CPI and RPI are weighted differently. This is largely due to the difference in populations used in the calculation of each index: RPI excludes expenditures by households in the top 4%, some pensioners, residents of communal establishments, and foreign visitors.[6]

[5] The actual cost of debt should be updated to reflect the point in time at which Ofcom's decision would be implemented. The post-tax, real, cost of debt is based upon the post-tax, nominal, cost of debt, adjusted for 2% inflation

[6] Office for National Statistics (2011), 'Consumer Price Indices – A brief guide', August, p. 14.

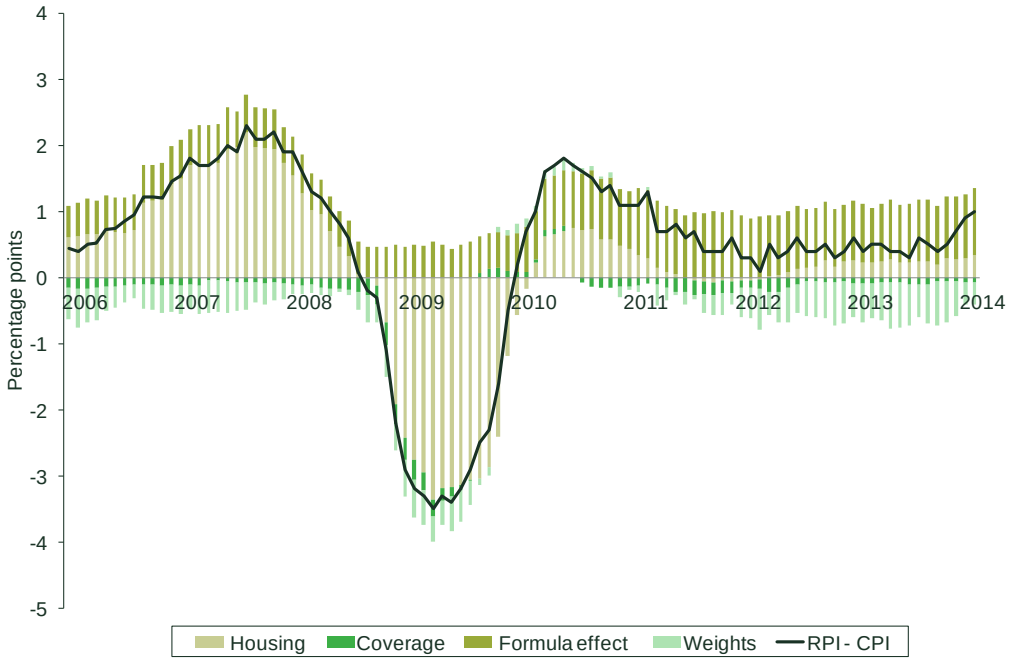
- **Coverage effect**—there are some other differences in the items that are included in RPI and CPI. For example, charges for financial services feature in CPI, but not in RPI.[7]

4.1 Historical differences between RPI and CPI

In assessing historical data on RPI and CPI, it is important to note that the formula used to compute RPI was changed in 2010.[8] This resulted in a larger formula effect between RPI and CPI: prior to 2010, this effect was about 0.5%[9] and since then it has been around 0.9%.[10] Therefore, any measurement of historical differentials needs to take into account this change in the formula effect when comparing pre-2010 data to either forecast values or post-2010 realisations of the wedge.

The remaining effects may fluctuate significantly in how they affect the wedge, and are much more difficult to forecast accurately. While RPI has typically been larger than CPI, there have been instances when CPI has been higher than RPI, as seen in Figure 4.1.

Figure 4.1 Difference between RPI and CPI (including components) (%)



Source: Office for National Statistics data, Oxera analysis.

The past data on the wedge includes the financial crisis, during which housing costs dropped dramatically, outpacing the changes in wages and other prices. The past observations of the wedge may therefore not be a particularly good indicator of future values, to the extent that these past fluctuations in prices and the economy as a whole may not be repeated in the future.

[7] Office for National Statistics (2011), 'Consumer Price Indices – A brief guide', August, p. 19.

[8] In particular, the method used for sampling clothing purchases for RPI calculations was altered. See Office for National Statistics (2011), 'CPI and RPI: increased impact of the formula effect in 2010', Information note, pp. 2–3.

[9] Miller, R. (2011), 'The long-run difference between RPI and CPI inflation', Office for Budget Responsibility, Working Paper No. 2, November, p. 7.

[10] Bank of England (2014), 'Inflation Report – Section 4 Costs and Prices', February, p. 34. Oxera has also confirmed this using data from the Office for National Statistics.

This is particularly important for the RPI–CPI wedge, as this measure critically depends on prices in a few sectors (e.g. housing and financial services) relative to the economy as a whole, and these few sectors may not have a trajectory that is as sharp (or indeed much sharper than) the macroeconomic business cycle.

Excluding the time period when the housing effect was negative (September 2008–February 2010), and uprating the remaining pre-2010 observations by 0.4% to account for the change in formula effect, gives a mean wedge size of about 1.1% over a six-year time period (January 2006–August 2008 and March 2010–February 2014). Over the longer term, and including the period when the housing effect was negative, the average wedge in 1989–2011 was also about 1.1%, when uprated by 0.4% for the change in formula effect.[11]

4.2 Long-term estimates of the RPI–CPI wedge

There are several long-term estimates of the RPI–CPI wedge available, given data provided by independent bodies. Comparing the forecasts below to past values of the wedge provides a general outlook that the RPI–CPI wedge is expected to be slightly greater in the future than in the past, although generally of a similar magnitude.

4.2.1 Bank of England

As mentioned above, the Bank of England projects a long-run wedge of 1.3% between RPI and CPI. This wedge is the sum of long-run estimates for the formula effect (0.9%), the housing effect (0.6%) and the effect of other differences between the two measures (-0.2%).[12]

4.2.2 Office for Budget Responsibility

The Office for Budget Responsibility (OBR) commissioned a study into the long-run difference between RPI and CPI, which concluded in 2011. This study found that the wedge is likely to be in the range of 1.3–1.5%, and that the range is driven by differing assumptions about the size of the formula effect.[13] The study assumes that the housing effect will be 0.5%, and that the remaining effects will effectively be zero in the long run.[14]

Additionally, the OBR notes that, if mortgage payments grow proportionally to average earnings, the size of the wedge would be expected to be around 1.2%.[15] That said, the OBR posits that mortgage payments are likely to outpace average earnings, thereby increasing the size of the wedge,[16] although this outlook may change in the future.

[11] The average wedge for 1989–2011 is reported as 'around 0.7%'; 0.4%, pro-rated for the proportion of the time period that was prior to the increased formula effect (i.e. 1989–2009), equals 0.36%. The sum of these two figures is around 1.1%. The actual average wedge for 1989–2011 is taken from Miller, R. (2011), 'The long-run difference between RPI and CPI inflation', Office for Budget Responsibility, Working Paper No. 2, November, p. 2.

[12] Bank of England (2014), 'Inflation Report – Section 4 Costs and Prices', February, pp. 34–5.

[13] Miller, R. (2011), 'The long-run difference between RPI and CPI inflation', Office for Budget Responsibility, Working Paper No. 2, November, p. 31.

[14] Miller, R. (2011), 'The long-run difference between RPI and CPI inflation', Office for Budget Responsibility, Working Paper No. 2, November, p. 31.

[15] Office for Budget Responsibility (2011), 'Economic and fiscal outlook', Cm 8036, March, p. 70.

[16] Office for Budget Responsibility (2011), 'Economic and fiscal outlook', Cm 8036, March, p. 70.

4.2.3 Oxford Economics

Oxford Economics provides forecasts for RPI and CPI via Datastream—Oxera has accessed these and calculated the wedge implied by the forecasts. While, in the short term, this wedge is 0.5–2.1%, from 2021 onwards it stabilises at around 1.2%.

4.3 Short-term estimates of the RPI–CPI wedge

HM Treasury also reports inflation forecasts provided by independent forecasting firms, and publishes them for a given year and for the next year. Oxera has used data from the April 2014 publication, which includes forecasts from 28 organisations.[17] The average of these forecasts implied a 0.9% wedge for 2014, and a wedge of 1.1% for 2015. For 2014, the lowest forecast wedge was 0.3% and the highest was 1.5%; for 2015, these numbers were 0.4% and 1.5% respectively.

These are short-term forecasts—they may be a poor predictor of the long-term wedge, but are indicative that, while there may be an argument that the wedge will trend towards 1.3%, it is currently lower, and may remain lower for some time.

5 Uncertainty over the forecasts of RPI and CPI

It is important to note that the estimates given above are point estimates, and do not take into account the possible path that the wedge may take over time. Additionally, the estimates do not provide any distribution for the expected long-run wedge; potentially, such a distribution may be very heavily skewed. It is unclear whether it is more, less or equally likely that the wedge will be greater than or less than 1.3%. Past evidence, however, shows that the wedge has generally been below 1.3%.

Indeed, there may be asymmetry in the risk of the wedge deviating from the long-run target. This target is dependent on a stable growth rate—however, this growth may disproportionately affect sectors that are covered by only one of the measures. Moreover, a recession, which may occur in the next 20 years, may again disproportionately affect sectors that are not covered by both metrics; it does not seem unreasonable to suppose that a future recession may affect housing costs disproportionately, as was the case during the most recent recession. Similarly, increased financial regulations and oversight may result in higher costs for financial services, decreasing the wedge, as this would increase CPI but would not affect RPI.

Table 5.1 illustrates how this has affected the size of the wedge in practice.

[17] Some organisations do not provide RPI forecasts, or forecasts for 2015. HM Treasury (2014), 'Forecasts for the UK economy: a comparison of independent forecasts', No. 324, April, Table 2 and Table 5, pp. 5 and 8.

Table 5.1 RPI–CPI wedge over different sample periods

Sample period start	Sample period end	Wedge
2011	2014	0.6%
2009	2014	0.1%*
2006	2014	0.6%*
1989	2011	1.1%*

Note: * Pre-2010 observations have been uprated by 0.4% to account for the change in sampling which resulted in a change in the size of the formula effect beginning in January 2010.

Source: Oxera analysis, Office for National Statistics, and Miller, R. (2011), 'The long-run difference between RPI and CPI inflation', Office for Budget Responsibility, Working Paper No. 2, November, p. 2.

Similarly, the recent evidence all points to actual CPI, on average, being more likely to be high relative to the target of 2%. Whilst 2% may be the most likely case, and is still the target, actual CPI has tended to overshoot (be higher than) 2%, rather than undershoot. If this continues, then setting a CPI-linked discount rate based on a CPI forecast of 2% will potentially result in a higher cost than intended, and will not achieve Ofcom's objective of indifference.

The analysis in these sections all illustrates that the art of forecasting RPI and CPI is complex. The least complex approach would be that proposed in section 3—to take the nominal cost of debt and deflate at the CPI forecasts. However, there is no economic evidence that 2% is an unbiased 20-year forecast.

Given the structure proposed for the ALF, a plausible alternative would be to lock in the 2% inflation target, as a nominal, fixed amount, and to apply a nominal discount rate to those fixed payments. This would achieve the intention of increasing payments with a likely measure of inflation over the 20-year period, without having to rely on an uncertain and, potentially, biased, point estimate for the forecast at this stage.

5.1 Conclusion: Ofcom's proposed wedge

If Ofcom chooses to apply a wedge, the level of 1.3% proposed by Ofcom is very similar to other long-term estimates provided by the OBR and imputed from forecasts from Oxford Economics.

In summary, the Bank of England estimate may be an accurate anchor point for the long-term wedge. However:

- the balance of risks over a 20-year period appears to be to that 1.3% may overestimate the longer-term average, based on recent evidence, longer-term evidence, and actual measures of key effects relative to those assumed in the Bank of England/OBR forecasts. None of the sources of outturn evidence that we considered were as high as the level of the economic forecasts;
- the assumption of a 1.3% differential between RPI and CPI is significantly above the current level—assuming a trajectory towards a long-term average could imply that the average will be more likely to be around 0.1%-0.2% lower than the long-term target;
- the forecast includes a significant housing wedge, which may be justified in the near term based on current economic assessment, but may be less likely to prevail over the longer-term;

- for a 20-year period, these points all suggest that a point estimate of average inflation should include an adjustment to the size of the wedge, towards 1.0–1.1%, which is more consistent with actual observed data on the wedge;
- similarly, if Ofcom were to accept the proposed approach of using a forecast of CPI, the 2% target is likely to be below the medium-term average, to the extent that the previous experience of how inflation tends to deviate from target, and a similar adjustment may therefore be appropriate to increase the relevant CPI forecast.

More generally, Ofcom could avoid the complexity and inherent arbitrariness of such through the use of a fixed forecast for CPI of 2%, thereby being consistent with the best estimate of CPI without needing to come to a forecast of how CPI may vary from this target level.