What is the right cost of debt for an ALF?

Note prepared for Vodafone

26 September 2014

Executive summary

Vodafone has asked Oxera to review Ofcom's updated proposals for annual licence fee (ALF) payments and, in particular, the methodology by which Ofcom has arrived at an annual payment from the equivalent lump sum calculation.

In deriving the ALF from an equivalent lump sum, Ofcom has to make a number of assumptions, many of which require economic judgement. For example, Ofcom has to assess the best approach to ensure tax equivalence between the lump sum and the ALF, and the expected level of CPI over the period.

However, Oxera's review of Ofcom's assumptions indicates that the most material area of economic judgement applied by Ofcom is in deriving the appropriate form of discount rate to apply in calculating the ALF. A higher discount rate means a higher ALF, as the amount to be paid in the future needs to be higher to have equivalent economic value to a lump sum today (or, in the language used by Ofcom, to ensure indifference).

In its detailed analysis in Annex 10 to its consultation, Ofcom has provided two options for the primary source of evidence to be applied in coming to a discount rate, and recognises that there is a material difference between the two. The options are as follows.

- **Option A: regulatory precedent (indicative rate 2.6%)**. Under Option A, Ofcom would calculate the discount rate for the ALF by shadowing the approach taken to determine a comparable debt rate to those used in its regulation of Mobile Call Termination (MCT) and other charge controls.
- **Option B: market interest yields (indicative rate 1.6%)**. Under Option B, Ofcom would apply a rate based on the rates currently observed in the market (or a short-term average), which would be equivalent to the rate at which an MNO would finance a lump sum today.

Ofcom provides arguments for both options. It then concludes that Option A is the more appropriate, and uses a rate based on this option (2.6%). We review this assessment below.

Overall, our analysis indicates that, of the two options, Option B is more consistent with Ofcom's objectives in setting the ALF. It is the rate which is consistent with Ofcom's stated approach of deriving a lump sum and ensuring indifference between the payment of a lump sum and the equivalent ALF payment.

By contrast, the arguments in support of Option A are more relevant to the regulatory context of charge controls. These arguments are relevant to a scenario where prices and the assumed WACC are reset regularly, and where a longer-term average may therefore be more appropriate for providing a stable basis for regulated prices. They are also relevant to assessing the cost of equity, which is generally based on very long-term averages, rather than the cost of debt, which tends to be based on market data.

In summary, our assessment of Ofcom's approach is that it fails to give weight to the arguments around the use of a market cost of debt, which are more relevant to the derivation of an ALF than the more complex approaches used in a charge control environment. It will therefore create distortions between the competitive positions of a lump-sum payer (such as BT) and an ALF payer.

Our analysis concludes that, at a minimum, greater weight should be given to current market yields—Ofcom's Option B. However, we also note below that the cost of debt applied by Ofcom is high and does not represent a conservative assumption, as it is based on a 20-year bond yield. The average life of an ALF is closer to ten years.

This is because, under the ALF arrangement, the lump sum is, in effect, repaid ('amortised') over the life of the ALF, rather than at the end of the 20-year period. Correcting for this reduces the appropriate discount rate to **around 1.0% (post-tax, real)** relative to Ofcom's calculation of 1.6% (post-tax, real).

1 Background

This section considers the process by which Ofcom has arrived at its further consultation on the ALF, and the specific issues within that process that are subject to review in this note.

1.1 Determining the proposed ALF

Ofcom has issued a series of consultations, culminating in July with its further consultation on ALF costs.[1] Based on this consultation process, Ofcom proposes to calculate the ALF using a discount rate of **2.6%, post-tax, relative to CPI inflation**. This is equivalent to a discount rate of around 5.8% on a pre-tax, nominal basis.

The relevant consultations are:

- Ofcom (2013), 'Annual licence fees for 900 MHz and 1800MHz spectrum: Consultation', October ('Ofcom's initial consultation');

[1] Ofcom (2014), 'Annual licence fees for 900 MHz and 1800 MHz spectrum. Annex 10', 1 August.

- Ofcom (2014), 'Annual licence fees for 900 MHz and 1800MHz: methodology to derive a discount rate consistent with CPI inflation', April ('Ofcom's CPI consultation');
- Ofcom (2014), 'Annual licence fees for 900 MHz and 1800 MHz spectrum, Further consultation', August ('Ofcom's further consultation').

1.2 Scope of Oxera's review

In considering Ofcom's approach to calculating the ALF, we consider below the key assumptions made by Ofcom in coming to its proposed cost of debt.

In particular, we focus on Ofcom's consultation on the choice of the appropriate benchmark when setting the discount rate. Ofcom considers two options—the MCT rate (Option A), and the current cost of debt (Option B). Ofcom chooses the MCT rate, but acknowledges that there is a significant difference between the two, with the cost of debt under Option A being 1% higher than that under Option B.

We also note in section 4 below that 1.6% represents a relatively high assumption for the current cost of debt (post-tax, real), and therefore that this further increases the potential for error by choosing Option A—i.e. 2.6%.

This relates to Ofcom's choice of bond duration. Ofcom proposes that the cost of debt should be based on a bond of around 20 years, which is equivalent to borrowing all of the lump sum using 20-year debt. As highlighted in our initial report,[2] this is not the pattern of payment to Ofcom under the ALF. Hence the ALF payments represent the repayment of a loan with an *average* duration signficantly less than a single 20 year bond..

In this note we explain why these assumptions, but in particular the choice of benchmark rate, result in a cost of debt that will be materially above that which would achieve Ofcom's objective of indifference for the owner of spectrum between the ALF and the equivalent lump sum value.

We note that Ofcom has argued that its approach is 'conservative'. In practice, in both in choosing Option A over Option B, and in how it defined the level of the cost of debt for Option B, Ofcom appears to have chosen a value close to the top end of what could be justified, and therefore the approaches taken here do not appear to be consistent with the stated intention of a conservative approach.

More generally, although our analysis focuses on these areas, we would also highlight that Ofcom's approach more generally does not appear to be conservative, for example in the choice of RPI to CPI adjustment discussed in our previous report. In coming to a final decision, we expect that Ofcom will need to consider an appropriate balance of caution between setting the discount rate too high and setting it too low, and the level of risk that could arise in either case.

2 What is the right approach to determining the discount rate?

2.1 Ofcom's approach

In coming to a view about the appropriate benchmark rate, Ofcom considered the following two sources of evidence.

[2] Oxera (2014), 'What is the right discount rate for an ALF? An alternative approach', January.

- **Regulatory precedent**—and, in particular, Ofcom's approach to the cost of debt in MCT and other charge controls ('Option A').

- **Market interest rates** ('Option B').

Ofcom states:

> In principle, there are two ways of deriving a debt rate. The first is to consider the spread of the debt over nominal UK government gilts, then add this to our estimate of the risk-free rate. This is the approach we typically take in calculating the cost of debt in estimating the WACC. The second would be to just take the current yield to maturity (YTM) of the debt, which reflects the expected rate of return on the debt if it was bought today and held to maturity. This reflects actual market data on the return investors expect from holding this asset. We show the results of both approaches in turn, and then assess which we consider to be the more appropriate approach[3]

As discussed further below, Ofcom proposes to use the approach based on regulatory precedent. In conclusion, Ofcom states:

> Option A is also the approach we generally take in calculating the cost of debt for the WACC for a similar reason of consistency through time, and so there is also a potential benefit from regulatory consistency to consider. Moreover, this will ensure consistency between different stakeholders and different market interventions. We also note that the Competition Commission took a similar approach to deriving the risk-free rate in their cost of equity calculation in the recent NIE determination, where it used a risk-free rate of 1-1.5%.[4]

In this note we have considered these two options further, consistent with Ofcom's approach. Overall, we consider that the arguments are not strongly supportive of the precedent approach. We discuss below that the Competition Commission precedent in respect of NIE actually employed a different methodology to determining the cost of debt to that proposed by Ofcom.

We do not consider that Ofcom has to choose a cost of debt which gives weight to only one of the two approaches, if it considers that both have merit. However, if it is to use one option by preference, then the arguments for market yields appear to be more consistent with the wider framework of what the ALF policy objective is trying achieve and under which the ALF is being calculated.

2.2 Oxera's assessment of Ofcom's two options

We discuss below the differences between the circumstances of the regulatory precedent and the situation around the ALF. Our analysis suggests that, in setting an ALF, it would be appropriate to give more weight to the current market yields (Option B) than the regulatory precedent (Option A). We consider three points below which support this approach:

- **the nature of the ALF decision (section 2.3)** and the difference between the regulatory considerations in setting the ALF (which are designed to promote equivalence between the ALF and a lump sum) and those in setting price controls, such as MCT;

- **developments in regulatory precedent in setting the cost of debt (section 2.4)**, which imply that the use of a long-term 'benchmark' risk-free

[3] Ofcom's further consultation, para. A10.9.

[4] Ofcom's further consultation, para. A10.30. See Competition Commission (2014), 'Northern Ireland Electricity Limited price determination. A reference under Article 15 of the Electricity (Northern Ireland) Order 1992', 26 March.

rate is, in any case, no longer the standard approach applied for setting the cost of debt (although it may be more appropriate for the cost of equity);

- **actual market data in recent years (section 2.3)**, which shows that the current market prices have now been embedded for many years and that there is no clear rationale for giving limited weight to current yields.

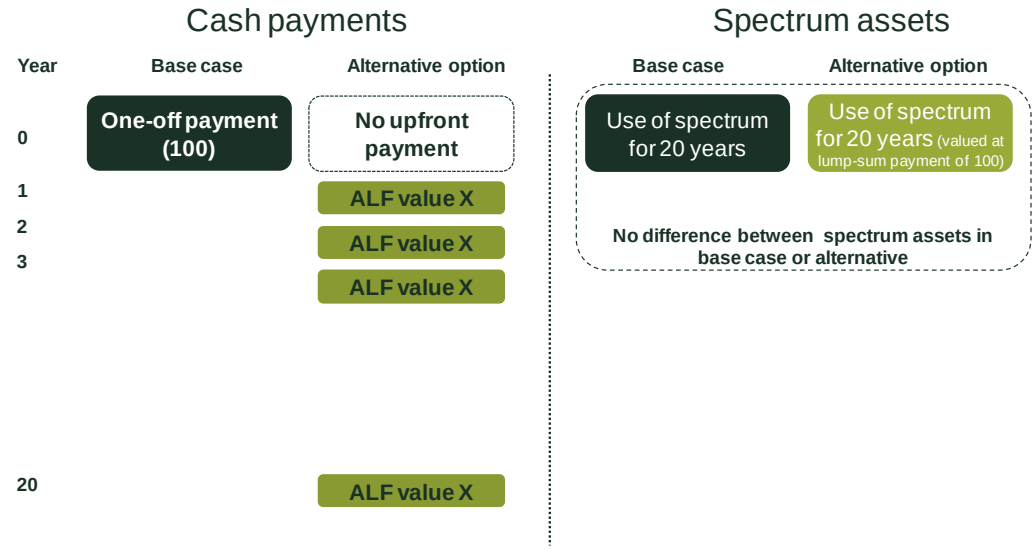
2.3 Nature of the ALF decision

Ofcom's approach to the ALF is to consider the appropriate level of ALF that would make investors 'indifferent' between the ALF and the notional lump-sum spectrum purchase that it is using as a benchmark rate.

On this basis, and given that the ALF is in the nature of a fixed liability, Ofcom proposes to discount the ALF at the equivalent discount rate that would be applied to a comparable financial liability—i.e. the cost of debt.

However, Ofcom then takes an approach to assessing the level of the cost of debt which is arguably no longer consistent with that objective. An analysis of indifference would conclude that, to be indifferent, the notional MNO would need to be indifferent between borrowing fixed-rate debt *today* to purchase the spectrum through a lump sum, and purchasing the spectrum through the ALF. Figure 2.1 below, from Oxera's original submission,[5] highlights the simple decision that a notional MNO would have in choosing between an upfront investment and an ALF.

Figure 2.1 MNO's decision—ALF or upfront fee?



Source: Oxera analysis.

Given that this is a 'one-off' decision, which will persist for 20 years from the date of the decision, the only way that indifference will be realised in practice is if that cost of debt reflects the actual cost of debt that would be incurred by incurring a fixed-rate liability at the same time.

Ofcom appears to recognise this in annex 10 to its consultation, which provides its analysis of the appropriate discount rate. However it calls the approach of using the current cost of debt 'Option B', and separately also considers an

[5] Oxera (2014), 'What is the right discount rate for an ALF? An alternative approach', 17 January.

additional option ('Option A') which involves taking a regulatory approach to the cost of debt, and is more comparable with Ofcom's approach in MCT. Ofcom then concludes that Option A is more appropriate. It quotes the following two main arguments.

- **Regulatory precedent**. As discussed above, Ofcom states:

  > Option A is also the approach we generally take in calculating the cost of debt for the WACC for a similar reason of consistency through time, and so there is also a potential benefit from regulatory consistency to consider. Moreover, this will ensure consistency between different stakeholders and different market interventions.[6]

- **Unreliability of current market data**. Ofcom also discounts current yields on the basis of unreliability relative to longer-term trends. It states:

  > We may therefore be more interested in the long-term equilibrium market rate as reflected in Option A, which is likely to be less affected by short-term distortions.[7]

These arguments have been extensively used by regulators, including Ofcom, in coming to a view on the cost of capital (and, in particular, the cost of equity) for price controls. It is less clear that they are relevant for the ALF decision illustrated in Figure 2.1 above.

2.4 Regulatory precedent

In this section we consider the appropriate role of regulatory precedent, including why such precedent tends to give weight to longer-term averages, and why this may not be relevant in the case of the ALF. We also provide examples which illustrate that the approach proposed by Ofcom is not consistent with much of the wider precedent on the choice of a cost of debt, including in the Competition Commission's NIE determination.

2.4.1 The aim of the approach in the regulatory precedent—providing a 'fair bet' over time

We discuss below that the regulatory precedent is arguably no longer supportive of the 'long-term' approach to determining the cost of debt. More fundamentally, it is at odds with Ofcom's aims in setting the ALF. As Ofcom itself acknowledges, charge control decisions are different to the ALF decision, as they are reset every three years:

> We are therefore setting these fees, including the discount rate, for an extended period of time. This makes potential short-term distortions more serious, since there are fewer prospects for these being removed in further reviews than in the case of setting WACC for periodic market reviews.[8]

However, this argument can also strongly support the use of current yields for the ALF. The point of using longer-term trends in regulatory precedent is partly around the assumption that the rate can then be reset over time, so that average rates will be consistent with average yields over time. If a consistent approach is taken, this will represent a 'fair bet', as investors will get a lower return when rates are rising and a higher return when rates are falling. This is illustrated in Figure 2.2, which shows that, over recent years, when yields have been

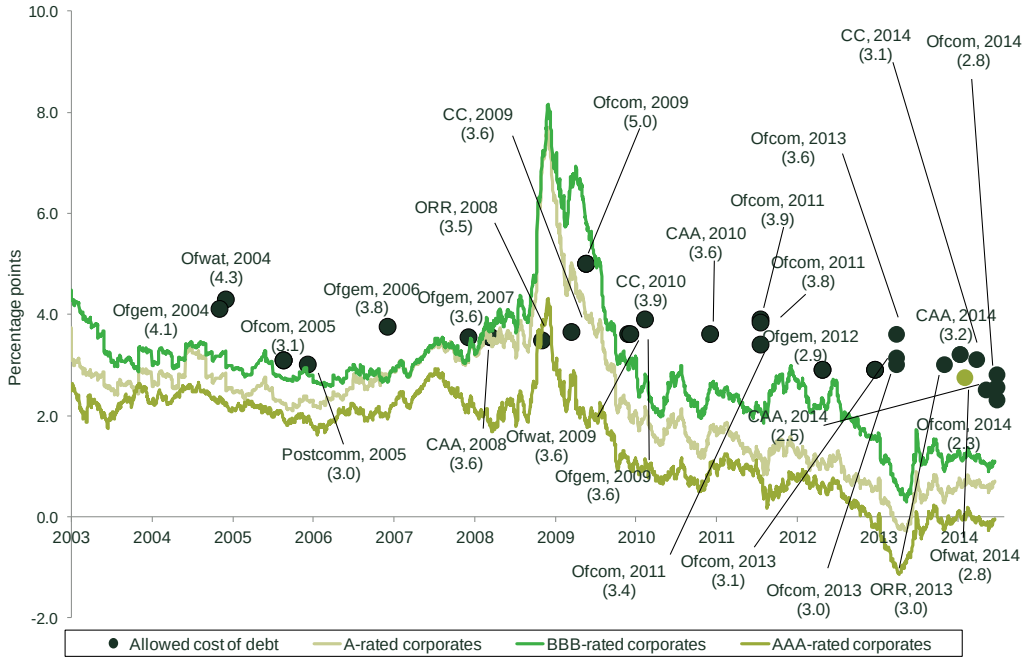
[6] Ofcom's further consultation, para. A10.30.

[7] Ofcom's further consultation, para. A10.29.

[8] Ofcom's further consultation, para. A10.29.

declining, the assumed cost of debt in regulatory decisions has tended to be higher than market yields.

Figure 2.2 Evolution of real yields on corporate bonds (%)



Note: CC, Competition Commission; ORR, Office of Rail Regulation; CAA, Civil Aviation Authority. The green dot denotes initial proposals, not final decisions. In determinations where the regulator sets a nominal rate of return (e.g. Ofcom), a real risk-free rate has been estimated using inflation assumptions reported by the regulator.

Source: Various regulatory documents, Datastream, and Oxera analysis.

In addition, this use of longer-term averages will generally take account of 'embedded debt', which means giving more weight to an average of past yields and expected future yields. The cost of debt allowance used by many regulators, including the risk-free rate, is designed to ensure that revenues from asset investments cover the average cost (or, at least, the expected average cost) of funding those investments over the asset lives.

Neither of these arguments is obviously relevant to the ALF decision. In the context of the ALF, the only 'fair bet' is to set the cost of debt at current rates—any other rate will embed an expected loss (or, theoretically, a gain) for the companies. Therefore, any other approach would not represent indifference between the ALF and the equivalent lump sum.

In illustrating this, it is instructive to consider the approach that would be most consistent with the indifference principle, which would be to give the MNOs the option either to pay a lump sum or to pay the ALF proposed by Ofcom. In the case of Option A, it is apparent from Ofcom's own analysis that the companies would not be indifferent—indeed, they would make significant value gains from the lump-sum approach (funded by debt at a rate materially below 2.6%).

If Ofcom were to set the ALF using Option A, it would therefore be moving away from this indifference principle.

Only the companies can resolve the uncertainty over market rates under the ALF framework

The second argument provided by Ofcom is based on the assumption that it is 'better' to use a longer-term average to allow for uncertainty around current market rates.

Our analysis below suggests that current rates are not actually subject to major uncertainty in the short to medium term. However, in any case, this argument is based on the premise that using a longer-term rate would resolve this uncertainty. In the case of the ALF, it does the opposite, and fixes the rate for 20 years at a level that cannot be matched by the companies. The use of longer-term average yields (where these differ from current market yields) may be appropriate when the regulator is seeking to achieve longer-term price stability, and has the ability to resolve any persistent short-term differentials between its predictions and actual market yields through regular regulatory reviews.

In the case of the ALF, the regulator has committed to a long-term stable discount rate. It is not feasible to correct for any differential embedded today, and the only way to give investors the opportunity to resolve this risk is to set rates based on current yields, which investors could, in theory, match through their financing approach for an equivalent lump sum.

2.4.2 Recent regulatory precedent in setting the cost of debt

In this section we consider Ofcom's argument for its use of 2.6%, and specifically the case that 2.6% is consistent with the use of longer-term rates by other regulators, including the Competition Commission. We agree with Ofcom that there is an argument for continuing to give weight to longer-term yields when making assumptions for the WACC or the discount rate to be used in regulatory charge control decisions. However, there are two key differences between the ALF decision and that type of precedent:

- first, the ALF is a **one-off decision** (discussed in the previous section);
- second, the ALF decision relates to the **cost of debt**, not the cost of equity.

In its consultation, Ofcom makes specific reference to the Competition Commission decision on NIE.[9] It states:

> We also note that the Competition Commission took a similar approach to deriving the risk-free rate in their cost of equity calculation in the recent NIE determination, where it used a risk-free rate of 1-1.5%[10]

While the Competition Commission did use a longer-term average in relation to the risk free rate used for deriving the cost of equity, it did not use a longer-term average for the cost of debt. This may appear inconsistent, but reflects the different contexts when deriving a cost of equity and a cost of debt.

- The **cost of equity cannot be directly observed, and its assessment draws on long-term yields**. The estimation of the cost of equity is based on theoretical models, generally the capital asset pricing model (CAPM). Such models approximate investor behaviour and create a model for the level of return required by equity investors in particular businesses. While there are a

[9] Competition Commission (2014), 'Northern Ireland Electricity Limited price determination. A reference under Article 15 of the Electricity (Northern Ireland) Order 1992'.

[10] Ofcom's further consultation, para. A10.30.

variety of such models, they all have key assumptions in common with the CAPM—i.e. that the level of (average) return will increase with the level of risk taken by investors, and that this will represent a premium to the return available on government bonds.

In the context of the CAPM, this is estimated through the use of a total market return, relative to the risk-free rate. The derivation of these parameters is complex. However, the most common approach to estimating this differential between the total market return and the risk-free rate is by using long-term data. A common source of such data is the tables of long-term returns prepared annually by Dimson, Marsh and Staunton (DMS).[11] There are complex theoretical questions about how to balance the long-term yields that have persisted over most of this period with the potential that current investors may have lower expectations in a low interest rate environment. Given the uncertainty over the 'right' assumption, some bodies, including the Competition Commission, have tended to give more weight to longer-term averages. Another option is to reduce the risk-free rate below Ofcom's levels, closer to market yields, and then increase the equity market risk premium, which would be consistent with the approach taken by the CAA.[12]

- The **current cost of debt can be directly observed, and regulators no longer operate a strict 'risk-free rate + observed debt premium = assumed cost of debt rule'**. The consequence of the long-term approach to the cost of equity is that the regulator may assume a risk-free rate that is different from that observable in the market. Applying a debt premium to such a risk-free rate will therefore result in a cost of debt which is also different to that in the market. This is the effect observed in the analysis in Ofcom's further consultation, and is the reason for the 1% differential between Option A and Option B. In much of the precedent, the regulators have increasingly recognised that the setting of the cost of debt therefore needs to give more weight to the observed levels of the cost of debt, given that financing is not, in reality, over a notional long-term horizon, but tends to be focused around 10–20 years. This is the approach taken by the Competition Commission in its NIE decision. The Competition Commission explicitly did not use the same risk-free rate in coming to a view on the cost of debt, but instead observed actual yields on NIE's bonds.

This is illustrated in Table 2.1, which compares the approach taken to the risk-free rate and cost of debt by regulators, including the Competition Commission, in recent decisions.

[11] The latest DMS publication is Dimson, E., Marsh, P. and Staunton, M. (2014), 'Credit Suisse Global Investment Returns Yearbook 2014'.

[12] For example, this is summarised in Figure 5.1 of Civil Aviation Authority (2013), 'Estimating the cost of capital: a technical appendix to the CAA's Final Proposal for economic regulation of Heathrow and Gatwick after April 2014'.

Table 2.1 Recent regulatory determinations and consultations: financing costs

Regulator	Risk-free rate	Cost of debt (pre-tax level and methodology)
Competition Commission (NIE)	Based on long-term averages	Based on observed NIE debt and forecast issue costs
Ofgem (RIIO)	Based on long-term averages	Actual cost of debt based on ten-year trailing yields for actual financing costs
Ofwat (PR14)	Based on long-term averages	Based on 75% embedded debt and 25% new debt
ORR (PR13)	Based on long-term averages	Based on comparator bonds (e.g. HS1)

Note: All levels given are pre-tax, real, and thus around 0.75–1.25% higher than the equivalent post-tax rates.

Source: Competition Commission (2014), 'Northern Ireland Electricity Limited price determination. A reference under Article 15 of the Electricity (Northern Ireland) Order 1992'; Ofgem (2012), 'RIIO-GD1: Final Proposals Finance and uncertainty supporting document'; Ofwat (2014), 'Setting price controls for 2015-20 – risk and reward guidance'; ORR (2013), 'Draft determination of Network Rail's outputs and funding for 2014-19'.

More generally, the assumptions on the cost of debt have fallen faster than the risk-free rate, although there has not been a comparable fall in the debt premium.

Overall, the case made in Ofcom's further consultation that UK regulatory precedent supports using the spread approach (Option A) appears to rely largely on Ofcom's own approach to determining the cost of debt, in a market where gearing is generally lower and the choice of the cost of debt has a smaller impact on the WACC. The other major UK regulators appear to take approaches that read across less clearly to Option A, as applied by Ofcom.

2.5 Unreliability of current yields

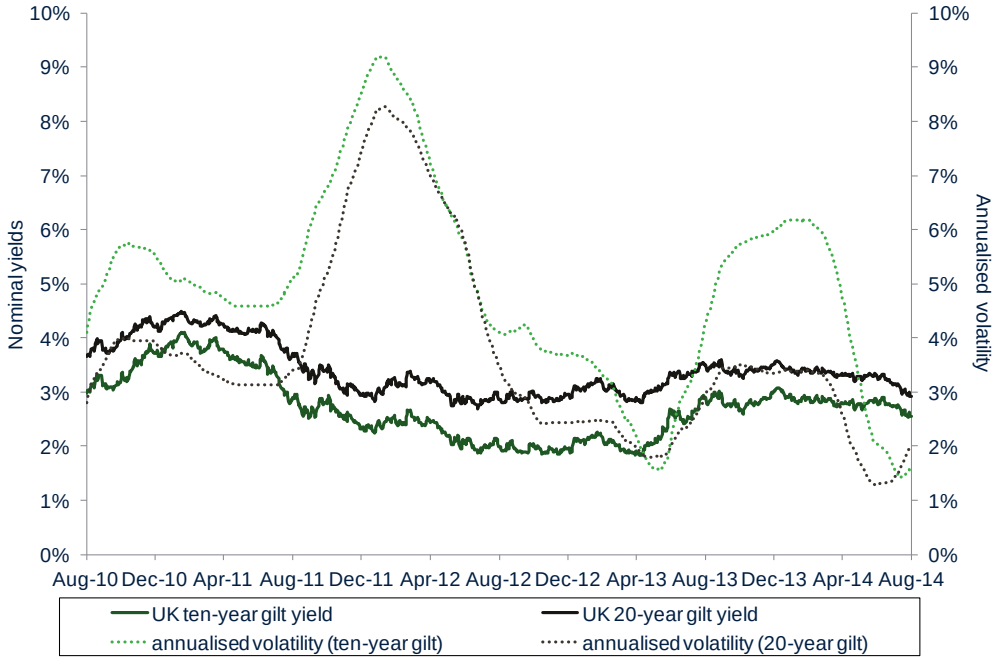
Ofcom also gives weight to the potential unreliability of current yield data. In highly volatile markets, there is a risk that short-term yields may not be a good proxy for longer-term yields. Ofcom states:

> This seems primarily to be because our risk-free rate estimate in the spread analysis is higher than observed gilt rates currently available in the market, as we consider we should be cautious about interpreting the evidence on index-linked gilts since a number of temporary distortions may be affecting the data.[13]

Overall, we consider that the extent of these distortions now appears to be relatively small in the context of the ALF decision. It is undoubtedly the case, as noted in the previous section, that current yields are different from longer-term averages. However, this shift in rates is no longer short-term in nature. Figure 2.3 illustrates this.

[13] Ofcom's further consultation, para. A10.26.

Figure 2.3 Government yields and volatilities over the last five years



Source: Datastream and Oxera analysis.

In particular, Figure 2.3 shows that the nominal yields (used by Ofcom for Option B) have been relatively benign in recent years. In addition, there is no evidence that rates are unusually volatile at present. The volatility of yields tends to fluctuate over time, but is currently at a five-year low.

In any case, short-term fluctuations can be managed through the choice of an average of yields over a range of dates. For example, ORR applied an average of yields in coming to Network Rail's actual cost of debt, applied in setting price controls for CP5.

2.6 Conclusion

Our assessment is that Ofcom gives too much weight to the arguments for longer-term averages in the specific context of setting an ALF that would result in the MNO being indifferent between paying the ALF or paying the lump sum up-front.

Generally, our discussion above indicates that the arguments for applying a spread approach based on a longer-term average for the cost of debt are not as strong or as clear as presented by Ofcom.

We also discuss above that Ofcom's assumptions both around the relevance of precedent (NIE in particular) and the uncertainty over market data are not strongly supportive in respect of its actual decision.

The case for Option A is largely that:

- Option A is consistent with Ofcom's precedent for setting the cost of debt, in a different context (charge controls);
- setting a level based on today's rates may underestimate the actual average cost of debt over a 20-year period, if today's yields represent a distortion from longer-term averages.

The case for Option B is as follows.

- Option B is the only level (of the two options presented by Ofcom) that seeks to achieve indifference, as stated by Ofcom to be its intention for the ALF. This intention could be tested by considering whether a notional MNO would actually be indifferent if offered the choice to take on the ALF obligation or a lump sum.
- Unlike for MCT or other charge controls, there is no opportunity for Ofcom to choose an approach to the cost of debt that can be changed over the period, should it become apparent that yields are different from expected.
- Setting a level based on current yields is more consistent with the majority of recent regulatory precedent for the cost of debt, which now tends to give weight to observations of actual debt yields.
- Given the context of the ALF, this approach would be applied by using yields today or over a short-term period, either of which would point to similar yield levels.

On balance, while there may be some arguments for a longer-term average, our conclusion is that, in the context of the ALF proposal, and the choice of a cost of debt in particular, these arguments are outweighed by those in favour of a current yield. In other words, in balancing Option A (2.6%) and Option B (1.6%), we would expect Ofcom to choose a rate at or close to Option B (1.6%). The actual approach of choosing 2.6% appears to err significantly towards the risk of setting the ALF too high. It is therefore at odds with both the indifference principle and Ofcom's approach (stated elsewhere) of being conservative in its choice of ALF.

We would also note that, in other areas discussed below (the choice of maturity of comparator bond, and the choice of CPI), it could be argued that 1.6% represents a relatively high assumption for the current cost of debt (post-tax, real), and therefore that this further increases the potential for error from choosing Option A—i.e. 2.6%.

Overall, we consider that the use of a discount rate for the ALF needs to give more weight to current yields than Ofcom's approach, if it is to provide indifference to an investor.

Given that the difference between the two rates appears to be at least 1%, the use of Option A (2.6%) would create a significant wedge between the ALF financing costs and the MNO's actual financing costs, and the use of Option B (1.6% in Ofcom's analysis) would be more consistent with the indifference principle.

By contrast, the choice of Option A would create distortions between a 'lump-sum payer', such as BT, and an ALF payer, and therefore would be less consistent with Ofcom's wider duties around providing efficient competitive signals to the market.

3 What is the 'right' discount rate?

This section considers the actual duration of the ALF versus the implied assumed duration that Ofcom has reflected in its derivation of an appropriate cost of debt for Option B, and an appropriate spread for Option A.

In coming to its assessment of the cost of debt, Ofcom applies a comparator set of long-term bonds. The sample applied is based on the following criteria:

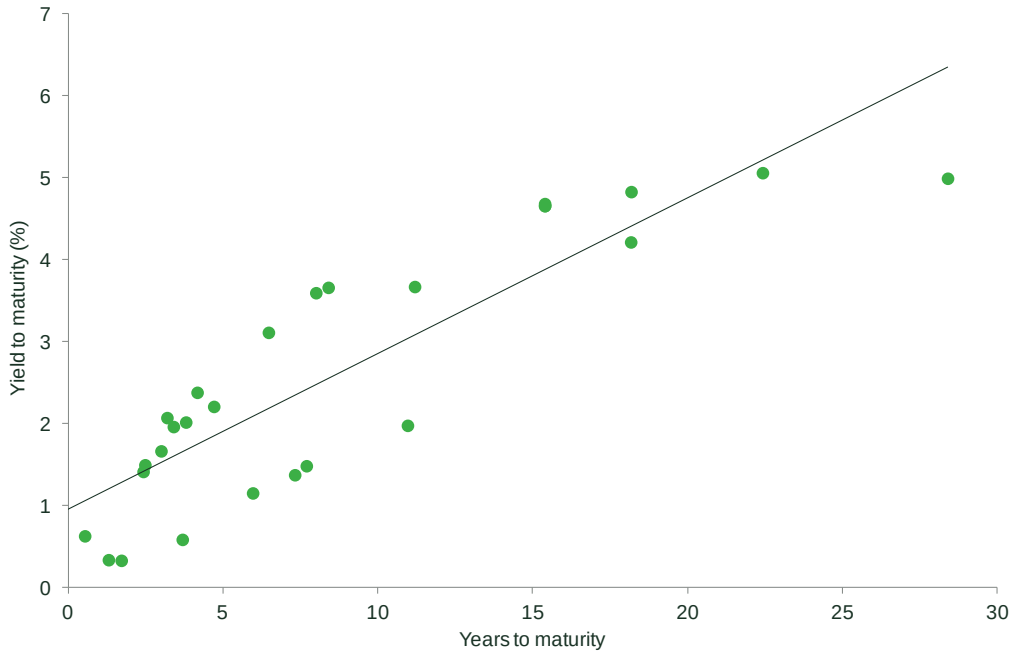
> a sample of the sterling denominated debt of each MNO parent company with a maturity date at least 20 years in the future, or with the longest maturity date (whichever is shorter).[14]

Given that all the companies have relatively long-dated bonds, the consequence is that Ofcom assumes an average life of bonds of around 20 years.

While the ALF has a life of 20 years, its 'average life' is, however, significantly shorter than a 20-year bond, the principal of which is repaid at maturity. 50% of the ALF (or over 50% in present value terms) is repaid within ten years of the start date.

Where the term structure of debt means that longer-term bonds have higher yields, as is normally the case, this implies that Ofcom's cost of debt is higher than that which an investor would apply to the ALF. This was illustrated in Oxera's original report, which demonstrated the term structure of Vodafone's debt, and in particular that the spread to benchmark yields increases with the yield to maturity, as investors take increased credit risk. Figure 3.1 illustrates the total yield on Vodafone bonds for different maturities.

Figure 3.1 Yield on Vodafone debt for different maturities



Note: Market information as at 26 September 2014. This analysis is based on a combined picture of total nominal yields across bonds denominated in GBP, USD and EUR.

Source: Bloomberg and Oxera analysis.

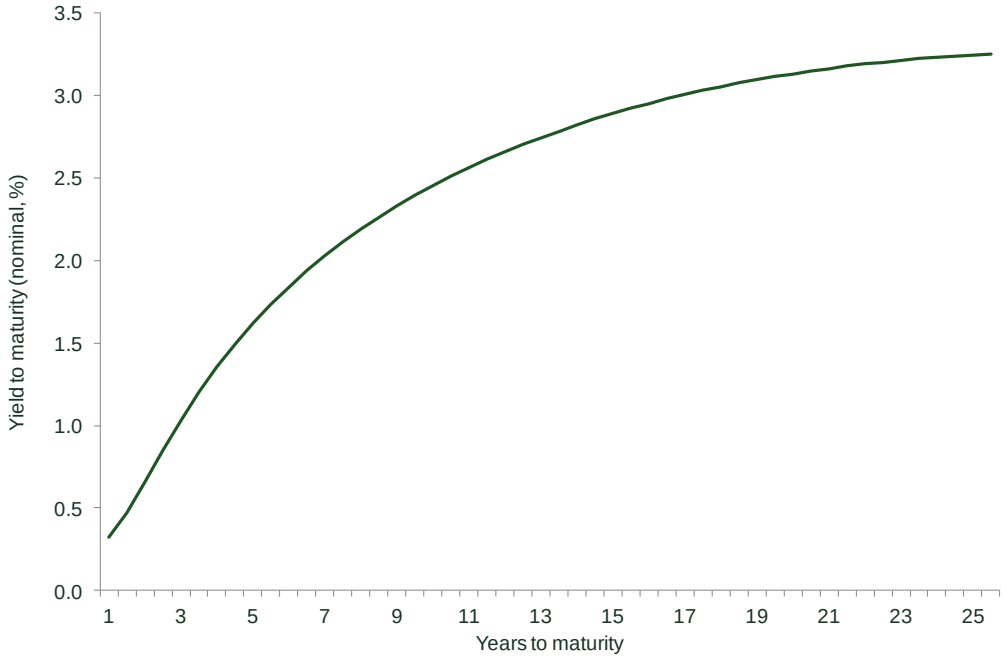
Figure 3.1 illustrates that, based on an assessment of Vodafone debt, the yield of a notional 10–15-year bond could be as much as 1% below that of a 20-year bond.

This can be demonstrated to apply to both the underlying benchmark government yields and the spreads paid by Vodafone. A similar picture is

[14] Ofcom's further consultation, para. A10.10.

observed for government benchmark yields, with longer-term bonds having higher returns than shorter-term bonds (Figure 3.2).

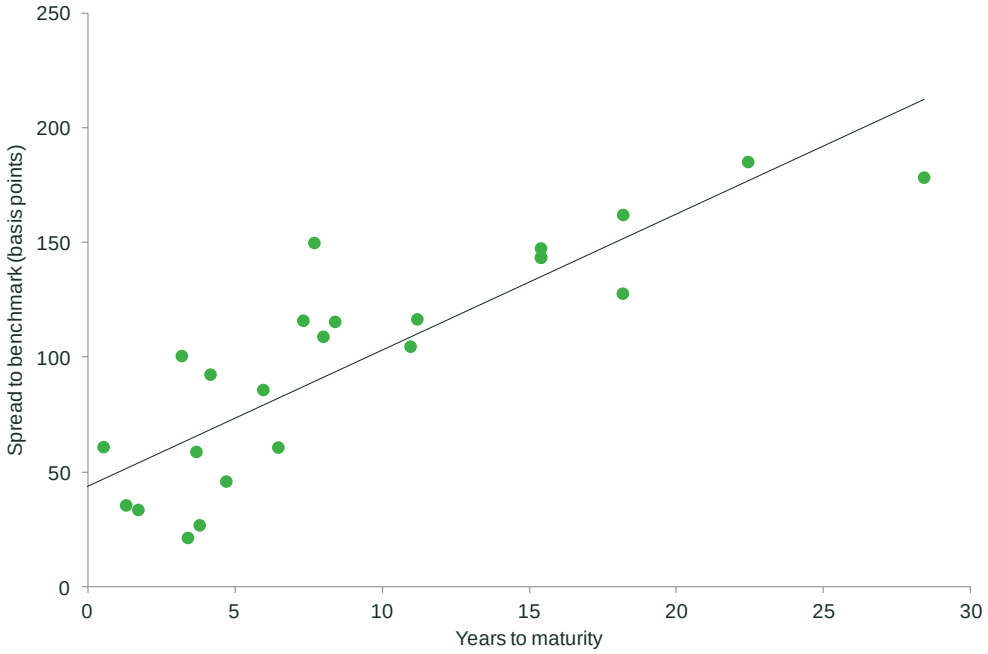
Figure 3.2 Benchmark government yields for different maturities



Source: Bank of England and Oxera analysis.

There appears to be a premium of around 0.25–0.65% for longer-term (20-year) bonds, relative to a 10–15 year bond. In assessing Vodafone's term structure, this is combined with a higher debt premium (spread) for longer-term corporate debt. Figure 3.3 provides an update of Oxera's analysis of the spreads on different maturities of Vodafone debt.

Figure 3.3 Spreads on Vodafone debt for different maturities



Note: Market information as at 26 September 2014. Vodafone bonds are denominated in EUR, GBP or USD. The spreads are obtained from Bloomberg and are calculated relative to their relevant benchmarks.

Source: Bloomberg and Oxera analysis.

Together these graphs indicate that, in all cases, a higher yield is paid for longer-term debt, and therefore Ofcom's approach to determining the current market rates is not conservative, but will actually over-state the level of the cost of debt. **The combination of the increase in the risk free rate and spread relative to the risk free rate indicates that the cost of debt for a 20-year bond appears to be potentially 0.75–1% higher than for a 10–15-year bond.**

In practice, a more exact analysis of the differential between the 20-year bond yields and the notional yield on a 'lease-like' ALF obligation over 20 years can be calculated by considering the implied average yield based on the annual discount rate that would be applied to each year's payment under the ALF (see Appendix A1). This can be derived from the term structure of Vodafone's debt (or comparators' debt), which provides an individual discount rate for each year's ALF payment. **The implication of this analysis is that the average cost of debt for the ALF payments would be very close the yield of a 12-year bond**.[15]

In summary, this analysis suggests that the most appropriate average cost of debt for an ALF, which is financed over 20 years, would be based on a 10–15-year bond, with detailed analysis of the term structure indicating a rate close to 12-year yields.

Given that longer-term yields (over 20+ years) are higher than medium-term (10–15-year) yields, this results in a lower cost of debt estimate. Relative to Ofcom's approach, we estimate that the cost of debt under Option B should in practice have been around 0.8% lower (pre-tax, real), or around **0.64% lower**

[15] Based on the current term structure of benchmark yields, the present value of the ALF payments, using the appropriate discount rates for each year of the ALF payment, is consistent with the present value of the ALF using a 12-year bond rate.

(post-tax, real). In summary, the appropriate rate for Option B should be closer to **1.0%, post-tax real**.

In its approach to Option A, Ofcom is not applying longer-term rates, and therefore the rate is notionally indifferent to the maturity of debt benchmark that is used. However, this in itself demonstrates the inconsistency of Option A, as it implies that the actual financing cost of the ALF and the choice of discount rate are independent. The appropriate cost of debt that promotes indifference, and is therefore neutral between lump-sum payers and ALF payers, must reflect that actual financing position, and therefore should give most weight to Option B.

The increased difference between Option A and Option B identified by Oxera therefore demonstrates that the impact of giving too much weight to Option A is higher than estimated by Ofcom.

A1 Additional evidence on the ALF cost of debt

As highlighted previously, the 'average life' of the ALF might be materially different from the period over which the payments on it are made. This appendix briefly demonstrates this using a simplified example.

Table A 1.1 shows the financing conditions for providing a hypothetical £100 loan for a 20-year period with a 'lease-like' repayment schedule comparable to the ALF. Our modelled repayment schedule comprises a constant principal repayment together with a financing cost, resulting in a total repayment that increases with expected inflation on an annual basis.

As shown in the table, there are two methodologies under which the present value of such a loan will be £100 today:

- **either**: if calculated as a series of individual repayments discounted to today at the individual financial costs (e.g. 1.0% for the first year's repayment, increasing to over 4% for the repayments in years 14–20);
- **or**: if calculated using a single equivalent interest rate across the period of 20 years (effectively the weighted average). It can be calculated that the single interest rate necessary to meet this condition would be 3.8%. As highlighted in the table, this rate would be similar to the cost for which Vodafone could issue a 12-year bond, and is 0.8% lower than the assumed cost of debt for a 20-year bond.

Therefore, it is evident that Vodafone would be able to finance the ALF at a materially lower cost than that of a 20-year bond, and closer to that of a 12-year bond. This implies that Vodafone would not be indifferent between a lump sum and future payments proposed by Ofcom until the discount rate reflects the cost of debt at which Vodafone is actually able to finance these payments.

Table A 1.1 Implied average discount rate and maturity for ALF payments

Maturity (years)	RFR (%)	Spread (%)	CoD (%)	Principal repayment (£)	Interest expense (£)	Total (£)	PV (total) (£) @ CoD	PV (total) (£) @ 3.77%
1	0.5	0.6	1.0	5.0	1.1	6.1	6.0	5.9
2	0.8	0.6	1.4	5.0	1.2	6.2	6.0	5.8
3	1.2	0.7	1.8	5.0	1.3	6.3	6.0	5.7
4	1.5	0.7	2.2	5.0	1.5	6.5	5.9	5.6
5	1.7	0.8	2.5	5.0	1.6	6.6	5.8	5.5
6	1.9	0.8	2.7	5.0	1.7	6.7	5.7	5.4
7	2.1	0.9	3.0	5.0	1.9	6.9	5.6	5.3
8	2.3	0.9	3.2	5.0	2.0	7.0	5.5	5.2
9	2.4	1.0	3.3	5.0	2.1	7.1	5.3	5.1
10	2.5	1.0	3.5	5.0	2.3	7.3	5.2	5.0
11	2.6	1.1	3.7	5.0	2.4	7.4	5.0	4.9
12	2.7	1.1	3.8	5.0	2.6	7.6	4.8	4.9
13	2.8	1.2	3.9	5.0	2.7	7.7	4.7	4.8
14	2.9	1.2	4.1	5.0	2.9	7.9	4.5	4.7
15	2.9	1.3	4.2	5.0	3.0	8.0	4.4	4.6
16	3.0	1.3	4.3	5.0	3.2	8.2	4.2	4.5
17	3.0	1.4	4.4	5.0	3.4	8.4	4.0	4.5
18	3.1	1.4	4.5	5.0	3.5	8.5	3.9	4.4
19	3.1	1.5	4.6	5.0	3.7	8.7	3.7	4.3
20	3.1	1.5	4.6	5.0	3.9	8.9	3.6	4.2
NPV (£)							**100**	**100**

Note: RFR, risk-free rate; CoD, cost of debt; PV, present value; NPV, net present value. The highlighted cells show the maturity and CoD coinciding with the initial interest rate implied by the loan profile. RFR is based on the Bank of England nominal rates for each maturity. Spread is based on Vodafone bonds spread at issuance. CoD is the sum of RFR and Spread. Interest expense is based on a progressive profile with the first year rate of 3.77% obtained using goal seeker conditioned on £100 NPV.

Source: Bank of England, and Oxera analysis.