What is the right discount rate for an ALF?

An alternative approach

Prepared for

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Contents

Executive summary

In its consultation, Ofcom proposes to change the approach to making Annual Licence Fee (ALF) payments by licence owners of 900Mhz and 1800 Mhz spectrum.[1]

The consequence of Ofcom's proposals is a significant increase in the value of the payments for the use of that spectrum. Ofcom proposes that the ALF should be calculated as follows:

- First, to calculate the single lump sum payment that would have been realised if this spectrum had been sold in that way, based on evidence from recent auctions for 4G and other spectrum, and;
- Second to 'annuitise' the value of that single lump-sum into an equivalent annual payment, to be increased each year at RPI. To achieve this equivalence, Ofcom uses the post-tax real WACC an efficient MNO as the discount rate to be applied to these annual payments so that the net present value of them is equal to the single lump sum calculated in the first step.

In undertaking this set of calculations, Ofcom states: (in 5.21 of its consultation) that the ALF should make the licence holder 'indifferent between paying the annual fee and paying the lump-sum value.'

We have reviewed Ofcom's analysis and find that, within the framework applied by Ofcom, the second part of this analysis is not consistent with how the equivalent annual fee should be calculated. In particular we find that:

- The proposed ALF is more in the nature of a debt obligation, or specifically a lease-type obligation.
- As a result, the methodology for converting such an obligation into a lump-sum would be consistent with that applied in valuing debt or lease obligations, ie at a rate comparable to the cost of debt.
- In practice, it is clear that, for any notional MNO with the ability to raise debt finance, they will not be indifferent if the WACC was used as the discount rate
- they would only become indifferent if the discount rate used were to be consistent with an appropriate measure of the cost of debt, and
- the impact is material - based on Ofcom's proposed level of the ALF, the impact of this on the size of ALF payments would be at least £20m.

[1] Ofcom (2013) Annual licence fees for 900 MHz and 1800 MHz spectrum', October

1 Background

Ofcom has issued a consultation on replacing the current annual licence fee (ALF) for 900/1800Mhz spectrum with a new, higher fee. The current fee is designed to cover administrative costs, while the higher proposed fee is designed to reflect the market value of the spectrum to a licence holder. The proposal increases the fees to around 5 times their current levels.

Ofcom is proposing that the fees be calculated using an annuitisation of a market-based measure of the value of the spectrum. This measure is linked to the recent 4G auctions and other European precedent, which provide context for what the market value of 900/1800Mhz spectrum should be.

There are a wide range of issues to be considered in respect of the proposed annuitisation, but which can be largely summarised within two questions.

- Is it appropriate to annuitise in the manner proposed by Ofcom at all? Vodafone is presenting evidence separately on whether this approach is appropriate in this context. In particular, it is highlighting the reasons why translating a fixed fee from the 4G auctions is likely to result in a biased estimate of the ALF, and thus, if an ALF is the proposed approach, it should be lower than would be obtained by direct translation of the 4G auctions, in order to ensure efficient use of the spectrum.
- In the context that Ofcom does identify an equivalent 'one-off payment' that is consistent with the efficient use of spectrum, how should such a 'one-off' payment be converted into an annual fee?

Vodafone has asked Oxera to review the second question. The important issue here is, having established the appropriate value for a single lump-sum payment, how should this be transformed into a series of equal, real (i.e. inflation-adjusted) annual payments? In particular, what discount rate should be applied to the annual payments to arrive at the equivalent net present value of the single lump-sum payment?

Oxera's approach in this analysis is therefore based on the presumption that Ofcom continues with its proposed approach of a uniform (real) annual payment over a 20-year annuitisation period.

1.1 Approach to annuitisation

In this report we consider the approach to annuitisation and why, according to finance theory, Ofcom's objectives require a different approach to discounting to that proposed in the consultation. Specifically, the report demonstrates that the correct financing approach to making a generic MNO indifferent between an upfront fee and a 20-year (real) fixed ALF is to discount the annual payments using the cost of debt. Our report does this as follows.

- Section 2 considers the financial implications for an MNO of being offered the option of a single lump-sum payment or 20 annual payments of a given real value, and the conditions under which these two options are equivalent. We conclude that indifference is achieved when the annual payments are treated in an equivalent way to the repayment of a debt instrument.
- Section 3 provides an alternative, but equivalent, analysis looking at the costs of the use of spectrum more generally. In particular, this section shows that the use of the weighted average cost of capital (WACC) is appropriate to evaluate the total costs of acquiring spectrum, and that a debt-like discount rate for calculating the annual payments to be made within an ALF structure is consistent with this.

- Section 4 provides numerical illustrative examples of the financial implications of the lump-sum payment and ALF. Assuming that the two choices are an upfront fee or a fixed 20-year payment stream, how can investors be shown to be indifferent in practice? For the MNO, what full costs does it incur in switching between a lump-sum payment and an annual ALF?
- Section 5 considers the implications for the licence fee in more detail. In particular, what precise cost of debt would be appropriate, and what would the fee be if such a cost of debt were applied?
- Section 6 considers the impact of applying Vodafone-specific, rather than notional MNO, parameters to the question of indifference.

2 Ofcom's proposal—a question of financial indifference

This section explains why Ofcom's proposed approach to **annuitisation** implies the use of a different discount rate to that applied in the current proposal.

By definition, an annuity-like stream of payments would normally be discounted at an annuity-like discount rate. The proposed ALF is no different. **It is comparable in nature to a lease, such as a property lease or asset finance**. The payments are fixed, and are independent of the earnings that Vodafone and its investors receive from the spectrum. Similarly, in considering the hierarchy of payment obligations from any MNO, continued payment of the ALF would be a precondition to continuing operations, and would therefore sit well above, for example, any returns to shareholders

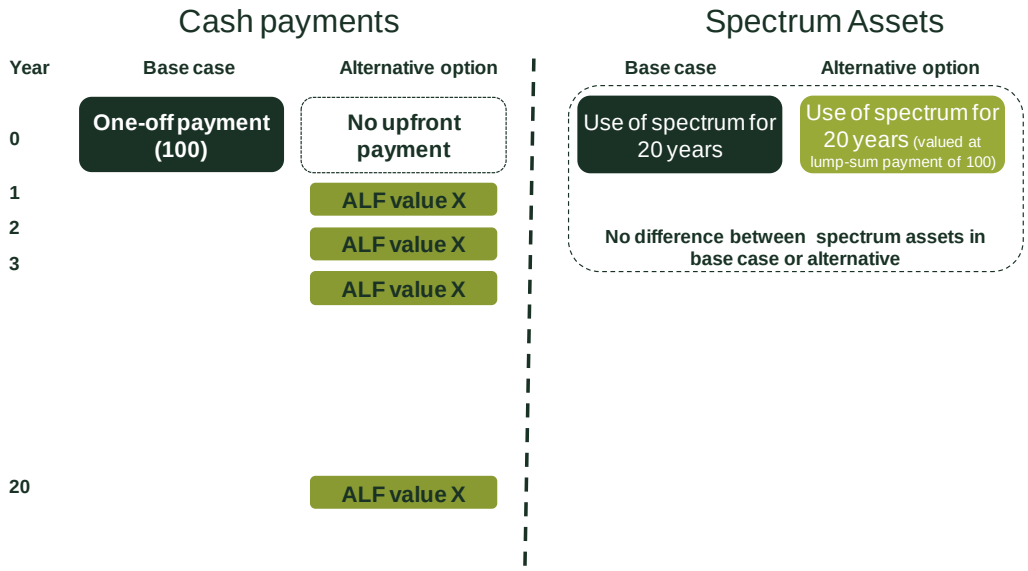
Therefore, in assessing whether to pay up front or through the ALF, Vodafone would be indifferent only if the discount rate were the same as for comparable sources of finance—ie, **the cost of debt (specifically the cost of debt for a comparable lease-type stream of payments)**. In practice, for a large business such as an MNO, with an investment-grade credit rating, the cost of debt for lease finance is likely to be similar to the corporate cost of debt.

In considering the appropriate discount rate to use in calculating the ALF, we have first considered the nature of the question that Ofcom is answering when setting the discount rate. Ofcom states (in 5.21 of its consultation):

> Noting that both the actual 800MHz and hypothetical 800MHz ALF licences have identical terms from year 20 onwards, the 'equivalent; annual licence fee would be the amount that could be charged as an annual fee for 20 years under the hypothetical ALF licence, such that the licence holder would be indifferent between paying the annual fee and paying the lump-sum value. This fee would be equivalent to the lump-sum value annuitized over the first 20 years during which the licence terms differ.

The key question is therefore what ALF would make a generalised MNO 'indifferent' between a hypothetical upfront fee, and the actual arrangements—20 identical (in real terms) annual payments of the ALF. This is illustrated in Figure 2.1.

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



Source: Oxera.

Figure 2.1. illustrates the simple concept which we describe in more detail in the next couple of sections. In deciding whether to move from the base case (one-off lump-sum payment) to the ALF:

- the assets are identical in either case—a spectrum asset;
- the differences for the MNO relate only to the liabilities. What is being offered to the MNO in the choice of moving to an ALF from a one-off payment (funded by investors) is an alternative form of financing; in this case, financing by the government over a 20-year period.

The MNO will therefore only be 'indifferent' if the costs (to them) of financing by the government is the same as the cost of comparable financing that it can achieve externally. By comparable financing, this means an alternative form of financing where the MNO has a fixed commitment to pay a fixed (in real terms) amount every year, and that amount is independent of the actual returns earned on the spectrum. In other words, the equivalent of 100% debt financing (with a payment stream most comparable to lease financing) of the lump-sum payment.[2]

To test this assumption, it can also be observed that the government would not be indifferent in this case. The government would value a 'debt-like' stream of ALF payments from Vodafone using the discount rate on a comparable Vodafone bond (at the cost of debt). Therefore, in the hypothetical scenario that the government were able to 'sell' the stream of ALF payments, it would earn more than the lump sum from doing so. The government would therefore also not be indifferent between the lump sum and the ALF payments.

[2] Given the nature of the payments, the closest financing would be asset-backed finance or leased finance, which may be slightly lower than the cost of debt in theory. However, in practice, there is limited market evidence of the actual cost of finance for such borrowing for Vodafone or MNOs more generally, and Vodafone is able to finance its asset investments efficiently through borrowing from the capital markets

2.1 When would a rational MNO be indifferent between the ALF and a lump sum?

In practice, under Ofcom's proposal, the cost of financing assumed for funding the spectrum payment through the ALF is the WACC. A reasonably efficient MNO should be able to raise comparable debt/lease finance at well below its WACC. As such, an MNO would not be indifferent between taking debt finance from the capital markets (at the cost of debt) and the ALF (finance from the government, at the WACC).

To make the MNO indifferent, the ALF would need to be set such that the implicit cost of finance from the government was the same as the cost of finance for the MNO were it to raise that finance from alternative sources—i.e. the cost of debt. There is no financial benefit to the MNO in paying the ALF to the government, compared with paying off a loan (raised in the capital market) for the lump-sum payment, over the same period, and then paying fixed payments to the provider of the finance. A rational MNO would therefore prefer a lump-sum payment than the ALF proposed by Ofcom.

2.2 Conclusion

In order for Ofcom to achieve the indifference it sets out in 5.21 of its consultation, it should **not** use the WACC as the discount rate to set the value of the ALF. To achieve indifference for a reasonably efficient MNO, the annual payment under the ALF should match the equivalent annual payment that would apply if the MNO had raised debt to pay the lump sum, since both represent fixed payment streams. This is achieved by discounting the annual fee by the interest rate that the MNO would face on this debt.

The most transparent assumption is the corporate debt rate. However, the nature of the obligation under ALF is not identical to that within corporate debt, in particular if the MNO were to be in financial difficulties. Since failure to pay the ALF would result in the government (i.e. the lender) obtaining a valuable asset (the relevant spectrum is returned), the actual rate of interest that would be payable on the equivalent asset-backed loan would be expected to be below the rate that the MNO would need to pay on a unsecured debt. As discussed in section 5, for an investment-grade MNO, this differential would be relatively small, and the use of the corporate cost of debt would therefore be a reasonable approximation.

Applying the upper boundary of unsecured corporate debt that would be available to a reasonably efficient MNO would reduce the level of the ALF by approximately 20% when the real WACC used by Ofcom in the consultation is 4.2%, and the comparable post-tax corporate debt rate within the MCT WACC would be in the region of 1.7%.

If, however, the current (spot) cost of debt were to be used, as this represents a 'one-off' decision between an upfront lump sum payment and an ALF, then the cost of debt would be lower, and the ALF would be a further 5-10% below Ofcom's assumptions for an efficient MNO in general, and for Vodafone in particular.

3 The role of the WACC: why it is not the discount rate to set the ALF

This section presents a recap on the use of the WACC in evaluating spectrum, and why, while Ofcom may use the WACC for MCT and for evaluating investments in spectrum, it is still consistent to use the cost of debt to calculate the equivalent ALF.

The liability to pay Ofcom's proposed (much higher) ALF does not just change cash flow, it also changes the risk associated with each of debt and equity of the MNOs.

To ensure that the value of the **total** additional costs faced by the MNO under the ALF, including the impact on financing costs, are, indeed, equivalent to the value of the lump sum, the ALF needs to be calculated by reference to the debt rate, and not WACC.

In particular, we demonstrate that if the ALF (which represents a fixed payment stream) is not discounted at the cost of debt, this would change the average costs facing the MNO relative to the upfront payment.

3.1 What is the WACC and when is it used?

Ofcom proposes to use the WACC as the discount rate on the annual payments to arrive at the equivalence (or indifference) value for the annual payments and the alternative lump-sum payment. For the reasons set out below, using the WACC in this way does not lead to cost equivalence for the MNO. However, to demonstrate this it is useful to first set out what the WACC is, and where (and how) it is legitimately used.

The WACC is, as defined, the 'weighted average cost of capital'. It therefore comprises a weighted average of the:

- **cost of debt**—the return required by providers of debt finance which is part-used to fund the business. In general, debt has a lower finance cost than equity, as it is lower risk;
- **cost of equity**—the return required by providers of equity finance which is used to fund and manage risks within the business.

The concept of the WACC is important for appraising investment decisions, and whether or not a specific investment is worthwhile. It is also useful to calculate the cost to the supplier of an investment, when that cost is required as an input to a regulatory decision like a price control.

One of the fundamental principles of corporate finance is that the return required on an investment is related to the risk associated with that investment, not to the method of financing used. The WACC is used because it reflects the overall level of risk taken by investors in the relevant assets, not because it reflects the incremental financing cost for any particular investment.[3]

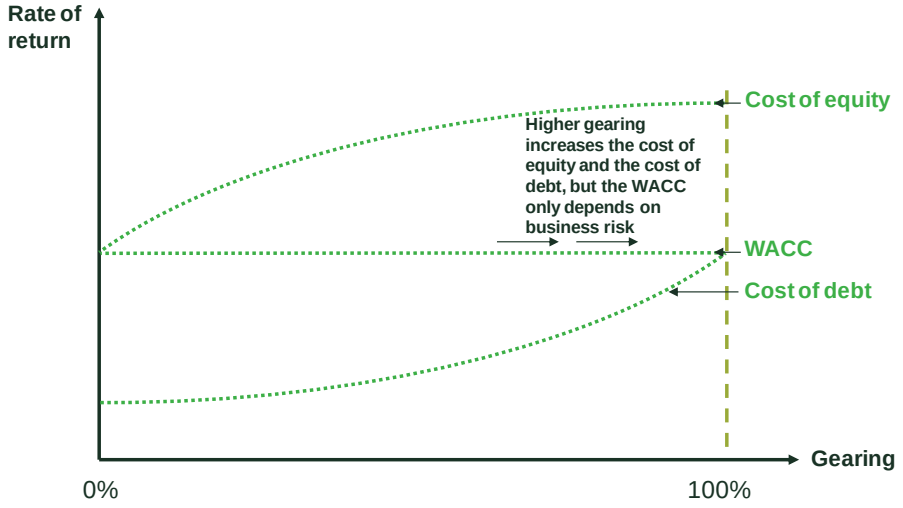
We demonstrate this through a simplified example of an MNO investing in spectrum.

[3] The specific circumstances where the firm WACC is also the cost of the incremental financing is where that financing exactly mirrors the current financing of the firm, and the risks of the incremental investment exactly match the risks of the firm, or where the deviations from this cancel out.

- An MNO in a competitive market has an opportunity to expand its business by purchasing additional spectrum (and associated equipment). The firm is currently funded 50/50 debt and equity. The new business is of very similar risk to the existing business.
- The firm approaches debt investors who offer to lend all the money to purchase the spectrum (and associated equipment), at the cost of debt. Should the company go ahead if the return on this additional spectrum and equipment only just covers the cost of this new debt?
- At first sight, the firm might go ahead. The expected revenues would (just) more than cover the increased costs of having to pay the loan costs. However, logically, it cannot be the case that existing investors will be happy with a just the debt return on the new investment. The new investment is the same risk as the existing business. Why would investors value one at a different rate to the other once they are merged into a single business?
- The explanation is that having made the purchase with the loan, to be paid at the debt rate, the risks faced by the equity holders have changed, as have the risks faced by the original debt holders. The total *cost* to the mobile phone firm of taking out the loan to buy the new spectrum therefore has three components: the cost of the new debt, the change in the cost of the existing equity, the change in the cost (if any) of the existing debt. All three need to be taken into account when appraising the investment, even when the investment is being funded by 100% of new debt. If all that he new business recovered was the cost of the new debt, there would be nothing left over to pay for the increase in the risk (ie cost) to the existing equity and (where appropriate) any increase in the cost of any old debt.
- The rate of return on the new investment that allows these other costs to be included in the investment appraisal is, in this instance, the firm WACC (as the new business has the same risk as the existing business). (If the new business had a different risk profile, the appropriate rate for investment appraisal (and hence the cost to the firm) would be the WACC of the new business.)
- So in this instance the return on the new investment that would make that investment worthwhile is the WACC, notwithstanding that the new investment is entirely financed by debt.

Figure 3.1. illustrates this concept - the WACC should be indifferent to the cost of debt and equity, and so the same WACC should (at least in theory) be used regardless of the choice of financing. So for investment appraisal purposes the WACC is the appropriate hurdle return, and for regulatory price setting purposes the WACC is the appropriate rate of return to calculate allowable costs, even if the firm has financed the new investment entirely with debt.

Figure 3.1 Illustration of the use of the WACC in investment decisions



Source: Oxera.

As a result, the WACC can be applied to a new investment regardless of how it is actually financed, which makes it practical and transparent for use in making business decisions. The WACC is commonly applied when making investment decisions and in assessing the present value of cash flows within a business.

In the context of an MNO and investment in spectrum, this represents an example where using the WACC to evaluate the investment is likely to be appropriate.

In purchasing spectrum, the MNO is likely to use its existing WACC to decide whether to go ahead with the purchase. Purchasing spectrum in general—and this spectrum in particular (as the MNO already uses the relevant spectrum)—is core to its business and will not change its business risk.[4]

3.2 Example—use of an ALF to invest in spectrum

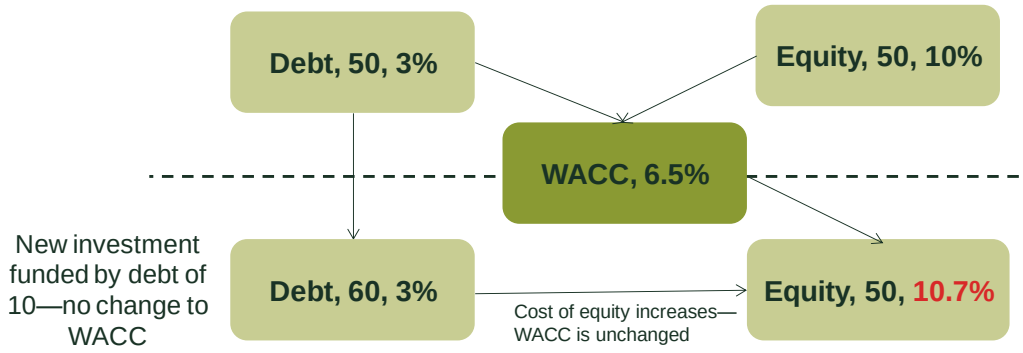
The analysis set out above explains that the required return on capital should not depend on the choice of financing. Instead it depends on the risk associated with the assets. The framework applied by Ofcom more generally (the WACC) is appropriate for setting the level of fees which are variable and linked to activity (eg. Mobile Call Termination).

The issue that Ofcom is addressing is in respect of the ALF, however, is neither a price setting nor investment appraisal, but in setting a level for a annual fee for the use of an asset that is equivalent to an alternative (and known) single lump sum payment. Set out below is why to achieve this equivalence the discount rate to use in calculating the equivalence is the debt rate and not WACC.

The starting point is that, as outlined above the WACC should not change if the business risk is the same. If a notional MNO with asset value of 100 and gearing of 50% borrows to make an incremental invest in additional spectrum (and associated equipment), and the WACC does not change, then the risk on existing equity must go up, as illustrated in Figure 3.2.[5]

[4] Even if the WACC were different, this would not change the conclusion that the WACC should be applied to the (uncertain) cash flows that arise from investment in spectrum, not to the (fixed) ALF.
[5] We assume no change to the cost of debt, as a simplifying assumption

Figure 3.2 Illustration of the use of the WACC in investment decisions[6]

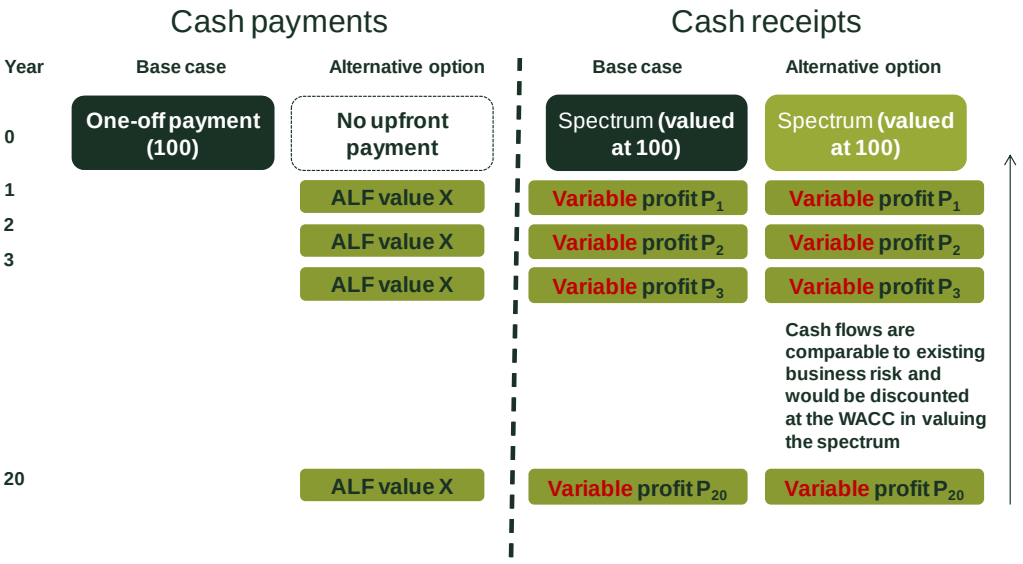


Source: Oxera.

Hence, in deciding whether or not to purchase the spectrum, the MNO is likely to use its existing WACC to decide whether to go ahead. Purchasing spectrum in general—and this spectrum in particular (as the MNO already uses the relevant spectrum)—is core to its business and will not change its business risk.

This illustrates in practice how the use of the WACC for an individual investment or a particular series of cash flows does not depend on what form of financing is used for the cash flows. Figure 3.3. demonstrates how this is relevant to any new spectrum investment such as that outlined in section 2 above, ie. the use of WACC for the investment decision will not be impacted by the choice of financing (ALF or lump sum).

Figure 3.3. Using the WACC in valuing spectrum



Ofcom's proposal will not change the asset risk at all, but is simply a change to the form of financing, from a lump-sum payment to a series of annual payments. We now demonstrate that, from the MNO's perspective, equivalence is achieved when the ALF is set using the debt rate as the discount rate.

[6] In this instance the financing cost to the notional MNO of borrowing the additional 10 to pay for the additional spectrum is equivalent to a cash cost of 3% of 10 (0.3) and an additional equity risk of 0.7% on 50 (0.35). The total financing cost of purchasing the additional spectrum is not 0.3 (the cost of the additional debt) but 0.65. This is equivalent to the WACC of 6.5% applied to the additional asset of 10. For simplicity, any impact on the cost of the existing debt has been ignored.

3.3 Equivalence for ALF

The analysis set out above traces the movement of costs in other parts of the business as a result of borrowing to pay a lump sum for spectrum. This analysis traces through the impact of paying an ALF instead of the need to finance an upfront cash payment. We therefore consider the scenario where the same MNO has the option to secure the use of the spectrum with an ALF.

The ALF represents an additional annual fixed payment (liability) for the firm. This liability has characteristics very similar to that of the payments required to finance a purchase of the spectrum under the lump sum.

If, consistent with Ofcom's requirement, the ALF is to be set such that the firm is indifferent between the cash purchase and the ALF, the effect on the business of paying the ALF and paying the financing costs of the loan must be the same, as this is the only difference between the two scenarios. That is, in the lump sum base case the firm pays the lender an annual charge, in the ALF scenario, the firm pays Ofcom an annual charge.

If the firm pays Ofcom an ALF that is higher than the charge that it would pay to the lender then the *total* costs of obtaining the spectrum under the ALF will be higher than under the lump sum. Absent any change in the capital structure, as demonstrated above, the total cost of borrowing the additional amount to pay for the new investment is the sum:

- the cost of the new financing;
- the additional costs of existing debt financing (if any); and
- an increase in the cost of the existing equity to reflect the additional risk as a result of obtaining the additional spectrum by pure debt financing.

This result holds even if the firm adjusts its capital structure to reflect the additional new debt it has taken on or, in the case of the ALF, to reflect the additional fixed annual liability it incurs. Figure 3.4 demonstrates this using a simplified example, where:

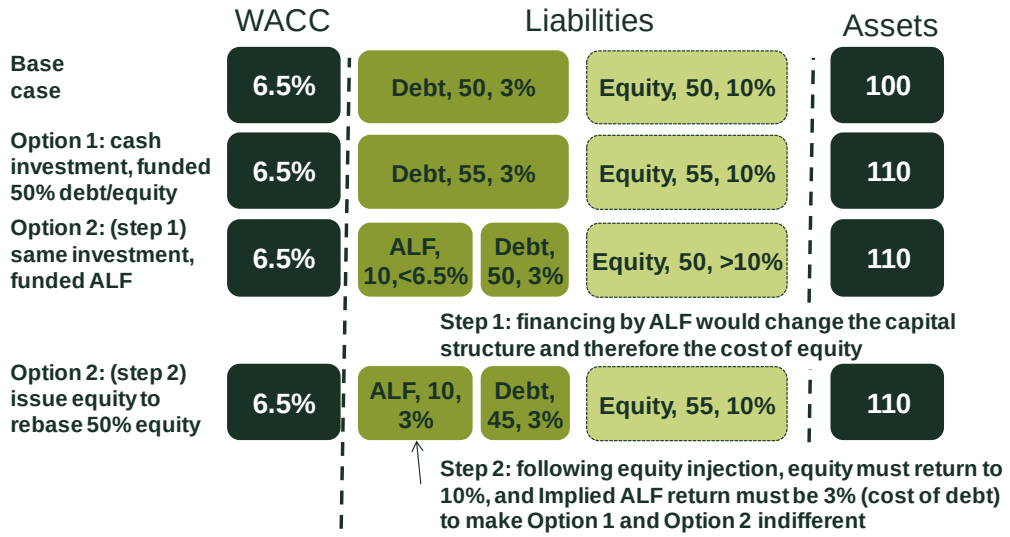
- an MNO currently has assets and liabilities worth 100;
- based on gearing of 50%, it has a cost of debt of 3% and a cost of equity of 10%;
- a new investment opportunity has arisen for additional spectrum worth 10;
- this will not change the risk of the business;
- the MNO has the opportunity to fund this through a cash payment (Option 1), or through an alternative fixed liability (the ALF).

Of these assumptions, the important one is that the ALF is a fixed liability. If it were a variable liability, it would be more like equity. However, it is designed to be a fixed liability, with payments being determined upfront, fixed in real terms, and, as with debt, the fixed payments are required to be made independently of the level of profits within the business.

We also assumed, for ease of illustration, that the firm chooses to revert to a 50/50 gearing structure in each case. This is not a critical assumption, but simplifies understanding of the relative costs of finance. Figure 3.2 shows that under Option 2 (ALF):

- **the gearing is the same as Option 1 (upfront payment)**, as the company can rebalance its capital structure accordingly. Again, this is not a critical assumption, as any capital structure could be compared under each of Options 1 and 2 and the same conclusion would be reached. It is, however, the most transparent example;
- **the WACC is the same as Option 1 (upfront payment)** as the business risk is the same;
- **the cost of equity is the same as Option 1 (upfront payment)** as the business risk and gearing are the same;
- **therefore the 'cost of finance' for the ALF must be the cost of debt**.

Figure 3.4 Comparison of financing options for spectrum



Source: Oxera.

Together with the analysis in section 2, Figure 3.3 shows that, as long as the ALF is a fixed liability, not a risky liability that may go up or down over time, the discount rate used to calculate the ALF from the given lump sum must be the cost of debt, and not WACC.

As set out above, the WACC has a role in evaluating the current value of spectrum, the costs to be recovered in price setting regulation and in investment appraisal. However, it is not the appropriate rate to use in calculating an equivalence between an ALF and a lump sum payment for spectrum

3.4 Why does the choice of discount rate matter?

In the context of the decision for ALFs, if the ALF is set using an inappropriate discount rate, the ALF will be too high or too low relative to upfront spectrum fees, which will have two potential impacts:

- distortion of competition between the users of spectrum if they have purchased the use of that spectrum in different ways. If the ALF is set using the WACC as the discount rate, the ALF will be too high relative to its reference lump-sum equivalent. An MNO that had obtained all its spectrum from lump-sum payments would have a competitive advantage over one that had obtained a significant part of its spectrum under the ALF payments. This is not only contrary to Ofcom's duties more generally, but also to the specific aims of the ALF proposal;

- if the ALF is set so high that MNOs can shift their use of spectrum to 'lump-sum' spectrum (which is cheaper), there is a risk of inefficient usage of spectrum, with the potential to leave some ALF spectrum unused and to (unnecessarily) strand associated assets. Both of these will reduce the overall efficiency of the provision of services over UK spectrum.

3.5 The ability to hand back the ALF spectrum and cease payments

The above analysis is based on the assumption that the MNOs will make the ALF payments for the full term. This mirrors the obligation that would arise if the MNO borrowed the lump sum with fixed repayments over the 20-year period. This does not quite match the conditions for the ALF payments, as it is possible for the MNO to hand back some or all of its ALF spectrum if it no longer requires that spectrum.

Whilst this potentially could create a number of complexities for the process of evaluating the right value of the spectrum, our view is that within Ofcom's framework, this would not impact the choice of discount rate. As long as:

- Ofcom requires a fixed fee, rather than a fee which fluctuates over time with the success or otherwise of the user of the spectrum; and;
- the size of that fee is expected to be fixed in real terms over the life of the spectrum (at least within normal profit fluctuations)

then the analysis in this note (that the ALF is in the nature of a fixed liability and should therefore be discounted at the cost of debt) would continue to apply.

3.6 Do the precise circumstances of the proposal change the analysis?

The examples above are based on an MNO acquiring additional spectrum to expand its business. These show that the correct economic appraisal for this purpose uses the discount rate of the WACC (i.e. the cost to the MNO of acquiring the additional spectrum), and that for equivalence the calculation of the ALF should use a debt discount rate.

This scenario does not quite match the circumstances applying to the issue at hand. This is because the MNOs are already using the spectrum at issue, and what is being proposed is simply a change in the annual payment for the use of this spectrum. In addition, the *option* of a single lump-sum payment is not being offered, but Ofcom's objective is to make the ALF equivalent to that option.

As a result of these specific circumstances, what Ofcom is proposing is essentially a cost shock to an existing business, rather than an opportunity. The equivalence objective is between a lump-sum cost shock and an annual payment cost shock.

However, in order to be indifferent between a lump-sum cost shock and an annual fee cost shock, exactly the same considerations apply. The firm could borrow to pay the lump sum cost shock, and itself convert the single payment to a set of annual payments to a lender. As a result, the analysis set out above dealing with the expansion of the MNO's business through the acquisition of spectrum applies in this case, even though the additional payment for spectrum does not increase the size of the business.

3.7 Summary

Based on this analysis of the proposed approach to defining ALF:

- the WACC is used to evaluate investment decisions that are directly comparable with the underlying risk of the existing business;
- by comparison, the decision between a fixed ALF or upfront payment is not related to the MNO's underlying business risk. This comparison relates to the *financing* cost of the lump-sum option, because, in economic terms, Ofcom (for the government) is offering to finance the lump sum on debt-like terms. This financing is more like taking a mortgage or lease from the government—the cash flows are the same and the financing decision therefore should be the same;
- in that context, for Ofcom to achieve its objective of making the MNO indifferent between a fixed ALF and an upfront investment, the appropriate discount rate to be applied to the annual payments would be the cost of debt.

4 Example of a stylised MNO

This section considers a practical analysis of how the two approaches to paying for spectrum would be reflected in the balance sheet of a mobile operator. In particular, we assess the difference between the two options considered in the previous section in relation to how the balance sheet would be treated, and why, in practice, investors should be indifferent between the two approaches when the ALF is calculated by reference to the cost of debt.

4.1 Example of an MNO

Consider an MNO with existing business value of 100, financed 60% debt, 40% equity. It has an option to purchase a further 100 of spectrum and double the size of its business. There are two options: purchase upfront (cost 100), or pay over time (committed cost 100).

Table 4.1 Financing position for an MNO with a opportunity to make a spectrum investment

	Current position	Option 1: purchase spectrum upfront	Option 2: purchase spectrum through ALF
Revenue	107	214	214
Cost	100	200	200
Operating margin	7%	7%	7%
Current debt	60	60	60
Current equity	40	40	40
Interest rate	5%	5%	5%
Additional investment required	-	100	Annual financing cost

Source: Oxera.

Currently the operator has a return on equity of 10%:

- margin = 7
- less interest = 3
- net profit for shareholders = 4
- return on equity = 10%

4.2 Option 1: purchase upfront

Under Option 1, assume the firm has two financing options:

- finance with debt—this will increase risk and therefore the cost of equity. For simplicity, we assume no change to the cost of debt;
- finance with 60/40 debt/equity—this will keep risk the same.

As illustrated in section 3, the WACC will be the same in either case[7] – the difference will just be in the share between debt and equity (see Table 4.2). In practice, over the longer-term, there is likely to be a transitional period, where

[7] If optimal gearing is no longer present, the WACC may rise slightly. To keep the analysis simple, this change in WACC has been ignored.

the transaction is initially funded through higher gearing, followed by a gradual recapitalisation over time.

Table 4.2 Balance sheet impacts – purchasing spectrum

	Current position	Option 1a: purchase spectrum upfront with debt	Option 1b: purchase spectrum upfront with debt/equity
Revenue	107	214	214
Cost	100	200	200
Operating margin	7%	7%	7%
Asset value	100	200	200
Debt	60	160	120
Equity	40	40	80
Interest rate	5%	5%	5%
Net profit for shareholders	4	6	8
Return on equity	10%	15%	10%
Debt/(debt+equity)	60%	80%	60%
Return on capital	7%	7%	7%

Source: Oxera.

4.3 Option 2: ALF

Under Option 2, the picture appears different—no financing is required as the spectrum is not paid for upfront.

However, whilst this appears the case, the economic position is different. In economic terms, the spectrum has still been purchased upfront. The firm has a economic asset and an economic liability relative to the current position—i.e.:

- **an intangible asset**—the firm has still 'purchased' the spectrum, although it has not paid cash upfront;
- **a liability to pay for the asset through the ALF**—while the liability may not be recognised on the balance sheet, it still exists.

Therefore, from an economic perspective, investors will be indifferent between Option 1 and Option 2, even if accountants are not, as illustrated in Table 4.3 – as long as the discount rate is the cost of debt. We assume, for simplicity, that the ALF is a permanent financing cost, rather than a 20 year fixed payment. If the ALF were higher and including an element of 'asset purchase' costs, more comparable to a lease, there would be a gradual shift from the contingent liability of 100 to an actual debt liability over the period.

Table 4.3 Balance sheet impacts – the use of an ALF (no equity)

	Current position	Option 1: purchase spectrum upfront with debt	Option 2: purchase spectrum through ALF (at cost of debt)	Option 3: purchase spectrum through ALF (at WACC)
Revenue	107	214	214	214
Cost	100	200	200	200
Operating margin	7%	7%	7%	7%
Asset value	100	200	100	100
Intangible value	-	-	100	100
Debt	60	160	60	60
Equity	40	40	40	40
Contingent liabilities (ALF)	-	-	100	100
Interest rate	5%	5%	5%	5%
ALF annual fee			5	7
Net profit for shareholders	4	6	6	4
Return on equity	10%	15%	15%	10%
Gearing (Debt+contingent liabilities)/(debt+ contingent liabilities+equity)	60%	80%	80%	80%
Return on capital	7%	7%	7%	6%

A similar picture would be observed in the context of a funding with a combination of debt and equity (ie with no change in gearing, so with a recapitalisation in the case of the ALF). In this case, the return on equity would fall, relative to the current position, if the ALF were financed at the WACC.

Table 4.4 Balance sheet impacts – the use of an ALF (with equity)

	Current position	Option 1: purchase spectrum upfront	Option 2: purchase spectrum through ALF (at cost of debt)	Option 3: purchase spectrum through ALF (at WACC)
Revenue	107	214	214	214
Cost	100	200	200	200
Operating margin	7%	7%	7%	7%
Asset value	100	200	100	100
Intangible value	-	-	100	100
Debt	60	120	20	20
Equity	40	80	80	80
Contingent liabilities (ALF)	-	-	100	100
Interest rate	5%	5%	5%	5%
ALF annual fee			5	7
Net profit for shareholders	4	8	8	6
Return on equity	10%	10%	10%	7.5%
Gearing (Debt+contingent liabilities)/(debt+ contingent liabilities+equity)	60%	60%	60%	60%
Return on capital	7%	7%	7%	6%

4.4 Summary

Section 2 demonstrated that, from the perspective of finance theory, investors are indifferent between an ALF and an upfront investment only if the ALF is calculated by discounting at the cost of debt.

This section has shown how this works in practice.

- If the ALF is set using the cost of debt as the discount rate, equity investors get the same return, for the same risk, as in the case of an upfront sunk investment in spectrum.
- If the ALF is set using WACC as the discount rate, equity investors get a lower return, for the same risk.
- Therefore, if Ofcom is applying an ‘annuitisation’ approach to set the ALF, the appropriate discount rate should be the cost of debt and not WACC.

5 What is the right cost of debt?

Table 5.1 describes the latest Ofcom assumptions (March 2011) on the cost of capital for UK mobile network operators. In coming to its proposed WACC calculation for the ALF, Ofcom has adjusted the WACC to reflect changes in corporate tax rate. However, this has not been big enough to have any impact on the post-tax real WACC figure of 4.2% and the post-tax cost of debt assumption of 1.7%.

Table 5.1 Latest regulatory precedent on WACC components

WACC component	Ofcom-2011, (%)	Adjusted Ofcom-2011, (%)
Risk-free rate (real)	1.5	1.5
ERP	5.0	5.0
Equity beta	0.8	0.8
Asset beta	0.6	0.6
Cost of equity, (pre-tax, nominal)	10.4	10.0
Cost of equity, (pre-tax, real)	7.7	7.4
Cost of equity, (post-tax, real)	5.3	5.3
Debt premium	1.5	1.5
Cost of debt (pre-tax, real)	3.0	3.0
Cost of debt (post-tax, real)	1.7	1.7
Corporate tax rate	24.0	21.0
Gearing	30.0	30.0
Inflation	2.5	2.5
WACC (vanilla, real)	4.6	4.6
WACC (pre-tax, real)	6.3*	6.1
WACC (post-tax, real)	4.2	4.2

Note: Adjustments have been made by Oxera based on our interpretation of Ofcom's methodology. Ofcom has not given a complete explanation of how it has derived its estimates. Its equivalent pre-tax WACC calculation is 6.5%. Any difference in approach to estimating the pre-tax WACC should not impact post-tax calculations.

Source: Ofcom regulatory documents, Oxera analysis

Therefore, if Ofcom were to take the cost of debt directly from the MCT WACC, the level assumed should be 1.7% (post-tax, real).

Is the MCT cost of debt appropriate here?

The 2011 MCT cost of debt may still be appropriate for MCT, which reflects the incremental costs of building a network over time, and where the risks associated with setting the cost of capital too high or too low need to be taken into account in setting an approach which is relatively stable over time.

In the case of the ALF, it is not clear that this holds. The comparison is between a 'one-off' payment now, and a 'one-off' increase in the ALF (which will, as discussed above, have a 'one-off' impact on the MNO's mix of liabilities). Therefore, there is an argument that a spot rate could be more relevant to the question of how to set an ALF today.

Alternative: find a comparator bond today

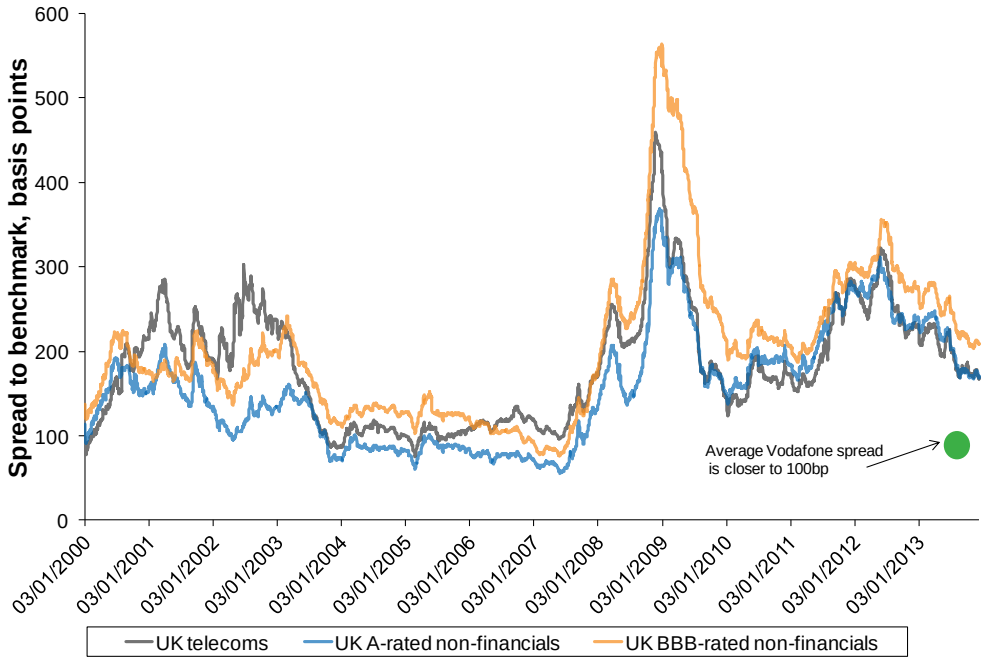
Another way to look at the question of which cost of debt would be applicable to obtain annual licence fee payments is to find a comparator bond , ie. a bond with comparable maturity and risk. The ALF represents a constant payment stream (in real terms). A comparator bond would have a (lower) interest payment over the period and (higher) principal repayment at maturity. Therefore, using a 20 year bond would overstate the average life of the risk taken by investors. Analysis of licence fee payments and Vodafone outstanding debt durations can therefore help to find a more appropriate comparator.

Duration represents a measurement of the average life of a bond weighted by its the value of its cash flows. If we consider licence fee payments on this basis, its duration turns out to be equal to around 9 years. This figure is quite close to the average Vodafone bond duration.

Taking this approach, we find that although relatively low (by comparison, for example, to the cost of debt assumed for BT), the cost of debt assumed by the regulator for MCT is higher than the comparable current cost of debt for MNOs in general, and for Vodafone in particular.

Figure 5.1 assesses current spreads of telecommunications companies and investment-grade issuers with credit ratings comparable to MNOs. It shows that market spreads in the last 12 months have been consistently higher than assumed in 2011.

Figure 5.1 Market and Vodafone spreads to benchmark



Note: Ten-year UK governement benchmark bond has been used to compute market spreads. Spread for Vodafone is based on Bloomberg analysis. UK telecoms index represents all maturities, UK A and BBB-rated non-financials represent 10+ years maturities, Vodafone analysis is based on a suitable comparable from a range of short/long maturites.

Source:Bloomberg, Datastream, and Oxera analysis

However, this is not the case for Vodafone. Due to its significant size and credit strength, Vodafone's cost of debt has been consistently lower than the market more generally. Table 5.2 describes the calculation of current cost of debt based on Vodafone embedded debt average spread, and average telecommunications market spread over the last 12 months. The choice of a specific cost of debt is

complex. Vodafone bond maturities range from 1 to 30 years, and the telecommunication market index also combines a full range of maturities. However, whilst there are complexities in interpreting the data, the current cost of debt is lower than the level set in March 2011 determination by Ofcom, and, for Vodafone, is significantly lower.

Table 5.2 Current cost of debt estimates

	Vodafone, (%)	Telecoms, (%)
Current Risk-free rate (nominal)	2.3	2.3
Current Risk-free rate (real)	-0.2	-0.2
Current cost of debt (pre-tax, nominal)	3.2	4.3
Current cost of debt (post-tax, nominal)	2.5	3.4
Current cost of debt (post-tax, real)	**0.0**	**0.9**

Note: A twelve month average (14/12/2012 - 13/12/2013) of ten-year UK government benchmark bonds has been used as a risk-free rate. A corporate tax rate of 21% has been used.

Source:Bloomberg, Datastream, and Oxera analysis

We have also considered whether, given that the payment made by the MNOs is effectively secured against the spectrum (ie if the MNOs don't pay, the government gets to take control of the spectrum), this would represent a lower risk with a lower cost of debt.

In principle, the answer would be that financing costs must be lower for a secured loan than an unsecured bond debt. However, in practice, we understand that the bond markets have the benefit of increased liquidity, and are therefore the core source of financing for MNOs. The cost of financing cannot be higher for a secured debt than an equivalent unsecured debt, but could be very similar where debt premia in the bond markets are already low.

In summary, we find that:

- the appropriate discount rate is the (unsecured) corporate cost of debt.
- based on MCT 2011, this would be around 1.7% (post tax, real)
- however, for a one-off financing decision today using spot rates, this could be lower, in the order of 0.9% (post tax, real); and
- even this level is still well above Vodafone's current cost of debt, which is closer to 0% (post tax, real).

On that basis, we consider that an appropriate discount rate would be in the range of 0.0-1.7% (post tax, real), and Ofcom should consider further the relative merits of different levels within this range.

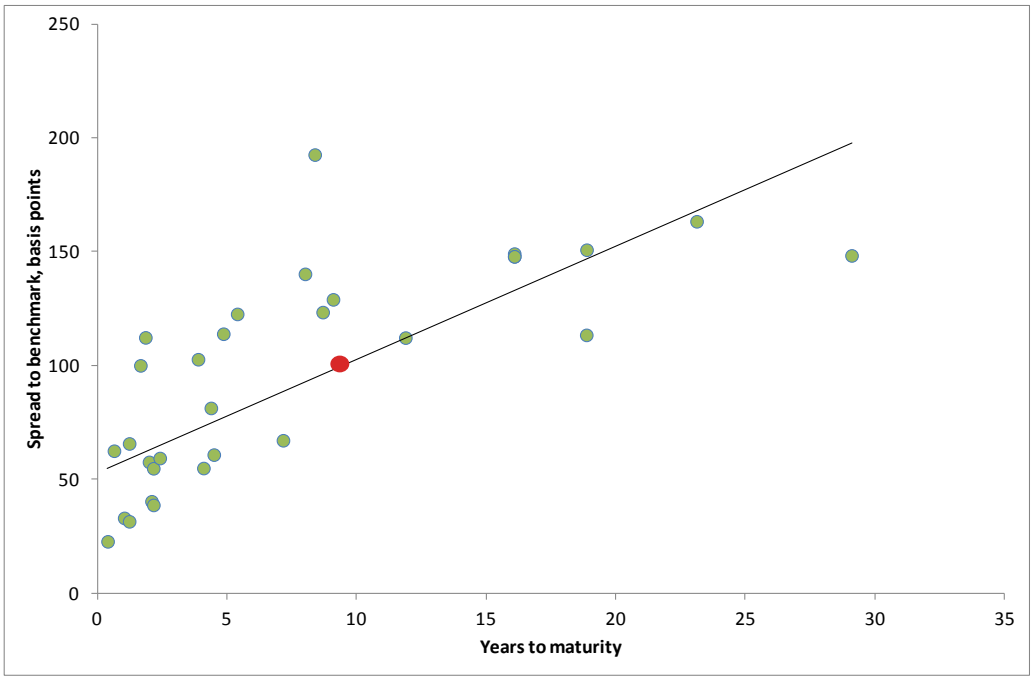
6 Vodafone specific analysis

Compared with a normally efficient MNO, Vodafone's ability to borrow to fund the equivalent of spectrum purchase on a lump-sum basis is enhanced. In other words, to make Vodafone indifferent to the lump-sum and annual payments, the discount rate that should be used is the Vodafone-specific debt rate.

Otherwise, while the industry on average may be indifferent, Vodafone would still be disadvantaged by the upfront payment. Unlike in, for example, MCT, where this would be the case if Vodafone had inefficient financing relative to Ofcom's assumption, here it is because Vodafone is more efficient than the average. This appears to be a perverse outcome and not one that Ofcom would have intended.

Figure 6.2 gives further details on Vodafone bonds profile. It shows the distribution of bond spreads across maturities with average duration of 9.3 years (highlighted in red). In particular, Vodafone has been able to raise debt across a wide range of maturities, though it borrows more frequently on a shorter-term basis. In addition, the amounts raised are not particularly different for bonds with higher and lower maturities.

Figure 6.2 Vodafone bond maturity profile



Source:Bloomberg, and Oxera analysis

In its consultation on annual licence fees for 900 MHz and 1800 MHz, and supporting evidence, Ofcom has proposed a figure of £85.5 million per year for the next 20 years. With the cost of capital of 4.2% from its 2011 determination, the present value of these annual payments is £1,140 million. If we assume this lump sum is unchanged, and apply different discount rates, the annual payments will change, as presented in Table 6.1 below.

Table 6.1 Annual licence fee payments

Option	Rate, %	Implied annual payments, £m
Ofcom 2011, WACC	4.2	85.5
Ofcom 2011, cost of debt (post-tax, real)	1.7	67.5
Current spot market cost of debt	0.9	62.5
Current Vodafone cost of debt	0.0	57.3

Note: Formula for annual payments has been derived from general annuity formula with periodic payments.

Source:Regulatory documents, Bloomberg, Datastream, and Oxera analysis

Table 6.1. shows that the largest impact (around a 20% reduction) comes from the move to a cost of debt from a WACC approach. However, if the MCT cost of debt is applied, this still results in an ALF £10m higher per annum than would need to be applied to make Vodafone indifferent between a lump sum and an ALF.

6.1 Conclusion

The application of an industry WACC as the discount rate penalises Vodafone twice: once because it is fundamentally the incorrect discount rate and should be a debt rate; and again because, even if an industry average debt rate is used, this will still mean that the ALF will be more expensive to Vodafone than the equivalent lump sum.

Indeed, based on Ofcom's approach, and assuming that the lump-sum value is set at a level that is consistent with Ofcom's objectives of ensuring that the spectrum will be used over the period (ie that there is a low probability of hand-back), a rational MNO would prefer to pay the government the lump-sum payment instead of the ALF and take on board any of the residual risk from being unable to hand back the spectrum.

Oxera is aware of the wider considerations for Ofcom in the choice of using different discount rates for different firms within a decision which impacts the whole industry. Nevertheless, the situation here is slightly different. If the ALF is in practice not a choice relative to a lump sum, but an obligation, then Vodafone is being penalised by being required to move to an inefficient long-term financing, relative to its own internal lower cost of debt.

We therefore propose that Ofcom should consider the full range for the cost of debt in this specific circumstance from 0.0% (post-tax, real), the value that would make Vodafone indifferent, to a maximum of 1.7% (post-tax, real), consistent with the MCT decision. The implication, if there were no other changes to Ofcom's proposed ALF of £85.5m, would be an ALF in the range of £57-67m.