Annual licence fees for 900 MHz and 1800 MHz spectrum

Ofcom consultation

10 October 2013

Telefonica UK Ltd response

Telefónica

Contents

Section 1

EXECUTIVE SUMMARY

1. Telefonica UK Ltd ("Telefonica") welcomes the opportunity to comment on Ofcom's proposals on annual licence fees ("ALFs") for 900 MHz and 1800 MHz spectrum[1].

Deployment of LTE networks

2. The consultation comes at an important point in time for the industry. Significant progress has been made in rolling out LTE networks. Telefonica launched its 4G service at the end of August 2013 and, by the end of last year, Telefonica' s 4G network reached over 17 million people in the UK, covering 13 major cities and over 120 other towns. Telefonica's network rollout plans will increase coverage to an additional two million people per month. This reflects significant network investment. On average, each day, Telefonica invests £1.5m in its UK network.

3. This network investment and rollout is entirely consistent with Government policy, broadly to improve broadband provision in the UK[2], and Ofcom's statutory duties, to promote investment and the availability and use of high speed data transfer services[3]. It is clear that both Government and Ofcom appreciate the wider benefits to society brought about by increased broadband provision, in general, and the proliferation of 4G services, in particular.

4. In November 2013, the Department for Culture, Media & Sport published a report by analysts, SQW, which assessed the economic, social and environmental impacts for the UK

[1] Annual licence fees for 900 MHz and 1800 MHz spectrum. Consultation. 10 October 2013

[2] See: https://www.gov.uk/government/policies/transforming-uk-broadband

[3] See sections 3(4)(c) and (d) of the Communications Act 2003

from faster broadband[4]. The report found that the government intervention was projected to return approximately £20 in net economic impact for every £1 of public investment in faster broadband. We see no reason why investment in 4G made by Telefonica would yield markedly different returns.

5. Following last year's spectrum auction, Ofcom commented:

> *"The value of the benefits which 4G services will provide to UK consumers over the next 10 years (the 'consumer surplus') is likely to be at least £20bn, according to Ofcom estimates.*
>
> *The UK's communications networks will become more advanced as 4G is rolled out over the coming months. This new infrastructure, together with software development, employment opportunities and new mobile revenues, means 4G is likely to make a significant contribution to UK economic growth*."[5]

6. It is also the case that the UK mobile sector is delivering for consumers. Ofcom's recent international price comparison research revealed that "*the biggest savings available to UK consumers are for mobile phone deals, which are significantly cheaper than in other major European countries – and almost three times less than what US consumers pay*" and that "*consumers in the UK are benefiting from one of the world's most price competitive marketplaces for communications services*"[6].

7. The profitability of UK mobile operators is, however, poor by international standards. In this response, we provide evidence that UK mobile operators' EBITDA margins are significantly lower than their counterparts in Europe and other regions. This is important because UK mobile operators are part of multi-national groups which seek to invest in territories where returns are greater. Consequently, UK operators must already overcome the problem of low returns when competing within their groups for scarce investment funds.

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[4] UK Broadband Impact Study – Impact Report, by SQW (with Cambridge Econometrics): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/257006/UK_Broadband_Impact_Study_-_Impact_Report_-_Nov_2013_-_Final.pdf

[5] See: http://media.ofcom.org.uk/2013/02/20/ofcom-announces-winners-of-the-4g-mobile-auction/

[6] See: http://media.ofcom.org.uk/2013/12/12/uk-communications-deals-cheaper-than-in-other-major-countries/

8. This is the context in which Ofcom makes its proposals to increase annual licence fees for 900 MHz and 1800 MHz by a factor of more than five (in the case of Telefonica). If these proposals were adopted, Telefonica's costs would increase significantly, by over £70m per annum.

Concerns with Ofcom's analysis

9. Ofcom's approach is narrowly focused on seeking to assess the market value of the relevant spectrum. Very little analysis has been undertaken on addressing the likely impact of increased ALFs on, for example, retail prices and investment (which, in turn, are likely to impact on consumers).

10. Ofcom has sought to use UK spectrum auction data, and similar information from European auctions, ultimately to estimate the market value of 900 MHz and 1800 MHz spectrum. Telefonica has a number of concerns about Ofcom's analysis and we set these out in detail in this response. Essentially, we believe that Ofcom has made various errors and problematic assumptions that have the effect of inflating the estimated value of the spectrum, possibly under the erroneous belief that the Government Direction requires Ofcom to maximise ALFs. In summary, we have identified a series of flaws and errors (including a lack of transparency, an apparent bias in sample selection and a lack of analytical rigour) in relation to Ofcom's analysis of:

    - Benchmarking;
    - The Linear Reference Price methodology;
    - The estimated lump sum valuation of 900 MHz and 1800 MHz spectrum; and
    - The conversion of the lump sums into annual fees

11. We have corrected for these errors to arrive at estimates[7] for the value of 1 MHz of 900 MHz and 1800 MHz spectrum of £15.22m and £8.63m respectively, and annual licence fees for 1 MHz of 900 MHz and 1800 MHz spectrum of £0.89m and £0.52m respectively. We believe that these values represent an upper bound for any range of plausible fee levels,

[7] Based on Ofcom's methodological approach. For the avoidance of doubt, we have reservations about this.

given the much greater risk of inefficiency if prices are set above, rather than below, the market level.

The need to assess the full impact of higher ALFs

12. We also have concerns about Ofcom's broad approach. It recognises that it is subject to a series of statutory duties and it acknowledges explicitly that there is a degree of uncertainty in estimating the market value of 900 MHz and 1800 MHz spectrum. However, nowhere in its consultation document does Ofcom engage meaningfully with this uncertainty with respect to its statutory duties. For example, Ofcom could have determined a range of values for the spectrum based on various assumptions and methodological approaches, and considered the effects of different values on prices, investment, coverage, etc. However, Ofcom has, to date, decided not to do this and, accordingly, Telefonica believes that it has missed an opportunity to undertake a sufficiently rigorous analysis of the consequences of its proposals. Consequently, Ofcom has not been able to form a view on how best to reflect those duties in the exercise of its discretion which, we believe, it is compelled to do.

13. Furthermore, Ofcom does not mention at all in the consultation document the *purpose* of the Direction issued by the Government, requiring Ofcom to revise the licence fees (which includes allowing early deployment and maximising the coverage of next generation wireless mobile broadband)[8]. Accordingly, it must be the case that Ofcom has not considered whether its proposals actually meet these fundamental objectives. In Telefonica's view, and for the reasons set out in this response, they do not.

14. Telefonica believes that Ofcom needs to reconsider its approach on annual licence fees. In addition to correcting the errors and omissions we have identified in its analysis, it needs to consider, properly, the implications of increasing fees in the context of its statutory duties and the purpose of the Government's Direction. Only when it has done this, and consulted again on a revised proposal, will it be in a position to press ahead with Regulations to amend the fees.

[8] See Article 2 of the Directions to Ofcom (SI 2010 No. 3024)

Section 2

LEGAL FRAMEWORK

15. Ofcom describes the relevant legal framework in paragraphs 3.11 – 3.36 of the consultation document.

16. Ofcom refers to the Direction made by the Government at paragraph 3.31[9]. Although not mentioned in the consultation document, it is instructive to note Article 2 of that Direction:

> **"Purpose of Directions**
>
> 2. The Secretary of State gives these directions for the purposes of: ensuring the release of additional electromagnetic spectrum for use by providers of next generation wireless mobile broadband; ***allowing early deployment and maximising the coverage of those services; creating greater investment certainty for operators***; and implementing Directive 2009/114/EC and the Decision on the liberalisation of frequencies in the 900MHz and 1800MHz bands." (emphasis added)

17. In Telefónica's view, this provides a very clear objective that Ofcom must seek to achieve when giving effect to the Direction. The Government's policy is to promote early deployment of next generation of wireless services and the maximisation of coverage of such services. Ofcom's analysis of the effect of implementing the Direction should therefore reflect the objectives described in Article 2, as well as the statutory General and Community Duties described in paragraphs 3.20 – 3.25 of the consultation document.

18. We return to this in our discussion in Section 5 of this response (on risk asymmetry).

[9] The Wireless Telegraphy Act 2006 (Directions to OFCOM) Order 2010. SI 2010 No. 3024

Section 3

ASSESSMENT OF LUMP-SUM VALUES

3.1 Introduction

19. Ofcom describes the evidence it has used to determine the value of 900 MHz and 1800 MHz spectrum in the UK in section 4 of the consultation document. Telefonica sets out its response to Ofcom's analysis in this section of our response.

20. Ofcom will note that we have a number of concerns about the approach that Ofcom has taken on benchmarking. Very broadly, we believe that the criteria that Ofcom has adopted to determine "*more important evidence*" and "*less important evidence*" is unclear and that the subsequent categorisation of the evidence appears to be inconsistent. Accordingly, sample bias appears to have crept into Ofcom's analysis, corrupting the results. We have identified other methodological problems (such as the use of PPP exchange rates).

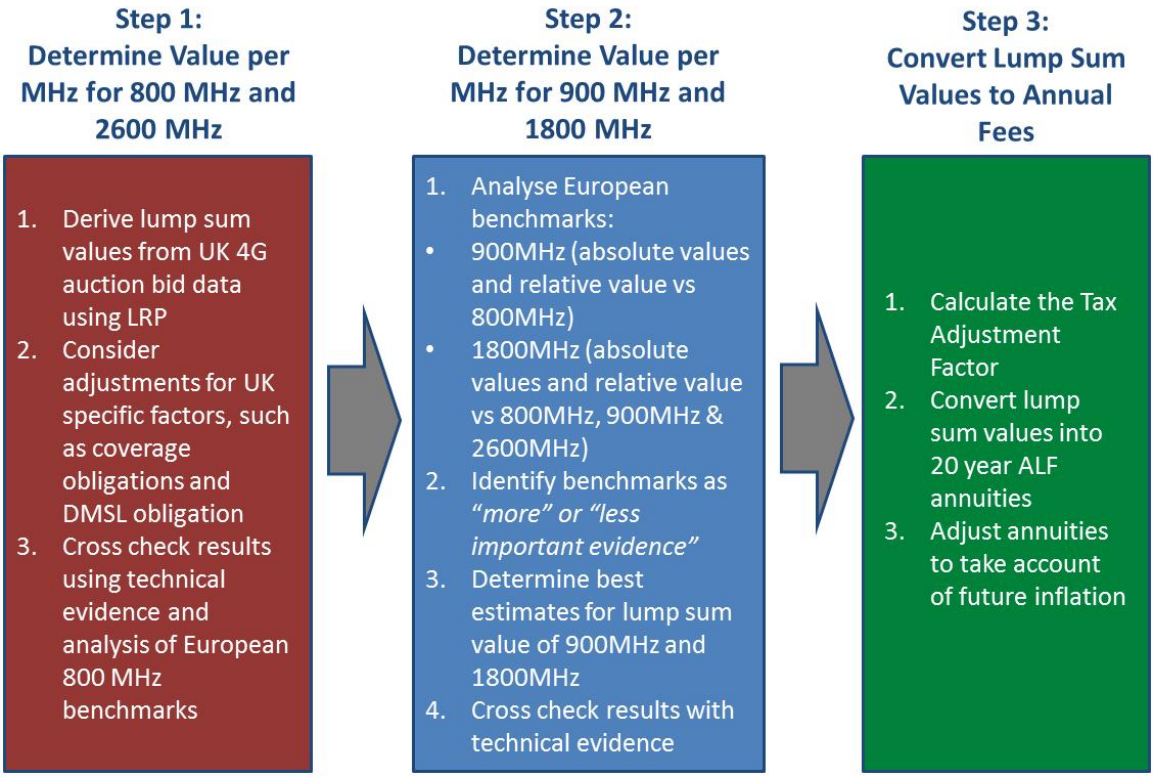
21. Whilst we agree with Ofcom that the Additional Spectrum Methodology approach to determining the value of 800 MHz and 2.6 GHZ is unhelpful in the present case, the Linear Reference Price methodology is not without problems, either (for example, it is very sensitive to the inclusion of specific bids).

22. Telefonica has sought to replicate the work that Ofcom has undertaken (ie we have used the LRP approach and benchmarked against European spectrum auctions), but correcting errors that we believe Ofcom has made, to arrive at values for 900 MHz and 1800 MHz spectrum in the UK. This is described in subsections 3.4 - 3.7 of this response. We also discuss Ofcom's mandate and approach in subsection 3.2, and the "technical evidence" in subsection 3.3.

3.2 Ofcom's approach

23. At the highest level, Ofcom's approach to calculating annual fees for 900MHz and 1800MHz spectrum consists of three main steps, as illustrated in Figure 3.1.

Figure 3.1: **Ofcom's approach to calculating annual fees for 900MHz and 1800 MHz**



24. In turn each of these steps involves a series of calculations, assumptions and exploration of alternative methodologies:

STEP 1: Determining a lump sum valuation per MHz for 800 MHz and 2.6 GHz spectrum involves the following steps:

a. Derivation of lump sum values from UK 4G auction bid data using the Linear Reference Price (LRP) approach developed for Ofcom by DotEcon.

b. Exploration of alternative methodologies using UK 4G auction bid data, such as the ASM and decomposition approaches, which ultimately were rejected by Ofcom.
c. For 800 MHz, Ofcom's calculation of a lump sum value includes two further adjustments:
    i. Exclusion of data regarding the 800 MHz coverage obligation lot, on grounds that there is no similar obligation for other UK bands; and
    ii. An uplift in the lump sum value equivalent to the maximum costs of funding DMSL obligation.
d. As a final step, the technical evidence on the value of 800 MHz, based on work by Aetha Consulting and DotEcon, and results from the benchmarking exercise for European 800MHz awards, using data and analysis from DotEcon, provide a sanity check on the Ofcom results.

STEP 2a: The derivation of a lump sum valuation per MHz for 900 MHz spectrum involves the following steps:

a. Analysis of absolute values for 900 MHz from other EU 4G awards, using benchmark data and analysis from the DotEcon report for Ofcom
b. Assessment of relative values for 800 MHz and 900 MHz spectrum, using benchmark data and analysis from the DotEcon report for Ofcom.
c. Identification of particular benchmarks as being "more important" or "less important" evidence.
d. Determination of a "best estimate" for the lump sum of 900 MHz, which is "*informed by the value of 800 MHz spectrum in the UK auction*". Ofcom does not present any specific calculations, but justifies its assessment with reference to steps (a), (b) and (c) above.
e. The technical evidence on the value of 900 MHz versus 800 MHz, based on work by Aetha Consulting and DotEcon, is cited as a cross check on the final results.

STEP 2b: The derivation of a lump sum valuation per MHz for 1800 MHz spectrum essentially follows the same steps as for 900 MHz, but draws on evidence from European benchmarks for 1800 MHz and 2.6 GHz, as well as 800 MHz and 900 MHz.

STEP 3: The conversion of 900 MHz and 1800 MHz prices from lump sum to annualized fees involves the following steps:

a. Convert the lump-sum value into a 20 year ALF annuity with a constant profile in real terms, using a discount rate that Ofcom says is equal to the WACC of a hypothetical UK mobile-only.
b. Adjust this amount to account for the differential tax benefits of the ALF annuity and the lump sum value when calculating the ALF annuity through a so-called tax adjustment factor (TAF).
c. Index the base year ALF rate by the outturn RPI index to calculate nominal ALF rates to be paid by spectrum licence holders each year.

25. The next two sections of this response analyses the work Ofcom has done and contains various criticisms and suggested improvements.

26. At this point, we would simply reiterate Ofcom's observation, that "*[w]e recognise that there is uncertainty about the full market value of these bands and that the process of revising annual licence fees necessarily requires us to use our judgement to estimate the full market value*" [10].

27. Whilst we accept that the issue of determining full market value is one in which the regulator must exercise its discretion, in Telefonica's view, it is also true that discretion may be exercised properly only after a full examination of the issues has been carried out. That includes exploring various methodological approaches and techniques that might give rise to different estimates, considering the extent to which such approaches are likely to provide reasonable estimates and examining the effect of higher ALFs on prices, investment, provision of services, etc. In Telefonica's view, it is only when a full and complete analysis has been carried out that Ofcom will be able to exercise its discretion properly. Our concern is that, to date, Ofcom's analysis is not full and complete.

28. The issue of ALFs is an important one to the mobile operators. Ofcom is, after all, proposing to extract an additional £250m per annum out of the industry. That is a significant figure. In Telefonica's view, it must surely be right (and consistent with Ofcom's statutory duties) that Ofcom undertakes a rigorous assessment of its proposals before exercising its discretion.

[10] See paragraph 2.10

3.3 Ofcom's use of technical evidence

29. Ofcom's position on the "technical evidence" (covering the technical and commercial characteristics of the spectrum bands) is set out in paragraphs 4.10 and 4.11.

30. Ofcom has "*not undertaken new technical or cost modelling*" for the purpose of valuing the 900 MHz and 1800 MHz bands. Ofcom concludes that "*[m]arket values derived from technical and commercial cost modelling are highly sensitive to the range of assumptions that need to be made, such that we consider that an attempt to derive point estimates of value based on this approach would be of limited additional benefit*."[11]

31. Telefonica's view is that Ofcom's conclusion that 900 MHz cannot be more valuable than 800 MHz is correct, but that Ofcom could have gone further in stating that the evidence firmly suggests 900MHz is less valuable. This is, however, implicit in Ofcom's analysis.

32. Telefonica believes that this value discount is much greater than Ofcom's proposed 16%. However, we recognise that it is difficult for Ofcom to demonstrate this using technical evidence, as the value difference greatly depends on rather uncertain projections for future developments in LTE ecosystems.

33. One obvious source of evidence that 800 MHz offers benefits that cannot be replicated by 900 MHz is the fact that both Vodafone and Telefonica were such strong bidders for 800MHz spectrum, despite already have 2x17.5 MHz each of 900 MHz spectrum.

[11] Ofcom, Annual licence fees for 900 MHz and 1800 MHz spectrum, Consultation, 10 October 2013, ¶ 4.11 (henceforth "Ofcom Consultation, 10 October 2013").

3.4 Ofcom's use of European benchmarks

Introduction

34. Telefonica welcomes the use of European benchmark data as an important source of evidence for the determination of prices for 900 MHz and 1800 MHz spectrum in the UK. Although operators primarily rely on technical and commercial models for valuing spectrum, they also use per MHz per pop benchmarks using award outcomes from other countries as a sanity check on these models. In situations, like this one, where there is a body of data from many countries that share some similarities to the UK market, appropriate benchmarking can be a powerful and informative tool.

35. In the context of this administrative pricing exercise, it makes sense that Ofcom should put somewhat more weight on benchmarking outcomes and somewhat less weight on technical modelling than an operator would. This is because, as a regulator, Ofcom is not as well placed as operators to make judgments about technical and commercial valuations, and therefore cannot easily estimate market value. Indeed this is one of the underlying rationales for having auctions. Furthermore, the timing of this analysis is good, as there is a set of European data, owing to the coincidental growth in number of countries using auctions, the common release of new LTE bands, and expiry and re-allocation of many 900 MHz and 1800 MHz licences across Europe.

36. That said, in many case, the number of data points for specific bands or for ratios across bands are still modest. Accordingly, we support Ofcom's own assessment "*that given variations between countries, no specific international benchmark is likely in itself to provide robust evidence of the value of spectrum in the UK*" but "*measures of absolute value are potentially informative if taken in the round and considered alongside other evidence*."[12] Consistent with this assessment, in our comments below, we put great emphasis on identifying and analysing a broad sample of realistic datapoints, applying a rigorous and accurate methodology to benchmark comparisons, and a balanced approach to identifying datapoints that might be low or high outliers.

[12] Ofcom Consultation, 10 October 2013,¶ 4.13a.

37. Given the weight that Ofcom attaches to benchmarking in its analysis, we have devoted considerable time and effort to reviewing the approach taken by Ofcom and its subcontractor, DotEcon. Unfortunately, in this process, we have identified a series of concerns with the Ofcom country benchmarks, which collectively cast grave doubt over the validity of Ofcom's results. Our concerns, which we discuss in detail below, are grouped under three headings:

    - *Problems with Ofcom's approach to benchmarking.* These include general concerns with the use of PPP exchange rates and inflations, specific methodological errors and problems with source data. Some of these problems are severe and can only be addressed by redoing the benchmarking exercise;

    - *Errors and omissions in the condoc and source data*. We have identified various errors and omissions that should be corrected. Fortunately, these appear modest and appear unlikely to have distorted Ofcom's analysis; and
    - *Sample bias*. Ofcom's choice of evidence points reveals a systematic bias towards evidence points that produce higher prices. We request that Ofcom revisit its approach to identifying "more important" and "less important" evidence, and consider a more balanced perspective across low and high data points. We particularly urge greater scepticism with respect to a limited number of outlying high value points that appear to be given undue weight at present.

38. We believe the problems we have identified can only be addressed by Ofcom redoing the benchmarking exercise and revisiting its choice of evidence points. It is particularly important that it removes the sample bias by either reinstating awards with lower price outcomes as evidence or stripping out high price outliers in the same way it strips out low price outliers. To facilitate this process, we have undertaken our own benchmarking exercise using public domain data (verified against DotEcon data provided to us by Ofcom). We present our results and describe how our approach differs from Ofcom/DotEcon approach later in this section. Obviously, Ofcom will need to perform its own calculations using a corrected DotEcon dataset to determine if it agrees with our calculations. Operators should then have a further opportunity to review and comment on the revised findings.

A. Problems with Ofcom's approach to benchmarking

39. We have identified a series of concerns with the approach that DotEcon and Ofcom have used in developing GBP-based benchmarks for the value of spectrum in each of the relevant spectrum bands. Our concerns fall into five categories:

    1. The case for using of purchasing power parity exchange rates for this data sample is weak, and may be a source of distortion given different methodologies for deriving and applying PPP. There is a particular problem that the dataset includes many licences that sold at reserve price, and in some cases these prices were based on benchmarking but without any similar adjustment for PPP.

    2. The case for applying inflation to adjust for the different timings of awards in the sample is weak, given that all awards in the sample are grouped together over a relatively narrow four year time period. In this period, inflation was modest and unlikely to be in anyway correlated to changes in spectrum prices and willingness to pay for mobile services.

    3. There is a methodological error in the approach to deriving GBP benchmarks: exchange rate conversions are not being made on the right dates and the wrong inflation rate is applied to all numbers.

    4. There is a mismatch between award dates, which may be linked to a particular month, and DotEcon's source data for PPP exchange rates, which are annual averages. There is also ambiguity with regard to use of inflation data in this respect.

    5. There is a general problem with the use of World Bank data, which is only reported on an annual basis and, at the time of the DotEcon study, was not up-to-date for recent years. To compensate for this, DotEcon appears to have extrapolated some exchange rate, inflation and population data points, which is an obvious source of error. Many of these problems could be avoided if Ofcom were to use Eurostat data instead.

40. We discuss each of these concerns in more detail below. Individually, the impact of each of these issues on the final data may vary from modest to substantial. However, taken

overall, it is clear that full dataset cannot be considered reliable. Our recommendation is that Ofcom revisit its entire benchmarking dataset, making adjustments as discussed above.

1. Use of purchasing power parity exchange rates

41. All benchmarks used by Ofcom have been converted into GBP using PPP exchange rates, derived from World Bank data. This is different from the standard industry approach of using market exchange rates. No substantive explanation is provided for the use of PPP rates, although Ofcom states in the consultation document that this "*to account for differences in the level of affluence between countries*" and DotEcon, in their report to Ofcom say that this is "*to account for price differences and levels of affluence between countries*."[13]

42. Telefonica has reviewed both the detailed approach for conversion used by DotEcon and the broader rationale for using PPP rates rather than actual rates. Our conclusion is that use of PPP rates does not add any value and may be distorting benchmarks for many countries. We recommend that Ofcom instead revert to using market exchange rates, which is the norm across the industry for making price per MHz comparisons.

43. There are a number of reasons why we conclude that use of PPP exchange rates is inappropriate for this particular exercise:

- PPP rates developed by institutions like Eurostat and the World Bank are based on comparisons of the prices of a basket of representative goods and services. However, they are not necessarily a good proxy for the willingness and ability of consumers to purchase any particular good or service. They are designed to allow comparison of purchasing power at the whole economy level, not for a specific sector, such as mobile services.

[13] Ofcom Consultation, 10 October 2013,¶ 4.28; and DotEcon, International benchmarking of 900MHz and 1800MHz spectrum value, Final Report for Ofcom, September 2013, ¶ 31 (henceforth "DotEcon, Final Report for Ofcom, September 2013").

- PPP exchange rates are only available as an annual average and are created retrospectively. Our understanding is that at the time that DotEcon did its study, there were are no actual data points for converting prices for awards that took place in 2012 or 2013, so DotEcon instead extrapolated PPP exchange rates (see further discussion under methodological error below). [14] This may lead to substantial errors. For example, DotEcon highlight just such an error occurring between their 2012 and 2013 versions of their benchmarking report for Ofcom:

  > *"We note that in our "Spectrum Value Report 2012" the average licence price paid in Germany was higher than in Italy, this is due to the use of a predicted PPP rate for Italy in the "Spectrum Value Report 2012" (as an official rate for 2011 was unavailable at the time of publication) which differs from the actual PPP rate used in this report (now available) to convert the Italian licence prices."*[15]

- PPP exchange rates are only available as an annual average, but awards take place in specific months. However, in reality, of course, PPP rates move over time, depending on the market exchange rate. As DotEcon simply apply the average exchange rate based on the year of award, there is no guarantee this rate will be particularly accurate. For example, suppose two awards took place in the same country either side of the New Year. Under the DotEcon methodology, two different exchange rates would apply, even though purchasing power and exchange rates may not have moved. If the sample dataset was much larger, this might not matter, but for a modest sized data set such as this one, there is a high risk that key benchmarks are skewed.

- There are discrepancies in PPP exchange rates depending on the source of data. For example, in Table 3.1, we compare the local currency-GBP exchange rates converted via a base currency using Eurostat and World Band PPP rates for the year of award. Many of the rates are different. It is unclear to us whether these differences are attributable to the use of different base currencies (Eurostat uses Euros whereas the World Bank uses US dollars), the World Bank data being updated less frequently or some other methodological differences.

[14] DotEcon, Final Report for Ofcom, September 2013, ¶ 27.

[15] DotEcon, Final Report for Ofcom, September 2013, p. 18, footnote 26.

- PPP rates should be correlated with relative wage levels, and so should – as DotEcon and Ofcom contend – provide a proxy for relative affluence. However, differences in purchasing power are just one of many factors why prices, costs and expected profits from deploying mobile services using radio spectrum may vary between countries. Other factors include, for example, the population distribution across rural and urban areas, terrain, differences in planning regulations and local competitive dynamics. It is problematic to make a quantitative adjustment for one factor, but not to make adjustment for other factors that may be just as important. Of course, one could attempt an econometric study to identify which factors are significant in determining spectrum values, but we doubt the sample of benchmarks is sufficient to produce reliable results.

- For auctions where final prices did not increase beyond reserve, there is a significant risk that using PPP exchange rates may distort benchmarks, depending on how the reserve prices were set. A number of countries, all significantly less affluent than the UK – for example, Greece, Portugal, Spain and Romania – appear to have themselves used international benchmarks to set reserve prices. Typically their methodology is opaque, but our suspicion is that these countries did not make any substantial adjustment for affluence levels when setting their own prices. Our conclusion is that many of these price points were set above market level. Applying PPP in this context is distorting, because it creates an exaggerated benchmark for the UK.

44. In summary, the case for using PPP is weak, and the approach prone to error and distortions. We propose instead that Ofcom reverts to using market exchange rates. This has the benefit of being straightforward. Of course, there are still methodological issues to resolve about what exchange rate to use. A typical approach in industry is just to use the exchange rate for the month or year of the award, but over time exchange rates may diverge significantly from the long-term rate, and any particular benchmark may be distorted because it occurred in a particular month or year when the pound was weak or strong.

45. We propose a simple solution to this. All the awards that Ofcom rely on occurred between 2010 and 2013, and almost all of them are for countries that use the Euro. During this period, as illustrated in Figure 3.1, the GBP-Euro exchange rate fluctuated significantly, but

the full term trend appears fairly flat. Therefore, Ofcom could simply convert all awards on the basis of an average exchange rate for the entire 4-year period, as reported in the final column of Table 3.1. This ensures a consistency of approach across the entire sample. More generally, using a proxy for the long-run exchange rate seems reasonable, given that operators are acquiring long-term licences. Finally, differences in affluence between the UK and benchmark countries can still be addressed, but through qualitative rather than quantitative comparison, which is the approach Ofcom de facto adopts for other factors that might influence the relevance of particular benchmarks.

Figure 3.1: Euro-GBP market exchange rate from 2010-2013

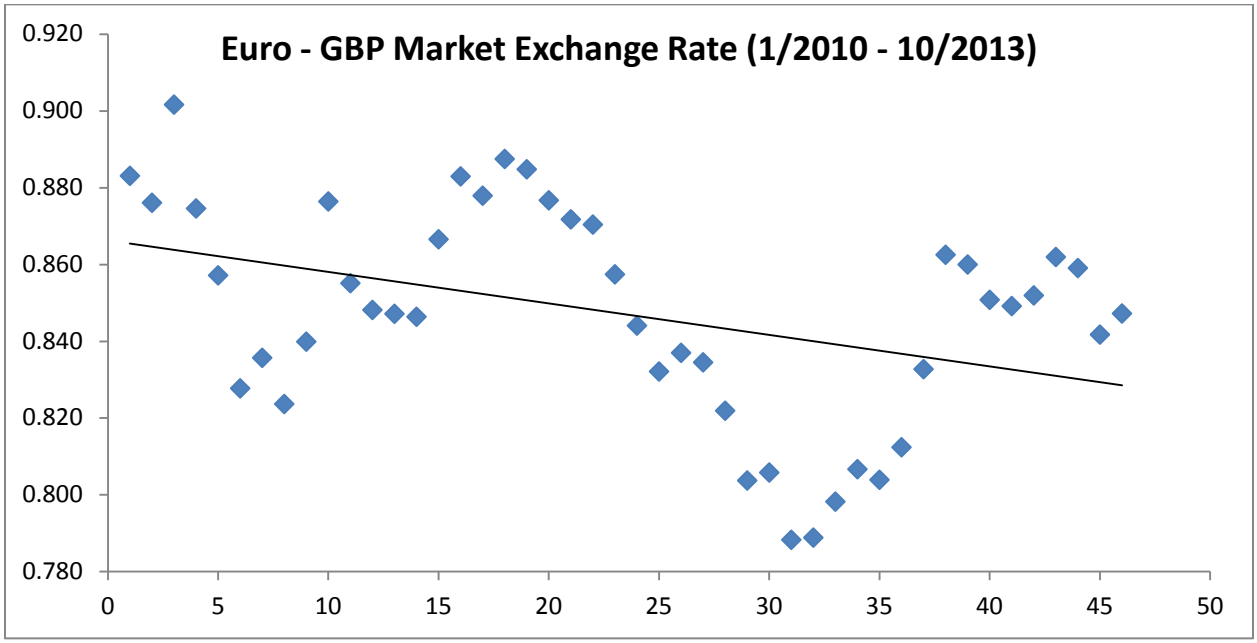


Table 3.1: Comparison of PPP and Market Exchange Rates for Benchmark Awards

Country (date of award)	World Bank PPP – Date of Award	Eurostat PPP – Date of Award	Market – Month of Award	Market – Year of Award	Market – Average for 2010-2013*[16]
Austria (2010)	0.790	0.772	0.840	0.858	0.847

[16] We calculate the average exchange rate for 2010-2013 by summing the monthly exchange rate between the local currency unit and GBP for all available months from January 2010 to October 2013, and dividing by the number of months. At the time of drafting this report, data for November 2013 was unavailable.

Country (date of award)	World Bank PPP – Date of Award	Eurostat PPP – Date of Award	Market – Month of Award	Market – Year of Award	Market – Average for 2010-2013*[16]
Austria (2013)	0.795	0.795	0.847	0.852	0.847
Belgium (2011)	0.783	0.787	0.857	0.868	0.847
Belgium (2013)	0.779	0.778	0.847	0.852	0.847
Czech Republic (2013)	0.048	0.048	0.033	0.033	0.034
Denmark (May 2010)	0.085	0.083	0.118	0.115	0.114
Denmark (Sep 2010)	0.085	0.083	0.115	0.115	0.114
Denmark (2012)	0.085	0.085	0.108	0.109	0.114
Finland (2013)	0.711	0.711	0.847	0.852	0.847
France (Sep 2011)	0.784	0.783	0.844	0.868	0.847
France (Dec 2011)	0.784	0.783	0.872	0.868	0.847
Germany (2010)	0.823	0.806	0.857	0.858	0.847
Greece (2011)	0.951	0.954	0.857	0.868	0.847
Ireland (2012)	0.808	0.799	0.804	0.811	0.847
Italy (2011)	0.853	0.851	0.872	0.868	0.847
Netherlands (2012)	0.797	0.793	0.812	0.811	0.847
Portugal (2011)	1.072	1.069	0.857	0.868	0.847
Romania (2012)	0.396	0.395	0.798	0.811	0.847
Slovakia (2013)	1.266	1.266	NA	0.852	0.847
Spain (May 2011)	0.946	0.943	0.878	0.868	0.847
Spain (Jul 2011)	0.946	0.943	0.885	0.868	0.847
Spain (Nov 2011)	0.946	0.943	0.857	0.868	0.847
Sweden (2008)	0.073	0.074	0.085	0.083	0.094
Sweden (2011)	0.076	0.075	0.098	0.096	0.094
Switzerland (2012)	0.476	0.476	0.701	0.692	0.669
United Kingdom (2013)	1.000	1.000	1.000	1.000	0.847

Sources: PPP data from Eurostat and World Bank; Market exchange rates from Eurostat.

2. Application of inflation

46. All benchmarks used by Ofcom have been adjusted for inflation. The purpose of this adjustment, we may suppose, is to allow for changes in general price levels between the date of each benchmark award and the date of the UK award. While Ofcom does not

specifically comment on the rationale the inflation adjustment with respect to the benchmarks, it does indicate elsewhere in the consultation document that the purpose of such adjustments is to account for "*the change in underlying value of 4G spectrum over time*."[17] We do not disagree with this objective per se, but our view is that for the purposes of benchmarking awards over a narrow four-year window, the case for making any type of inflation rate adjustment is weak. Moreover, it is prone to error and distortions which more than outweigh any benefits.

47. There are a number of reasons why we conclude that adjustment for inflation is inappropriate for this particular exercise:

- For the purposes of benchmarking for 900 MHz and 1800 MHz prices, Ofcom has sensibly limited itself to considering a modest sample of European awards taking place in a four-year window from 2010-2013. This relatively short period of time has coincided with an era of low inflation across the developed world. Accordingly, there is good reason to doubt whether price changes have had any impact on willingness to pay for spectrum over this narrow period.

- When benchmarking, the case for adjusting for inflation is greater the longer the time period addressed in the sample. For example, the ComReg benchmarking study, cited by DotEcon in their report to Ofcom,[18] covered a 15-year period from 1996-2011, during which ComReg say that there was 43.33% change in CPI.[19] It follows that, over a period of such length, changes in price levels impact on wages and consumer willingness to spend on mobile services and thus affect the underlying value of spectrum – although this affect could still be swamped by other factors, such as the telecoms bubble of 2000, which in retrospect is perceived as period of irrational exuberance. By contrast, for a period of less than four years, there is unlikely to be any affect.

[17] This comment is made in relation to the discussion of choice of price index as a measure of inflation to be used for the purposes of converting lump sum fees to annual fees. (Ofcom Consultation, 10 October 2013, ¶ 5.47.)

[18] DotEcon, Final Report for Ofcom, September 2013, p. 5, footnote 9.

[19] ComReg, Interim Licenses for the 900 MHz Band, Response to Consultation and Decision, Document No. 11/29, Decision No. D03/11, 13 April 2011, p.63.

- In each of the benchmark awards, operators are buying long-term licences, covering periods of 12 to 25 years. One may suppose that the effects of anticipated inflation over the full licence term will swamp any impact of price difference between the different award start dates across Europe. Accordingly, for practical purposes, it seems quite reasonable to treat all the benchmark awards as if they took place at the same time.

- When looking at any specific sector, there is a general problem with identifying the appropriate index for inflation. For spectrum awards, Ofcom has indicated a preference for using CPI, which is a broad measure of inflation covering a basket of goods and services. However, as Ofcom acknowledges, this is only one of a number of potential indexes. Other candidates include RPI and a telecom-specific input price index. This debate can be avoided by not applying any inflation indexation.

48. There are also serious methodological problems with the way DotEcon has applied inflation adjustments to the benchmarks. Our understanding is that they have used annual CPI data reported by the World Bank. This creates two problems. Firstly, DotEcon use differences in the year of award to determine how many inflation adjustments they make. For example, if an award takes place in 2010, then adjustments are made for inflation in 2011, 2012 and 2013 to create a benchmark for the UK. However, this approach ignores that fact that awards may be tied to specific months rather than years. Even though the UK award took place in January 2013, our understanding is that DotEcon apply a full year of inflation versus any award that took place in 2012, regardless of whether that award happened early or late in 2012. The implication is that any benchmark for an award that took place from February onwards in a calendar year will be overstated. Secondly, the World Bank had not published 2012 or 2013 CPI data at the time when DotEcon did its study, so all benchmarks used must depend on CPI numbers that DotEcon have made up, apparently by extrapolating from past inflation trends.[20]

49. In summary, the case for applying an inflation adjustment across a sample of spectrum award benchmarks that spans a period of less than four years is weak, and the approach prone to error and distortions. We propose instead that Ofcom does not apply any adjustment for inflation, on the basis that all the sample awards have taken place at

[20] DotEcon, Final Report for Ofcom, September 2013, ¶ 27.

roughly the same time in the investment cycle for use of spectrum bands by mobile operators.

3. Methodological error

50. We believe there is a methodological error in DotEcon's approach to converting benchmarks to GBP using PPP exchange rates and inflation adjustments. For each award, the process is supposed to produce a benchmark for the UK in GBP adjusted for differences in the purchasing power of the two currencies and adjusted for changes in general price levels. However, the DotEcon approach does not achieve this because it converts to GBP using the wrong PPP exchange rate and, bizarrely, applies the US rather than UK inflation rate.

51. The approach that we believe DotEcon should have followed to implement their methodology is as follows:

- Step 1: Convert to a base currency at date of award.
- Step 2: Convert to GBP from base currency *at the same date of award.* This creates a benchmark for the UK at the time of the benchmark award.
- Step 3: Adjust for inflation using UK CPI data, for the period between the benchmark award date and the UK auction date. This adjusts the UK benchmark to take account of any change in UK prices over the time period under analysis.

52. Instead, DotEcon follow a completely different and erroneous approach:

- DotEcon do correctly convert to a base currency at date of award. However, owing to their use of World Bank data, they use USD as the base currency. We appreciate that the choice of the US dollar as a base currency may make sense in the context of DotEcon's broader international dataset. However, we think it is inappropriate for a European dataset. Instead, they could have used Eurostat PPP data, which uses the Euro as the base currency.

- DotEcon inflate all benchmarks using US CPI data. This is a mistake. Ofcom should not be relying on US inflation data in its determination of European benchmarks for UK prices. US inflation is not a satisfactory proxy for changes in prices in the UK.

- DotEcon attempt to convert the price per MHz into GBP at a PPP exchange rate for the date of the UK award. We use the word "attempt" because World Bank PPP data for 2012 was not available, so instead DotEcon use a "guestimated" rate of 0.6593 for all benchmarks.[21] It appears that this notional exchange rate was derived by extrapolating from previous trends in USD-GBP PPP exchange rates. However, as the USD-GBP exchange rate can go up and down, we contend that there is no basis for such an extrapolation; a better but still unsatisfactory approach would simply have been to use the PPP exchange rate for the most recent available year. Of course, the reliance on using estimated exchange rates would have been largely eliminated if DotEcon had used the correct approach of converting directly to GBP at the time of the award.

53. The DotEcon approach is clearly wrong and all the benchmarks will have to be recalculated. We recommend Ofcom simply abandon the approach of using PPP exchange rates and adjusting for inflation, for the reasons we presented above. We describe a much simpler approach that should be both more accurate and less susceptible to error in the final part of this section.

4. Mismatch between award dates and available source data

54. A general problem throughout the Ofcom/DotEcon benchmarking exercise is the mismatch between award dates, which can be tied to specific months, and the source data that DotEcon use for adjustments across countries, which is only available on an annual basis. We have already highlighted the distortions this may create when applying PPP exchange rates and inflation, depending on whether awards actually happened early or late in a given year. This is also a problem when adjusting for population.

[21] DotEcon, Final Report for Ofcom, September 2013, ¶ 31.

55. In our previous comments, we proposed a straightforward solution to the exchange rate issue (and to abandon any adjustment for inflation). Similarly, we believe that the population issue can be addressed in a straightforward manner. As all awards are for long-term licences covering roughly similar periods, there is really no strong rationale for applying population rates for different years based on the year of the award. Instead, we propose Ofcom simply use the same year for all countries when applying population rates. The obvious candidate year to use is 2012, as this is the most recent year for which population data is available for all countries in the sample.

5. Use of World Bank data

56. The Ofcom/DotEcon benchmarking exercise uses World Bank data on exchange rates, inflation and population for the purposes of adjustments across countries. We suppose that an advantage of the World Band data is that it covers the entire world, so is a consistent source for global benchmarking exercises, such as DotEcon's 2011 study for ComReg. [22] However, World Bank data seems to us to be a rather poor choice for a European benchmarking exercise, such as this one. As an obvious alternative, Ofcom and DotEcon could have used Eurostat data, which is also open source.

57. Eurostat data offers a number of obvious advantages over the World Bank as a source for the specific requirements of this exercise:

- Eurostat is a Directorate-General of the European Commission, with responsibility for providing statistical information to the institutions of the European Union. Under European law, statistical bodies in member state and affiliated countries have legal obligations to provide Eurostat with timely access to a wide range of statistics.[23] All countries in Ofcom's sample report data to Eurostat.

- Eurostat appears to update its statistics more frequently than the World Bank, which is an important benefit for a benchmarking exercise that covers awards up

[22] DotEcon, Award of 800MHz, 900MHz and 1800MHz spectrum: Further update report on Benchmarking, A report for ComReg, 24 August 2011, available at: http://www.comreg.ie/_fileupload/publications/ComReg1159.pdf

[23] Regulation (EC) No 223/2009 of the European Parliament and of the Council of 11 March 2009.

to and including the current year. We note, for example, that Eurostat data for 2012 was published before similar World Bank data become available. Had DotEcon used Eurostat data, it may have been able to substantially reduce its dependence on extrapolation from past trends, which is a source of potential substantive errors in its current dataset.

- Some Eurostat data, such as CPI, is reported on a monthly basis, which means there is greater flexibility when selecting data points.

58. When Ofcom revisits its benchmarking exercise, we strongly recommend its switches to Eurostat instead of the World Bank as a common source for data when making adjustments across European countries.

B Errors and omissions in the Condoc and source data

59. In the process of reviewing the Ofcom Condoc, the DotEcon report for Ofcom and the datasets supplied to us by Ofcom, we have identified a number of errors and omissions. These are summarized below. We urge Ofcom to check each one and confirm that they either did not affect the benchmarking exercise or make appropriate adjustments. In one case, Sweden, we are concerned that the error has led Ofcom to make mistakes in analysing an important benchmark.

60. We identified the following errors in the Consultation Document. We should be grateful if Ofcom would confirm that these are simple errors and did not impact on any actual analysis:

- Denmark carried out two separate awards for 900MHz and 1800MHz, which took place in the same year, 2010. Ofcom's description of the process appears to imply that this was a single award[24], which is not the case.

- In an explanatory note to a table reporting Greek spectrum awards, Ofcom states that "*A portion of the 900MHz spectrum was pre-assigned to each operator and cost them a total of EUR181.7 million – this is included in the allocations of the 900*

[24] Ofcom Consultation, 10 October 2013, pp. 88-89.

MHz spectrum above, but not in the total price paid." In the subsequent table, Ofcom further state that "*All spectrum sold at reserve prices…*".[25] Based on the reserve prices, all spectrum selling at reserve prices, the amount of spectrum awarded, and the DotEcon source document for the "Price Paid", we believe that the EUR181.7 million is included in the "Price Paid".

- The reported prices for the Irish November 2012 multi-band auction are incorrect. Although the allocations are correct, the table mixes up the prices paid by Telefonica and Vodafone.[26] Specifically, rounding to the nearest million euros, Telefonica paid €125m not €161m, and Vodafone paid €161m not €125m.[27]

- In Italy, Telecom Italia, 3 Italia and Vodafone each won one 2x5 MHz lot of 1800 MHz in the September 2011 auction. However, the Ofcom condoc erroneously reports that Wind not Telecom Italia won one of these lots.[28]

- The reported spectrum allocations for the Spanish July 2011 multi-band auction are incorrect. Although the prices are correct, the table incorrectly reports that a 2x5 MHz block of 900 MHz was won by Orange, when this spectrum was in fact won by Telefonica (Movistar).[29]

- In Sweden, in relation to the 800 MHz auction, Ofcom makes on factual error and one methodological error. Firstly it states that "*Coverage and rollout obligations only apply to **FDD6 which was won by Hi3G** and included a commitment of up to SEK 300m to meet the obligation. The two bottom blocks of 800 MHz were also subject to stricter usage restrictions related to DTT coexistence*" (emphasis added). In fact, Hi3G won the two bottom blocks, FDD1 and FDD2, with the usage restrictions. FDD 6, with the special coverage obligations, was won by the JV of Tele2 and Telenor. Furthermore, Ofcom only reports the amount bid in the

[25] Ofcom Consultation, 10 October 2013, p. 95.

[26] Ofcom Consultation, 10 October 2013, p. 97.

[27] See: ComReg Media Release 15/11/2012, available at: http://www.comreg.ie/_fileupload/publications/PR15112012.pdf.

[28] Ofcom Consultation, 10 October 2013, p. 101.

[29] Ofcom Consultation, 10 October 2013, p. 111.

auction, but ignores the fact that FDD6 included an obligation to spend SEK 300m on roll out to uneconomic rural areas, spend that an operator would not normally make. We believe this SEK 300m should properly be included in the price reported for Tele2 and Telenor, as indeed it is reported by PTS.[30] (A similar error is made in the DotEcon benchmarks, as reported below). We calculate the Swedish benchmark for UK 800 MHz to be £19.0m, not £14.3m as reported by Ofcom. We are further concerned that Ofcom has not put enough weight on Sweden as a benchmark because it underestimated this value.

61. We have also identified some errors and omissions with the data set provided in the file MC156 International Benchmarking Data_v2-0 stc 17102013 LLD PLD.xlsx (subsequently referred to as "DotEcon Dataset") and the data in Annex 7 of the OFCOM consultation document:

- The Ofcom condoc correctly reports that a total of 2x60 MHz was sold in the Italian September 2011 multiband auction. However, the DotEcon Dataset lists only 11 lots of 2.6 GHz spectrum, each 2x5 MHz in size (lots 12101 – 12111) as being awarded. It appears that the DotEcon Dataset is omitting the fourth lot won by Wind in this band.

- For the Greek auction, the DotEcon Dataset only lists 5 lots of 900 MHz spectrum as being awarded in the Greek November 2011 multiband auction (lots 12125-12129). We presume that these correspond to the lots that were not pre-assigned to operators by the regulator. We note that as the other 9 lots in the 900 MHz spectrum band were pre-assigned at reserve prices, and all other spectrum in the 900 MHz spectrum band was also sold at reserve prices, there is no reason to omit the pre-assigned lots from the benchmark. However, we also note that this should not have any impact on the benchmark calculations.

- For the Swedish 800 MHz auction, DotEcon correctly reports the winning bid for FDD6, won by Tele2/Telenor, as SEK 349m. However, when adjusting for license fees, DotEcon incorrectly discounts the price by SEK 300m. While it is correct that Telenor/Tele2 may ultimately be refunded up to SEK 300m against the cost of

[30] See: http://www.pts.se/upload/Ovrigt/Radio/Auktioner/10-10534-results-800mhz.pdf

specified rural area coverage, this is not a discount, as the operator must incur equivalent costs in rolling out to uneconomic areas.

62. Finally, owing to the timing of its reports, the DotEcon dataset and Ofcom analysis excludes six recent European auctions including spectrum in the 800 MHz, 900 MHz, 1800 MHz and/or 2600 MHz bands that concluded in the final months of 2013:

    - Austria – October 2013 (800 MHz, 900 MHz & 1800 MHz)
    - Finland – October 2013 (800 MHz)
    - Belgium – November 2013 (800 MHz)
    - Czech Republic – November 2013 (800 MHz, 1800 MHz & 2600 MHz)
    - Norway – December 2013 (800 MHz, 900 MHz & 1800 MHz)
    - Slovakia – Late 2013 (800 MHz, 1800 MHz & 2600 MHz) – at the time of preparing this consultation, results had not yet been announced.

63. This is a large addition to the sample. Given that Ofcom will need to redo its benchmarking exercise anyway, this provides an opportunity to add these auctions, thus creating a near complete sample of European countries. Belgium, Finland and Czech Republic all used SMRA data, so it should be straightforward to add these auctions to the benchmarks. Austria, Norway and Slovakia used combinatorial formats and did not / will not publish disaggregated data, so prices cannot be so readily discerned. Austria and Norway both reported revenues substantially above reserve, so there is no obvious way to derive individual band prices. No results have yet been announced for Slovakia, so it is unclear whether this auction too will need to be excluded from the expanded data set or could be included on same basis as the Romania auction. Accordingly, in our benchmarking exercise below, we add results for Belgium, Finland and Czech Republic, but exclude Austria and Norway.

B. Opaque criteria for selecting "more important" evidence and apparent sample bias

64. In any benchmarking exercise, the selection of the dataset is a critical part of the process. Over the last twenty years, there have been hundreds of spectrum auctions held around the world. However, most have little relevance to UK 900 MHz and 1800 MHz, because they concern unrelated bands, happened a long time ago and/or were in countries that

share few characteristics with the UK market. Here, we consider Ofcom's approach to selecting sample data. Telefonica is comfortable with Ofcom's first step of limiting the sample to European awards of 800, 900, 1800 and/or 2600MHz that took place in 2010-2013. However, we have serious misgivings with Ofcom's approach to identifying points within this sample that it considers "more important" evidence. The criteria that Ofcom has adopted to select such evidence is opaque. Further, it appears to us that the approach Ofcom has adopted has resulted in a bias against auction results producing lower outcomes, while never excluding high price outcomes even when they appear to be clear outliers from the full dataset.

65. According to DotEcon, its Spectrum Awards Database (SAD) "*includes information on 305 award processes across 61 countries worldwide, covering 12,467 licences*."[31] However, Ofcom ultimately rely on only a modest subset of these awards, namely European ones for 800, 900, 1800 and/or 2600MHz that took place in 2010-2013. Telefonica is comfortable with this approach. Recent European auctions of similar spectrum are likely to be the most relevant benchmarks for the UK, given similarities in technical ecosystems and market penetration across European countries, common regulatory frameworks, and the fact that most countries are fairly affluent (albeit with significant variation). Cutting out older awards and those from outside Europe removes many factors that could skew results, such as differences in technical ecosystems and significant changes in market assumptions about the future development of the industry.

66. Having established clear boundaries for the sample of awards, Ofcom's next step is to use quantitative and qualitative analysis of individual benchmarks to identify what it calls "more important evidence points." It then relies on these more important points as evidence for its proposed prices for 900 MHz and 1800 MHz prices. Although Ofcom says it has not used a mechanistic approach for calculating these values, there is a striking similarity between Ofcom's final proposed numbers and simple averages across its "more important" evidence points. We highlight these incidents in our concluding sections on each of the approaches to benchmarking 900 MHz and 1800 MHz (in subsections 3.6 and 3.7, below).

[31] DotEcon, Final Report for Ofcom, September 2013, ¶ 27.

67. In principle, the Ofcom approach of identifying more and less important evidence points has potential merit. The datasets that Ofcom are working with are modest in size and therefore vulnerable to distortion from the inclusion of outliers. There is therefore a case for weeding out outlying data – i.e. data points that are obviously low or high or inconsistent – before undertaking a final analysis. This is de facto what Ofcom does, as less important evidence points appear to be essentially discarded from its decision.

68. Regrettably, the qualitative process that Ofcom adopts to distinguish between less and more important evidence points is opaque and appears to us to be systematically biased towards removing lower price points. In the case of 900 MHz, amongst those awards with known results, every single one that is ignored or treated as less important evidence has below average prices whereas high price outliers are always identified as more important evidence. The only excluded value that comes close to the Ofcom valuation is the Portuguese value for the 900 MHz band.[32] The rest of the excluded 900 MHz values are all significantly below the "full market value" estimated by Ofcom for these two bands. Ofcom's approach to 1800 MHz is similar, although we note it does treat some relatively low priced observations, such as Greece and Romania, as more important evidence where they happen to be from the same auction as high prices observations in the 900 MHz band. This peculiar approach to selecting evidence appears to reflect a systematic bias within Ofcom's qualitative analysis of individual benchmarks against auctions with lower reserve prices, especially if they used an SMRA format.

69. In the section titled "Assessment of evidence points" Ofcom explained its approach to judging whether an auction was competitive:

> "*We have considered whether the auction conditions in different countries are likely to be informative for our purposes. For example, we have sought to assess whether the auctions have seen sufficient competition and led to results which accurately reflect market value in the country concerned. Informed by DotEcon's work and our own research, we have considered circumstances such as whether the number of eligible bidders exceeded the number of lots, whether bidding might have been restricted by spectrum caps, and the possible effects of conditions attached to licences. We have also considered auction outcomes, looking for*

[32] This does not include the Spain July 2011 900 MHz value of £24.4 million since Ofcom includes the Spain November 2011 900 MHz value of £25.4 in its "more important" category. (Ofcom, Correction Slip, ¶ 10.)

example at whether all licences were sold, and whether final prices were above reserve prices."[33]

70. Ofcom and DotEcon use information on reserve prices and the number of bidders to categorize auctions as being competitive (and thus being "more important" and to be relied upon in their analyses) and non-competitive (and thus being "less important" or completely omitted and not to be relied upon). However, Ofcom does not apply a consistent approach across high and low price auctions:

1. Reserve Prices

71. Ofcom states that its standard is that bids above reserve price reflect the presence of competition while those at or close to reserve price reflect a lack of competition. Specifically, Ofcom states:

"If spectrum was sold above the reserve price then we consider there was excess demand for this spectrum indicating a degree of competition in the award."[34]
"In cases where all spectrum in a band was sold at, or close to, reserve prices, we have noted the risk that this understates the value of spectrum in the band (as bidders might have been willing to pay above reserve price if there had been stronger competition for the spectrum)."[35]

72. The latter view was more strongly expressed in Ofcom's consideration of auctions in Greece, Romania, Spain (November 2011), and Sweden, where it stated:

"*In each of these cases, realised prices were at or close to reserve prices. We consider that there is a significant risk that this may have been symptomatic of limited competition in these auctions, as in a competitive auction bidding would tend to drive prices above any reserve price which was set below market value, while a reserve price set above market value would lead to unsold spectrum. It is*

[33] Ofcom Consultation, 10 October 2013, ¶ 4.14.

[34] Ofcom Consultation, 10 October 2013, ¶ A7.2.

[35] Ofcom Consultation, 10 October 2013, ¶ A7.2.

possible that reserve prices happened to be set close to market value in these countries, but there is no basis for assuming this to be the case."[36]

73. There are several problems with Ofcom's approach. The main one is that, without more evidence, there is no reasonable basis for assuming that just because spectrum sold at or close to reserve, this is due to low competition rather than uncompetitive high reserve pricing. There is substantial evidence that, for a number of auctions, especially those in Eastern and Southern Europe, that local regulators set the reserve prices above market value.

74. Furthermore, the Ofcom approach to assessing individual countries is inconsistent. For example, it considers certain auctions in Ireland and Italy, where spectrum licences were sold above reserve price "to offer more important evidence of the value of these bands in the UK" while, on the other hand, Germany is entirely omitted from the Ofcom analysis despite the fact that all spectrum sold above reserve prices and there was no unsold spectrum.[37] Meanwhile, it considers some high price auctions where all or most lots sold at reserve, such as Greece and Romania, as more important evidence, while dismissing others where all lots sold at reserve, such as Denmark and Portugal, as lesser evidence.

2. Number of Bidders

75. Ofcom's assessment of the importance of the number of bidders is also not consistent throughout the report. In most auctions, the number of bidders ranges from 3 to 5 operators; the exceptions being the few instances where the regulator excluded certain larger operators or there was some other special event such as re-farmed spectrum.

76. An example of the inconsistent approach on valuing the importance of number of bidders can be found in comparing Ofcom's treatment of Greece and Portugal. Greece is treated as providing "more important" evidence on the absolute values of 900 MHz and 1800 MHz but with the risk of understating these values owing to the auction price equalling the reserve price. In Greece there were 3 bidders and the number of lots exceeded the number of bidders. Portugal is treated as providing "less important" evidence on the absolute values of 900 MHz and 1800 MHz even though in Portugal there were 4 bidders,

[36] Ofcom Consultation, 10 October 2013, ¶ 4.33.

[37] Ofcom Consultation, 10 October 2013, ¶ 4.34 and pp. 93-94.

the number of lots exceeded the number of bidders, the auction price equalled the reserve price, and both 900 MHz and 1800 MHz had unsold spectrum.[38] A difference in reserve price between Greece and Portugal is not likely to justify the different approach Ofcom takes to these countries as the Greek reserve price was set by its regulator "*based on [Ireland's] ComReg's published spectrum benchmark results*" and the reserve price in "*Portugal [was] similar to those in Ireland where reserve prices were set to reflect market value (and the auctions took place in the same year)*."[39]

3. Type of award format

77. By necessity, the benchmark database is weighted towards SMRAs, because, as DotEcon says, these "*auctions provide individual prices for specific lots and are thus an accessible source of data for band-specific benchmarks even in the case where spectrum in multiple bands was auctioned in a single award*," whereas "*the CCA format makes it difficult, if not impossible, to attribute the prices paid for packages of spectrum lots to individual lots*".[40] However, when selecting between evidence points with the sample, we detect an apparent bias *against* SMRAs. Specifically, there seems to be a presumption that low competition in an SMRA must always be explainable by strategic factors, such as demand reduction incentives or aggregation risk, whereas CCAs are more likely to produce prices reflective of market value.

78. For example, DotEcon makes comments that are very critical of the SMRA:

> "*However, the* [SMRA] *format suffers from stronger incentives for reducing demand in order to keep prices from increasing than Combinatorial Clock Auctions (CCAs) with their second price rule. We also noted in our Spectrum Value Report 2012 that bidders might face severe aggregation risks in an SMRA format, which may lead them to bid conservatively. Therefore in an SMRA auction, final auction prices may not provide a good indication of market value if competition within the auction was limited or aggregation risks were substantial*."

79. But is very positive about the CCA:

[38] Ofcom Consultation, 10 October 2013, pp. 95-96 and 106-107.

[39] DotEcon, Final Report for Ofcom, September 2013, ¶¶ 66-67.

[40] DotEcon, Final Report for Ofcom, September 2013, ¶¶ 37-38.

> "*By contrast, the CCA format that has been used in a number of recent awards reduces the incentives for reducing demand in order to keep prices down. Bidders have good incentives to compete for incremental spectrum because this does not increase the price they pay for the frequencies they eventually win, but determines opportunity cost for other bidders. Aggregation risks are absent. This means that the prices paid in CCAs should in principle provide a good indication of market value*."[41]

80. Telefonica thinks this presumption against low price SMRAs is too strong. Of course, demand reduction and aggregation risk can be a concern in some SMRAs. However, this must be assessed on a case-by-case basis. We think that Ofcom far too readily excludes lower priced SMRAs on the presumption that competition was distorted owing to the auction format, when there is actually no substantive evidence to suggest this was the case.

81. Meanwhile, Ofcom and DotEcon completely fail to discuss the possibility that CCAs may lead to outcomes in which bidders pay significantly above market price, because bidders have obvious opportunities to inflate their demand, so as to drive up prices for rivals and exploit potential budget constraints of rivals. Whether or not Ofcom thinks this is a good strategy in a CCA, it is apparent that some bidders have behaved in this way. For example, after the recent Austrian auction, Telecom Austria published a presentation on the outcome which discussed bid strategy in the auction. Under a slide entitled "*The Combinatorial Clock Auction Format is Highly Complex and Creates Partly Undesired Incentives*", it states that "*Each bidder has a high incentive to bid on much more spectrum than its real demand and thus to reduce its demand late to influence the price of rivals*"[42]. It is also our view that bidders in the Irish auction may have deliberately driven up the price of 900 MHz and 1800 MHz beyond their true market price (see analysis of Ireland in subsections 3.6 and 3.7), before dropping demand late in the auction.

82. In conclusion, we suggest that Ofcom revisits its analysis of individual benchmarks with a view to taking a more transparent and balanced approach in designating them as less important or more important. In particular, it should not be so quick to dismiss lower price points on the basis that competition was somehow artificially constrained, and it should be

[41] DotEcon, Final Report for Ofcom, September 2013, ¶¶ 37-38.

[42] Telecom Austria Group, Results of the Austrian Spectrum Auction, October 21, 2013, p. 5.

somewhat more sceptical about high price points, which may be attributable to overpriced reserves or incentives to overbid. As a sanity check against sample bias, we strongly suggest applying some simple statistical tests, such as systematically stripping out the lowest and highest data points and taking the average for the remaining sample.

83. As it stands, the lack of transparency and apparent arbitrary selection of data points in Ofcom's approach to benchmarking in this matter resembles its approach in assessing the extent to which 2.1 GHz spectrum costs were recoverable from wholesale voice call termination charges in it 2006/07 market review. Ofcom will recall that the Competition Commission was critical of its approach in that matter:

> *"2.7.5 Considering scenarios can be a sensible way to proceed when there are inherent uncertainties in relation to future developments such as traffic growth. It may also be a useful approach to exploring the effects of various inputs which cannot be accurately estimated. However, we consider it important that a careful, consistent and systematic approach is taken to the development of relevant scenarios, the combination of variables within those scenarios, the identification (whether qualitatively or quantitatively) of the appropriate weights to be attributed to them and to the assessment of the results.*
> *2.7.6 We also consider that, in the context of a regulatory decision, each of these aspects should be carefully described. Should the exercise lack adequate structure and explanation the result will lack transparency.*
>
> *2.7.7 In general, we would expect a final assessment to be based upon a weighted balance of the results of the various likely scenarios although account would be taken of various other factors including, in particular, the distribution of outcomes and any limitations arising from the way the process was carried out (although we accept that it may be appropriate for the weighting of the scenarios to be assessed qualitatively in some cases). We would expect that in most cases purely hypothetical scenarios designed to explore upper or lower bounds, but which have little or no probability of occurring, might inform the assessment of other scenarios but would not be attributed weight in deciding upon a final figure.*
> *[.....]*
>
> *2.7.40 Whilst we accept Ofcom's first point that the transparency or otherwise of its decision does not necessarily imply that the price controls have been set at an*

inappropriate level, in our view Ofcom takes this point too far in divorcing the issue of transparency from our task. We do not think it would be appropriate, in an appeal of this sort, for issues of transparency to be passed over without comment. If an approach is not transparent, it may be difficult to determine whether the charge controls have been set at an inappropriate level, and a regulator could always respond to a challenge by commenting that it took everything into account in taking a decision. Furthermore, a lack of transparency may mask the fact that certain factors or inputs had not been subject to sufficient consideration, and may therefore indicate areas where further investigation would lead to the conclusion that the price controls have been set at an inappropriate level."[43]

84. Our concern is that Ofcom's approach to selecting more and less important evidence points, as with its approach to considering and weighing alternative scenarios in the case of 2.1 GHz spectrum costs, is not transparent and lacks rigour.

C. Alternative benchmarks

85. In the tables below, we report the results of our own benchmarking analysis. This draws on the same sample dataset of awards as Ofcom, but a much simpler approach to converting to GBP benchmarks, in line with our comments above. We also provide the Ofcom/DotEcon benchmarks for comparison. All results are in GBP and show price per MHz. Our methodology is as follows:

- For each band in each award, we identify a price per MHz in local currency. We use our own data, but have compared this to the DotEcon data, and believe it to be identical, except for the correcting the errors noted above. This includes adjusting upwards the Swedish benchmark to take account of SEK 300m obligation on one of the winners to roll out in uneconomic rural areas.

- To correct for differences in licence duration, we calculate a notional price for a 20-year licence for each country. For ease of comparison, we use the same approach as DotEcon and use a WACC of 4.10%, in line with the lower of DotEcon's two numbers.

[43] See: http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/appeals/communications_act/mobile_phones_determination.pdf

- Where data can be verified, we have also calculated a price per MHz for any additional spectrum fees within a 20-year term, and added this to the auction fee. To convert from annual payments to a lump sum, we use the same approach as DotEcon including using a WACC of 4.10%, so as to facilitate comparison. Ofcom provided us with data revealing a long list of annual licence fees that DotEcon attributes to each country. However, these fees are not sourced and we have been unable to verify them (with the exceptions of Belgium, Denmark and Ireland, where data was published in auction documents). Although we have used DotEcon data for all countries, so as to facilitate comparison between our results and Ofcom's results, we request that Ofcom provide public domain evidence that all charges included are accurate.

- We then divide the total price per MHz by the local population, using Eurostat 2012 population data.

- We then convert the total price per MHz per pop from local currency into GBP using the average exchange rate over the 2010-2013 period (see detailed explanation above). We use market exchange rates, not PPP rates and make no adjustments for inflation.

- Finally, we multiple the price per MHz per pop by the UK population, using 2012 Eurostat data, to obtain our UK benchmark price per MHz for each band and award.

86. At this stage, we only provide our quantitative results (for qualitative judgments about the importance of individual benchmarks, please see subsections 3.6 and 3.7), although we have crossed out some specific benchmarks that we see as being inappropriate for reasons we explain later. In the tables below, we report the absolute values for benchmarks in each band, and the resulting ratios between bands. In each case, we show the equivalent Ofcom numbers for comparison. We also show results from some simple statistical tests for both the full sample and for two subsets that strip out potential outliers (the first strips out the highest and lowest numbers in each case; and the second strips out observations based on two standard deviations so as to reduce the risk of bias in the results given the modest number of observations). In each case, we show the number of observations,

mean average and medians for absolute values in each band and the variance between high and low points.

Table 3.2: Benchmarks for absolute values – Telefonica and Ofcom methodologies compared

Telefonica Methodology

£m/MHz (UK Equivalent)	800MHz	900MHz	1800MHz	2.6GHz
Austria				1.5
Belgium	35.9			5.3
Czech Republic	30.1		~~0.8~~	2.0
Denmark	18.0	3.9	1.7	8.3
Finland	17.9			
France	36.2			5.5
Germany	47.8		1.7	1.5
Greece		27.5	12.1	
Ireland	60.9	36.8	23.9	
Italy	46.8		15.1	3.4
Portugal	28.0	18.7	2.4	1.9
Romania	11.4	13.1	3.3	1.3
Slovakia				
Spain	26.8	21.7	~~1.7~~	1.5
Sweden	19.0		10.6	10.7
Average	31.6	20.3	8.9	3.9
Median	29.1	20.2	6.9	2.0
Range	49.5	32.9	22.2	9.4
Removing Highest and lowest numbers				
Average	32.1	20.2	7.5	3.4
Median	30.1	20.2	6.9	2.0
Range	28.8	14.4	13.4	6.8
Using 2σ interval				
Average	28.9	20.3	6.1	3.2
Median	28.0	20.2	2.9	1.9
Range	36.4	32.9	13.4	7.0
Ofcom report for comparison:				
LRP /Proposed	29.9	25.0	15.0	5.0

Ofcom Methodology

£m/MHz (UK Equivalent)	800MHz	900MHz	1800MHz	2.6GHz
Austria				1.8
Belgium				4.5
Czech Republic				
Denmark	10.1	2.4	1.0	9.5
Finland				
France	34.5			5.2
Germany	50.1		1.8	1.5
Greece		31.4	13.9	
Ireland	58.6	35.7	23.1	
Italy	48.3		15.5	3.5
Portugal	36.1	24.1	3.1	2.4
Romania	21.8	24.9	6.2	2.5
Slovakia				
Spain	31.4	25.4	~~2.9~~	3.1
Sweden	14.3		9.1	9.7
Average	33.9	24.0	8.5	4.4
Median	34.5	25.2	6.2	3.3
Range	48.5	33.3	22.1	8.2
Removing Highest and lowest numbers				
Average	32.1	26.5	7.2	3.8
Median	34.5	25.2	6.2	3.1
Range	35.8	6.5	14.5	7.0
Using 2σ interval				
Average	33.9	28.3	6.7	4.4
Median	34.5	25.4	4.7	3.3
Range	48.5	11.6	14.5	8.2
Ofcom report for comparison:				
LRP /Proposed	29.9	25.0	15.0	5.0

Table 3.3: Benchmarks for relative values across bands – Telefonica and Ofcom methodologies compared

Telefonica Methodology

Country	900MHz / 800MHz	1800MHz / 800MHz	1800MHz / 900MHz	1800MHz / 2.6GHz
Austria				
Belgium				
Czech Republic		~~3%~~		~~40%~~
Denmark	22%	10%	45%	~~21%~~
Finland				
France				
Germany		4%		113%
Greece			44%	
Ireland	60%	39%	65%	
Italy		32%		442%
Portugal	67%	9%	13%	131%
Romania	114%	29%	25%	250%
Slovakia				
Spain	81%	~~7%~~	~~8%~~	~~115%~~
Sweden		56%		~~99%~~
Average	69%	25%	38%	234%
Median	67%	29%	44%	190%
Range	93%	53%	52%	328%
Removing Highest and lowest numbers				
Average	69%	24%	38%	190%
Median	67%	29%	44%	190%
Range	21%	30%	20%	119%
Using 2σ interval				
Average	69%	25%	38%	234%
Median	67%	29%	44%	190%
Range	93%	53%	52%	328%
Ofcom report for comparison:				
Ratios	84%	50%	60%	303%

Ofcom Methodology

Country	900MHz / 800MHz	1800MHz / 800MHz	1800MHz / 900MHz	1800MHz / 2.6GHz
Austria				
Belgium				
Czech Republic				
Denmark	24%	10%	42%	~~11%~~
Finland				
France				
Germany		4%		120%
Greece			44%	
Ireland	61%	39%	65%	
Italy		32%		443%
Portugal	67%	9%	13%	129%
Romania	114%	28%	25%	248%
Slovakia				
Spain	81%	~~9%~~	~~11%~~	~~94%~~
Sweden		64%		~~94%~~
Average	69%	27%	38%	235%
Median	67%	28%	42%	189%
Range	90%	60%	52%	323%
Removing Highest and lowest numbers				
Average	70%	24%	37%	189%
Median	67%	28%	42%	189%
Range	20%	31%	19%	119%
Using 2σ interval				
Average	69%	27%	38%	235%
Median	67%	28%	42%	189%
Range	90%	60%	52%	323%
Ofcom report for comparison:				
Ratios	84%	50%	60%	303%

87. The effect of the recalculation of the auction values is generally to decrease the values in the less affluent European countries such as Romania and Portugal and increase values, albeit more modestly, in the more fully developed countries such as Denmark and Sweden. The overall effect can be most easily seen by comparing the average and median values of the spectrum bands derived from the Telefonica and Ofcom methodologies. For example, the average of all countries auctioning 800 MHz spectrum drops from £33.9 million to £31.6 million while the median drop from £34.5 million to £30.1 million. The relative values, as is to be expected, do not change appreciably regardless of methodology.

88. The calculations excluding the highest and lowest auction values or those based on using only observations within two standard deviations highlight the sensitivity of the Ofcom numbers to potential outliers.

89. These points are discussed in more detail in subsections 3.6 and 3.7, where we describe the findings of our analysis of 900 MHz and 1800 MHz benchmarks respectively.

D. Summary of findings and next steps

90. Our analysis has demonstrated that there are serious errors in the Ofcom/DotEcon approach to benchmarking, with the implication that every benchmark reported is wrong. We regard Ofcom's approach as opaque and there appears to be evidence of systematic bias in Ofcom's choice of evidence points which skews the outcome towards higher prices. We believe the problems we have identified can only be addressed by Ofcom redoing the benchmarking exercise and revisiting its choice of evidence points.

91. When Ofcom rerun their benchmarking approach, we recommend that it does not attempt to use PPP exchange rates and abandons the use of CPI data. Such adjustments are unnecessary for a European sample covering a narrow four-year period, and the approach is unduly prone to error and distortions, not least because recent data is missing and cannot reliably be extrapolated. We have described and implemented a much simpler benchmark adjustment approach that should be both more accurate and less susceptible to error. Once the process of recalculating the benchmarks is complete, we request a further opportunity to review the results and underlying data, and comment on the revised findings.

3.5 Lump sum values for 800 MHz and 2.6 GHz

92. In this subsection, we present our observations regarding Ofcom's analysis of the lump sum values of 800 MHz and 2.6 GHz spectrum in the UK. For these bands, Ofcom's approach focuses primarily on deriving lump sum valuations from the UK auction results, in accordance with the Government's Direction that these should be important evidence points for determining prices for 900 MHz and 1800 MHz licences.

93. Ofcom explored two different methodologies, an Additional Spectrum Methodology (ASM) and a Linear Reference Price Methodology (LRP) and. The two methodologies are representatives of broader classes of methodologies:

    - ASM belongs within the class of **shadow price methods**, which seek to identify prices by hypothetically relaxing constraints, such as making extra spectrum available; and

    - LRP belongs within the class of **revenue attribution methods**, which seek to allocate the revenue raised in the auction to create an average price per lot.

94. We note that both approaches suffer from a fundamental limitation: any methodology for constructing prices for individual lots does not create a set of prices that necessarily support the auction outcome, in the sense that bidders would choose their winning packages if faced by those prices. Therefore, as Ofcom has recognized, both methods involve compromises and approximations. Consequently, the reliability of the results produced by the two methods depends to a large extent on the sensitivity of results to key assumptions. We review Ofcom's implementation of the ASM and the LRP methodologies in the following sections, and also discuss the other assumptions and methods underpinning Ofcom's valuation of 800 MHz and 2.6 GHz spectrum.

95. A key observation from our analysis, consistent with Ofcom's own work, is that the ASM methodology must be discarded, as results are too sensitive to input assumptions to produce reliable results. The LRP approach appears to have greater merit, as it is somewhat less sensitive to inputs and produces more plausible results. However, in constructing its LRP benchmarks, Ofcom has made a series of questionable assumptions that have tended to inflate the price of both 800 MHz and 2.6 GHz lots.

A. Review of ASM Methodology

96. Ofcom provides an overview of the ASM methodology in Section 3.2 of the report prepared by DotEcon.[44] The central idea behind this methodology is that it values spectrum by hypothetically making extra lots available and then re-determining the winning bids. The increase in the value of winning bids is the shadow price of the extra lots, according to the ASM methodology.

97. As noted by Ofcom, one problem with this approach is that adding different numbers and different combinations of hypothetical extra lots can lead to different shadow prices. This is for same reason that the value of a lot may depend on what other lots it is packaged with. As such, the ASM methodology is inherently ill suited to produce reliable results using bids from a complex multi-band auction.

98. In addition, when Ofcom expand the approach to consider the value of operator specific holdings of 900 MHz and 1800 MHz that were not included in the auction, results become even more volatile. Ofcom ask the question: If we increase the supply of lots in the auction by releasing spectrum held by a specific operator, what value does it generate for other bidders? This approach means the analysis has to be repeated for different operators who release spectrum, each time excluding the bids made by the bidder who is releasing spectrum. Unsurprisingly, the results that follow from this approach are very volatile and we agree with Ofcom that the ASM methodology must be discarded.

B. Review of DotEcon's LRP Methodology

99. Ofcom's implementation of the LRP methodology is set out in Section 3.1.2 of the report prepared by DotEcon.[45] We note that the precise mathematical formulation of the LRP methodology has changed from the methodology that was published in the March 2011

[44] Dotecon, 800MHz and 2.6GHz linear reference prices and additional spectrum methodology, Report prepared for Ofcom, September 2013.

[45] DotEcon, 800MHz and 2.6GHz linear reference prices and additional spectrum methodology, Report prepared for Ofcom, September 2013.

consultation.[46] We believe that the new formulation is incorrect and we urge Ofcom to review its process.

100. In order to assess the LRP methodology used by Ofcom, we started by attempting to implement the methodology described in most recent DotEcon report. However, in so doing, we identified errors which make implementation impossible. For example, the first constraint states that the "excursion" for each bidder must be at least as large as a term that is equal to zero when evaluated at winning bids. Excursions are defined as the subsidy that is needed to induce each winner to choose his winning package at the linear reference prices. However, as the result of the LRP analysis reveals that excursions are negative for Niche, Telefonica and Vodafone, this constraint cannot be satisfied.

101. We then proceeded to implement the LRP methodology proposed by Ofcom in the March 2011 consultation. Using this approach, we were able to replicate the same linear reference prices as reported by Ofcom in the current condoc. From this, we infer that the DotEcon report contains errors in the formulation of the methodology rather than errors in the results.

102. Having replicated the DotEcon work, our next steps were to explore the underlying sensitivity of the results, and some of the key assumptions underpinning Ofcom's approach. Specifically, we have investigated the:

- sensitivity of the results to particular bids;
- impact of including government reserve price bids; and
- impact of excluding the coverage obligation lot from Ofcom's analysis.

103. Our findings are reported below.

[46] Ofcom, Consultation on assessment of future mobile competition and proposals for the award of 800MHz and 2.6GHz spectrum and related issues, March 2011.

1. Sensitivity analysis

104. One of Ofcom's arguments for using the LRP methodology rather than a simple linear fit (as outlined in section 3.1.1 of the consultation document) is that the simple linear fit does not take into account information contained in losing bids.[47] The simple linear fit attempts to explain base prices purely by the number of lots won by each bidder in each category.

105. While we agree that the LRP methodology does take losing bids into account, a simple sensitivity analysis reveals that linear reference prices are very dependent on specific losing bids (the losing bids with the maximum excursions). Table 3.4 compares linear reference prices with all bids (as reported by Ofcom) and linear reference prices when the two bids with maximum excursions are eliminated from the analysis. The two eliminated bids are as follows[48]:

- EE: 2-0-6-0-0-0
- H3G: 2-0-10-0-1-7

Table 3.4: LRP Sensitivity

Category	Linear Reference Price (All Bids)	Linear Reference Price (Constraining Bids from EE and H3G Removed)	Difference
A1	£268.5m	£279.3m	£10.8m
A2	£506.1m	£527.6m	£21.5m
C	£49.5m	£44.9m	£-4.6m
E	£7.5m	£7.5m	£0.0m

106. The sensitivity analysis reveals that linear reference prices are very sensitive to the inclusion of specific bids. In the example above, prices are shifted significantly from 2.6 GHz to 800 MHz lots.

[47] DotEcon, 800MHz and 2.6GHz linear reference prices and additional spectrum methodology, Report prepared for Ofcom, September 2013, p. 8.

[48] Where the numbers shown reflect the total bids in each category, as follows: A1 (800MHz) – A2 (800MHz coverage obligation) – C1 (2.6GHz paired) – D1 (2.6GHz low power) – D2 (2.6GHz low power) – XX – E (2.6GHz unpaired)

107. This volatility of the linear reference prices casts some doubt on the validity of the overall approach. It also raises broader questions about the dependence of Ofcom's approach on a small set of bids by EE and H3G, and whether these are really reflective of the market value of individual frequency bands.

108. Analysis of the bid data from the UK auction suggests that EE and H3G's choice of bids were heavily influenced by Ofcom's decision to impose a spectrum floor that ensured that H3G, as the only opted in bidder, was guaranteed to win at least 2x5 MHz of 800 MHz or 2x20 MHz of paired 2.6 GHz. This conclusion is supported in published research by Geoffrey Myers, Director of Competition at Ofcom, writing in his capacity as a Visiting Professor in Regulation at the London School of Economics. In relation to H3G's bidding strategy, Mr Myers observes that:

> "*One notable feature of H3G's bids for its three spectrum floors is that it chose marginal values that reflected the differences in reserve prices. … It is possible that the relativities in Ofcom's reserve prices precisely captured H3G's true marginal values for the spectrum floors, although that would be a considerable coincidence. Perhaps the more likely explanation is that it was a bidding strategy by H3G which guaranteed that it would not pay more than the reserve price for its winning spectrum floor*."[49]

109. And in relation to the influence of EE's bidding on H3G's winning spectrum floor, he states that:

> *"As actually occurred, EE might reasonably have expected that its bids would have a significant influence on the spectrum floor won by H3G. This is because each of Telefónica and Vodafone bid strongly for 2x10MHz of 800MHz, and neither was permitted to bid for any larger quantity because of the sub-1GHz cap. Given this, H3G would only acquire a floor of 800MHz spectrum if EE won less than 2x10MHz in that band; and if not, H3G would need to win the floor of 2x20MHz of 2.6GHz. As set out below, EE chose to bid especially aggressively for large quantities of paired 2.6GHz*

[49] Geoffrey Myers, *Spectrum floors in the UK 4G auction: an innovation in regulatory design*, p.15-16, available for download from SSRN.

(category C) up to 2x35MHz, ie one-half of the entire band, and it generally bid more aggressively at the margin for 4xC than for an additional 1xA1."[50]

110. Of course, the influence of the spectrum floor may not be the only factor driving strategic bidding behaviour by EE and H3G, or other bidders for that matter, it just happens to be an area where bid data gives particularly strong grounds for suspecting such behaviour. For example, as may be inferred from Myers' analysis, EE and H3G may have correctly anticipated that Telefonica and Vodafone would bid strongly for 2x10 MHz of 800 MHz, and this could also have affected their bidding behaviour on that band in the clock rounds.

2. Reserve Price Bids

111. A further problem with Ofcom's implementation of the LRP methodology is that it claims to produce linear reference prices based on the information contained in losing bids from the auction. However, as the linear reference prices are constrained to produce the same revenue as in the auction, the LRP methodology is also implicitly using the "artificial" government reserve price bids (as these reserve price bids affect the auction revenue).

112. To control for the impact of government reserve prices bids, we re-ran the winner determination without these bids.[51] We then proceeded to calculate linear reference prices for the auction revenue that would have resulted without reserve price bids. Table 3.5 below shows the results.

Table 3.5: LRP without Reserve Price Bids

Category	Linear Reference Price (With Reserve Price Bids) per MHz	Linear Reference Price (Without Reserve Price Bids) per MHz	Difference

[50] Geoffrey Myers, *Spectrum floors in the UK 4G auction: an innovation in regulatory design*, p.19, available for download from SSRN.

[51] In order to re-run the winner and price determination algorithms without reserve price bids, we used the DotEcon winner and price determination software released by Ofcom prior to the auction. Specifically, we inflated all bids by a factor of 1,000 before re-running the software, and subsequently adjusted the results down by a factor of 1,000. This method assures that the results generated by the software are driven by opportunity costs contained in real bids rather than government reserve price bids. We recognise that this method is an approximation.

A1	£26.85m	£24.35m	£-2.50m
A2	£50.61m	£45.59m	£-5.02m
C	£4.95m	£4.29m	£-0.66m
E	£0.75m	£0.74m	£-0.01m

113. As can be seen, the LRP for each of the bands is substantially lower if government reserve prices are excluded. We conclude from this that Ofcom's calculation of LRP overstates the market value of both 800 MHz and 2.6 GHz, owing to the impact of artificial reserve price bids.

3. The 800 MHz coverage obligation lot

114. For its base case assessment of the value of 800 MHz spectrum, Ofcom takes as its base case the LRP for 800 MHz *without* the coverage obligation. In doing so, it disregards the LRP for 800 MHz *with* a coverage obligation, even though this accounts for one-third of the available spectrum. This is a major decision which has a non-trivial impact on the price determination and yet there is no substantive justification provided for this action. The only comment in the consultation, provided in parentheses, is that Ofcom uses data without the coverage obligation, "*as no coverage obligation is specified for the 900 MHz and 1800 MHz licenses*."[52]

115. Telefonica's view is that, for its base case, Ofcom has a duty to consider the value of bids for all 800MHz spectrum. Any analysis of a sub-set of 800MHz data should, in the first place, be for sensitivity analysis purposes, with a high burden of evidence necessary to justify any subsequent decision to exclude some data. Our view is that the evidence for excluding data on bids for 800MHz spectrum *with* the coverage obligation is weak. Therefore, Ofcom should revisit its base case, taking account of bids for all 800MHz spectrum.

116. The arguments for including analysis of bids for all 800MHz spectrum in Ofcom's base case are compelling:

- The government directed Ofcom to have particular regard to the sums paid for licences in the auction. We interpret this as meaning that Ofcom has a duty to use

[52] Ofcom Consultation, 10 October 2013, ¶ 4.25.

as wide a body of evidence as possible, and should not disregard 800 MHz evidence points from the auction without substantive reasoning.

- Telefonica's view is that the coverage obligations imposed on the A2 block were not sufficiently onerous to justify discarding this as a relevant indicator of the value of 800 MHz. Our plan going into the auction was that if we won 800 MHz, we would meet the terms of the coverage obligation, whether or not we won the A2 lot. Based on the bids observed in the auction, it may be surmised that Vodafone considered that the lots were essentially identical substitutes, and Telefonica even expressed a small preference for A2.

- H3G and EE do seem to have placed a modest premium on the lots without coverage obligation, and it is their bids that underpin the difference in LRP for A1 and A2. However, their preferences may be driven by the difference in lot size (2x5MHz vs 2x10MHz) rather than any perceived cost of fulfilling the coverage obligation. In particular, H3G's bid preferences may have been distorted by its desire to win a reserved 2x5MHz block at reserve. Certainly, it is impossible to distinguish such effects when analysing the bid data. Also the differences in LRPs between A1 and A2, although non-trivial, are not – in our view – large enough to draw any definitive conclusion on whether the coverage obligation really affected final prices.

- Many other countries have applied coverage obligations to spectrum lots, both at 800 MHz and in other bands. When looking at the relationship between 800 MHz, 900 MHz and 1800 MHz in other EU countries, Ofcom does not systematically account for any distortions in value such obligations may create. Indeed, were it to follow its approach to the UK data of simply discarding data where there are asymmetric coverage obligations, it would be left with almost no benchmarks. Therefore, for consistency of analysis, the only viable approach is to analyse bids for all UK 800 MHz spectrum.

117. For its base case, there are two obvious approaches that Ofcom could take in calculating an LRP for all 800 MHz spectrum:

- It could take a simple weighted average (based on amount of spectrum) of the LRP for 800 MHz with and without the coverage obligation. This produces an LRP of £26.34m per MHz for the entire 800 MHz band.

- It could, for the purpose of analysing bids from the auction, merge the A1 and A2 categories. This means re-running the LRP calculations on the basis of a bid set in which we suppose there are 6 A1 lots, and a bid containing an A2 lot is treated as if contained two A1 lots.[53] This produces an LRP of £26.69m per MHz for the entire 800MHz band, as reported in Table 3.6. This approaches also results in a reduction in the LRP for 2.6 GHz.

118. We believe the second approach is superior as it does not rely on arbitrary weighting of results for 800MHz with and without the coverage obligation. Instead, by merging the two categories (A1 and A2), for the purpose of replicating the LRP calculations, we assume that reference prices for all bands are consistent with the LRP methodology. This point is highlighted by the fact that the reference price for 2.6GHz is reduced as a result of merging A1 and A2.[54]

Table 3.6: LRP with A1 and A2 Categories Merged

Category	Linear Reference Price (With Separate A1 and A2 Categories) per MHz	Linear Reference Price (With Merged A1 and A2 Categories) per MHz	Difference
A1	£26.85m	na	na
A2	£50.61m		
A1 + A2	na	£26.70m	£-0.15m
C	£4.95m	£4.80m	£-0.15m
E	£0.75m	£0.75m	£0.0m

[53] To be precise, we used a hypothetical set of bids where each bid for an A2 lot was converted into a bid for two A1 lots. No bid amounts were modified. Also, no modifications were made to the LRP methodology; we used the same method as we used to replicate Ofcom's LRP results for the base case.

[54] When A1 and A2 are merged, the original reference prices would yield revenues that exceed the auction revenue (as 6 times LRP for A1 is larger than 4 times LRP for A1 plus LRP for A2), As a result, LRP's for all categories, including C, adjust downwards when the LRP methodology is replicated.

119. In conclusion, we believe that if Ofcom continues to rely on the LRP methodology, it must consider the value of bids for all 800 MHz spectrum. Using the LRP methodology, the appropriate way to address when analysing bids made in the auction is to merge the A1 and A2 categories.

4. Revised calculation of LRP for UK

120. We have identified two flawed assumptions underpinning Ofcom's approach to determining LRP, namely: failure to consider the impact of artificial reserve price bids in the auction; and failure to take account of the value of the coverage obligation lot. Table 3.7 presents the results that the LRP methodology would yield if both A1 and A2 categories are merged, and reserve price bids are eliminated from the analysis.

Table 3.7: LRP with A1 and A2 Categories Merged and no Reserve Price Bids

Category	Linear Reference Price (With Separate A1 and A2 Categories and Reserve Price Bids) per MHz	Linear Reference Price (With Merged A1 and A2 Categories and no Reserve price Bids) per MHz	Difference
A1	£26.85m	na	£-2.69m (A1 vs A1+A2)
A2	£50.61m	na	
A1+A2	na	£24.16m	
C	£4.95m	£4.21m	£-0.74m
E	£0.75m	£0.65m	£-0.10m

Source: Telefonica analysis

121. We have reservations about the LRP methodology. However, if Ofcom decides to persevere with this approach, we propose that the values be corrected for the reasons described above. These changes would result in an LRP of £24.16m for 800 MHz and an LRP of £4.21m for 2.6GHz.

C. Arbitrary inclusion of DMSL costs

122. After calculating the LRP for 800 MHz, Ofcom makes a further adjustment to derive its base case price for 800 MHz: it adds £3m per MHz to the LRP, as the payment required by each 800 MHz licensee to DMSL for the purpose of funding DTT co-existence. This is justified "*on the basis that bidders knew they would have to make such payments and so*

are likely to have subtracted the DMSL payments from their bids." [55] Ofcom notes, however, that this assumes that bidders expected to receive no refund of such payments. In its sensitivity analysis, Ofcom does explore the implications of relaxing this assumption.

123. Telefonica's view is that the DMSL payments should be excluded entirely from the calculation of the 800 MHz lump sum price. In its base case, Ofcom is treating these payments as if they were a one-off licence fee, the amount of which is fixed and immutable. This approach completely disregards the nature of these payments, which are made to a joint company owned by the licence holders. The company is obliged to fund only the costs of managing DTT co-existence, with the understanding that any unused funds will be refunded to the shareholders, i.e. the operators themselves.

124. Ofcom itself acknowledges the likelihood that the £3m per MHz is likely overstated: "*We provisionally conclude that we should put some weight on the possibility that the expectation of at least a partial rebate of co-existence costs may have informed bids for 800 MHz spectrum. However, we remain of the view that our base case should include these co-existence costs in full*." [56]

125. It is now clear that the incidence of LTE/DTT interference and, therefore, DMSL costs are likely to be very small. Evidence to date from across Europe shows that the costs required to fund DTT co-existence with 4G mobile deployed in the 800 MHz band are minimal, and there is no reason to expect the situation to be different in the UK. Therefore, the operators can expect to have the majority of their payments refunded. Telefonica acknowledges that, at the time of the auction, the evidence that DMSL costs would be minimal was not as clear cut as it is now. Nevertheless, we believe that there was strong awareness in the industry that the problem had been overstated and that costs would likely be modest, certainly less than the payments into the DMSL funds. For example, by the time of the auction, Telefonica UK had already received information from its German sister company that the costs of managing DTT co-existence were small. We would expect that Vodafone, EE and H3G would be in possession of similar intelligence from their sister operations in Germany and Sweden.

[55] Ofcom Consultation, 10 October 2013, ¶ 4.25.

[56] Ofcom Consultation, 10 October 2013, ¶ A8.13.

126. Accordingly, we think that it is simply not credible to suggest that a marginal bidder for 800 MHz spectrum in the UK auction in January 2013 would have incorporated the full cost of DMSL funding into their valuations. It is rather more likely that it would have included a small allowance for a proportion of costs, if anything. It seems to us that there is no obvious basis for determining what an appropriate small allowance might be. Therefore, the prudent approach would be for Ofcom not to make any adjustment for DMSL costs. Alternatively, the possibility that a marginal operator would have made some small allowance for DMSL costs may serve as a justification for rounding up the final price to the nearest one decimal place.

D. Cross check: Benchmark results for absolute value of 800 MHz and 2.6 GHz

127. In the previous sections, we concluded that correct values for 800 MHz and 2.6 GHz, if an LRP methodology is used, are £24.16m for 800 MHz and £4.21m for 2.6 GHz. No further adjustments are required to these numbers.

128. As a cross-check against our revised LRP results, it is informative to look at the results of other European awards of 800 MHz and 2.6 GHz. In Table 3.8 and Table 3.9, we provide our own estimates of benchmark prices for 800 MHz and 2.6 GHz in the UK using the methodology that we outlined in subsection 3.4. These are presented in descending order by prices, with the highest and lowest benchmarks highlighted as potential outliers. In each case we highlight where our estimates for UK LRP reported above fall in the rank order.

129. We observe that the revised UK LRP values both fall in the middle of the observed range of European benchmarks excluding outliers. The value for 800 MHz is in the lower middle of European benchmarks, while the 2.6 GHz value lies in the upper middle. Based purely on comparisons with other European outcomes, one may conclude that both are plausible estimates for market value. Put differently, European benchmarks do not provide any evidence that the market value for 800 MHz and 2.6 GHz should be higher or lower than these estimates.

Table 3.8: European benchmarks for price/MHz of 800 MHz in the UK

European benchmark 800MHz awards	800MHz benchmark £m/MHz (UK Equivalent)
Ireland	60.9
Germany	47.8
Italy	46.8
France	36.2
Belgium	35.9
Czech Republic	30.1
Portugal	28.0
Spain	26.8
Sweden	19.0
Denmark	18.0
Finland	17.9
Romania	11.4
All benchmarks:	
Average	31.6
Median	29.1
Range	49.5
Removing Highest and lowest numbers:	
Average	32.1
Median	30.1
Range	28.8
Ofcom modified LRP for comparison:	
LRP /Proposed	29.9

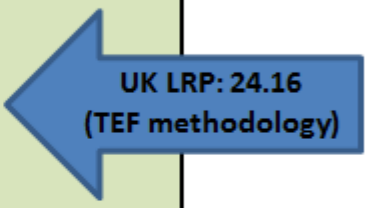
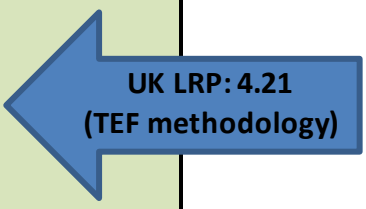


Table 3.9: European benchmarks for price/MHz of 2.6 GHz in the UK

European benchmark 2.6GHz awards	2.6GHz benchmark £m/MHz (UK Equivalent)
Sweden	10.7
Denmark	8.3
France	5.5
Belgium	5.3
Italy	3.4
Czech Republic	2
Portugal	1.9
Germany	1.5
Spain	1.5
Austria	1.5
Romania	1.3
All benchmarks:	
Average	3.9
Median	2
Range	9.4
Removing Highest and lowest numbers:	
Average	3.4
Median	2
Range	6.8
Ofcom modified LRP for comparison:	
LRP /Proposed	4.95



E. Conclusions: lump sum values for 800 MHz and 2.6 GHz

130. There is no satisfactory way to determine lump sum prices for separate bands in the context of a competitive combinatorial clock auction. Nevertheless, given the directive from the government to use the auction results as primary evidence in deriving prices for 900 MHz and 1800 MHz, Ofcom is compelled to try. It has explored two approaches: the Additional Spectrum methodology (ASM) and a Linear Reference Price Methodology (LRP). The ASM methodology produces highly volatile and inconsistent results, and we support

Ofcom's decision to reject this approach. The LRP approach is more stable and produces results that, at least superficially, look plausible.

131. We have reviewed the LRP methodology in detail. We observe that the results are very sensitive to specific bids in the auction and that there are solid grounds to question whether these particular bids are really representative of the marginal value of spectrum. While we have not developed any specific alternative to LRP at this stage, we reserve our judgement on whether this is really the best available approach for approximating the market value of 800 MHz and 2.6 GHz, pending review of consultation responses from other stakeholders.

132. If Ofcom does ultimately proceed with using the LRP methodology, we urge it to correct a number of methodological flaws:

- It should strip out the effect of government reserve price bids, as these are not real bids and are not relevant to a determination of market value. This can be addressed by rerunning the price determination without these bids, and then recalculating LRP.

- It should take into account the value of all 800 MHz spectrum, including the coverage obligation spectrum won by Telefonica in the auction. This can be done by merging the A1 and A2 categories when running the LRP calculation.

- It should not include any uplift for DMSL costs, given that these are expected to be very small.

133. Applying these three corrections together yields revised prices of £24.16m for 800 MHz and £4.21m for 2.6 GHz. A simple comparison to available European benchmarks suggests that both values are plausible.

3.6 Lump sum price for 900 MHz

134. In this sub-section, we review Ofcom's approach to deriving a lump sum price for 900 MHz. In the consultation document, Ofcom states that: "*Our assessment is informed by the value of 800 MHz spectrum in the UK 4G Auction: as set out below, we have considered evidence points derived from a combination of this value with implied 900 MHz / 800 MHz values in other countries. More generally we have considered the likely value of 900 MHz relative to 800 MHz informed by technical analysis and international evidence*."[57] Notwithstanding the claimed focus on relative values, much of the "more important" evidence identified by Ofcom relies upon the absolute values of absolute value of 900 MHz auctions in other European countries.

A. Absolute Values in Other Countries

135. The absolute value of 900 MHz is calculated by Ofcom as £25 million per MHz. In support of this number, Ofcom looked at the absolute price of 900 MHz spectrum from eight award processes across seven other European countries. Ofcom identified four of these awards as "more important" evidence, namely Ireland, Greece, Romania, Spain, and three others, namely Portugal, a second auction in Spain and Denmark as "less important" evidence.[58] Spectrum in the 900 MHz band has also sold in four other recent European awards: Norway (2011), Switzerland (February 2012), Netherlands (December 2012) and Austria (October 2013), but the nature of these awards means that the data is not suitable for benchmarking.[59]

136. In the paragraphs below, we consider, in chronological order, each of these awards and their relevance as benchmarks for the absolute value of 900 MHz spectrum in the UK. Our conclusion is that, individually, none of the benchmarks stand out as reliable indicators of the value of UK 900 MHz spectrum. In all but one country, 900 MHz sold at reserve,

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[57] Ofcom Consultation, 10 October 2013, ¶ 4.57.

[58] See countries listed in Figures 4.2 and A7.1 (Ofcom Consultation, 10 October 2013). While Ofcom now treats the July and November 2011 auctions as separate events we discuss them together.

[59] Ofcom omitted Norway from its summary because the "*lowest winning bid was trivial*" (Figure A7.1); and omits Switzerland and the Netherlands because they were CCA auctions with package bidding and disaggregated data for individual bands is not available. We disregard Austria, which took place after publication of the Ofcom condoc, for the same reason as Ofcom disregard Switzerland and Netherlands.

making it very difficult to judge whether spectrum was sold at a price above or below the market level. Nevertheless, Ofcom attempts to distinguish between these countries, dismissing those with lower reserve prices but not those with higher ones. Ofcom's approach is not consistent. It should either give equal weighting to all eight awards or conclude that the evidence from absolute values for 900 MHz is insufficient to draw any conclusions.

1. Denmark (September 2010)

137. Ofcom reports a per MHz value of £2.4 million for 900 MHz, which is recalculated as £3.9m million using Telefonica's own benchmarking methodology. There were two separate award processes, both of which took place around September 2010, one for 900 MHz for a single 2x5 MHz lot and one for 1800 MHz for a single 2x10 MHz lot. The regulator had proposed a single unit ascending clock format for each of the awards. However, as there was only one applicant for each lot (Hi3G, Denmark's fourth largest incumbent operator), no actual bidding was required. As a result, the spectrum sold at the reserve price.

138. Ofcom considers the Danish 900 MHz auction to be less important evidence. It states that the 900MHz spectrum sold at "*a very low price*" and argues that this outcome is not surprising "*given that the three largest operators were not allowed to bid*."[60] Given the lack of information on how the reserve price was set and the fact that that there was no competition, we agree that the Danish result does not provide strong evidence for setting UK prices. However, Ofcom's implicit judgement that this benchmark should be ignored because the price is below market value does not stand up to scrutiny. As Ofcom recognises, the regulator did try to attract a new entrant bidder; the fact that none was forthcoming means that we cannot rule out the possibility that the reserve price was above market value, even if this seems less likely than the opposite conclusion. More generally, if Ofcom treats this benchmark as lesser evidence, for consistency reasons it would also have to downgrade other benchmarks, such as Romania or Spain, where 900 MHz sold at reserve and caps may have constrained incumbent bidders (see discussion below).

2. Spain (May 2011)

[60] Ofcom Consultation, 10 October 2013, p. 89-90.

139. Ofcom reports a per MHz value of £17.2 million for 900 MHz, which is recalculated as £15.5 million using Telefonica's own benchmarking methodology. The award process was held in May 2011 and included 900 MHz and 1800 MHz. The award used a "beauty contest" format with the Spanish regulator requiring applicants to set out their cases for award of the available spectrum. For the 900 MHz band, the two largest operators (Vodafone and Telefonica, dba Movistar) could not bid. Of the two remaining bidders, Orange and Yoigo, only Orange submitted a bid for 900 MHz. It won the license at the reserve price. In addition to the reserve price, Orange also made a three year investment commitment.[61]

140. Ofcom excludes this value from its analysis. We broadly agree with this conclusion, given the lack of information on how the reserve price was set, the complication of the inclusion of an investment commitment, and the restrictions on participation of Vodafone and Telefonica. Nevertheless, the benchmark may have some value as a lower bound for the value of 900 MHz spectrum in the auction. Also, while the restrictions do appear to have limited competition, it is still the case that there was a credible bidder (Yoigo) that had the opportunity to bid for 900 MHz spectrum but declined to do so at the reserve price.

141. In conclusion, we consider the May 2011 Spanish auction to be a rather unreliable benchmark for the UK auction. The likelihood is that it understates market value of 900 MHz, given the inclusion of the investment commitment in the licence.

3. Spain (July and November 2011)

142. In its original Consultation, Ofcom reported a per MHz value of £24.9 million for 900 MHz. This was based on two linked auctions.[62] The price reported by Ofcom was an average of the two auctions. The first auction was held in July 2011 and was a multiband auction covering 800 MHz, 900 MHz and 2.6 GHz.[63] There were six bidders, four incumbent operators and two additional bidders. The second auction, covering spectrum that was unsold in the first auction, was held in November 2011. All four incumbent operators could bid for the spectrum, although there were caps that restricted incumbents base on

[61] Ofcom Consultation, 10 October 2013, Figure 4.2, p. 110 and ¶ 4.32.

[62] This omits a May 2011 900 MHz and 1800 MHz auction described by Ofcom as a "beauty contest" because only two of the four incumbent operators were invited to bid. (Ofcom Consultation, 10 October 2013, p. 110.)

[63] The 2.6 GHz spectrum consists of paired and unpaired spectrum. This discussion is limited to the paired spectrum.

their existing holdings in the July auction, notably at 900 MHz.[64] In the first auction, all the 800 MHz spectrum was sold at prices moderately above reserve, while one block of 900 MHz was sold in each of the auctions at reserve price. The remainder of the 900 MHz was auctioned in the second auction.

143. Ofcom concluded that these Spanish auctions represented more important evidence. This makes some sense, given that Spain – like the UK – has one of Europe's largest populations and, although poorer, has a level of affluence that is closer to the UK than many of the other benchmark countries. Furthermore, as Ofcom point out, the auction was competitive, with a large number of bidders, including many regional cable companies, and one national incumbent, Yoigo, that declined to participate. With higher competition comes greater certainty that prices reflect market value.

144. In a subsequent Ofcom Correction Slip, Ofcom reported separate 900 MHz values for the two auctions, the July 2011 auction valued the band at £24.4 million and the November 2011 at £25.4 million, which is recalculated as £20.8 and £21.7 million using Telefonica's own benchmarking methodology. Ofcom now places "*less weight on the absolute values in the July 2011 auction*" but considers the absolute values of the November auction as providing "*more important evidence*." It further considers that with the November auction there is a "*risk of understating*."[65]

145. We disagree with Ofcom's conclusion that the November benchmark may understate the market value of 900 MHz. To the contrary, there is systematic evidence that marginal bidders were not willing to buy 900 MHz at the reserve price: in the first auction, Yoigo declined to bid even though if it had it would have won 2x5MHz at reserve; and, in the second auction, Orange and Vodafone declined to bid after the caps had been relaxed. The obvious conclusion is that 900MHz was priced above the market level. For 800 MHz, the situation is more ambiguous; the fact that no fourth bidder participated is evidence that this spectrum too was priced above the market level, but we cannot rule out the possibility that smaller bidders simply declined to participate because there was a strong expectation that the three biggest companies would win all 2x30 MHz.

[64] Ofcom does not specify if all four bid.

[65] Ofcom, Correction Slip, ¶¶ 6, 10, and 20.

146. Another indication that the value for 900 MHz in Spain is likely overvalued is the fact that, as a DotEcon report states, *"reserve prices in Spain and Portugal were similar to those in Ireland where reserve prices were set to reflect market value (and the auctions took place in the same year)."*[66]

147. In conclusion, we consider the July and November 2011 Spanish auctions as better benchmarks than most for the UK auction. The likelihood is that the 900 MHz price overestimates market value. It is ambiguous whether the 800 MHz price overstates or understates market value.

4. Portugal (November 2011)

148. Ofcom reports a per MHz value of £24.1 million for 900 MHz, which is recalculated as £18.7 million using Telefonica's own benchmarking methodology. The auction was held in November 2011 and was a multiband auction covering substantial amounts of 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz as well as bits of 450 MHz, unpaired 2.1 GHz and unpaired 2.6 GHz. There were four qualified bidders: Vodafone, TMN, Optimus and Zon III, but only the first three won spectrum. Of the main bands auctioned the 800 MHz band was fully sold, while the 900 MHz, 1800 MHz and 2.6 GHz all had unsold spectrum. All spectrum sold at the reserve price, from which we can infer than Zon III did not place any valid bids.

149. Ofcom provisionally conclude that Portugal provides less important evidence for pricing 900 MHz spectrum. In support of this conclusion, we note that Portugal has both a much smaller population than the UK, and a much less developed economy. Ofcom further suggest that the fact that some 900 MHz spectrum went unsold may be a result of the tight spectrum caps, and that Portuguese prices therefore are likely to be below market value. However, the evidence for this is ambiguous. It is equally possible that marginal bidders were deterred by the substantial reserve prices. Ofcom point out that "*DotEcon notes in their report that no indication is given to suggest that the reserve prices were set to reflect market value*."[67] In a subsequent report, DotEcon repeat this view but state *"[w]e note however that reserve prices in Spain and Portugal were similar to those in*

[66] DotEcon, Final Report for Ofcom, September 2013, ¶ 67. Ireland auctioned 800 MHz, 900 MHz and 1800 MHz.

[67] Ofcom Consultation, 10 October 2013, p. 107, citing to DotEcon, *International benchmarking of 900MHz and 1800MHz spectrum value*, May 2013.

Ireland where reserve prices were set to reflect market value (and the auctions took place in the same year)."[68] Given that Portugal is a small and relatively poor market, we think it quite plausible that reserve prices overstated market value.

150. Within the 900 MHz band, the lots available in the auction were adjacent to Vodafone's existing frequencies. Vodafone bid for and won one of the lots. According to DotEcon, the "*lack of bids from Optimus and TMN for the remaining 2x5 MHz lot suggests that these operators' valuation for incremental, non-contiguous spectrum was below the reserve price of £0.354 (though this does not necessarily form an upper bound on 900 MHz market value in general, as the value would have been depressed by the fact that contiguity could not be achieved with existing holdings).*"[69] While this argument cannot be entirely dismissed, we think it most unlikely that contiguity was a critical factor, for two reasons. Firstly, in the short-medium term, operators at 900 MHz in Portugal are likely to be running both 2G and 3G spectrum in the bands, so having spectrum in two blocks should not be a serious constraint. Secondly, in the medium-long term, an operator acquiring disaggregated spectrum may have strong grounds to appeal to the regulator for the band to be re-planned.

151. In conclusion, we consider the Portuguese auction to be a rather unreliable benchmark for the UK auction. However, as we discuss below, it does appear to be just as good a benchmark as Greece or Romania, so it should only be treated as less important evidence if those other countries are treated in the same way. It is ambiguous whether it understates or overstates market value of 900 MHz.

[68] DotEcon, Final Report for Ofcom, September 2013, ¶ 67. Ireland auctioned 800 MHz, 900 MHz and 1800 MHz.

[69] DotEcon, Final Report for Ofcom, September 2013, ¶ 68.

5. Greece (November 2011)

152. Ofcom reports a per MHz value of £31.4 million for 900 MHz, which is recalculated as £27.5 million using Telefonica's own benchmarking methodology. The auction was held in November 2011 and was a multiband auction covering 900 MHz and 1800 MHz. There were three bidders: Cosmonote, Vodafone and Wind Hellas. The spectrum sold at the reserve price. Ofcom characterizes this as *"indicating that there was not strong excess demand."*[70] Notwithstanding this comment, Ofcom adopts the Greek benchmark as a "more important" evidence point, and argues that the lack of competition implies that the benchmark risks understating market value.

153. Telefonica's view of this award is that a much more plausible explanation for the lack of competition in the auction is that the reserve price was set significantly above the true market level. The auction took place against a back-drop of economic crisis in Greece, with a government facing budgetary crisis and in desperate need of new revenues. There was little likelihood any entrant would have a business case to enter the Greek market at such a time. However, for incumbent operators, there was no choice but to acquire 900 MHz spectrum, as without it they would have had to prematurely close down their 2G networks. In this situation, the government obviously had a strong rationale to set reserve prices above the market clearing level, and rely on the fact that incumbents would still buy the spectrum.

154. One piece of important evidence for the conclusion that spectrum was over-priced is that the third operator, Wind, apparently did not bid for any 1800 MHz spectrum, allowing its two larger rivals to take the entire band at reserve. With Wind obliged to pay so heavily for 900 MHz spectrum, it presumably had no budget left for 1800 MHz spectrum, whether or not it even had a business case to acquire 1800 MHz at the prevailing prices. Although the auction was an SMRA, this failure to bid cannot be explained by demand reduction, given that Wind did not bid for any 1800 MHz so had nothing to gain from this band selling at reserve.

155. Another piece of evidence supporting the argument that the spectrum was over-valued is the methodology adopted by the Greek regulator in setting the reserve price. The EETT apparently based its reserve price on a study prepared by DotEcon for the Irish regulator

[70] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 95-96.

ahead of the Irish multi-band auction and then adapted the numbers to Greece. However, in doing this, they appear merely to have adjusted the reserve price to reflect population differences and not the much lower purchasing power of Greek consumers relative to Irish consumers and to European consumers on average.[71] By contrast, when Ofcom look at the Greek auction data, they do apply a PPP exchange rate, with the implication that the Greek benchmark has been over-stated to the maximum possible extent.

156. In conclusion, we consider the Greek auction to be a rather unreliable benchmark for the UK auction. The likelihood is that it overstates market value of 900 MHz.

6. Romania (September 2012)

157. Ofcom reports a per MHz value of £24.9 million for 900MHz, which is recalculated as £13.1 million using Telefonica's own benchmarking methodology. The auction was held in September 2012 and was a multiband auction covering 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz. There were five bidders: the four incumbents: Cosmote RMT, Orange, RCS & RDS, and Vodafone, and one new entrant, 2K Telecom. All 900 MHz and 1800 MHz spectrum was sold. Some of the 800 MHz and a significant amount of the 2.6 GHz spectrum was unsold.

158. As Romania used a package bid format (a version of the combinatorial clock auction) band, no disaggregated prices are available. However, as *"all packages sold for prices which were very close to the sum of the reserve prices for lots within the package. [Ofcom] therefore take reserve prices as a close proxy for band-specific auction prices in this case*." Ofcom further conclude that because for 900 MHz and 1800 MHz spectrum auction prices did not exceed reserve price the reserve price risks understating the value of the spectrum "*although [Ofcom] recognise that the resulting prices are not low compared to other benchmarks we are considering*."[72]

159. As with Greece, we disagree with the conclusion that Romanian benchmark prices may understate market value. Observe that all spectrum in bands currently in use were sold, but that spectrum in new bands went unsold. This is exactly what you would expect to

[71] EETT, Liberalisation of the use of 900 MHz and 1800 MHz spectrum bands and assignment of the relevant rights of use, January 2011, pp. 5-6 (henceforth "EETT Liberalisation, January 2011").

[72] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 108-109.

happen if the spectrum was over-priced. Incumbent operators (of which there are four in Romania) have little choice but to buy back the 2G and 3G spectrum they need for business continuity, especially in a less developed market where 2G subscribers are still a very large part of the market. This is true even if the long term value of this spectrum is less than new 4G bands, as operators fear the brand damage that may flow from premature re-farming. This is particularly true for the 900 MHz band where, unsurprisingly, the three largest Romanian operators each took the maximum 2x10 MHz.

160. Our view is that the Romanian authorities over-priced both 800 MHz and 900 MHz spectrum. The 900 MHz band still sold because there was exact demand for 2x35 MHz, with incumbents collectively having a value well above the market price. This can be explained by the need for the three larger incumbents to protect their core 2G business, and the fourth operator RCS&RDS to improve the economics of its 3G network. Meanwhile, 800 MHz failed to sell, because the third and fourth operators had no value at these high prices and/or they had exhausted their budgets paying an above-market price for 900 MHz.

161. Like Greece, there is evidence that the Romanian regulator may have been more concerned about revenue than efficiency when setting reserve prices. DotEcon described the Romanian reserve price setting process as follows: "*ANCOM considered outcomes from other spectrum auctions, spectrum demand and the physical characteristics of the various bands amongst other factors when setting reserve prices. There was however, no specific reference to reserve prices reflecting market value*."[73] DotEcon further notes that in "*Romania … [800 MHz] reserve prices are not far off those set in Ireland*." This was true for the Romanian 900 MHz price as well.[74] Indeed, it seems quite reasonable to suppose that ANCOM would have considered the DotEcon ComReg report when setting its prices, but, like the Greeks, only adjusted for population not purchasing power.

162. We also have general concerns about the inclusion of Romania within the benchmark sample, given lack of similarity to the UK market. Amongst all the countries that Ofcom looks at, it has by some margin the least affluent consumers. According to World Bank data, Romania had an average GDP per capita of $9,036 in 2009-13, compared to over

[73] DotEcon, Final Report for Ofcom, September 2013, ¶ 67.

[74] DotEcon, Final Report for Ofcom, September 2013, ¶ 83 and Figures 3 and 4.

$20,000 each for the next poorest countries, Portugal and Greece, and $39,093 for the UK.[75]

163. In conclusion, we consider the Romanian auction to be a very unreliable benchmark for the UK auction. The likelihood is that it overstates market value of 900 MHz.

7. Ireland (November 2012)

164. Ofcom reports a per MHz value of £35.7 million for 900 MHz, which is recalculated as £36.8 million using Telefonica's own benchmarking methodology. The auction was held in November 2012 and was a multi-band spectrum award covering three spectrum bands: 800 MHz, 900 MHz, and 1800 MHz. There were four bidders: H3G, Meteor Mobile, Telefonica and Vodafone, all incumbent operators. The auction was highly competitive, with all long-term licences,[76] including the seven lots of 2x5 MHz at 900 MHz, attracting bids well above reserve.

165. A cursory glance might suggest that the Irish auction is a better benchmark for UK 900 MHz prices than the other seven awards, given that there was actual bid competition for 900 MHz. However, there are a number of issues that must be considered when analysing the Irish data:

- Like the UK, Ireland used a CCA format with package bidding. Consequently, there is no actual price for 900 MHz. Instead, Ofcom uses a "guestimated" price based on information provided to them by Vodafone and ComReg.[77] Telefonica also participated in this auction. Our view is that the numbers presented are credible as an indicator of relative prices across bands, but it would be erroneous to look at individual values produced for any one band in isolation.

[75] World Bank data, available at: http://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[76] ComReg also sold some short-term licences at 900MHz and 1800MHz. Like Ofcom, we exclude these from our analysis, as the long-term licences are the more relevant benchmark. However, we note that, in the context of a package auction, their inclusion further complicates attempts to identify disaggregated prices on a band-by-band basis.

[77] Ofcom Consultation, 10 October 2013, p. 98. According to ComReg, these percents are "reasonable indications" "within a couple of percentage points."

- We believe that bids in the Irish auction overstate the price of 900 MHz. This is because the use of a CCA format and structure of spectrum caps gave strong incentives for H3G to overstate its value for two lots of 900 MHz. The outcome of the auction for this band was particularly predictable, as Meteor, Telefonica and Vodafone are all heavily committed to the 900 MHz band, and needed exactly the cap of 2x10 MHz to support their legacy 2G and 3G operations. With seven lots available, H3G was essentially guaranteed one lot. Furthermore, it was in an ideal position to drive up the 900 MHz price by bidding for a second lot, even if it had no business case for that lot at reserve. Such action would have made no difference to H3G's price (provided it dropped back to one lot before reaching a rival's high marginal value for a second lot) but would have driven up expected price for rivals, potentially reducing their funds for bidding for 800 MHz, where the auction outcome was much less certain. Obviously, Ofcom is not in a position to judge whether Irish prices were distorted by such strategic behaviour, but it should bear this in mind when assessing the evidence.

- A substantial component of the Irish 900 MHz price is an annual licence fee, charged in addition to the auction price. This further complicates the process of determining a UK benchmark.

166. In conclusion, we think there is a strong likelihood that the disaggregated Irish 900 MHz price overestimates market value. Great caution should be taken when considering the absolute value of 900 MHz as a benchmark for the UK.

8. Conclusion on benchmarks for absolute values for 900 MHz

167. These absolute values for 900 MHz should not be given much, if any, weight. In the first place, these countries are likely not ones that make good absolute value comparables. As DotEcon noted when looking at "*economic, demographic and market data for a number of European countries of comparable size to the UK*," it found that "*Germany, France, Italy and to a lesser extent Spain, have comparable economic and mobile market conditions to that of the UK and might therefore be considered as reasonably good comparators*."[78] Of these, only Spain is on the list of countries that Ofcom used as absolute value benchmarks.

[78] DotEcon, Final Report for Ofcom, September 2013, ¶ 48.

168. As Ofcom itself points out, absolute value comparisons require "*[m]aking appropriate adjustments for currency (purchasing power parity), population, licence duration and date of auction to show figures on a UK-equivalent basis*."[79] In addition, as Vodafone has pointed out, issues such as "*the general availability of spectrum, supply-side and demand-side factors, mobile market competition, and geography*" come into play.[80] The "more important" absolute values shown by Ofcom are all anomalous, likely reflecting differences in how reserve prices were set and the difficulties in converting absolute auction values across countries and exchange rates. A further concern is that reserve prices in Ireland, Greece and Romania may all have been influenced by the same source, namely the DotEcon benchmarking study for ComReg,[81] suggesting that Ofcom's already small sample of benchmarks for the absolute value of 900 is heavily dependent on a single source, developed by its own advisor from the same data source.

169. In selecting country benchmarks as more or less important, Ofcom appears to have an implicit bias towards higher value outcomes. All the values considered by Ofcom as "more important" are either equal to Ofcom's proposed UK spectrum value (Romania and Spain) or significantly above it (Greece and Ireland). In contrast, the Danish and Portuguese auctions, which had lower prices, are dismissed as lesser evidence, even though competitive conditions were not significantly different from Romania, Spain and Greece. Ofcom also appears blind to the possibility that if spectrum sells at reserve, this may be because it was priced above the market level. This leads it to conclude that its Greek, Romanian and Spanish benchmarks likely understate the UK equivalent price, when the opposite conclusion that they overstate the price is far more credible.[82]

170. Further, as acknowledged by Ofcom, the reported values for Greece and Ireland suggest that the value of 900 MHz is higher than that of 800 MHz in the UK while elsewhere, with

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79 Ofcom Consultation, 10 October 2013, ¶ 4.13a, footnote 29. It is also described as: "in this consultation we have used UK-equivalent prices which account for differences in currency, purchasing power, country population, and licence duration." (Ofcom Consultation, 10 October 2013, ¶ A7.3.)

80 Ofcom Consultation, 10 October 2013, ¶ 4.13a, footnote 30.

81 DotEcon, Final Report for Ofcom, September 2013, ¶¶ 66, 83.

82 For example, Ofcom states: "*There may also be country-specific reasons why we may consider it appropriate to place less weight on some of these results as a guide to values in the UK. In particular, in Romania the income per capita is a fraction of that in the UK. We recognise that there may be a case, despite the use of purchasing power parity exchange rates, for placing less weight on Romania than on other countries which may be more closely comparable to the UK*." (Ofcom Consultation, 10 October 2013, ¶ 4.33.)

exception of Romania, the value for 800 MHz is higher than that of 900 MHz.[83] Elsewhere in its report Ofcom has used similar anomalous results to dismiss the usefulness of an observation, namely where it found the absolute value of 2.6 GHz in another country above that of 1800 MHz in the UK.[84]

171. Even using the values developed by Telefonica is not recommended as these countries largely differ from the UK in their economic and mobile market conditions and these estimates continue to be affected by country specific factors such as reserve prices and bidding strategies. If Ofcom wishes to retain the use of absolute values in its evaluation it should use those developed by Telefonica as the resulting average and median values are in line with those developed using the relative values discussed below.

B. Relative Value of 900 MHz versus 800 MHz

172. The relative value for 900 MHz as a proportion of 800 MHz is calculated by Ofcom as 0.84 for the UK market. This ratio is significantly above that of all other European countries for which data is available with the exception of Romania. Once Romania, as an obvious outlier, is stripped out, it is apparent that the evidence does not support such a high ratio.

173. In support of its relative value, Ofcom looked at the relative price of 900 MHz and 800 MHz spectrum in four European countries. It identified Romania, Spain, and Ireland as "more important evidence", but marked Portugal as "less important evidence". It disregards Denmark completely, even though data is available, albeit as of September 2010 for the 900 MHz auction and July 2012 for the 800 MHz auction. There are three other European countries that have sold both 900 MHz and 1800 MHz spectrum (Switzerland, Netherlands

[83] As Ofcom states: "*Also among the evidence points that we consider to be more important, the relative value of 900 MHz to 800 MHz in Ireland is substantially lower (£18.2m per MHz), while the absolute values of 900 MHz in Ireland and Greece are substantially higher (£35.7m per MHz and £31.4m per MHz respectively), as is the relative value of 900 MHz to 800 MHz in Romania (£34.1m per MHz).*" "*The[se] three more important evidence points … which are above our best estimate also imply a 900 MHz value which is above the value of 800 MHz spectrum in the UK. This is inconsistent with our view, noted in paragraph 4.52 (a) that 900 MHz is unlikely to have a higher value than 800 MHz spectrum. This view is supported by the fact that Romania was the only country in our evidence set in which the value of 900 MHz was higher than that of 800 MHz: in Ireland, Spain, Portugal and Denmark 900 MHz had the lower value of the two bands.*" (Ofcom Consultation, 10 October 2013, ¶¶ 4.57. and 4.57.d.)

[84] DotEcon, Final Report for Ofcom, September 2013, ¶ A7.2.

and Austria), but all of these may reasonably be ignored, owing to the use of a multi-band CCA format, and lack of disaggregated prices and bid data.

174. In the paragraphs below, we consider, in chronological order, each of the five awards for which data is available and their relevance as benchmarks for the relative value of 900 MHz spectrum in the UK. Individually, the Spanish and Irish benchmarks stand out as the most plausible indicators of the value of UK 900 MHz spectrum, followed by the Portuguese and Danish ones. The Romanian benchmark stands out as an outlier that should be dismissed outright.

1. Spain (July and November 2011)

175. In its original Consultation Ofcom reported a 900 MHz to 800 MHz value ratio of 0.79, based on the results of two linked auctions.[85] As discussed previously, all the 800 MHz spectrum sold in the first auction, and was acquired by the three largest operators. The two 900 MHz lots were both sold to Telefonica, which was the only bidder for this spectrum, with one lot sold in the second auction, after caps on incumbent operators were relaxed. The fourth incumbent, Yoigo, declined to bid in both auctions. In its subsequent Ofcom Correction Slip, Ofcom based its ratio calculation using only the 900 MHz value of November 2011, calculating a 900 MHz to 800 MHz value ratio of 0.81.[86]

176. In Spain, the 900 MHz spectrum sold at reserve, while for the 800 MHz spectrum "*there was only a small amount of competition*" with competition apparently driven solely by the three incumbents competing for positions within the band not subject to DTT protection requirements.[87] Thus, the 900:800 price ratio, regardless of auction included, was heavily influenced by the reserve prices set by the regulator. The fact that there was no excess demand at these price levels is unsurprising given that, according to DotEcon, prices were set at a high starting level: "*[w]e note however that reserve prices in Spain and Portugal*

85 This omits the May 2011 900 MHz and 1800 MHz auction described by Ofcom as a "beauty contest" because only two of the four incumbent operators were invited to bid. (Ofcom Consultation, 10 October 2013, p. 110.)

86 Ofcom, Correction Slip, ¶¶ 7.

87 "The bottom 2x5MHz block sold at reserve, €50 million cheaper than the rest of the band." (DotEcon and Aetha Spectrum Value, July 2012, ¶ 69.)

were similar to those in Ireland where reserve prices were set to reflect market value (and the auctions took place in the same year)."[88]

177. Ofcom treats its revised Spanish 900:800 value ratio as "more important evidence" for setting UK prices. One rationale for this is that both countries are large European markets. Another is a presumption, which seems plausible but is not backed by any firm evidence, that the regulator set relative prices to reflect perceived differences in the value of the two bands. We have not identified any evidence to the contrary, so broadly accept Ofcom's conclusion.

178. We do, however, strongly disagree with Ofcom's assertion that this benchmark "*risks understating market value*," which is presented in Figure 4-4, as revised by the Correction Slip of the consultation document, but not supported by any evidence. To the contrary, the evidence suggests that there is a much greater risk that this benchmark overstates the market of 900 MHz. As we discussed above, the repeated decisions by incumbent bidders other than Telefonica to pass up the opportunity to bid for 900 MHz strongly suggests that the price was above the market value (i.e. above the value that a marginal bidder would have been willing to pay for the spectrum). It is possible of course that 800 MHz was also over-priced, but this is more ambiguous as we cannot rule out the possibility that smaller bidders simply declined to bid for this band because there was a strong expectation that the three biggest companies would together win all 2x30 MHz.

179. We conclude that the 900:800 ratio of 0.81 is a more important evidence point for UK prices, but with a greater risk that it overstates rather than understates the true value of 900 MHz.

2. Portugal (November 2011)

180. Ofcom reports a 900 MHz to 800 MHz value ratio of 0.67 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). As discussed previously, both bands were sold together in the context of a broader multi-band auction using the SMRA format. The 800 MHz band was sold in full, but one of two 2x5 MHz lots at 900 MHz went unsold.[89]

[88] DotEcon, Final Report for Ofcom, September 2013, ¶ 67. Ireland auctioned 800 MHz, 900 MHz and 1800 MHz.

[89] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 106-107.

181. Spectrum in both bands sold at the reserve price. Like Spain, the fact that there was no excess demand at these price levels is unsurprising given that, according to DotEcon, prices were set at a high starting level: "*[w]e note however that reserve prices in Spain and Portugal were similar to those in Ireland where reserve prices were set to reflect market value (and the auctions took place in the same year)*."[90]

182. Ofcom treats the Portuguese 900:800 value ratio as "less important evidence" for setting UK prices. However, Ofcom presents no evidence that the relative prices across the bands were not reflective of market value, and its conclusion is inconsistent with how Ofcom approaches other benchmark awards. As with Spain, there is no reason not to presume that the Portuguese regulator also set relative prices to reflect perceived differences in the value of the two bands. Of course, in isolation, Portugal is a less attractive benchmark than Spain because the differences in its size and wealth relative to the UK are more pronounced, but these factors do not merit it being excluded as a data point in a broader benchmarking analysis – especially when Ofcom does include even smaller (Ireland) and poorer (Romania) countries.

183. There is no firm evidence to suggest whether the ratio understates or overstates the value of 900 MHz. Ofcom has noted concerns about contiguity as a possible reason why demand for 900 MHz may have been depressed. On the other hand, the fact that the 800 MHz band sold in full and some 900 MHz spectrum did not sell may imply that incumbents thought it was better value at already high reserve prices for both bands.

184. We conclude that the 900:800 ratio of 0.67 is a plausible evidence point for UK 900 MHz prices, provided it is considered in a broader context of multiple benchmarks. It is ambiguous whether this value is more likely to overstate or understate the true market value.

3. Denmark (September 2010) and 800MHz (June 2012)

185. The value ratio of 900 MHz to 800 MHz is 0.24, which is recalculated as 0.22 using Telefonica's own benchmarking methodology. Ofcom fails to report this ratio, but it can be derived from the absolute values that it does report in Table 4.2 of the consultation

[90] DotEcon, Final Report for Ofcom, September 2013, ¶ 67. Ireland auctioned 800 MHz, 900 MHz and 1800 MHz.

document. This ratio spans two separate single band auctions, which each took place approximately 21 months apart. All available spectrum was sold in both auctions.

186. In the 900 MHz award in September 2010, there was only one bidder (H3G) and the spectrum sold at reserve. By contrast, in the 800 MHz award which used a CCA format, there were three bidders, each under a cap of 2x20MHz. Only two of the bidders were successful, with one taking 2x20 MHz. The average price per MHz for 800 MHz was about 120% above reserve.[91]

187. Ofcom disregards these auctions in its analysis of valuation ratios. We suppose that this decision follows from its conclusion that the absolute value of 900 MHz auction was less important evidence owing to observed weak competition.[92] However, as we discussed above, while Denmark is clearly not the strongest available evidence point, the case for excluding it outright is weak, given the dubious quality of some other benchmarks at the higher end of the price range that are kept in.

188. Further, the case for excluding this from an analysis of value ratios is even weaker. For other countries, Ofcom appears to make the presumption that reserve prices were likely indicative of the regulator's view on relative values, and there is no reason not to think this was the case in Denmark. Ofcom has few enough evidence points, without weeding out points simply because it thinks some values are low. That said, we accept that – unlike most other evidence points – there is a greater risk that this ratio understates rather than overstates the 900 MHz price, given the that competitive pressures in the 800 MHz auction were stronger than in the 900 MHz auction.

189. We conclude that the 900:800 ratio of 0.24 is a plausible evidence point for UK 900 prices, provided it is considered in a broader context of multiple benchmarks. It is likely that this benchmark understates rather than overstates the value of 900 MHz.

4. Romania (September 2012)

190. Ofcom reports a 900 MHz to 800 MHz value ratio of 1.14 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). As discussed

[91] DotEcon and Aetha Spectrum Value, July 2012, ¶ 46, Figure 4.

[92] Ofcom Consultation, 10 October 2013, pp. 88-90.

previously, both bands were sold together in the context of a broader multi-band auction using a variant of the CCA format with package bidding. The 900 MHz band was sold in full, but one of six 2x5MHz lots at 800 MHz went unsold.

191. No disaggregated prices are available for the individual bands. However, given that "*all packages sold for prices which were very close to the sum of the reserve prices for lots within the package. [Ofcom] therefore take reserve prices as a close proxy for band-specific auction prices in this case*."[93]

192. A value ratio of 1.14 is an extreme outlier from all other benchmark ratios, as it implies that 900 MHz spectrum is valued more highly than the 800 MHz spectrum. We believe that this peculiar outcome can be explained by local factors. As we discussed earlier, our view is that the price of spectrum at both 800 MHz and 900 MHz was set above market value. This situation likely arose because the auction was in part designed to raise revenues and the regulator appears to have used Western European benchmarks to price spectrum without adequately adjusting for lower incomes in Romania. The four incumbents nevertheless had core demand for 2x35 MHz of 900 MHz spectrum, so this all sold despite the high price. In this context, demand from the two smaller incumbents for 800 MHz was choked off, because 800 MHz was also too expensive and possibly also because budgets were limited.

193. Ofcom itself states that an outcome in which 900 MHz is above the value of 800 MHz "*is inconsistent with our view … that 900 MHz is unlikely to have a higher value than 800 MHz spectrum. This view is supported by the fact that Romania was the only country in our evidence set in which the value of 900 MHz was higher than that of 800 MHz: in Ireland, Spain, Portugal and Denmark 900 MHz had the lower value of the two bands*."[94] Nevertheless, in Figure 4.4, it still reports the Romanian value ratio as "*more important evidence*" and claims that "*the benchmark risks understating market value*." This makes no sense to us. Based on Ofcom's own reasoning, it is clear that the Romanian benchmark is perverse. Either this metric should be dropped, or if included, other evidence points that produced lower values but were dropped by Ofcom, such as Portugal and Denmark, must be given at least equal weighting in the analysis.

[93] Ofcom Consultation, 10 October 2013, ¶ 4.57a.

[94] Ofcom Consultation, 10 October 2013, ¶ 4.57d.

194. We conclude that the 900:800 ratio of 1.14 is an outlier and is not a plausible evidence point for UK 900 prices. If given any weight is given to this metric it should only be in the context of a broad analysis in which all five available 900:800 ratio benchmarks are considered. This benchmark clearly overstates the value of 900 MHz.

5. Ireland (November 2012)

195. Ofcom reports a 900 MHz to 800 MHz value ratio of 0.61, which is recalculated as 0.60 using Telefonica's own benchmarking methodology. As discussed previously, both bands were sold together in the context of a broader multi-band auction using the CCA format with package bidding. Both bands were sold in full.

196. No disaggregated prices are available for the individual bands. However, the auction was competitive and it is clear that marginal bidders submitted bids which implicitly valued each band above the reserve. Ofcom derives the relative value using guestimated auction prices for 800 MHz and 900 MHz based on information provided to them by Vodafone and ComReg, combined with estimated lump sum equivalents of the annual fees.[95] As stated previously, our view – based on Telefonica's own participation in the auction – is that the numbers presented are credible as an indicator of relative prices across bands.

197. The Irish value 900:800 ratio is presented by Ofcom as a "*more important evidence*" point for the UK auction. We broadly agree with this assessment. Amongst the available benchmarks, it is the only one where there is evidence of competition for both bands in the auction. Whereas with other benchmarks, there is risk that the ratio is distorted by the choice of reserve price levels, this seems less likely in Ireland.

198. Ofcom do not take a position whether the ratio risks understating or overstating the market value. As previously discussed, we believe that bids in the Irish auction overstate the price of 900 MHz, as it is likely that one of the bidders overstated its demand for 900 MHz for strategic reasons. There is no reason to suppose that 800 MHz prices were similarly distorted, so we may reasonable suppose there is a significant risk that the 900:800 ratio will overstate the value of UK 900 MHz spectrum.

[95] Ofcom Consultation, 10 October 2013, p. 98, footnote 130. According to ComReg, these percents are "reasonable indications" "within a couple of percentage points."

199. We conclude that the 900:800 ratio of 0.61 is a plausible evidence point for UK 900 MHz prices. There is a much greater risk that this benchmark overstates rather than understates the value of 900MHz.

6. Conclusion on benchmarks for relative values of 900 MHz & 800 MHz

200. As a general principle, the rationale for looking at benchmarks for value ratios rather than absolute values is very strong. This is because potential distortions, such as adjustments for purchasing power, are cancelled out in a ratio. Telefonica's view is that much greater weight should therefore be put on value ratios. Unfortunately, in its current analysis, Ofcom appears to fall into the trap of dismissing too readily those benchmarks that produce lower numbers, and putting undue weight on those that give higher outcomes. In particular, Ofcom's rationale for excluding Portugal and Denmark while still giving substantial weight to Romania is inexplicable.

201. The ratio results based on Ofcom data for each of the five countries are summarized in Table 3.10. All the data points except Romania and Denmark are concentrated into a relatively narrow range of 0.61 to 0.81. By contrast, Romania is 33-percentage points higher than the next highest ratio (Spain) and Denmark 37-percentage points lower than the next lowest ratio (that of Ireland). Together with the qualitative arguments we have presented about the Romanian auction and Ofcom's own conclusion that it is not feasible that the value of 900 MHz could be higher than 800 MHz, we propose that Ofcom should simply disregard the Romanian award from the analysis of ratios. We have not identified any similarly strong justification for excluding other data points, although we note that Denmark may also be considered an outlier.

Table 3.10: 900 MHz / 800 MHz Price Ratios for Benchmark Awards

	Ofcom Data			Telefonica Data		
Award	900MHz Price (£m/MHz)	800MHz Price (£m/MHz)	Ratio	900MHz Price (£m/MHz)	800MHz Price (£m/MHz)	Ratio
Spain (November 2011)	25.4	31.4	0.81	21.7	26.8	0.81
Portugal (Nov 2011	24.1	36.1	0.67	18.7	28.0	0.67
Denmark (Sep	2.4	10.1	0.24	3.9	18.0	0.22

2010 & Jun 2012)						
Romania (Sep 2012)	24.9	21.8	1.14	13.1	11.4	1.14
Ireland (Nov 2012)	35.7	58.6	0.61	36.8	60.9	0.60

Source: Ofcom Consultation, 10 October 2013, Figure 4.2.

202. We note that Ofcom says that it "*has not sought to take a mechanistic approach to deriving best estimates from the available evidence*."[96] However, Ofcom's approach on calculating ratios is opaque – it is simply not clear to us how it has arrived at a ratio of 900:800 of 0.84. Furthermore, we think it is instructive to calculate and compare benchmark averages and medians using the available evidence on ratios. We consider three approaches:

    1. All five benchmark awards, including Romania
    2. Four benchmark awards – with Romania excluded as an outlier
    3. Three benchmark awards – with the highest (Romania) and lowest (Denmark) evidence points excluded as outliers

203. Table 3.11 compares the results for each approach to the proposed Ofcom 900:800 ratio of 0.84. Telefonica's view is that approaches (2) and (3) provide the more relevant data, and that the final UK ratio should be within the range of these numbers. Approach (1) is clearly skewed by the inclusion of the Romanian data, and illustrates how simple averages and medians calculated from a limited number of observations may be susceptible to the effect of an outlier.

Table 3.11: Benchmark Ratios for Price of UK 900MHz / 800MHz

		Ofcom Data		Telefonica Data	
Approach	Sample countries	Simple average	Median	Simple average	Median
All five benchmark awards, including Romania	Spain, Romania, Portugal, Denmark, Ireland	0.69	0.67	0.69	0.67

[96] Ofcom Consultation, 10 October 2013, ¶ 110.

Four benchmark awards, excluding Romania	Spain, Portugal, Denmark, Ireland	0.58	0.64	0.57	0.64
Three benchmark awards – exclude highest and lowest evidence points	Spain, Portugal, Ireland	0. 70	0.67	0.69	0.67
Ofcom proposed prices (for comparison)	Spain, Romania, Ireland	0.84 *		na	

Sources: Ofcom Consultation, 10 October 2013, ¶ 1.11 and Figure 4.2.

* Approach not specified. Although Ofcom states that it does not use a mechanistic approach, we note that a simple average of ratios for Spain, Romania and Ireland, Ofcom's "more important" evidence points, yields a ratio of 0.85, almost identical to Ofcom's number.

204. One striking observation is that all our mechanistic calculations, even those that include Romania, produce results significantly below Ofcom's proposed ratio of 0.84. Although Ofcom says it does not use a mechanistic approach, we note that a simple average of the ratios for Spain, Romania and Ireland, the awards it specified as "more important" evidence points, yields a ratio of 0.85; however, this is clearly not a reasonable data set.

205. In summary, a broad analysis of ratios provides no evidence to support Ofcom's ratio of 0.84 for 900 MHz/800 MHz prices in the UK. Instead, the evidence from benchmarks is that the ratio should be set in a range between 0.57 and 0.69. These ratios would be virtually identical if based on Telefonica's estimates of absolute values.

C. Conclusion on benchmark values for 900MHz

206. In this sub-section, we explored two approaches for deriving benchmark values for 900 MHz, one drawing on absolute values from other European auctions, and the other using relative values for 900 MHz / 800 MHz from other auctions. We identified a series of concerns with the absolute value approach which suggest this is not a reliable approach. There are also issues with many of the benchmarks for 900/800 value ratios, but these are fewer and of lesser magnitude. Accordingly, we propose that Ofcom focus on the 900/800 ratio as the best available source of benchmarks for the value of 900 MHz in the UK.

207. A broad analysis of ratios provides no evidence to support Ofcom's proposed ratio of 0.84 for 900 MHz/800 MHz prices in the UK. Instead, the evidence from benchmarks is that the

ratio should be set in a range between 0.57 and 0.69. We take a simple average of these approaches of 0.63 as a central case estimate for the value of 900 MHz in the UK.

208. In subsection 3.5, we identified a revised value of £24.16m per MHz for the value of 800 MHz in the UK. Accordingly, we estimate the value of 900 MHz in the UK at £15.22m (63% of £24.16m) per MHz.

3.7 Lump sum price for 1800MHz

209. In this sub-section, we review Ofcom's approach to deriving a lump sum price for 1800 MHz. In the consultation document, Ofcom states that: "*Our assessment is informed by the value of 800 MHz and 2.6 GHz spectrum in the UK 4G Auction: as set out …, we have considered evidence points derived from a combination of these values with implied relative values between 1800 MHz and these bands in other countries. We have also considered the likely value of 1800 MHz relative to 2.6 GHz informed by technical considerations.*"[97] As with the 900MHz band, notwithstanding the claimed focus on relative values, much of the "more important" evidence identified by Ofcom relies upon the absolute value of 1800 MHz auctions in other European countries.

A. Absolute Values in Other Countries

210. In support of its absolute value for 1800MHz, Ofcom identified five countries as "more important" evidence points, namely Italy, Sweden, Greece, Romania, and Ireland. The other awards in Germany, Denmark, Spain (May 2011) and Portugal are identified as "less important" evidence points in Figure 4.5 of the Ofcom report, but are ignored in the written analysis in the main report.[98]

1. Germany (May 2010)

211. Ofcom reports a per MHz value of £1.8 million for 1800 MHz, which has been recalculated as £1.7 million using Telefonica's own benchmarking methodology. The auction was a multiband award covering 800 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz as well as unpaired 2.1 GHz and unpaired 2.6 GHz. There were four bidders, the incumbent operators T-Mobile, Vodafone, Telefonica, and E-Plus.

212. All spectrum was sold, and all spectrum was sold above reserve prices.[99] For the 1800 MHz band, Ofcom argues that although 1800 MHz was sold above reserve price and there was no unsold spectrum, "*the 1800 MHz band split the available blocks in such a manner that there were obvious contenders for the available spectrum among the incumbent*

[97] Ofcom Consultation, 10 October 2013, ¶ 4.58a.

[98] Ofcom Consultation, 10 October 2013, p.34.

[99] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 93-94.

operators who were the only participants in the auction."[100] Put differently, Ofcom is implicitly assuming that the four operators engaged in demand reduction. This is possible in the context of an SMRA format, but is only one feasible explanation. Another explanation is that there was a significant quantity of high frequency spectrum in the auction, and at the prevailing prices, demand from the four incumbents was fully sated, revealing a true market price.

213. Ofcom further points out that "*the price of 1800 MHz spectrum implies a UK valuation below that of 2.6 GHz spectrum.*" Again, it takes this as evidence that the German auction was not sufficiently competitive to reveal a market price. However, there may be other explanations. One is that the German auction took place in 2010, when the prospects for the development of the LTE ecosystem at 1800 MHz relative to 2600 MHz was less certain than at the time of the UK auction. This might imply that the German 1800 MHz price is a good benchmark for market price in 2010 but understates the 2013 view. Another explanation is that the UK price may be excessive, perhaps because some bidders overbid and will suffer winner's curse.

214. Our view is that Ofcom is too hasty in dismissing the German benchmark as less important evidence. Firstly, Germany should be a priority benchmark for the UK, as it shares many market characteristics, including a large population and similar level of affluence. Secondly, it is inconsistent for Ofcom to ignore Germany, given the selling price was above reserve, when other countries, such as Greece and Romania, where 1800 MHz sold at reserve, are treated as "more important" evidence points. We do agree, however, that the German benchmark is more likely to understate rather than overstate the UK price, for example because of the change in sentiment towards the 1800 MHz LTE ecosystem between 2010 and 2013.

2. Denmark (September 2010)

215. Ofcom reports a per MHz value of £1.0 million for 1800 MHz, which is recalculated as £1.7 million using Telefonica's own benchmarking methodology. This award process included a single 2x10MHz lot. As per the sister award of 900 MHz (discussed above), the regulator proposed a single unit ascending clock format. However, as there was only one applicant

[100] Ofcom Consultation, 10 October 2013, p. 94.

(Hi3G, Denmark's fourth largest incumbent operator), no actual bidding was required. As a result, the spectrum sold at the reserve price.

216. Ofcom considers the Danish 1800 MHz auction to be less important evidence. It states that the 1800MHz spectrum sold at "*a price which would, in UK terms, be well below the price of 2.6 GHz spectrum*" and argues that this outcome is not surprising "*given that the three largest operators were not allowed to bid*."[101] Given the lack of information on how the reserve price was set and the fact that that there was no competition, we agree that the Danish result does not provide strong evidence for setting UK prices. However, Ofcom's implicit judgment that this benchmark should be ignored because the price is below market value does not stand up to scrutiny. As Ofcom recognises, the regulator did try to attract a new entrant bidder; the fact that none was forthcoming means that we cannot rule out the possibility that the reserve price was above market value, even if this seems less likely than the opposite conclusion.

217. Like Germany, our view is that Ofcom is too hasty in dismissing the Danish benchmark, although it is clearly amongst the weaker of the available benchmarks. We agree that Denmark is likely to significantly understate rather than overstate the UK price, given uncertainty over the competitiveness of the award and because of the change in sentiment towards the 1800MHz LTE ecosystem between 2010 and 2013. However, to ignore the award completely is inconsistent with Ofcom's conclusion that Greece and Romania are important evidence points, when these countries too sold all spectrum at reserve and featured constraints on incumbent bidders.

3. Spain (May 2011)

218. Ofcom reports a per MHz value of £2.9 million for 1800 MHz, which has been recalculated as £1.7 million using Telefonica's own benchmarking methodology. The award process was held in May 2011 and included 900 MHz and 1800 MHz. The award used a "beauty contest" format with the Spanish regulator requiring applicants to set out their cases for award of the available spectrum. For the 1800 MHz band, the three largest operators (Orange, Vodafone and Telefonica) could not bid. Only Yoigo was able to submit a bid for

[101] Ofcom Consultation, 10 October 2013, p. 89-90.

1800 MHz. It won the license at the reserve price. In addition to the reserve price, Yoigo also made a €300 million investment commitment.[102]

219. Ofcom excludes this value from its analysis. We broadly agree with this conclusion, given the lack of information on how the reserve price was set, the complication of the inclusion of an investment commitment, and the restrictions on participation of Orange, Vodafone and Telefonica. Nevertheless, the benchmark may have some value as a lower bound for the value of 1800 MHz spectrum in the auction.

220. In conclusion, we consider the May 2011 Spanish auction to be a rather unreliable benchmark for the UK auction. The likelihood is that it understates market value of 1800MHz, given the inclusion of the investment commitment in the licence.

4. Italy (September 2011)

221. Ofcom reports a per MHz value of £15.5 million, which has been recalculated as £15.1 million using Telefonica's own benchmarking methodology. The auction was a multiband auction covering 800 MHz, 1800 MHz and 2.6 GHz.[103] There were four bidders, the incumbent operators Telecom Italia, Vodafone, Wind and 3 Italia. All paired spectrum was sold at prices above the reserve level.[104]

222. Ofcom concludes that the Italian auction is "more important evidence" for the auction, which seems reasonable given the competitive nature of the process. Nevertheless, we have identified strong grounds for believing that the absolute benchmark may overstate the value of 1800 MHz, which Ofcom fails to consider. As Ofcom notes, the relative prices of the 800 MHz, 1800 MHz and 2600 MHz bands appear peculiarly disparate, resulting in a wide range of benchmarks for Italy. We believe that this can be explained by the progression of the bidding in the Italian auction. Owing to the structure of eligibility points and starting prices across categories, the auction following a sequential path, with competition initially focused at 800 MHz, then moving to 1800 MHz and finally to 2.6 GHz. Competition was particularly intense at 800 MHz. In the higher frequency bands, it appears operators eventually found a compromise outcome, in which Wind did not buy

[102] Ofcom Consultation, 10 October 2013, Figure 4.2, p. 110 and ¶ 4.32.

[103] In addition there was unpaired 2.1 GHz and unpaired 2.6 GHz auctioned, these are not discussed here.

[104] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 101-102.

any additional 1800 MHz spectrum and Vodafone and Telecom Italia settled for just three lots of 2.6 GHz each, one less than Wind. At this point, prices in the 1800 MHz had already reached rather high levels, but the 2.6GHz band was relatively cheap. Thus, while overall prices across the band may reflect market values, it is possible that both the 800 MHz and 1800 MHz prices were inflated relative to the 2.6GHz price.

223. In conclusion, we agree with Ofcom that the Italian 1800 MHz should be considered as a more important evidence point. Like Germany, Italy in principle should be a preferred benchmark for the UK, as it is a large country and fairly affluent (albeit less so than the UK). The likelihood is the benchmark overstates rather than understates the value of 1800 MHz, owing to the impact of strategic bidding in the auction.

5. Sweden (October 2011)

224. Ofcom reports a per MHz value of £9.1 million, which has been recalculated as £10.6 million using Telefonica's own benchmarking methodology. The auction only covered the 1800 MHz band. There were three bidders for 1800 MHz spectrum: Teliasonera, Tele2/Telenor (a joint venture between two incumbents) and Hi3G.

225. The auction was competitive and all the spectrum sold above the reserve price. Accordingly, Ofcom recognises this auction as "more important evidence." However, it also claims the benchmark "*risks understating market value*", as one of the bidders was a joint venture between two operators.[105] This argument is not compelling, given that the JV approach was cleared by the regulator as not being anti-competitive. Ofcom does not even consider the possibility that the JV arrangement strengthened Tele2-Telenor as a competitor, and may even have enhanced competition.

226. In conclusion, we agree with Ofcom that the Swedish 1800 MHz is a more important evidence point. It is ambiguous whether it overstates or understates the true market value.

[105] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 114-115.

6. Greece (November 2011)

227. Ofcom reports a per MHz value of £13.9 million for 1800MHz, which has been recalculated as £12.1 million using Telefonica's own benchmarking methodology. The auction was held in November 2011 and was a multiband auction covering 900 MHz and 1800 MHz. There were three bidders: Cosmote, Vodafone and Wind Hellas. The spectrum sold at the reserve price.

228. Ofcom characterizes the outcome as *"indicating that there was not strong excess demand."*[106] Notwithstanding this comment, Ofcom adopts the Greek benchmark as a "more important" evidence point, and argues that the lack of competition implies that the benchmark risks understating market value.

229. Telefonica's view of this award is that a much more plausible explanation for the lack of competition in the auction is that the reserve price was set significantly above the true market level. The auction took place against a back-drop of economic crisis in Greece, with a government in desperate need of new budget revenues. There was little likelihood any entrant would have a business case to enter the Greek market at such a time. In this situation, the government obviously had a strong rationale to set reserve prices above the market clearing level, and rely on the fact that incumbents would still buy the spectrum.

230. One piece of important evidence for the conclusion that spectrum was over-priced is that the third operator, Wind, apparently did not bid for any 1800 MHz spectrum, allowing its two larger rivals to take the entire band at reserve. With Wind obliged to pay so heavily for 900 MHz spectrum, it presumably had no budget left for 1800 MHz spectrum, whether or not it even had a business case to acquire 1800 MHz at the prevailing prices. Although the auction was an SMRA, this failure to bid cannot be explained by demand reduction, given that Wind did not bid for any 1800 MHz so had nothing to gain from this band selling at reserve.

231. Another piece of evidence supporting the argument that the spectrum was over-priced is the methodology adopted by the Greek regulator in setting the reserve price. The EETT apparently based its reserve price on a study prepared by DotEcon for the Irish regulator ahead of the Irish multi-band auction and then adapted the numbers to Greece. However,

[106] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 95-96.

in doing this, they appear merely to have adjusted the reserve price to reflect population differences and not the much lower purchasing power of Greek consumers relative to Irish consumers and to European consumers on average.[107] By contrast, when Ofcom look at the Greek auction data, they do apply a PPP exchange rate, with the implication that the Greek benchmark has been over-stated to the maximum possible extent. We note that in our benchmark numbers, which do not use PPP, the Greek 1800 MHz benchmark falls by nearly 10%.

232. In conclusion, we believe the Greek auction is not a reliable benchmark for the UK auction. The likelihood is that it overstates market value of 1800 MHz.

7. Portugal (November 2011)

233. Ofcom reports a per MHz value of £3.1 million for 1800 MHz, which has been recalculated as £2.4 million using Telefonica's own benchmarking methodology. The auction was a multiband auction covering substantial amounts of 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz as well as bits of 450 MHz, unpaired 2.1 GHz and unpaired 2.6 GHz. There were four qualified bidders: Vodafone, TMN, Optimus and Zon III, but only the first three won spectrum. Of the main bands auctioned, the 800 MHz band was fully sold, while the 900 MHz, 1800 MHz and 2.6 GHz all had unsold spectrum. All spectrum sold at the reserve price, from which we can infer than Zon III did not place any valid bids.

234. Ofcom concludes that Portugal provides less important evidence for pricing 1800 MHz spectrum. In support of this conclusion, we note that Portugal has both a much smaller population than the UK, and a much less developed economy. Ofcom further suggest that the fact that some 1800 MHz spectrum went unsold may be a result of binding spectrum caps, and that Portuguese prices therefore are likely to be below market value. However, the evidence for this is ambiguous. It is also possible that marginal bidders were deterred by the substantial reserve prices. Ofcom point out that "*DotEcon notes in their report that no indication is given to suggest that the reserve prices were set to reflect market value*."[108] In a subsequent report, DotEcon repeat this view but state *"[w]e note however that reserve prices in Spain and Portugal were similar to those in Ireland where reserve prices*

[107] EETT Liberalisation, January 2011, pp. 5-6.

[108] Ofcom Consultation, 10 October 2013, p. 107, citing to DotEcon. *International benchmarking of 900MHz and 1800MHz spectrum value*, May 2013.

were set to reflect market value (and the auctions took place in the same year)."[109] Given that Portugal is a small and relatively poor market, we think it quite plausible that reserve prices overstated market value.

235. In conclusion, we consider the Portuguese auction to be a rather unreliable benchmark for the UK auction. However, as we discuss elsewhere, it does appear to at least as good a benchmark as Greece or Romania, so it should only be treated as less important evidence if those other countries are treated in the same way. It is ambiguous whether it understates or overstates market value of 1800 MHz.

8. Romania (September 2012)

236. Ofcom reports a per MHz value of £6.2 million for 900 MHz, which has been recalculated as £3.3 million using Telefonica's own benchmarking methodology. We note that this number is hugely inflated by Ofcom's use of PPP – in our benchmarks, which use the market exchange rate, we correct this benchmark to £3.3 million. The auction was a multiband auction covering 800 MHz, 900 MHz, 1800 MHz and 2.6 GHz. There were five bidders: the four incumbents: Cosmote RMT, Orange, RCS & RDS, and Vodafone, and one new entrant, 2K Telecom. All 900 MHz and 1800 MHz spectrum was sold. Some of the 800 MHz and a significant amount of the 2.6 GHz spectrum was unsold.

237. As Romania used a package bid format (a version of the combinatorial clock auction), no disaggregated prices are available. However, as "*all packages sold for prices which were very close to the sum of the reserve prices for lots within the package. [Ofcom] therefore take reserve prices as a close proxy for band-specific auction prices in this case*." Ofcom further conclude that because for 900 MHz and 1800 MHz spectrum auction prices did not exceed reserve price the reserve price risks understating the value of the spectrum "*although [Ofcom] recognise that the resulting prices are not low compared to other benchmarks we are considering.*"[110]

238. In earlier comments on 900 MHz, we concluded that Romania over-priced both the 800 MHz and 900 MHz bands. It is much more ambiguous what happened at 1800 MHz, where the starting price was less aggressive. Both the 1800 MHz and 2600 MHz were made

[109] DotEcon, Final Report for Ofcom, September 2013, ¶ 67. Ireland auctioned 800 MHz, 900 MHz and 1800 MHz.

[110] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 108-109.

available in their entirety in the auction, so it is quite plausible that demand was sated. Alternatively, it may be that operators exhausted their budget in lower frequency bands or engaged in a degree of demand reduction. Regardless, Romania is a very different market from the UK, being smaller, much less affluent and at an earlier stage in terms of penetration of high speed data services, which may mean it is a rather poor benchmark for the UK.

239. In conclusion, we consider the Romanian auction to be a rather unreliable benchmark for the UK auction. It is ambiguous whether the benchmark overstates or understates market value of 1800 MHz.

9. Ireland (November 2012)

240. Ofcom reports a per MHz value of £23.1 million for 1800 MHz, which has been recalculated as £23.9 million using Telefonica's own benchmarking methodology. The auction was a multi-band spectrum award covering three spectrum bands: 800 MHz, 900 MHz, and 1800 MHz. There were four bidders: H3G, Meteor Mobile, Telefonica and Vodafone, all incumbent operators. The auction was highly competitive, with all long-term licences[111], including the fifteen lots of 2x5 MHz at 1800 MHz, attracting bids well above reserve.

241. At first look, the Irish auction looks like one of the better benchmark for UK 1800 MHz prices, given that there was bid competition for 1800 MHz. However, there are a number of issues that must be considered when analysing the Irish data:

- Like the UK, Ireland used a CCA format with package bidding. Consequently, there is no actual price for 1800 MHz. Instead, Ofcom uses a guestimated price based on information provided to them by Vodafone and ComReg.[112] Telefonica also participated in this auction. Our view is that the numbers presented are credible

[111] ComReg also sold some short-term licences at 900MHz and 1800MHz. Like Ofcom, we exclude these from our analysis, as the long-term licences are the more relevant benchmark. However, we note that, in the context of a package auction, their inclusion further complicates attempts to identify disaggregated prices on a band-by-band basis.

[112] Ofcom Consultation, 10 October 2013, p. 98. According to ComReg, these percents are "reasonable indications" "within a couple of percentage points."

as an indicator of relative prices across bands, but it would be erroneous to look at individual values produced for any one band in isolation.

- In Ireland, the 2.6 GHz band has not yet been released, and there was uncertainty when this might become available at the time of the auction. Accordingly, one would expect operators in the Irish auction to place a higher relative values on 1800 MHz than in other countries, such as the UK, where the 2.6GHz was made available in full.

- The price of 1800 MHz may have been further uplifted by strategic bidding. The use of a CCA format and structure of spectrum caps created potential incentives for Meteor, Telefonica and Vodafone to overstate their values for 1800 MHz. This was because 1800 MHz was the only band in which these three operators (unlike H3G) were not capped at their level of core demand. As we have previously discussed, we believe that H3G has strong incentives to overbid for 900 MHz, with the implication that the only defence against this and the only way in which other operators could put some price pressure on H3G (or each other) was to overbid for 1800 MHz and drop demand late in the auction. Obviously, Ofcom is not in a position to judge whether Irish prices were distorted by such strategic behaviour, but it should keep this in mind when assessing the evidence.

- A substantial component of the Irish 1800 MHz price is an annual licence fee, charged in addition to the auction price. This further complicates the process of determining a UK benchmark.

242. In conclusion, we think there is a strong likelihood that the disaggregated Irish 1800 MHz price overestimates market value. Great caution should be taken when considering the absolute value of 1800MHz as a benchmark for the UK.

10. Czech Republic (November 2013)

243. The Czech multi-band auction for 800 MHz, 1800 MHz and 2.6GHz concluded in November 2013, after the publication of Ofcom's consultation document. There were five bidders: T-Mobile, Telefonica and Vodafone, all incumbent operators, and Sazka Telecommunications and Revolution Mobile, both potential entrants. The auction was competitive, with both 800 MHz and 1800 MHz licences attracting bids above reserve. However, the 1800 MHz

price was low, producing a benchmark UK price of just £0.8 million, lower than any other country in Europe.

244. The structure of spectrum available at 1800 MHz was rather unusual. Incumbents could only bid on incremental 1MHz blocks positioned in between existing assignments; this a is a very different structure from most recent auctions in Europe, where 1800 MHz has been restructured into 2x5 MHz lots suitable for LTE. We also note there were obvious market sharing outcomes in this band, given existing 1800 MHz assignments, so it is possible that competition was stalled owing to demand reduction incentives.

245. In conclusion, we do not think the Czech result for 1800 MHz represents a reliable benchmark for the general value of 1800 MHz in the UK, so we have not included it in our own analysis. If it were included, we would say there is a strong likelihood that it underestimates market value. Nevertheless, the fact that this spectrum sold so cheaply does provide an indication that smaller chunks of 1800 MHz spectrum may have much lower value than coherent 2x5 MHz LTE lots.

11. Conclusion on benchmarks for absolute values for 1800 MHz

246. Telefonica is generally sceptical about putting much weight on absolute values. Many of the reservations we expressed about absolute values for 900 MHz also apply to this band. This sample is larger than the 900 MHz one and also includes a number of countries, such as Germany, Italy and Sweden, that might be considered better benchmarks for the UK based on demographic and economic profiles than most. Nevertheless, there are potential concerns all the available data points.

247. As with 900 MHz, in selecting 1800 MHz country benchmarks as more or less important, Ofcom appears to have a bias against lower value outcomes. Portugal, Germany and Denmark are all deemed less important evidence without any obvious rationale, given the designation of Greece and Romania as more important evidence. In this band, if Ofcom were to downgrade Greece and Romania, it might actually push up the average price for more important evidence points, but at the same time it would greatly reduce the average 900 MHz price. From this, it may be implied that Ofcom's choice of more important evidence at 1800 MHz may be being unduly influenced by a bias towards including particular benchmarks at 900 MHz.

248. We also have specific concerns about the absolute benchmarks for Italy and Ireland, which return the highest values for 1800 MHz. In both these countries, it appears that there were incentives for strategic bidding, linked to auction design and local restrictions on available spectrum that may have artificially inflated prices for 1800 MHz.

249. Finally, we believe that Ofcom's benchmark values are being distorted by flaws in its benchmark methodology, as identified in subsection 3.4. In particular, the use of PPP exchange rates exaggerates benchmarks for Greece, Portugal and Romania, and understates Denmark. If Ofcom wishes to retain the use of absolute values in its evaluation it should use numbers based on a similar methodology to that developed by Telefonica.

250. In conclusion, we urge Ofcom to follow its own advice of taking a broader perspective of the available benchmarks. Its approach of identifying more important evidence points in this case is creating an undue bias towards higher price points. If the higher price points like Italy and Ireland are to be included in the analysis, then so should lower ones like Germany or Portugal.

B. Relative Values of 1800 MHz versus 800 MHz

251. The relative value for 1800 MHz as a proportion of 800 MHz is calculated by Ofcom as 0.50 for the UK market. This ratio is significantly above that of all other European countries for which data is available with the exception of Sweden. However, as highlighted earlier in the report, the Swedish value is overstated by Ofcom owing to error. There are also good reasons to believe Sweden overstates the value. Using a broader approach, we estimate the ratio at around 0.37.

252. In support of its relative value, Ofcom looked at the relative price of 1800 MHz and 800 MHz spectrum in four European countries. It identified Sweden, Italy, Romania, and Ireland as "more important evidence". It disregards Germany, Denmark and Portugal completely. There are six other European countries that have sold both 800 MHz and 1800 MHz spectrum. Three of these – Switzerland, Netherlands and Austria – are necessarily excluded, owing to the lack of disaggregated prices and bid data owing to the use of a CCA format. Of the three others, Spain, Czech Republic and Slovakia, we agree it is reasonable to exclude Spain and Czech Republic, owing to doubts over relevance of their 1800 MHz

benchmarks, as discussed above. Data on Slovakia was not available at the time of our analysis.

253. In the paragraphs below, we consider, in chronological order, each of the seven awards for which data is available and their relevance as benchmarks for the relative value of 1800 MHz spectrum in the UK. Individually, the Irish and Italian benchmarks stand out as the most plausible indicators of the value of UK 1800 MHz spectrum, followed by the (adjusted) Swedish one.

1. Germany (May 2010)

254. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.04 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). Although all spectrum was sold above reserve price in both bands, Ofcom has expressed doubt about whether the auction was sufficiently competitive.[113] In particular, it suggested that 800 MHz demand might have been affected by spectrum caps and that there was evidence of demand reduction for 1800 MHz band.[114] We disagree with Ofcom's conclusion about 800 MHz and also think the conclusion on 1800 MHz is overstated. None of Ofcom's concerns directly addresses the relevance of Germany's relative prices. As we noted above, an explanation for the respective values may be that there was a significant quantity of high frequency spectrum in the auction, and at the prevailing prices, demand from the four incumbents was fully sated, revealing a true market price for both bands.

255. Notwithstanding these comments, we do think that the above ratio understates the value of 1800 MHz. There has been a very substantial positive shift in market sentiment towards 1800 MHz as an LTE band in the years since the German auction, and its seems quite likely that German operators bidding for 1800 MHz in 2010 undervalued this spectrum.

256. We conclude that the 1800:800 ratio of 0.04 is an evidence point for UK prices, but with a significant likelihood that it understates the true value of 1800 MHz.

2. Denmark (September 2010 and June 2012)

[113] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 93-94.

[114] Ofcom Consultation, 10 October 2013, p. 94.

257. The value ratio of 1800 MHz to 800 MHz is 0.10 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). Ofcom fails to report this ratio, but it can be derived from the absolute values that it does report in Table 4.2 of the consultation document. This ratio spans two separate auctions, which each took place approximately 22 months apart. All available spectrum was sold in both auctions.

258. In the 1800 MHz award in September 2010, there was only one bidder (H3G) and the spectrum sold at reserve. By contrast, in the 800 MHz award which used a CCA format, there were three bidders, each under a cap of 2x20 MHz. Only two of the bidders were successful, with one taking 2x20 MHz. The average price per MHz for 800 MHz was about 120% above reserve.[115]

259. Ofcom disregards these auctions in its analysis of valuation ratios. We suppose that this decision follows from its conclusion that the absolute value of 1800 MHz auction was less important evidence owing to observed weak competition.[116] However, as we discussed above, while Denmark is clearly not the strongest available evidence point, the case for excluding it outright is weak, given the dubious quality of some other benchmarks at the higher end of the price range that are kept in.

260. Further, the case for excluding this from an analysis of value ratios is even weaker. For other countries, Ofcom appears to make the presumption that reserve prices were likely indicative of the regulator's view on relative values, and there is no reason not to think this was the case in Denmark. Ofcom has few enough evidence points, without weeding out points simply because it thinks some values are low. That said, we accept that – unlike most other evidence points – there is a greater risk that this ratio understates rather than overstates the 1800 MHz price, given that that competitive pressures in the 800 MHz auction were stronger than in the 1800 MHz auction, and the shift in market sentiment in favour of 1800 MHz LTE since this auction.

261. We conclude that the 1800:800 ratio of 0.10 is a plausible evidence point for UK 1800 MHz prices, provided it is considered in a broader context of multiple benchmarks. It is likely that this benchmark understates rather than overstates the value of 1800 MHz.

[115] DotEcon and Aetha Spectrum Value, July 2012, ¶ 46, Figure 4.

[116] Ofcom Consultation, 10 October 2013, pp. 88-90.

3. Sweden (March and October 2011)

262. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.64.[117] Ofcom considers the relative value as "more important evidence" with a "risk of understating."[118] These values come from two separate auctions that took place within a six-month period in 2011. Ofcom has raised concerns about the competitiveness of both processes, owing to factors such as use of spectrum caps at 800 MHz and the approved decision of two incumbents to participate in both auctions as a joint venture.[119] However, as we have pointed out, it might alternatively be argued that the caps made no difference and the joint venture strengthened competition. The evidence is not clear either way.

263. We have one major concern with the comparison of the two values, which relates to factual and methodological errors in Ofcom's analysis of the Swedish 800 MHz auction. Specifically, Ofcom appears to have been confused about who won which lots in Sweden and to have omitted the SEK 300m coverage spend obligation on uneconomic rural areas associated with one of the lots. This should properly be included as if it were auction revenue, as the operator did have to pay this money upfront, and although it may be refunded up to SEK 300m for roll-out costs, these are real costs that the operator would not otherwise have spent without the obligation. As a result, Ofcom underestimates the value generated by the 800MHz auction, and this leads it to over-estimate the 1800 MHz/800 MHz ratio. Using Telefonica's own approach, we estimate the value of 800MHz to be £19.0m, not £14.3m as Ofcom reported, and the ratio of 1800 MHz/800 MHz to be 56%, not 64%, as Ofcom reports.

264. Furthermore, we share Ofcom's concern that the Swedish benchmark for 800 MHz risks understating UK value, owing to potential distortions created by lot-specific coordination requirements and coverage obligations. This conclusion is supported by the huge variations in prices for individual 2x5 MHz lots in Sweden, in marked contrast to other

[117] Using the method described above, Telefonica estimates the Swedish 1800 MHz to 800 MHz value ratio as 0.66 before any adjustments to the 800 MHz value for DTT coexistence and coverage obligation.

[118] Ofcom Consultation, 10 October 2013, Figure A7.1.

[119] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 114-115.

European countries.[120] There are no similarly strong grounds for concern about the 1800 MHz price. Accordingly, we believe that the 56% ratio is likely to overstate the value of 1800 MHz, contrary to Ofcom's conclusion that it may understate or overstate the value.

265. We conclude that the revised benchmark ratio of 56% is a plausible evidence point for UK 1800 MHz prices, but with a likelihood of overstating the value. We note that this conclusion is more consistent than Ofcom's own finding with the broader data set, in which Sweden is a high-end outlier for the relative value of 1800 MHz to 800 MHz.

4. Italy (September 2011)

266. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.32 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). The auction was a multiband one covering 800 MHz, 1800 MHz, and 2.6 GHz.[121] There were four bidders, Telecom Italia, Vodafone, Wind and 3 Italia. All spectrum sold above the reserve price.[122] Ofcom considers the relative value to be "*more important evidence.*"[123]

267. In our analysis, we observed that the prices of both 800 MHz and 1800 MHz may both have been exaggerated relative to 2600 MHz owing to strategic bidding behaviour, such that both may overstate the value of 1800 MHz. However, given that both bands were affected, the impact on the ratio of such distortions should be less.

268. We conclude that the 1800:800 ratio of 0.32 is a more important evidence point for UK prices, in line with Ofcom's finding.

5. Portugal (November 2011)

269. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.09 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). Both bands were

[120] Prices varied from a low of £165m for FDD1 up to £468m for FD4. See: http://www.pts.se/upload/Ovrigt/Radio/Auktioner/10-10534-results-800mhz.pdf

[121] In addition there was unpaired 2.1 GHz and unpaired 2.6 GHz auctioned, these are not discussed here.

[122] Ofcom Consultation, 10 October 2013, Figure 4.2 and pp. 101-102.

[123] Ofcom Consultation, 10 October 2013, ¶ 4.58c.

sold together in the context of a broader multi-band auction. The 800 MHz band was fully sold while the 1800 MHz band had unsold spectrum. Both sold at the reserve price.

270. Ofcom considers the absolute values of the two bands to be "*less important evidence*", and argues that they likely understate UK value on the basis that the auction was not very competitive. However, we observed that the low level of competition could also reflect the fact some prices were above the market level. This seems rather more likely at 800 MHz, where the price is in the mid-range of available benchmarks, than 1800 MHz, where the price is towards the low end. This suggests the ratio is more likely to understate than overstate the value of 1800 MHz.

271. We conclude that the 1800:800 ratio of 0.09 is an evidence point for UK prices, but with a risk of understating value. Our general observation that Portugal is not a very reliable benchmark for the UK for other reasons remains valid.

6. Romania (September 2012)

272. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.28, which has been recalculated to 0.29 using Telefonica's own benchmarking methodology. Both bands were sold together in the context of a broader multi-band auction. All the 1800 MHz was sold, but one block of 800 MHz was unsold.

273. Ofcom considers this relative value to be "*more important evidence.*"[124] We have previously expressed deep reservations about the use of Romania as a benchmark for the UK, in particular because Romania is a very different market and Ofcom's results are hugely sensitive to the dubious use of PPP conversion rates. This particular ratio happens to look plausible in the context of other benchmarks, but we do not think the data that it rests are very reliable indicators for the UK.

274. We conclude that the 1800:800 ratio of 0.28 is an evidence point which could either overstate or understate UK prices. We do not think that any Romanian data points should be considered as more important evidence.

[124] Ofcom Consultation, 10 October 2013, Figure A7.1 and ¶ 4.58c.

7. Ireland (November 2012)

275. Ofcom reports an 1800 MHz to 800 MHz relative value of 0.39 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). Both bands were sold together in the context of a broader multi-band auction and both appear to have sold for prices significantly above reserve, based on analysis of bid data.

276. Ofcom recognises this ratio as "*more important evidence*".[125] This seems reasonable given the competitive nature of the auction. In our analysis, we observed that it is quite likely that the 1800 MHz (as well as 900 MHz) price was exaggerated owing to local factors, such as spectrum availability and strategic bidding. The concerns did not affect the 800 MHz band. Accordingly, we think the ratio is more likely to underestimate than overestimate the value of 1800 MHz.

277. We conclude that the 1800:800 ratio of 0.39 is a more important evidence point for UK prices. It is more likely to underestimate than overestimate the value of 1800 MHz.

8. Conclusion on benchmarks for relative values for 1800 MHz & 800 MHz

278. As a general principle, the rationale for looking at benchmarks for value ratios rather than absolute values is strong. This is because potential distortions, such as adjustments for purchasing power, are cancelled out in a ratio. For example, we note that our own benchmark ratios are largely identical to Ofcom's benchmarks, even though we do not use PPP conversion rates. We therefore agree with Ofcom that is valuable to look at 1800 MHz / 800 MHz price ratios as potential benchmarks for the UK. Unfortunately, Ofcom appears to have disregarded completely its own findings in setting the 1800 MHz price.

279. Ofcom proposes an 1800 MHz / 800 MHz ratio of 50% for UK prices. As illustrated in Table 3.12, this is significantly higher than any reasonable conclusion that could be taken from the benchmarks. All the data points except Sweden are concentrated into two relatively narrow ranges, 0.04 to 0.10 (3 observations) and 0.28 to 0.39 (3 observations), both well below Ofcom's proposal. Only one country, Sweden, reports a value above Ofcom's proposal; Ofcom erroneously reports this as 0.64, which we have corrected to 0.56.

[125] Ofcom Consultation, 10 October 2013, ¶ p.100

Table 3.12: 1800 MHz / 800MHz Price Ratios for Benchmark Awards

	Ofcom Data			Telefonica Data		
Award	1800MHz Price (£m/MHz)	800MHz Price (£m/MHz)	Ratio	1800MHz Price (£m/MHz)	800MHz Price (£m/MHz)	Ratio
Germany (May 2010)	1.8	50.1	0.04	1.7	47.8	0.04
Denmark (Sep 2010 & Jun 2012)	1.0	10.1	0.10	1.7	18.0	0.10
Sweden (Mar & Oct 2011)	9.1	14.3	0.64	10.6	19.0	0.56
Italy (Sep 2011)	15.5	48.3	0.32	15.1	46.8	0.32
Portugal (Nov 2011)	3.1	36.1	0.09	2.4	28.0	0.09
Romania (Sep 2012)	6.2	21.8	0.28	3.3	11.4	0.29
Ireland (Nov 2012)	23.1	58.6	0.39	23.9	60.9	0.39

Source: Ofcom Consultation, 10 October, 2013, Figure 4.2; and public domain data collected by Telefonica.

280. We note that Ofcom says that it "*has not sought to take a mechanistic approach to deriving best estimates from the available evidence*."[126] Once again, the approach that Ofcom has taken to determine the ratio is opaque. Furthermore, we think it is instructive to calculate and compare benchmark averages and medians using the available evidence on ratios. We consider four approaches:

1. All seven benchmark awards, including Sweden.
2. Five benchmark awards – with the highest (Sweden) and lowest (Germany) evidence points excluded as outliers.
3. Italy only – with all points that we identified as likely understating (Germany, Denmark and Portugal), overstating (Sweden) value or being generally unreliable (Romania) removed.

[126] Ofcom Consultation, 10 October 2013, ¶ 110.

4. Three benchmark awards – with only those points that we identified as likely understating value (Germany, Denmark and Portugal) or being generally unreliable (Romania) removed.

281. Table 3.13 compares the results for each approach to the proposed Ofcom 1800:800 ratio of 0.50. One striking observation is that all our mechanistic calculations produce results significantly below Ofcom's proposed ratio of 0.50. Telefonica's view is that approaches (3) and (4) provide the most plausible data points, and that the final UK ratio should probably be within this range.

Table 3.13: Ofcom Benchmark Ratios for Price of UK 1800MHz / 800MHz

Approach	Sample countries	Ofcom data		Telefonica data	
		Simple average	Median	Simple average	Median
All seven benchmark awards	Germany, Denmark, Sweden, Italy, Portugal, Romania, Ireland	0.27	0.28	0.25	0.29
Five benchmark awards – exclude highest and lowest evidence points	Denmark, Italy, Portugal, Romania, Ireland	0.24	0.28	0.24	0.29
Italy only (strip out all benchmarks that cause concern)	Italy	0.32	0.32	0.32	0.32
Three benchmark awards – exclude possible underestimates	Sweden, Italy, Ireland	0.45	0.39	0.42	0.39
Ofcom proposed prices (for comparison)	Sweden, Italy, Romania, Ireland	0.50 *		na	

Sources: Ofcom Consultation, 10 October, 2013, ¶ 1.11 and Figure 4.2; and public domain data collected by Telefonica.

* Approach not specified; Ofcom states that it does not use a mechanistic approach. A simple average of Ofcom data for the four "more important" countries, Sweden, Italy, Romania and Ireland, yields a ratio of 0.41.

282. In summary, a broad analysis of ratios provides no evidence to support Ofcom's ratio of 0.50 for 1800 MHz / 800 MHz prices in the UK. Instead, the clear evidence from benchmarks is that the ratio should be set in a range between 32% and 42%. These ratios are not significantly altered by using Telefonica's revised methodology for benchmarking instead of Ofcom's approach (except for the impact of the Swedish error correction).

C. Relative Values of 1800MHz versus 2600MHz

283. The relative value of 1800 MHz / 2600 MHz is calculated by Ofcom as 300% for the UK market. In support of this relative value, Ofcom looked at the relative price of 2.6 GHz and 1800 MHz spectrum in two European countries. It identified Italy as "more important" evidence and Romania as "less important" evidence. It disregards Denmark, Germany, Sweden and Portugal completely. There are four other European countries that have sold both 1800 MHz and 2600 MHz spectrum, but Ofcom reasonably ignores Switzerland, Netherlands and Austria, owing to lack of data, and we do not add Czech Republic, given previous concerns we identified with the 1800 MHz element of the Czech multi-band auction.

284. In the paragraphs below, we consider, in chronological order, each of the six awards for which data is available and potentially relevant. There is an exceptionally large range of data points in this case, which makes it difficult to draw firm conclusions. Nevertheless, it is apparent that the evidence does not support Ofcom's ratio, which appears to be based on a highly selective choice of benchmarks. We note, in particular, that all the benchmarks except Italy are well below the proposed Ofcom ratio and, contrary to Ofcom's finding, we think there are good reasons to believe that Italy is overstated.

1. Germany (May 2010)

285. Ofcom reports an 1800 MHz / 2.6GHz value ratio of 1.20, which is recalculated as 1.13 using Telefonica's own benchmarking methodology. Both bands were sold together in the context of a broader multi-band auction and both sold above reserve prices.

286. As previously noted, Ofcom has argued that the 1800 MHz price is an underestimate. It further argues that the German result implies that the absolute value of 1800 MHz in Germany is below the 2.6 GHz absolute value in the UK, a result that Ofcom "*do[es] not*

consider plausible."[127] Ofcom does not discuss the paired 2.6 GHz portion of the auction. DotEcon, in its report to Ofcom, does discuss it. DotEcon notes that Germany had the lowest average price for 2.6 GHz spectrum of any country in their benchmarking dataset and that "*[b]oth paired and unpaired spectrum sold at approximately the same average price (£0.022 and £0.021 respectively), and all four bidders acquired unpaired spectrum. This suggests that prices were driven mostly by bidders trying to 'park' eligibility rather than genuine demand for incremental spectrum.*"[128]

287. Neither the Ofcom criticism nor the DotEcon concerns directly address the relevance of Germany's relative prices. However, we tend to agree that the ratio looks too low, and given concerns over the input data, it seems reasonable to treat this benchmark as suspect.

288. We conclude that the 2600:1800 ratio of 0.83 is a less important evidence point for UK prices, with a greater risk that it understates rather than overstates the true value of 1800 MHz.

2. Denmark (April 2010 and September 2010)

289. Denmark conducted separate auctions for 1800 MHz and 2.6 GHz in the same year. Whereas the 1800 MHz spectrum sold at reserve, the 2.6 GHz price was significantly higher. The resulting ratio, which implies a value of 2.6GHz significantly above 1800 MHz is not plausible as a benchmark for the UK, so we agree it should be discarded.

3. Sweden (October 2011 and 2008)

290. Ofcom reports values for 1800 MHz and 2600 MHz but as the auctions were conducted in, respectively 2011 and 2008, during which time there was marked change in LTE band development, we doubt the value of any comparison. This may be one explanation why the value Ofcom reported for 2.6 GHz is above that for 1800 MHz. We thus exclude this observation.

[127] Ofcom Consultation, 10 October 2013, ¶ 4.32.

[128] DotEcon, Final Report for Ofcom, September 2013, ¶ 114. Footnote omitted.

4. Italy (September 2011)

291. Ofcom reports a 1800 MHz / 2.6 GHz ratio of 4.55, which is recalculated as 4.42 using Telefonica's own benchmarking methodology. (We note that 4.55 reported by Ofcom is not consistent with the £/MHz values for the 1800 MHz and 2.6 GHz bands in Italy. The £/MHz values reported by Ofcom for the 1800 MHz and 2.6 GHz are 15.5 and 3.5 respectively, producing a ratio of 4.43). Both bands were sold together in the context of a broader multi-band auction, and both sold above the reserve price.

292. Ofcom considers the resulting relative value as "*more important evidence*."[129] It notes that, unlike the 1800 MHz band the 2.6 GHz band was associated with coverage obligations of 20% in 24 months and 40% in 48 months. Ofcom thought that the "*Italian obligations do not seem particularly onerous. However they do refer to land coverage rather than population coverage, which tends to make them more costly.*" As discussed previously, we believe that the 1800 MHz price in Italy may be overstated, owing to strategic factors, while at 2.6 GHz, there is evidence of demand reduction. These factors suggest the ratio is overstated.

293. We conclude that the 1800 MHz / 2.6 GHz ratio of 4.43 is a relevant evidence point but with a significant likelihood that it overstates UK prices.

[129] Ofcom Consultation, 10 October 2013, ¶ 4.58c.

5. Portugal (November 2011)

294. Ofcom reports a 1800 MHz / 2.6 GHz ratio of 1.29, which is recalculated as 1.31 using Telefonica's own benchmarking methodology. Both bands were sold together in the context of a broader multi-band auction. Both bands were awarded at reserve price with some lots unsold.

295. While Ofcom considered the absolutes values of the two bands as "*less important evidence*", it presented no evidence that the relative prices among the bands were not reflective of market value.

296. We conclude that the 1800 MHz / 2.6 GHz ratio of 1.29 is an evidence point, but with no evidence to indicate whether it overestimates or underestimates UK prices.

6. Romania (September 2012)

297. Ofcom reports a 1800 MHz / 2.6 GHz ratio of 2.50 (which is the same as the ratio Telefonica calculates using their own benchmarking methodology). Both bands were sold together in the context of a broader multi-band auction. While all of the 1800 MHz sold, a significant amount of the 2.6 GHz spectrum went unsold. Spectrum in both bands sold at reserve price.

298. The Romanian 2.6 GHz to 1800 MHz relative value falls between that of Italy and Portugal. Ofcom views the fact that "*some … 2.6 GHz spectrum was unsold suggest the reserve price of these bands risk overstating their value*." It seems more likely that the high prices for the other bands exhausted the resources of the bidders. In any case, since prices paid were apparently at the reserve price for all bands it is unclear why the relative values would be affected.

299. We conclude that the 1800 MHz / 2.6 GHz ratio of 2.50 is an evidence point, but with no clear evidence to indicate whether it overestimates or underestimates UK prices.

7. Conclusion on benchmarks for relative values for 1800 MHz & 2.6 GHz

300. Telefonica is generally in favour of putting greater weight on relative values than absolute values for this benchmarking exercise. However, in the case of the 1800 MHz to 2.6 GHz

ratio, the available evidence looks is particularly weak. What evidence there is though does not support Ofcom's proposal that 1800 MHz is worth three times as much as 2.6 GHz.

301. The ratio results for the four countries that value 1800 MHz above 2.6 GHz are reported in Table 3.14. We exclude Denmark and Sweden for the reasons discussed above. The data points are still strongly dispersed, ranging from 120% to 443% using Ofcom's numbers (ours differ only slightly). We have potential issues with all the data points. Notably, there are arguments that Germany and Portugal understate 1800 MHz value, while Italy overstates it. Romania is in general a completely inappropriate benchmark for the UK.

Table 3.14: 1800 MHz / 2.6 GHz Price Ratios for Benchmark Awards

	Ofcom Data			Telefonica Data		
Award	1800MHz Price (£m/MHz)	2.6GHz Price (£m/MHz)	Ratio	1800MHz Price (£m/MHz)	2.6GHz Price (£m/MHz)	Ratio
Germany (May 2010)	1.8	1.5	1.20	1.7	1.5	1.13
Portugal (November 2011)	3.1	2.4	1.29	2.4	1.9	1.31
Italy (September 2011)	15.5	3.5	4.43*	15.1	3.4	4.42
Romania (September 2012)	6.2	2.5	2.48	3.3	1.3	2.50

Source: Ofcom Consultation, 10 October 2013, Figure 4.2. ; and public domain data collected by Telefonica

*Ofcom erroneously report this number as 4.55; we have used the corrected ratio of 4.43.

302. As with previous ratios, we think it is instructive to calculate and compare benchmark averages and medians using the available evidence on ratios. We consider two approaches:

1. All four benchmark awards (excluding Denmark and Sweden)
2. Two benchmark awards – with the highest (Italy) and lowest (Germany) evidence points excluded as outliers

303. Table 3.15 compares the results for each approach to the proposed Ofcom 2600:1800 ratio of 300%. We provide ratios using both Ofcom data and our own; the results are similar. It

is apparent that the Ofcom value is very high, and cannot be substantiated by the available evidence.

Table 3.15: Benchmark Ratios for Price of UK 1800MHz / 2.6 GHz

Approach	Sample countries	Ofcom data		Telefonica data	
		Simple average	Median	Simple average	Median
All four benchmark awards	Germany, Portugal, Italy, Romania	2.35	1.89	2.34	1.90
Two benchmark awards – exclude highest and lowest evidence points	Romania, Portugal	1.89	1.89	1.90	1.90
Ofcom proposed prices (for comparison)	Italy, Romania	3.0 *		Na	

Sources: Ofcom Consultation, 10 October 2013, ¶ 1.11 and Figure 4.2; and public domain data collected by Telefonica

* Approach not specified; Ofcom states that it does not use a mechanistic approach. However, we note that a simple average of the two countries that Ofcom considers, namely Italy as "more important" and Romania as "less important", yields a ratio of 300%.

304. In summary, the evidence available on the 1800MHz to 2.6 GHz ratio is weak. To the extent it may be considered, the implied ratio is between 190% and 234%. The evidence does not support Ofcom's proposed ratio of 300% for 1800MHz / 2.6 GHz.

D. Relative Values of 1800 MHz versus 900 MHz

305. One further possible evidence point for the value of 1800 MHz is the ratio of prices for the 900 MHz and 1800 MHz bands. This ratio is available for five countries: Denmark, Greece, Ireland, Portugal and Romania. Ofcom's proposed ratio between 1800 MHz and 900 MHz is 60%. This looks high when compared to the average of 38%, as reported in Table 3.16. It is above all the benchmarks except Ireland, although we believe that Ireland is, in this case, probably the most important evidence point.

306. As with the 2.6 GHz data, we have concerns about the quality of all the available benchmarks:

- In four of the five (all except Ireland), spectrum in both bands sold at reserve, with the implication that the ratio was set by the government not the market.
- Three of the countries (Greece, Portugal and Romania), are significantly poorer than the UK, and thus not preferred benchmarks.
- In Ireland, both 900 MHz and 1800 MHz prices likely overstate market value for reasons that we have previously described. It is ambiguous what this might mean for the ratio.

Table 3.16: 1800 MHz / 900 MHz Price Ratios for Benchmark Awards

	Ofcom data			Telefonica data		
Award	1800MHz Price (£m/MHz)	900MHz Price (£m/MHz)	Ratio	1800MHz Price (£m/MHz)	900MHz Price (£m/MHz)	Ratio
Denmark	1.0	2.4	0.42	1.7	3.9	0.45
Greece	13.9	31.4	0.44	12.1	27.5	0.44
Ireland	23.1	35.7	0.65	23.9	36.8	0.65
Portugal	3.1	24.1	0.13	2.4	18.7	0.13
Romania	6.2	24.9	0.25	3.3	13.1	0.25
Simple average	9.5	23.7	0.38	8.7	20.0	0.38
Median	6.2	24.9	0.25	3.3	18.7	0.18

Source: Ofcom Consultation, 10 October 2013, Figure 4.2; and public domain data collected by Telefonica.

307. In summary, the evidence available on the 1800 MHz to 900 MHz ratio is weak. Only the Irish benchmark is consistent with Ofcom's proposed ratio of 60% for 1800MHz / 900MHz. However, we accept this may be a more realistic benchmark than the other available data points.

E. Conclusion on benchmark values for 1800 MHz

308. In this subsection, we explored four approaches for deriving benchmark values for 1800 MHz, one drawing on absolute values from other European auctions, and three using relative values for 1800 MHz versus other bands from other auctions. Amongst these, we identified the ratio of 1800 MHz to 800 MHz ratio as the best available source of benchmarks. However, both the absolute values and 1800/2600 ratio produce similar results.

309. Evidence from each of these benchmark approaches suggest Ofcom has overvalued 1800 MHz:

- A simple average of 1800 MHz absolute values, with or without outlying data removed, suggests a benchmark value for the UK of £8.9m, significantly below Ofcom's proposal value of £15m.

- Our analysis of 1800 MHz/800 MHz ratios suggests a ratio of between 32% and 42%, less than the 50% used by Ofcom. Applying an average ratio of 37% to our 800 MHz value of £24.16m per MHz (as explained in subsection 3.5) results in an 1800 MHz value of £8.93m per MHz

- Our analysis of 1800 MHz/2.6 GHz ratios suggests a ratio of between 190% and 234%, down from the 250% used by Ofcom. Applying an average ratio of 212% to the 2.6 GHz value of £4.21m per MHz (as explained in subsection 3.5) coincidentally also results in an 1800 MHz value of £8.93m per MHz.

- We did not identify any reliable benchmark for the 1800 MHz/900 MHz ratio. However, we note that applying the same 60% ratio that Ofcom uses (which is at the high-end of the plausible ratio range) to our value for 900 MHz of £15.22m results in an 1800 MHz value of £9.13m per MHz, which is only slightly higher than our other estimates.

310. In conclusion, the benchmark evidence points suggest a value of 1800 MHz in the UK in the region of £8.93m per MHz.

Section 4

DERIVING ANNUAL LICENCE FEES FROM LUMP SUM VALUATIONS

4.1 Introduction

311. Ofcom's intention is to convert its estimates of the market values of the two spectrum (the lump sums) into new annual licence fee (ALF) payments such that the values of the two approaches are equivalent to the mobile operator. To ensure equivalence, Ofcom proposes the following:

- convert the lump-sum value using a real, post-tax WACC of 4.2 per cent, based on Ofcom's 2011 MCT determination, as the discount rate;
- increase the lump-sum amount by 11 per cent to account for the beneficial tax treatment of the ALF annuity relative to the lump-sum (a so called tax adjustment factor (TAF)); and,
- index the base ALF rate with outturn RPI inflation to calculate nominal license fees.

312. In this section, we discuss errors that we believe Ofcom has made in its methodological approach in converting the lump-sum value into an ALF annuity, and we set out our best estimate of the value of the ALF annuity correcting for these errors.

313. In summary, we believe that Ofcom's errors fall into three categories:

1. Ofcom's discount rate overstates the cash flow risk of ALF payments

314. In order for the lump sum and annual payments to be equivalent in value to the mobile company, the discount rate used to convert an upfront payment into an annuity needs to reflect the riskiness of the future cash-flows. The riskiness of cash-flows under the ALF licence is akin to the risks associated with a debt instrument, and therefore the discount rate used to convert the lump sum into a series of annual payments should be the cost of debt. Our conclusions are based on the following reasons:

- the ALF payments are fixed in advance and generally do not depend on the project's performance (i.e. the performance of the mobile services business supported by the spectrum);

- the government under the ALF has a priority claim on project cash flows above other claims of debt and equity holders; and

- the ALF obligation is backed by an asset (the ALF licence), which can be re-sold by the government in the event of default by the mobile operator.

315. By granting the ALF licence, the government effectively provides debt financing to the project, equal to the value of the licence. Based on our experience, we estimate that the value of the licence represents [✂] of the total investment costs for providing mobile services. The cost associated with this type of financing is thus similar to secured senior debt of a project.

316. Our analysis of market evidence on the observed costs of debt of UK mobile operators shows that a discount rate of 1.7 per cent (real, pre-tax) should be used to convert the lump-sum into an ALF rate, substantially lower than Ofcom's proposed use of a WACC of 4.2 per cent. Indeed, we note that 1.7 per cent represents a conservative estimate of the discount rate, given it is derived from actual cost of debt of UK mobile operators with rating in the range of A to BBB. The ALF licence risk is however more akin to risk of secured senior debt with a higher rating and it is therefore plausible that the discount rate lies below 1.7 per cent.

2. Ofcom uses an outdated estimate of the cost of debt in determining its WACC

317. Even if the WACC were the correct discount rate– which, we believe, it is not – we consider that Ofcom has overestimated the cost of debt and therefore the WACC of a UK mobile operator for 2013/14, the beginning of the annuitisation period. We calculate an updated real, post-tax WACC of 3.5 per cent, using latest market evidence on the cost of debt of 1.7 per cent while retaining Ofcom's cost of equity and gearing assumptions. A discount rate of 3.5 per cent results in a 6 per cent reduction in ALF when using Ofcom's model to calculate the ALF.

3. **Ofcom makes a number of conceptual errors on its taxation modelling in calculating the TAF and ALF**

318. Our review of Ofcom's modelling suggests that Ofcom made a number of conceptual errors which overstate the tax benefit of the ALF relative to the lump-sum payment, even under Ofcom's own methodology of using the WACC of a UK mobile-only operator as the discount rate.

319. The ALF annuity can be more favourable from a tax perspective, as it allows the company to deduct the amortisation and the full financing cost (i.e. the debt *and* equity financing cost) from taxable profits, whereas in case of the lump-sum financed only the amortisation and debt financing costs are deductible.

320. In its modelling, Ofcom omits the interest debt tax shield associated with the financing of the lump-sum, which overstates the relative tax advantages of the annuity, results in a higher TAF and therefore ALF. This error is partly offset by Ofcom's use of a fully post-tax WACC to calculate the annuity. That is, instead of modelling the tax benefits of the lump sum financing explicitly, Ofcom accounts for the tax shield in the discount rate. However, this approach is only correct under certain circumstances, e.g. where the tax rate is constant, which is not necessarily true in this instance. Instead, we believe that the correct approach is to take into account interest deductibility of debt financing of the lump sum in the TAF calculation, and use a "vanilla" WACC to calculate the annuity.

321. We also believe that Ofcom overstates the value of the TAF because of a failure to consider the effect of companies' tax paying position on the value of the tax benefits. In a highly competitive industry, we may expect realised tax benefits to be much lower than Ofcom's modelled tax benefits, which is based on the mobile operator reporting continuous profits.

322. As discussed above, Ofcom overstates the riskiness of the ALF annuity payments using a post-tax WACC. We consider that the riskiness of the ALF cash-flows is akin to that of senior debt as the payments are fixed and rank ahead of all other claims. This is equivalent to the lump sum financed by 100% debt. If we assume 100% debt financing of the lump sum and explicitly incorporate the interest debt tax shield in the TAF calculation, there is no tax advantage to the ALF annuity relative to the lump-sum, as the financing costs of both are 100% tax deductible, and the TAF term falls away.

We estimate annuities of less than half Ofcom's values when correcting for both: (I) Ofcom's errors in relation to discounting as set out in this section, and (II) our estimates for the lump-sum spectrum value, as set out in Section 3 of this response

323. With no TAF adjustment and using the correct discount rate of 1.7% (real, pre-tax), but retaining Ofcom's estimates of the spectrum values (the lump sums), results in a 27 per cent reduction of the ALF for the base year relative to Ofcom's calculations. The correct ALF for the first year should be £1.46m and £0.88m per MHz of 900MHz and 1800 MHz spectrum respectively, compared to Ofcom's proposals of £1.99m and £1.19m per MHz of 900 MHz and 1800 MHz spectrum respectively.

324. As set out in Section 3 of this response, we also consider that Ofcom has made errors in assessing the lump sum value of 900 MHz and 1800 MHz spectrum. We estimate a value per MHz for the spectrum of £15.22m and £8.93m for 900 MHz and 1800 MHz respectively. Using our lump-sum values for the spectrum in place of Ofcom's values, and correcting for Ofcom's errors in converting these values into annuities (i.e. using a discount rate of 1.7%, and no TAF) results in ALF payments of £0.89m and £0.52m for 900 MHz and 1800 MHz respectively, 55% less than Ofcom's estimates (see Table 4.1).

Table 4.1 Annuities (£m): Telefonica's estimates of the annuity are 55% less than Ofcom's

Spectrum	Ofcom	Correcting for discounting but retaining Ofcom lump-sum	Correcting for discounting & lump-sum
900 MHz	1.99	1.46	0.89
1800 MHz	1.15	0.88	0.52

325. The remainder of this section is structured as follows:

- Subsection 4.2 sets out Ofcom's proposals for converting the lump-sum value into an ALF annuity;
- Subsection 4.3 explains why the WACC of a UK mobile-only operator should not be used as the discount rate to derive the ALF annuity, while the cost of debt should be used instead;
- Subsection 4.4 discusses the errors in Ofcom's methodology when calculating its tax adjustment factor (TAF); and
- Subsection 4.5 presents market evidence showing that Ofcom's forecast RPI assumption is too low.

4.2 Ofcom's Proposed Calculating of the ALF

326. In Section 5 of its consultation document, Ofcom sets out its proposal to translate the lump-sum values into an ALF rate for each of the 900 MHz and 1800 MHz spectrum bands.

327. Ofcom's intention is to convert its estimates of the market values of the two spectrum bands (the lump sums) derived from UK 4G auction prices and information from other auctions, into new ALF payments such that the values of the two approaches are equivalent, or alternatively, such that the mobile company is indifferent towards paying the lump sum or the annual fee. To ensure equivalence, Ofcom proposes the following:

1. Convert the lump-sum value into a 20 year ALF annuity with a constant profile in real terms, using a discount rate equal to the WACC of a hypothetical UK mobile-only operator of 4.2 per cent (real, post-tax), based on Ofcom's 2011 MCT determination;

2. Take into account the differential tax benefits of the ALF annuity and the lump sum value when calculating the ALF annuity through a so called tax adjustment factor (TAF); and

3. Index the base year ALF rate by the outturn RPI index to calculate nominal ALF rates to be paid by spectrum licence holders each year.

328. Ofcom proposes to use the below formula for calculating the ALF payment for each year t from the lump sum spectrum value, derived from the amounts bid in the recent UK 4G auction. The formula assumes an annuity payment with the payments made at the beginning of the year:

$$ALF_t = LSV * TAF * \left[\frac{WACC}{1-(1+WACC)^{-t*}}\right] * \left[\frac{1}{(1+WACC)}\right] * \left[\frac{RPI_t - RPI_{t0}}{RPI_{t0}}\right]$$

Where:

- ALF_t is the value of the annual licence fee in year t;
- *LSV* is the lump sum value of spectrum assumed by Ofcom;
- *TAF* is an adjustment factor that reflects the tax advantages of ALF over lump sum payments (equal to 1.11 according to Ofcom's calculations);
- *t** is the period over which the LSV is spread for calculating ALF (20 years);

- *WACC* is the real post-tax weighted average cost of capital, as determined in the March 2011 MCT Statement (adjusted for differential tax rates);
- RPI_{t0} is the level of the RPI (all items) index in March 2013 and RPI_t is the latest available figure.

329. In relation to the last term, Ofcom's formula contains a term to calculate the nominal ALF in each year of the licence period (the indexation term). This term is incorrectly specified. The correct indexation term would be $[RPI_t / RPI_{to}]$. We discuss our concerns with the other elements of Ofcom's approach in the following subsections.

4.3 Ofcom's Discount Rate Overstates the Cash-flow Risk of ALF Payments

Introduction

330. Ofcom proposes to use the WACC of a notional UK mobile-only operator of 4.2% (real, pre-tax), based on its 2011 MCT determination, to calculate the ALF annuity consistent with the lump-sum payment. The discount rate used to convert an upfront payment into an annuity must reflect the riskiness of expected cash-flow payments by the mobile operator to the government under the license agreement, otherwise the mobile operators will not be indifferent between the two approaches.

331. In this section, we set out why the WACC of a notional UK mobile-only operator overstates the riskiness of ALF cash-flows. The payments to the government under the ALF licence are fixed in advance, have a priority claim on project cash-flows and are backed by an asset (the spectrum licence itself). This means the riskiness of ALF cash-flows is akin to the riskiness of cash-flows to senior debt. Hence, the correct discount rate used to calculate the ALF annuity is cost of debt. Market evidence on the cost of debt shows that a cost of 1.7 per cent (real, pre-tax) should be used as the discount rate to convert the lump-sum into an ALF.

332. In fact, a discount factor of 1.7 per cent (real, pre-tax) is a conservative estimate of the discount rate, as it is derived from actual cost of debt of UK mobile operators and wider UK benchmarks, with rating in the range of broad A to broad BBB. The ALF licence risk is however more akin to risk of secured senior debt with a rating above the range of broad A to broad BBB. It is therefore plausible that the correct discount rate lies below 1.7 per cent (real, pre-tax).

Ofcom's Proposed use of WACC

333. In support of its use of the WACC of a UK mobile-only operator, Ofcom states:

> *"We consider that the MCT WACC remains a reasonable proxy for the discount rate which would have been used to calculate the lump-sum values."*[130]

334. Ofcom further adds:

> "*As the MCT WACC aims to estimate the WACC applicable to a hypothetical UK mobile-only operator we consider that this is likely to capture the systematic risks which would apply to the licences covered by the annual licence fees. We think that the systematic risks associated with the 4G spectrum, the value of which has been used to inform our analysis of the lump-sum value, would also be consistent with the systematic risk of a hypothetical UK mobile-only operator. […] we have not seen any evidence to suggest that systematic differences in the cash-flow risk associated with 4G as compared to the cash flow risks which are captured within the observed beta of mobile operators and used to estimate the MCT WACC."* [131]

Analysis of Ofcom's Approach

335. Telefonica believes that discounting ALF payments at the WACC of a notional UK mobile-only operator is incorrect because it overstates the riskiness of the ALF cash-flows to the government. While it seems plausible that the operators have used the project WACC when discounting project cash-flows (i.e. *all* cash flows generated by the mobile operator under the licence) when bidding for spectrum, this is irrelevant for the discount rate to be used to calculate the annuity associated with the spectrum licence.

336. The project cash-flows are used to repay the *whole* capital investment necessary for undertaking the project, which consists of investments in both physical assets (the mobile network assets) as well as intangible assets (the licence). However, under Ofcom's proposals for the ALF licence, the government has a priority claim on the project cash-

130 See paragraph 5.67

131 See paragraphs 5.67 and 5.68.

flows above all other claims of debt and equity holders, given that the operators need to first pay the licence fee to be allowed to use the spectrum. The priority claim on project cash-flows makes the ALF cash-flows to the government less risky than the average project cash-flow while also making the residual cash-flows more risky. It is therefore incorrect to use the project's WACC to discount the ALF cash-flows, given that they represent a lower risk than the average project cash-flow, whose risk is measured by the WACC.

337. Separately, even if the WACC is the correct discount rate– which it is not – we consider that Ofcom has overestimated the cost of debt and therefore the WACC of a UK mobile operator for 2013/14, the beginning of the annuitisation period. As we explain below, Ofcom's methodological approach in calculating the cost of debt in its 2011 MCT determination is not directly applicable to calculating the discount rate for the ALF annuity. Using the latest market evidence on the cost of debt of 1.7% real, but retaining Ofcom's cost of equity assumptions, we calculate an updated WACC (real, post-tax) as of 2013/14 of 3.5 per cent, 70 bps below Ofcom's estimate (see Annex A for details).

338. Substituting Ofcom's WACC of 4.2 per cent in its ALF calculation spreadsheet with the updated WACC of 3.5 per cent reduces the ALF by 6 per cent. Hence, even under Ofcom's own methodology, and just correcting for this error, the ALF for the first year should be £1.88m and £1.13m per MHz for 900MHz and 1800 MHz spectrum, respectively.

The Cost of Debt is the Correct Discount Rate

339. As explained above, the average risk of the project cash-flow is measured by the WACC. However, claimants on cash-flows can face higher or a lower risk than the overall WACC depending on the ranking of the claim (e.g. cash flows to debt investors are less risky because they rank above cash flows to equity). Below, we explain why the government, which has a fixed (index-linked) priority claim on the project cash-flows, i.e. the ALF payment, faces similar risk as senior debt holders. Hence the discount rate should correspond to the cost of senior debt.

340. The spectrum licence represents one of the investment costs the licensee needs to incur to undertake the project.[132] Ofcom has set out two payments in order to recover the costs of the spectrum:

- upfront-payment (like it did in the case of 800 MHz and 2600 MHz spectrum auction); or
- in the form of an ALF (as currently proposed for the existing 900 MHz and 1800 MHz spectrum).

341. Ofcom's intention is to convert the lump sum estimates into annual payments such that the values of the two approaches are equivalent to the mobile operator. In order for the two approaches to be equivalent, the discount rate used to convert an upfront payment into an annuity needs to reflect the riskiness of the future cash-flows. The riskiness of cash-flows under the ALF licence is akin to the risks associated with a debt instrument, and therefore the discount rate used to convert the lump sum into a series of annual payments should be the cost of debt. This approach is based on the following rationale:

- The annual payments made by the mobile operators to the government are ***fixed in advance*** (in real terms) and their repayment does not depend on the project's performance;
- The payments have a ***priority claim*** on the project cash-flows above the claims of other debt and equity holders, since the licensees have an obligation to pay the licence fee in order to use the spectrum; and
- In the event of bankruptcy (or failure to pay the ALF), the government will be able to recover the residual value through re-selling (re-auctioning) the spectrum licence to another mobile operator. This is akin to debt holders of a company whose claims might be (partially) met by selling physical assets following a credit event. In both cases, the claimants face the risk that the recoverable amount of the asset will be less than the residual claim (in case of a bondholder the principal). This risk is, inter alia, reflected in the debt premium.

[132] Based on our experience, we consider the value of the licence represents around 10 to 20 per cent of the value of the overall investment necessary to undertake the (standalone) project.

342. By granting the ALF licence, the government effectively provides debt financing to the project equal to the value of the licence. Based on our experience, we estimate that the value of the licence represents around [✂] of the total investment costs for providing mobile services using the spectrum. As explained above, the cost associated with this type of financing is likely to be similar to highly secured senior debt of a project that has 10 to 20 per cent leverage. Hence the correct discount rate to calculate the ALF annuity is the cost of senior debt (based on a capital structure of 10 to 20 per cent leverage).

343. We note that the spectrum licence includes additional features not present for a conventional debt instrument. Specifically:

- the option for the licensee to hand back the licence to avoid future ALF payments; as well as
- the option for Ofcom to revoke the licence under specific conditions.

344. All else equal, the first point would make the ALF payment more risky than conventional senior debt and the second point would make it less risky from the viewpoint of the government. Ofcom acknowledged these offsetting features in its consultation[133] and concluded that it is difficult to quantify the potential net effect. Based on the assumptions that both effects are equally likely, it is reasonable to assume that the riskiness of the ALF payment is akin to the risk of senior secured debt.

Market Evidence on Cost of Debt

345. We now turn to the empirical evidence on market cost of debt of a notional UK mobile-only operator to determine the appropriate discount rate to calculate the ALF payments.

[133] See paragraphs 5.28 and 5.29

Ofcom's Approach in its MCT 2011 Determination

346. In its 2011 MCT determination, Ofcom set the real cost of debt of a notional UK mobile-only operator equal to 3 per cent, based on a real risk free rate estimate of 1.5 per cent and a debt premium of 150 bps. Ofcom's debt spread of 150 bps was based on observed spreads of bonds issued by the parent companies of UK mobile operators (Vodafone, Deutsche Telekom, France Telecom and Telefónica). Ofcom considered bonds with maturity of around 5 years, consistent with its preference for the risk free rate being based on 5 year government bonds. Ofcom's estimate of the real risk free rate of 1.5 per cent was based on long run averages (5 and 10 year) of 5 year maturity government bonds.

347. Ofcom's methodology in calculating the cost of debt in its 2011 MCT determination is not, we believe, directly applicable to calculating the discount rate for the ALF annuity. In its 2011 MCT determination, Ofcom used a forward looking measure of the cost of debt over the 2011-2015 regulatory period. When setting allowed rate of return for regulated services, it might be correct to use forward-looking measures of the financing cost to reflect the fact that the regulated company is expected to raise new funds during the regulatory period.

348. This is however not the case for the ALF annuity, which is akin to a 20 year loan that is provided on the effective date when the new licence fees come into effect, with no future re-financing assumed. In Section 6 of its consultation document, Ofcom states that it intends to start charging the revised ALF rates *"as soon as practically possible"*[134], following the required consultation process and the new Fees Regulations coming in effect. The correct figure to use as the discount rate is therefore current (e.g. spot market evidence), as opposed to forward looking.

Evidence on Cost of Debt

349. We have reviewed current evidence on the cost of debt of a notional UK mobile-only operator. In line with Ofcom's approach in its 2011 MCT determination, we have calculated yields on bonds issued by the parent companies of UK mobile operators. We focussed on bonds with maturities close to 20 years, in line with the period over which the lump sum payment is spread to calculate the ALF annuity. We have cross checked the

[134] See paragrah 6.16

evidence on the cost of debt of UK mobile operators with wider evidence from UK corporate bond indices of comparable rating.

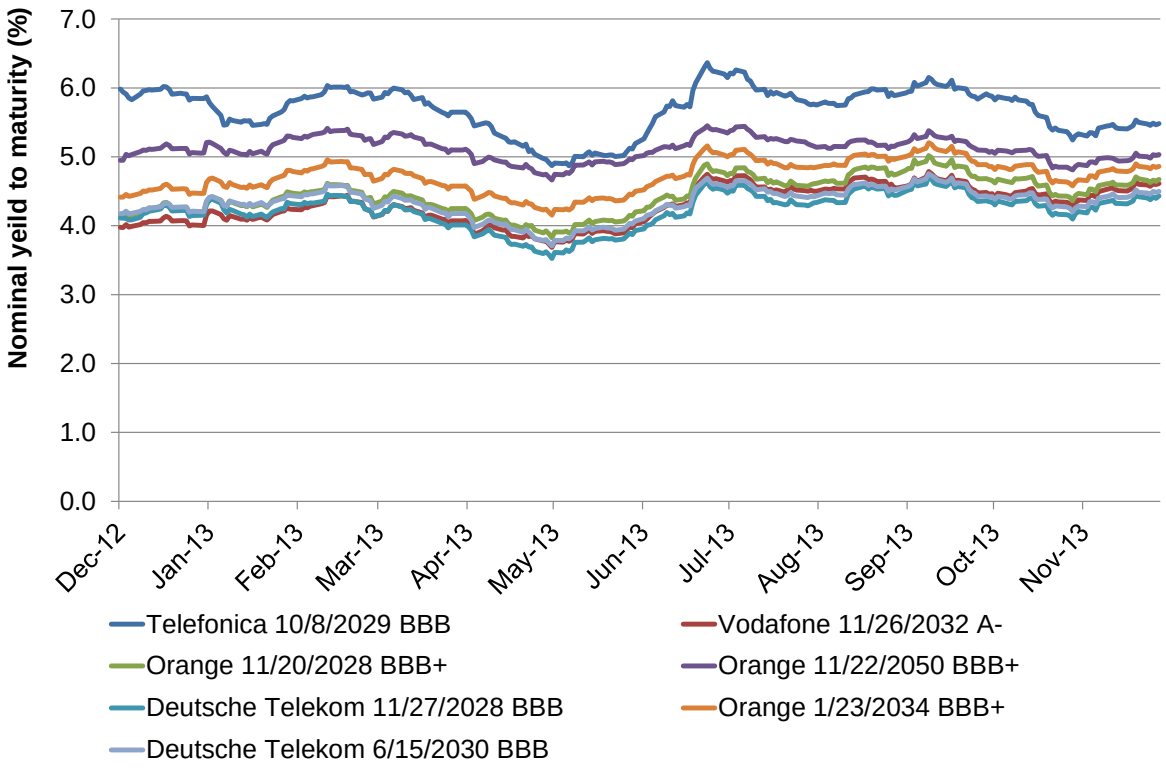
350. Figure 4.1 shows the nominal yield to maturity over the last year for selected bonds issued by UK mobile operator's parent companies. We included bonds based on the following criteria:

- issued in GBP currency;
- matures after 2027 (i.e. with maturity in excess of 15 years).

351. We have identified 7 bonds which satisfy these criteria.

Figure 4.1

Nominal Yields on Selected UK Mobile Operator's Bonds



Source: Telefonica analysis of Bloomberg data.

352. The yields on selected bonds were between 4 and 6.3 per cent nominal over the last year, with relatively small variation in yields for individual bonds. Table 4.2 shows the spot yield (calculated as of 29/11/2013) on the selected bonds as well as average yields calculated over a 1 month, 3 months, 6 months and 1 year period.

Table 4.2

Average Yields on Selected UK Mobile Operators' bonds

	Spot	1M avg	3M avg	6M avg	1Y avg	Maturity
Telefonica 10/8/2029 BBB	5.5	5.4	5.7	5.8	5.7	15.9
Vodafone 11/26/2032 A-	4.6	4.5	4.5	4.5	4.3	19.0
Orange 11/20/2028 BBB+	4.7	4.6	4.7	4.7	4.5	15.0
Orange 11/22/2050 BBB+	5.0	5.0	5.1	5.1	5.1	37.0
Deutsche Telekom 11/27/2028 BBB	4.4	4.3	4.4	4.4	4.2	15.0
Orange 1/23/2034 BBB+	4.9	4.8	4.9	4.9	4.7	20.2
Deutsche Telekom 6/15/2030 BBB	4.5	4.4	4.5	4.5	4.3	16.6
Average	**4.8**	**4.7**	**4.8**	**4.8**	**4.7**	**19.8**

Source: Telefonica analysis of Bloomberg data. The cut-off date for the spot and maturity calculation is 29/11/2013.

353. The selected bonds have an average maturity of close to 20 years, with the average yield fairly stable between 4.7 and 4.8 per cent nominal, when averaged over short run periods of up to 1 year.

354. There is no a priori reason to prefer a specific short-run averaging time horizon over another when calculating the "current" cost of debt. As shown in Table 4.2, the yields have been fairly stable when averaged over short-run periods of up to one year. We consider that an estimate of 4.7 to 4.8 per cent nominal represents a reasonable estimate of the current cost of debt of UK mobile operators.

355. We cross-check the evidence on cost of debt of UK mobile operators with evidence on yields from UK corporate bond indices with comparable rating. The UK mobile operator's bonds considered above are rated between broad A and BBB. We therefore consider benchmark yields for broad A and BBB rated indices. We use a benchmark index with maturity as close to 20 years as possible.

356. We use the iBoxx corporate non-financial series as the benchmark bond index. The iBoxx series is currently used by Ofgem for cost of debt indexation for setting allowed cost of debt for regulated companies as part of Ofgem's latest RIIO price controls.[135] Specifically, we use:

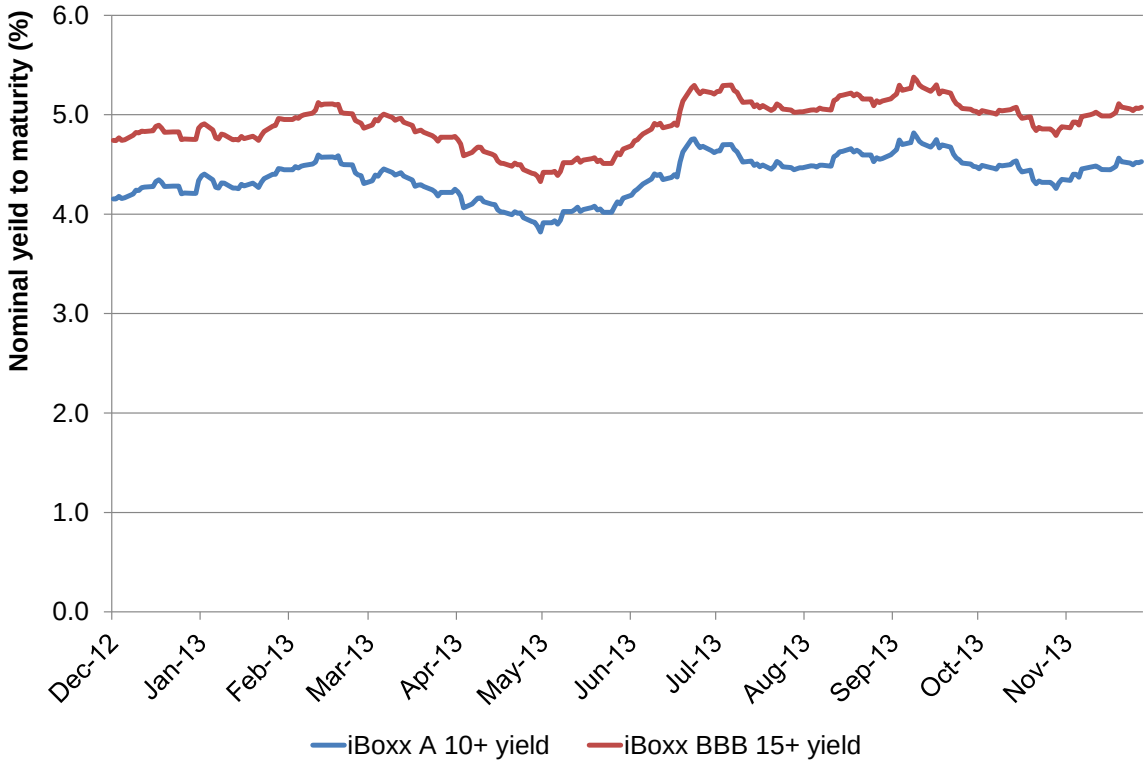
- the iBoxx corporate non financials index with A rating and 10+Y maturity, whose average maturity over the last year was 21.7 years; and
- the iBoxx corporate non financials index with A rating and 15+Y maturity, whose average maturity over the last year was 21.8 years.

357. Figure 4.2 shows the nominal yield to maturity for the iBoxx corporate non financials series with A rating and a 10+Y maturity as well as the iBoxx corporate non financials series with BBB rating and a 15+Y maturity.

[135] For details on the iBoxx index, see Ofgem's consultation on cost of debt indexation. Ofgem (March, 2011): Decision on the strategy for the next transmission and gas distribution price controls – RIIO T1 and GD1 Financial issues ,p. 21-24. Available at: https://www.ofgem.gov.uk/ofgem-publications/53838/t1decisionfinance.pdf.

Figure 4.2

Nominal Yields on iBoxx A 10+ and iBoxx BBB 15+ Indices



Source: Telefonica analysis of Datastream data.

358. The yields varied between 3.8 per cent and 4.8 per cent nominal over the last year for the A rated iBoxx index and 4.4 per cent and 5.4 per cent nominal for the BBB rated iBoxx index. Table 4.3 shows the spot yield on the iBoxx indices as well as average yields calculated over a 1 month, 3 months, 6 months and 1 year period.

Table 4.3

Average Yields on iBoxx Indices

	Spot	1M avg	3M avg	6M avg	1Y avg
iBoxx £ corp non-fin A 10+Y	4.5	4.4	4.5	4.5	4.4
iBoxx £ corp non-fin BBB 15+Y	5.1	5.0	5.1	5.1	4.9
Average	**4.8**	**4.7**	**4.8**	**4.8**	**4.6**

Source: Telefonica analysis of Datastream data. The cut-off date for the spot calculation is 29/11/2013.

359. The average yield of the A and BBB indices has been fairly stable between 4.6 and 4.8 per cent nominal, when averaged over short run periods of up to 1 year. The evidence on benchmark indices corroborates with the evidence from actual debt issued by parent companies of UK mobile operators (4.7 to 4.8 per cent).

360. We consider that the current cost of debt for a notional UK mobile-only operator lies in a range between 4.7 and 4.8 per cent nominal. This is consistent with a real cost of debt of about 1.7 per cent, when using a long-run RPI inflation assumption of 3 per cent.[136] We discuss the RPI inflation separately in section 4.4, below.

Table 4.4

Current Cost of Debt of a UK Mobile-only Operator

	Low	High
Cost of Debt nominal	4.7%	4.8%
RPI inflation	3.0%	3.0%
Cost of Debt real	**1.7%**	**1.7%**

Source: Telefonica Analysis; Real cost of debt is calculated from nominal using the Fisher formula and an RPI inflation assumption of 3 per cent.

361. As discussed above, the riskiness of the ALF annuity is akin to senior debt of a project that has [✂] leverage. The 1.7 per cent real cost of debt estimate is based on actual cost of debt of UK mobile operators with rating between broad A and broad BBB. It is therefore likely to be a conservative estimate, given that the parent companies of UK mobile operators have a gearing which is in excess of 50 per cent in most cases. It is therefore plausible that the true estimate of the discount rate reflecting the riskiness of the ALF payments is below 1.7 per cent (real, pre-tax).

Conclusion

362. The WACC of a notional UK mobile-only operator overstates the riskiness of the ALF payments to the government and hence should not be used as the discount rate to calculate the ALF annuity.

[136] We use the Fisher formula to convert the nominal cost of debt into real cost of debt.

363. Standard finance theory states that the discount rate used to convert an upfront lump-sum payment into an annuity should represent the riskiness of the expected cash-flows. The riskiness to the government of the ALF cash-flows is akin to the riskiness of (senior) debt for the following reasons:

- the ALF payments are fixed in advance and generally do not depend on the project's performance;
- The government under the ALF has a priority claim on project cash flows above other claims of debt and equity holders; and
- the ALF obligation is backed by an asset (the ALF licence), which can be re-sold by the government in a credit event.

364. The correct discount rate which corresponds to the riskiness of ALF payments is thus the cost of senior debt. Based on our review of market evidence on current cost of debt, we consider that 1.7 per cent (real, pre-tax) is a conservative estimate of the discount rate to convert the lump-sum into an ALF annuity.

4.4 Ofcom's Calculation of the Tax Adjustment Factor (TAF) is Incorrect

Introduction

365. Ofcom believes that the tax treatment of the ALF is more favourable than that for a lump sum payment and proposes to increase the lump-sum value by 11 per cent to offset this benefit, before calculating the associated annuity. Ofcom published an Excel Spreadsheet entitled *"alf.xlsm"*[137] alongside its consultation, which sets out how Ofcom derived its Tax Adjustment Factor (TAF) of 11 per cent.

366. Our review of Ofcom's modelling suggests that Ofcom made a number of errors which result in an overstatement of the TAF. We identify the following errors in Ofcom's modelling:

- Ofcom omits the tax shield effect associated with interest deductibility for debt financing of the lump-sum which results in higher TAF and therefore a higher annuity. This error is partly offset by Ofcom's use of a fully post-tax WACC to calculate the annuity. However, the conceptually correct approach is to take into account interest deductibility of debt financing of the lump sum, and use a "vanilla" WACC to calculate the annuity.

- Ofcom fails to consider the companies' future expected tax paying position, again, overstating the TAF and the annuity value; and

- Ofcom's calculation of the TAF is based in real terms, whereas taxes are levied on outturn (i.e. nominal) income.

367. Correcting for these errors results in a significant reduction of the TAF below the 11 per cent, even under Ofcom's own methodology of using the WACC of a notional UK mobile-only operator as the discount rate. Moreover, correcting for Ofcom's omission of the debt tax shield and using a discount rate based on the real *pre-tax* cost of debt, which is the correct discount rate as we explain above, results in the TAF term falling away. That is,

[137] Ofcom (2013): Spreadsheet showing Ofcom's derivation of the ALF. Available at: http://www.ofcom.org.uk/static/models/alf.xlsm.

there is no tax advantage to the annuity relative to the lump sum, and the TAF terms drops out in the calculation of the ALF.

Ofcom's Proposals

368. Ofcom believes that the tax treatment of the ALF is more favourable than that for a lump sum payment. Although the tax treatment for both is broadly similar (both are deductible items for tax purposes), the deduction from taxable profits each year is greater for the ALF payment than for the lump sum for the following two reasons:

- **Time value of money**: The tax deduction for the lump sum represents only the *return of capital* (i.e. the annual amortised amount of the lump sum), whereas the tax deduction for the ALF is the annuity, which comprises a *return of capital* (equivalent to the amortisation of the lump sum), and the *return on capital* (reflecting the return to investors for providing their funds).

- **Inflation**: In real terms, the amortised amount of the lump sum deducted each year from taxable profits falls over time. This is because the capitalised amount of the lump-sum in the companies' balance sheet is not adjusted with general inflation. Conversely, the ALF is calculated in real terms and takes account of general inflation.

369. Ofcom believes that the ALF annuity payment needs to reflect this tax advantage. Ofcom calculates that the impact of this tax advantage is equivalent to an increase of 11 per cent in the lump sum value. Ofcom provides an Excel Spreadsheet *"alf.xlsm"*[138] that sets out the calculation of its TAF of 11 per cent.

Ofcom Ignores Tax Shield Effect of Debt Financing of the Lump-sum

370. In its TAF modelling, Ofcom overlooks that the lump sum would incur debt financing costs that are tax deductible, and therefore understates the tax benefits associated with the lump sum, and overstates the TAF. This error is partly offset by Ofcom's use of a fully post-

[138] Ofcom (2013): Spreadsheet showing Ofcom's derivation of the ALF. Available at: http://www.ofcom.org.uk/static/models/alf.xlsm.

tax WACC in calculating the ALF annuity, that, is the debt tax shield benefit is implicit in the use of a fully post tax WACC.

371. However, Ofcom's approach is not conceptually correct and does not provide the correct annuity value, for example, where taxes are not constant (as in the present case). If we were to assume that the WACC is the relevant discount factor (which, we believe, it is not), the correct approach would be to explicitly model the interest tax benefits associated with the lump sum and calculate the ALF annuity using a vanilla WACC, which is gross of the debt tax shield benefit.

372. We explain Ofcom's errors in more detail below.

The omission of tax shield on debt interest financing of lump sum

373. In calculating the ALF, Ofcom implicitly assumes that the annuity is financed with some proportion of debt and equity (reflected in the WACC Ofcom assumes to discount the annuity payments). In economic terms, the ALF annuity can be thought of as consisting of two components:

- a **return *of* capital**, which corresponds to the repayment of the principal amount of overall funds provided (equivalent to an amortisation charge of the lump-sum payment); and

- a **return *on* capital**, which represents the return to investors providing funds to the company. The return paid to investors is equivalent to the company's financing cost.

374. When calculating the return *on* capital component of the annuity, Ofcom uses a WACC which assumes 30% debt and 70% equity financing. This is equivalent to assuming that the principal "lump-sum" amount is financed by 30% debt and 70% equity.

375. When calculating the tax benefit of the lump-sum, Ofcom only considers the tax benefit associated with the amortisation of the lump-sum payment. This is equivalent to the return *of* capital component of the annuity payment. Ofcom overlooks that the lump-sum also needs to be financed. If the lump-sum is (partly) financed with interest bearing debt, the associated interest payments are also deductible from taxable profits. Ofcom does not

model any interest tax shield and thus effectively assumes that the lump-sum is 100 per cent financed by equity (since equity financing costs are not tax deductible). Ofcom's 100 per cent equity financing is inconsistent with the WACC it uses to discount the cash flows, which assumes 30 per cent debt financing.

376. The annuity payment is indeed more favourable from a tax perspective, since it allows the company to deduct the amortisation and the full financing cost (i.e. the debt *and* equity financing cost) from taxable profits, whereas in case of the lump-sum financed with external capital, only amortisation and debt financing costs are deductible. The tax advantage of the ALF relative to the lump-sum therefore arises by allowing for deductions of equity financing costs from taxable profits. However, debt financing costs are deductible in both cases. By ignoring deductibility of debt financing costs associated with the lump-sum, Ofcom understates the tax benefit of the lump-sum payment, and overstates the TAF and, consequently, the ALF annuity.

The omission of debt interest from TAF is partly offset by use of fully post tax WACC

377. Ofcom calculates the ALF annuity using a fully post tax WACC. The post-tax WACC is calculated using post-tax cost of equity and post-tax cost of debt, weighted by the proportion of debt and equity financing assumed, or algebraically:

$$WACC_{post-tax} = g * CoD_{pre-tax} * (1-t) + (1-g) * CoE_{post-tax}$$

Where: *g* is the gearing (calculated as debt over debt + equity); $CoD_{pre\text{-}tax}$ is the pre-tax cost of debt; $CoE_{post\text{-}tax}$ is the post-tax cost of equity; and *t* is the statutory corporation tax rate.

378. Ofcom's use of a fully post-tax WACC in calculating the ALF annuity incorporates the benefits of the debt tax shield within the cost of debt term, i.e. by multiplying the pre-tax cost of debt by the term (1-t).

379. Ofcom's use of a fully post tax WACC to calculate the ALF annuity partly offsets its omission of the interest tax benefits associated with the lump sum in determining the TAF. However, the approach of implicitly allowing for interest costs within the discount rate is only valid where: (I) tax rates are constant (as the approach requires the adoption of a

constant tax rate), and (II) there is a constant capital structure (as the tax benefit is qualified by the term g). Neither of these assumptions is true in the present case and, as a result, Ofcom's approach is, we believe, incorrect.

The conceptually correct approach

380. The conceptually correct approach is to model the tax benefits associated with debt financing of the lump sum as an explicit tax benefit to this method of financing, and calculate the TAF on this basis. The overall ALF annuity should then be calculated using a vanilla WACC defined as post-tax cost of equity and a pre-tax cost of debt, weighted by debt and equity shares, or algebraically:

$$WACC_{vanilla} = g * CoD_{pre-tax} + (1 - g) * CoE_{post-tax}$$

where the terms are defined as above.

381. Unlike Ofcom's approach which relies on a fully post tax WACC, the use of a vanilla WACC is independent of the assumed tax rate and debt tax shield. Instead, the debt tax shield is explicitly modelled explicitly and can allow for changes in tax rates over time and capital structure.

Impact of Companies' Tax Paying Position

382. Notwithstanding our conceptual concerns about Ofcom's approach as set out above, Ofcom overstates the tax benefits that mobile companies enjoy, and therefore overstates the TAF and the ALF annuity.

383. According to Ofcom, the UK market is one of the most competitive mobile markets in Europe.[139] Substantial competition in the mobile market increases the riskiness of profits. As a result, profits can become more volatile, thus increasing the likelihood of losses in any given year. Over the long-run, the losses are compensated by higher returns in other years

[139] See, for example, Ofcom (January, 2012): "*Proposals to extend 4G mobile coverage*", press release; available at: http://media.ofcom.org.uk/2012/01/12/proposals-to-extend-4g-mobile-coverage/

such that in expectations, the operator recovers the economic cost of the investment. However, as we discuss below, the existence of losses reduces the tax shield benefit to the operator in NPV terms. In addition, tax losses can be risky themselves as the operator may not be able to realise them in the future, should the use of historical losses become more restrictive e.g. through new tax legislation. It is therefore important that Ofcom incorporates the effect of future expected tax losses on the TAF value in its modelling.

384. The present value of the tax benefit of both the ALF and the lump-sum decreases if the mobile operator makes a loss. When a company makes a loss, it is unable to realise the tax benefit associated with a tax deductible cost item within the year the cost is incurred, since there are no available profits in that year to be reduced. Under UK tax law, companies are allowed to accumulate historical losses over time and use them to offset taxable profits in the future. However, the tax benefit is reduced relative to a case when companies are making profits, because losses are carried forward at their nominal rate and not in NPV neutral terms. In other words, when a company makes a loss, there is no compensation in form of return to investors for having to delay the receipt cash-flows into the future, when taxable profits are high enough for losses to be utilised. This reduces the present value associated with the tax benefit of both the ALF as well as the lump-sum payment.

385. The effect of delaying the recovery of tax benefits into the future has a higher impact on the present value of the ALF payment than the lump-sum, because tax deductions for the ALF are higher than for the lump-sum in nominal terms. A delay of nominal cash-flows into the future results in the same *proportional* reduction in the present value of both cash-flow streams (i.e. the reduction in the present value of both streams is identical in *percentage* terms). However, since the stream related to the ALF payments is higher in nominal terms, the *absolute* reduction in the present value of the ALF cash-flow stream is higher than the lump-sum. This reduces the benefit of the ALF relative to the lump sum and hence the TAF.[140]

386. The impact of companies' future tax paying position on the value of TAF depends on the future profile of taxable profits. We do not attempt to model companies' future taxable profits with any precision. Instead, we adjust Ofcom's model to illustrate the impact of

[140] In the extreme (and unrealistic) case of companies not generating any taxable profits, the value of the tax shield effect is zero and the benefit of the ALF relative to the lump-sum disappears completely.

losses on the value of TAF. We demonstrate the impact of losses on the value of TAF separately, without modelling the effect of interest tax deductibility associated with debt financing of the lump-sum (as discussed above). The results are shown in Table 4.5

Table 4.5
Impact of Tax Losses on TAF

Scenario description	Ofcom's TAF[1]
100% of deductions utilised within year (Ofcom's assumption)	11%
50% of deductions utilised over first 10Y period, losses utilised in years 11-20	9%
50% of deductions utilised over 19Y, losses utilised in year 20	8%
0% of deductions utilised over first 10Y period utilised in years 11-20	7%
0% of deductions utilised over 19Y, losses utilised in year 20	5%

Source: Telefonica analysis based on "Ofcom ALF calculation.xlsm". (I) The TAF is based on Ofcom's approach to the TAF which excludes the value of the tax benefit associated with the debt financing of the lump sum. As we explain above, this is not conceptually correct.

387. As shown in Table 4.5, assuming that companies realise zero tax benefit associated with deductions in the first half of the licence period with losses utilised in the second half reduces the TAF to 7 per cent. Assuming that companies realise zero deductions over all but last year with losses utilised in full in year 20 reduces the TAF further to 5 per cent. As modelled by Ofcom, assuming that all tax deductibles are realised within the year they are incurred results in TAF adjustment of 1.11 (or 11%).

388. The illustrative results presented in the table above show that the future tax paying position of the companies has a significant impact on the TAF. Historically, companies have been paying very low (or zero) corporation taxes. It is therefore important that Ofcom incorporates modelling of companies' future expected tax losses in its TAF calculation.

TAF Falls Away with Use of Correct Discount Rate

389. As discussed above, the riskiness of cash-flows promised to the government under the ALF licence is equivalent to cash-flows to senior debt holders. This is equivalent to the lump sum financed by 100 per cent debt and with associated debt interest costs fully deductible from taxable profits. Assuming 100 per cent debt financing of the lump-sum makes the licensee indifferent between accepting the ALF annuity or paying the lump-sum to the government in advance and raising debt in the market.

390. With 100% debt financing of the lump sum, the tax shield effect of the ALF annuity and the lump sum is broadly equivalent, where the tax benefits of the lump sum comprise both the tax benefits of both the amortised value and the interest debt tax shield.[141] That is, where we assume 100% debt financing of the lump sum and explicitly incorporate the interest debt tax shield in the TAF calculation (which is conceptually correct as we explain above), the TAF term falls away.

391. With no TAF adjustment, and using the correct discount rate of 1.7% pre-tax results in a 27 per cent reduction of the ALF for the base year relative to Ofcom's calculations. Hence the correct ALF for the first year should be £1.46m and £0.88m per MHz of 900MHz and 1800 MHz spectrum respectively, compared to Ofcom's proposals of £1.99m and £1.19m per MHz of 900 MHz and 1800 MHz spectrum respectively.

Conclusion

392. Our review of Ofcom's modelling suggests that Ofcom's TAF calculation overstates the tax benefit of the ALF, even under Ofcom's own methodology of using the WACC of a notional UK mobile-only operator as the discount rate. This is because Ofcom omits the interest debt tax shield associated with the financing of the lump-sum which results in higher TAF and therefore a higher annuity. This error is partly offset by the use of a fully post-tax WACC to calculate the annuity. However, the conceptually correct approach is to take into

[141] Minor differences arise due to the fact that the annuity is constant in real terms (the annuity is indexed to RPI), whereas the sum of financing costs and amortisation of the lump sum is not indexed to inflation.

account interest deductibility of debt financing for the lump sum, and use a vanilla WACC to calculate the annuity.

393. Notwithstanding Ofcom's conceptual error, Ofcom also overstates the value of the TAF because of a failure to consider the effect of companies' tax paying position on the value of the tax benefits: in a highly competitive industry we may expect realised tax benefits to be much lower than Ofcom's modelled tax benefits based on the company reporting continuous profits.

394. Furthermore, drawing on our analysis, cash flows under the ALF licence are equivalent to an upfront-lump sum payment to the government financed with 100 per cent debt raised in the market. In this case, the tax benefit of the ALF annuity relative to the lump-sum payment, where we acknowledge the interest debt tax shield associated with financing of the lump sum, disappears and the TAF falls away. With no TAF adjustment, and using the correct discount rate based on the cost of debt of 1.7% real pre-tax, results in an ALF annuity which is 27% lower than Ofcom's calculated annuity.

4.5 Ofcom's RPI Inflation Assumption is Too Low

Introduction

395. Ofcom proposes to set the annual licence fee (ALF) in real terms and index it each year with outturn RPI inflation to determine the nominal payments that companies need to make each year. Ofcom derives the ALF in real terms using a real WACC, based on RPI inflation assumption of 2.5 per cent used in Ofcom's MCT 2011 determination.[142]

396. Ofcom's proposals transfer outturn inflation risk from the government to the licensee. This is because the ALF payment is set in real terms based on an ex-ante RPI inflation assumption of 2.5%, whereas actual ALF payments are indexed to outturn RPI. Any deviation of outturn RPI inflation from Ofcom's assumption of 2.5 per cent will result in companies paying more or less in nominal terms than initially assumed by Ofcom. It is therefore important that Ofcom uses an assumption of RPI inflation which reflects the future expectations of RPI inflation over the period of the ALF licence, otherwise Ofcom will expose the ALF licensee to asymmetric inflation risk.

397. We consider that Ofcom's assumption of RPI inflation of 2.5 per cent underestimates current market expectations of future RPI inflation. Evidence suggests that market expectations of medium and long-run RPI inflation are at least 3 per cent. If current market expectations of future RPI inflation materialise, companies will need to make higher nominal ALF payments than currently assumed by Ofcom. Ofcom should therefore revise its inflation assumption and align it with current market expectations over the period of the ALF licence.

398. In the remainder of this subsection, we set out market evidence supporting the use of expected RPI inflation of at least 3 per cent. We have used our revised estimate of future inflation of 3% to derive the real cost of debt of 1.7% from the observed nominal cost of debt of 4.7%.

[142] See paragraph 5.63

Market Evidence on Expected RPI Inflation

399. HM Treasury (HMT) publishes quarterly medium term forecasts of RPI inflation from independent City forecasters. The advantage of HMT forecasts is that it represents forecasts made by independent analysts, rather than governmental bodies which may have an incentive to report biased forecasts to achieve their own policy objectives. The reliability of HMT forecasts of RPI inflation has been recognised by a number of UK regulators who have relied on these forecasts when setting regulatory WACC allowances.

400. Common practice in UK regulation has been to use medium-term HMT forecasts for setting regulatory WACC allowances in real terms. In the recent past, regulators have also considered medium-term RPI forecasts provided by the Office for Budget Responsibility (OBR). Regulators often combine these with a long-run assumption consistent with the long run bank of England CPI inflation target of 2 per cent and the expected structural difference between RPI and CPI.

401. The Competition Commission (CC) in its Bristol 2010 determination assumed RPI inflation of 2.9 per cent to set the allowed WACC for Bristol Water for 2010-2015.[143] The Competition Commission in its latest (provisional) determination on NIE assumed RPI inflation range of 2.7 to 3.2 per cent to set the allowed WACC for NIE for 2013-2017. To determine its range, the CC considered evidence from HMT forecasts, OBR forecasts, breakeven inflation forecasts made by the Bank of England (calculated as the difference between yields on nominal and index-linked government bonds), and long run estimates based on the Bank of England's 2 per cent CPI target and a long-run wedge of 0.8 per cent between RPI and CPI.

402. Table 4.6 shows the latest available HMT forecasts of RPI inflation (from November 2013).

[143] Competition Commission (August 2010): *"Bristol Water plc price determination Appendices and Glossary"*. Available at: http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2010/fulltext/558_appendices.pdf.

Table 4.6
HMT Forecasts of RPI Inflation

Year	RPI in Year (%)
2013	3.1
2014	3.1
2015	3.1
2016	3.3
2017	3.5

Source: HMT Forecasts for the UK economy November 2013 – a comparison of independent forecasts.

403. Table 4.6 shows that the HMT medium-run RPI inflation forecasts are 3.1 per cent for the next three years with expectations of RPI inflation increasing even further in the subsequent two years.

404. Table 4.7 shows the RPI inflation forecasts provided by the Office of Budget Responsibility (OBR) in its March 2013 report.

Table 4.7
OBR Forecasts of RPI Inflation

Year	RPI in Year (%)
2013	3.2
2014	2.8
2015	3.2
2016	3.6
2017	3.9

Source: OBR Economic and Fiscal Outlook March 2013, p.82.

405. The OBR medium-term forecasts exhibit a similar trend as the HMT forecasts, with RPI inflation expectations growing in the medium-term well above 3 per cent.

406. As forecasts of RPI inflation beyond 2017 are not available, we consider it reasonable to assume long run RPI inflation based on the long run Bank of England CPI inflation target of 2 per cent and the structural difference between RPI and CPI.

407. The OBR (2011) estimated the historical difference between CPI and RPI of 0.7% between 1989 and 2011. However, the OBR (2011) also stated that it expects this difference to increase in future:

> *"Between 1989 and 2011 Retail Prices Index (RPI) inflation tended to be around 0.7 percentage points higher than Consumer Price Index (CPI) inflation on average. Recent developments suggest that the long-run difference between these measures may be significantly higher in the future. This paper decomposes the differences in RPI and CPI inflation and looks at the prospects for the evolution of the wedge between the two measures over the long term. Possible methodological developments to the CPI and RPI could have a substantial impact on the difference between RPI and CPI inflation, and constitute one of the main uncertainties surrounding the long-term difference between the two measures."* [144]

408. Moreover, the ONS (2012) found that the difference between CPI and RPI rose in 2010 owing to a change in the formula for calculating RPI. Specifically, differences in the treatment of clothing indices have resulted in the gap between CPI and RPI widening to 1.0%:

> *"The Carli is used to produce the clothing elementary aggregate indices in the RPI and the Jevons is used in the CPI. This difference is the primary cause of the formula effect, which was relatively stable at around 0.5 percentage points on the annual growth rate until changes were introduced to the collection guidelines for clothing[7]. The changes were introduced to improve the quality of clothing price collection, but resulted in the formula effect widening to around 1.0 percentage point."* [145]

[144] Office for Budget Responsibility (2011): *"The long-run difference between RPI and CPI inflation"*, Working paper no. 2, p2.

[145] Office for National Statistics (2012): *"National Statistician's consultation on options for improving the retail prices index".*

409. The formula change is a permanent one and suggests that the structural difference of 1.0% is likely to persist in the long-run. Moreover, the ONS (2011) support the growing structural difference and estimate a long-run "RPI-CPI wedge" of 1.3-1.5 per cent.[146]

410. The above evidence supports the use of a structural difference greater than the historical 0.7 per cent. Given the formula change, we consider an assumption of 1.0 per cent difference between RPI and CPI to be a minimal long-term one.

Conclusion

411. The ALF licence transfers outturn inflation risk from the government to the licensee. This is because the ALF payment is set in real terms based on an ex-ante RPI inflation assumption whereas actual ALF payments are indexed to outturn RPI. It is therefore important that Ofcom uses an assumption of RPI inflation which reflects the future expectations of RPI inflation over the period of the ALF licence.

412. Current market evidence supports a long-run inflation assumption of at least 3.0 per cent. This assumption is consistent with medium-run projections of RPI inflation from HMT and OBR as well as the Bank of England's CPI target of 2.0 per cent and a forward looking structural difference between RPI and CPI of at least 1 per cent.

413. Consequently, we consider Ofcom should revise its assumption of 2.5 per cent inflation upwards to 3 per cent as a minimum.

[146] Office for Budget Responsibility (2011): *"The long-run difference between RPI and CPI inflation"*, Working paper no. 2, p31.

Section 5

RISK ASYMMETRY

Introduction

414. Ofcom assesses the extent to which spectrum efficiency might be compromised by setting ALFs either below or above the levels implied by its estimate of market value, in Annex 9 of the consultation document. This analysis is carried out in the context of uncertainty about the market value of 900MHz and 1800MHz spectrum[147].

415. Ofcom's provisional conclusion is that it is not appropriate to set ALFs either below or above the levels implied by its best estimate of market value for reasons of spectrum efficiency, for the reasons stated in paragraph A9.4.

416. Ofcom also dismissed other arguments in support of lower ALFs at paragraphs A9.5 – A9.7.

417. Elsewhere in this response, we explain why, in our view, Ofcom has erred in estimating the market value of 900MHz and 1800MHz spectrum and in converting those values into annual licence fees.

418. That aside, Telefonica also disagrees with Ofcom's approach and analysis on risk asymmetry.

419. Firstly, we do not agree with Ofcom's provisional conclusion, even in the narrow confines of spectrum efficiency; we think that there is an asymmetric risk, because setting fees higher than the best estimate is likely to result in greater spectrum inefficiency compared to setting fees lower than the best estimate.

420. More fundamentally, however, Ofcom's analysis focuses on only one aspect of Ofcom's statutory duties (spectrum efficiency). Insufficient consideration has been given to other

[147] See paragraphs A9.2 and 2.10 of the consultation document, for example

duties imposed under the Communications Act and Wireless Telegraphy Act[148]. Further, there is no assessment at all of whether the purpose of the Government's Direction[149] can be expected to be better met by setting fees above or below the best estimate (but within a range of reasonable estimates). As noted above, the purpose of the Direction reflects the Government's policy of promoting the early deployment of next generation of wireless services and the maximisation of coverage of such services. Telefonica believes that the omission of an assessment of whether Ofcom's broader statutory duties and the purpose of the Directions have been met, is a major oversight.

Spectrum efficiency

421. Ofcom summarises its provisional conclusion in paragraph A9.4. Ofcom recognises that the risk of setting ALFs too high is the subsequent return of spectrum and a fallow period of inefficient use. In response, Ofcom's position appears to be that:

- There is a risk in setting prices too low if spectrum is not used efficiently as a result; and

- That the chance of Ofcom setting ALFs too high is small because:
  - Ofcom has based them on auction prices and these are lower than bids; and
  - Sunk investment means that incumbents value spectrum to a greater extent, lessening the likelihood of a return of the spectrum

422. Ofcom also says that setting ALF too high or too low could incentivise inefficient use and poor investment decisions.[150]

423. Telefonica notes that the spectrum in question, here, is not new. As Ofcom observes:[151]

[148] As described at paragraphs 3.20 – 3.27 of the consultation document

[149] Article 2, set out elsewhere in this response.

[150] Second bullet, paragraph A9.4 and paragraph A9.6

[151] At footnote 182

"*the licences concerned here have been held for a number of years and…licence holders have paid fees which are substantially below those we are currently proposing*"

424. The issue of assessing whether there might be asymmetric risk from setting fees to high or too low is, therefore, not some abstract piece of analysis. There is valuable empirical evidence that is available, to demonstrate whether or not low spectrum fees do, in fact, lead to inefficiencies in 900 MHz and 1800 MHz use because, as Ofcom acknowledges, the spectrum has been in use and the fees paid for it have been relatively low . However, it is striking that Ofcom has presented no empirical evidence at all of any inefficiency relating to spectrum use by any provider under the current regime.

425. In our view, that is not surprising; we are unaware of any inefficient spectrum use in these bands. The general scarcity of spectrum for mobile services relative to demand (which was the justification for the 800 MHz and 2.6 GHz spectrum auction) and the high degree of competition in the market has, we believe, provided sufficient commercial incentive for operators to make the best use of all of their scarce resources, including spectrum. By way of an example, Telefonica's request to Ofcom to use its 900 MHz spectrum for 3G services in 2010 and EE's request to use its 1800 MHz spectrum for LTE services in 2012 demonstrate that operators have, in fact, innovated in order to use spectrum efficiently under the present regime, with relatively low fees.

426. Accordingly, given the lack of any evidence of inefficient spectrum use under the current fees regime, we think that there is no realistic prospect that that low ALFs would lead to inefficient spectrum use in the future.

427. Ofcom has acknowledged that there is a risk of inefficient spectrum use if fees are inadvertently set too high. Therefore, in Telefonica's view, there is an asymmetric risk that Ofcom should be cognisant of in determining ALFs. There is no empirical evidence that low fees result in inefficiencies. Conversely, it is common ground that high fees could result in inefficiencies. Therefore, Ofcom should set fees at the lower end of the range of values in which reflect the market value of 900 MHz and 1800 MHz spectrum, on the basis of spectrum inefficiency.

The ability of UK mobile operators to absorb an increase in ALFs

428. The profitability of UK mobile operators is relatively poor both by reference to mobile operators in Europe and in other regions. The table below is from a Bank of America Merrill Lynch report and sets out average EBITDA percentages in Q2 2013 of mobile operators from the UK, Europe and around the World:

Table 18: Mobile market scorecard – developed country markets

	Market Potential				Market Growth		Revenue Growth			Service Margins	
	Mobile Penetration	Wireline Penetration	MOU per Capita	Mobile Spend/GDP	Real GDP Growth '13	Pop. Growth '08-'13 CAGR	Service Revenue	Serv Rev Acceleration	RPM YoY	Average EBITDA	YoY (bps)
DEVELOPED COUNTRIES											
ASIA-PACIFIC:											
Australia	135%	48%	372	1.0%	3.0%	1.3%	-1.1%	-1%	-18%	35.4%	472
Hong Kong	240%	N.A.	N.A.	0.7%	3.0%	0.8%	4.0%	4%	N.A.	43.9%	5
Japan	109%	29%	127	1.4%	1.6%	-0.1%	0.5%	0%	-17%	47.8%	(118)
New Zealand	117%	40%	220	0.8%	2.7%	0.9%	3.3%	3%	-12%	33.4%	(666)
Singapore	152%	38%	492	1.2%	2.0%	2.0%	5.6%	6%	4%	35.3%	153
EUROPE:											
Austria	157%	22%	268	0.9%	0.8%	0.6%	-10.5%	-10%	-10%	30.7%	(64)
Belgium	111%	29%	165	1.1%	0.2%	0.8%	-10.8%	-11%	-20%	34.9%	(574)
Denmark	144%	36%	322	0.8%	0.8%	0.3%	-16.4%	-16%	-19%	29.7%	80
Finland	177%	14%	363	1.2%	0.5%	0.5%	-7.3%	-7%	-19%	39.8%	469
France	108%	32%	260	1.2%	-0.1%	0.4%	-12.8%	-13%	-25%	31.5%	(192)
Germany	139%	27%	191	0.8%	0.6%	-0.1%	-3.3%	-3%	-9%	44.1%	(186)
Greece	134%	40%	301	1.4%	-4.2%	0.2%	-17.0%	-17%	-17%	37.8%	(52)
Italy	152%	30%	300	1.3%	-1.5%	0.3%	-17.0%	-17%	-23%	46.3%	(174)
Netherlands	102%	21%	164	1.1%	-0.5%	0.4%	-8.6%	-9%	-9%	36.8%	(190)
Norway	117%	22%	324	0.7%	2.5%	1.2%	-6.6%	-7%	-21%	39.3%	(57)
Portugal	162%	24%	221	1.7%	-2.3%	-0.1%	-13.6%	-14%	-17%	49.9%	166
Spain	112%	30%	187	1.6%	-1.6%	0.4%	-7.8%	-8%	-16%	36.9%	(177)
Sweden	150%	30%	402	1.0%	1.0%	0.7%	2.0%	2%	-17%	39.5%	198
Switzerland	125%	47%	153	1.0%	1.3%	1.2%	-4.4%	-4%	-7%	43.9%	(118)
UK	122%	31%	227	1.0%	0.7%	0.7%	-4.7%	-5%	4%	27.1%	425
NORTH AMERICA:											
Canada	80%	54%	309	1.1%	1.5%	1.1%	4.4%	4%	-9%	47.7%	85
US	104%	36%	987	1.2%	1.9%	0.8%	3.0%	3%	N.A.	38.5%	(113)

Source: Bank of America Merryll Lynch

429. Ofcom will note that UK mobile operators are the least profitable. The profitability of operators in other countries is typically at least 20% or 25% greater, and often significantly more.

430. This is an important point to note. UK mobile operators are part of multi-national telecommunications groups that invest in territories on the basis of anticipated returns. As a consequence, mobile operators within any particular group effectively compete for a share of a fixed investment budget. The lower the returns in any particular country (or region), the harder it is to attract investment. As Ofcom will be aware, UK mobile operators have already taken measures to try and sustain profitability (for example, cost

cutting measures, network sharing, consolidation). Nevertheless, profits have slipped in recent years, from a relatively low base. In Telefonica's view, the likelihood that shareholders would absorb the additional costs of increased spectrum fees is very low indeed. We believe that it is far more likely that they will demand that UK mobile operators seek either to increase prices to consumers, reduce the scale of investment, or a combination of the two. We examine the implications for UK consumers, below.

The impact on retail prices

431. Ofcom's analysis of the effect of higher ALFs on mobile providers' pricing and investment capability is limited to two paragraphs in the consultation document and a footnote[152].

432. Ofcom appears to argue that if consumer demand for mobile services is made artificially high (because prices do not reflect the real opportunity cost of spectrum), then mobile operators might seek additional spectrum, at the expense of other applications. However, in its spectrum management strategy paper, Ofcom envisages greater demand for mobile services and, consequently, spectrum for mobile services, presumably having taken into account higher ALFs. No evidence has been presented about the extent of greater demand (for mobile services and spectrum for mobile applications) if retail prices are kept lower in response to lower ALFs. We believe that this effect is likely to be trivial, compared to the scale of increasing demand for mobile services that Ofcom has acknowledged. In any event, the proposed levels of ALFs are being driven by the opportunity cost of denying other mobile operators additional spectrum, not other applications.

433. Ofcom does appear, therefore, to acknowledge that higher ALFs could result in increased retail prices. That is consistent with its approach in other regulatory issues in which Ofcom has recognised that a reduction in revenues (or increase in costs) in one activity is likely to result in increased charges in another[153]. Ofcom's provisional view is that it does not think that it should seek to bring about lower consumer prices if that entails introducing a market distortion (which we understand to be a reference to lower retail prices not reflecting the opportunity cost of spectrum). As described above, Ofcom has not

[152] See paragraphs A9.45 and A9.46 and footnote 183

[153] The "waterbed effect". See Ofcom's analysis of mobile termination rates and interconnection "ladder pricing", for example.

attempted to assess the extent or effect of any alleged distortion in its consultation document. Neither is there any analysis of the effect on consumers of higher ALFs. On the face of it, the effect on prices could well be non-trivial (an increase in ALFs of the scale that Ofcom is proposing is equivalent to about £3 per customer per annum in the case of Telefonica).

434. As Ofcom notes[154], it has a principal statutory duty to further the interests of consumers in relevant markets. Ofcom acknowledges that consumer prices might increase in response to higher ALFs, but it does not appear to have carried out any analysis about the likelihood, scale and effect of such price increases. Ofcom simply assumes that higher ALFs will cure a "market distortion" (which it has not sought to quantify) and that this necessarily outweighs the likely impact on prices. In Telefonica's view, the analysis which underpins Ofcom's conclusion does not appear to be sufficiently robust and, therefore, not capable of sustaining its decision to increase ALFs.

435. Furthermore, the likely impact on retail prices would appear to be at odds with broader Government policy to support families with their cost of living[155].

The impact on investment

436. As noted above, the profitability of UK mobile operators is relatively low. Telefonica believes that shareholders would be unlikely to absorb the additional costs represented by an increase in ALFs. There are good reasons to believe that retail prices might rise as operators seek to recover the additional costs. To the extent that they do not increase to fully recover the additional costs, Telefonica believes that investment is likely to adversely affected, as shareholders would be more reluctant to invest in the UK as a result of declining profit levels.

437. In its consultation document, Ofcom has not sought to evaluate the likelihood of lower investment levels as a consequence of higher ALFs, or the consequences of them. Instead, Ofcom's position appears to be that its principal role is in seeking to reduce the prospect of distorting efficient decisions that would result from the "*wrong*" price signals.

[154] See paragraph 3.20

[155] See: https://www.gov.uk/government/news/autumn-statement-2013-key-announcements for example

438. In response, we would repeat the point made above, that Ofcom has presented no evidence of inefficient use of spectrum or poor investment decisions despite the fact that the fees for 900 MHz and 1800 MHz spectrum have , to date, been set at levels far lower than those now contemplated by Ofcom.

439. We would also observe that "*efficient*" investment levels may not be socially optimal. For example, under its Mobile Infrastructure Project[156], the UK Government is investing £150m of public money to improve mobile network coverage in rural areas of the country not served by any of the mobile operators. Telefonica believes that this intervention is an explicit recognition that the private investment decisions of the UK mobile operators have resulted in coverage levels that are less than those that society as a whole may prefer.

440. In our view, higher ALFs are likely to reduce profitability and put pressure on the level of investment that UK operators are able to make, including on their networks. Approximately [✂] of Telefonica's capital expenditure is invested in its mobile networks. A reduction in network investment is likely to affect coverage and capacity in rural areas disproportionately, because network usage is relatively low in such areas.

441. In summary, to the extent that mobile operators will not be able to make good the reduction in profitability brought about by higher ALFs through an increase in retail prices, they are likely to become less profitable. Other things being equal, this is likely to make them less attractive for investment, as multi-national groups divert funds elsewhere. Since investment in mobile networks makes up a large proportion of mobile operators' capital expenditure, network coverage and capacity are likely to be adversely affected. This effect is contradictory to the Government's policy of increasing the provision of broadband[157] and Ofcom's statutory duties, to promote investment and encourage the availability and use of high speed data transfer services throughout the United Kingdom[158].

[156] See: https://www.gov.uk/government/news/mobile-coverage-in-rural-areas-set-to-improve

[157] See: https://www.gov.uk/government/policies/transforming-uk-broadband and https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/257006/UK_Broadband_Impact_Study_-_Impact_Report_-_Nov_2013_-_Final.pdf

[158] Sections 3(4)(d) and (e) of the Communications Act 2003 refer.

442. Ofcom has not considered the likelihood or consequences of a reduction in investment on consumers which might be anticipated following an increase in ALFs. In Telefonica's view, without such an assessment, Ofcom is not in a position to exercise its discretion about how best to balance its statutory duties.

443. Furthermore, Telefonica notes that the purpose of the Government's Direction to Ofcom to revise the fees for 900 MHz and 1800 MHz spectrum included allowing early deployment and maximising the coverage of next generation wireless mobile broadband services. To the extent that increasing ALFs will deter investment, it appears to Telefonica that they would be inconsistent with the purpose of the Direction.

Conclusion

444. In the consultation document, Ofcom says, and we agree, that there is uncertainty about the full market value of 900 MHz and 1800MHz spectrum, and that the process of revising annual licence fees necessarily requires Ofcom to exercise its judgment. In our view, the correct approach to such uncertainty, bearing in mind the range of relevant statutory duties and the Article 2 of the Direction, would have been to determine a likely range of market values by reference to acceptable methodological approaches and assumptions, and then to examine how values within these ranges would be best expected to satisfy those duties and objectives. This is the approach that Ofcom has adopted in other matters (in its 2010/11 market review of mobile voice call termination, for example).

445. For the reasons set out above, we believe that there are risks to consumers from setting ALFs too high that Ofcom has not considered either properly or at all. In our view, Ofcom is required to carry out this analysis in the context of its statutory duties and Article 2 of the Direction

446. Ofcom has said that it did not seek to determine a range within which full market value fell because of the "nature of the evidence…and spread and distribution of the evidence points" We do not understand this reasoning. In any event, Ofcom does not appear to argue that it was not possible to determine a range. Bearing in mind the importance of this issue (Ofcom is proposing to extract £250m pa from the industry), we believe a full analysis is proportionate. In Telefonica's view, the fact that Ofcom elected not to determine a range has meant that it did not avail itself with the opportunity to carry out a

risk asymmetry assessment that takes into account all of the relevant considerations. We believe that this this deficiency would render a decision to give effect to Ofcom's proposal as unsound.

Section 6

CONCLUDING REMARKS

447. We describe in Section 3 of this response, the errors that we believe Ofcom has made in assessing the lump sum value of 900 MHz and 1800 MHz spectrum. We estimate a value per MHz for the spectrum of £15.22m and £8.93m for 900 MHz and 1800 MHz respectively.

448. Using these lump-sum values for the spectrum in place of Ofcom's values, and correcting for Ofcom's errors in converting these values into annuities in the way we describe in section 4 of this response (i.e. using a discount rate of 1.7%, and no TAF), results in ALF payments of £0.89m and £0.52m for 900 MHz and 1800 MHz respectively, 55% less than Ofcom's estimates (see Table 6.1).

Table 6.1
Annuities (£m): Telefonica's estimates of the annuity are 55% less than Ofcom's

Spectrum	Ofcom	Correcting for discounting but retaining Ofcom lump-sum	Correcting for discounting & lump-sum
900 MHz	1.99	1.46	0.89
1800 MHz	1.15	0.88	0.52

449. However, Ofcom should note that these are the results from amendments to its analysis and relies on Ofcom's broad methodological approach. For the record, we have doubts about a number of aspects of this (set out in section 3 of this response).

450. In section 5 of this response, we explain our concerns about the approach that Ofcom has taken in assessing the effects of increased ALFs. We argue that it is too narrowly focussed and that, consequently, Ofcom fails to grapple meaningfully with either its statutory duties or the purpose of the Government's Direction.

451. In our view, Ofcom is required to arrive at a range of credible market values for ALFs, and then to consider the effects of ALFs within that range on prices, investment, etc. We have not undertaken this work (the time provided to respond to Ofcom's proposals would not permit it), but our initial view is that the estimates we have arrived at for the ALFs, above, are likely either to be at the upper end of such a range, or represent the upper bound (broadly, because we believe that there is an asymmetric risk, as higher ALFs are likely to have a negative impact on consumers, relative to lower ALFs). This contrasts with the description that Ofcom has used for its own proposed figures for ALFs (i.e. "best estimates").

452. Telefonica believes that Ofcom needs to reconsider its approach on annual licence fees. In addition to correcting the errors and omissions we have identified in its analysis, it needs to consider, properly, the implications of increasing fees in the context of its statutory duties and the purpose of the Government's Direction. Only when it has done this, and consulted again on a revised proposal, will it be in a position to press ahead with Regulations to amend the fees.

Annex A

Update of Ofcom's MCT 2011 WACC

Ofcom proposes to calculate the ALF annuity associated with the lump-sum amounts derived from the recent UK 4G auction using a real, post-tax WACC of 4.2%, based on its 2011 MCT determination (adjusted for the effect of differential corporate tax rates). Table below shows the individual WACC components from Ofcom's 2011 MCT determination which form the basis of the 4.2 per cent real, post-tax WACC used by Ofcom to calculate the ALF annuity.

Table A.1
Ofcom's 2011 MCT WACC Estimate (Adjusted for Taxes)

WACC Component	%
Tax	20%
Gearing	30%
Nominal risk-free rate	4.0%
Equity risk premium	5.0%
Asset Beta	0.56
Equity Beta	0.76
Cost of equity (post-tax, nominal)	7.8%
Cost of debt (pre-tax, nominal)	5.5%
WACC (post-tax, nominal)	6.8%
RPI inflation	2.5%
WACC (post-tax, real)	4.2%

Source: Ofcom (March 2011): "Wholesale mobile voice call termination Modelling Annexes", p106, Telefonica calculations.

We consider Ofcom's estimate of the cost of debt of 5.5 per cent nominal overstates the cost of debt of a UK mobile operator in 2013/14. This is because the cost of debt estimate applies to the cost of debt for a five year period from 2011. Instead, the relevant cost of debt is the cost that a mobile operator would face at the start of the annuitisation period to finance a twenty year bond.

As we discuss in detail in Section 4 of this response, the current estimate of cost of debt for a UK mobile operator lies in the range of 4.7 to 4.8 per cent nominal. In addition, as we discuss in Section 0, Ofcom's assumption of 2.5 per cent RPI underestimates the expected RPI inflation

over the period of the ALF licence. Current market evidence supports expected future RPI inflation of 3 per cent.

Table A.2 shows that updating the cost of debt and RPI assumptions in Ofcom's WACC calculation, but retaining Ofcom's cost of equity assumptions, reduces the real, post-tax WACC by 70 bps to 3.5 per cent.

Table A.2

WACC Estimate Updated to 2013/14

WACC Component	%
Tax	20%
Gearing	30%
Nominal risk-free rate	4.0%
Equity risk premium	5.0%
Asset Beta	0.56
Equity Beta	0.76
Cost of equity (post-tax, nominal)	7.8%
Cost of debt (pre-tax, nominal)	4.8%
WACC (post-tax, nominal)	6.6%
RPI inflation	3.0%
WACC (post-tax, real)	3.5%

Source: Telefonica calculations.

Annex B

Answers to specific questions raised in the consultation document

Question 1. Do you agree with the approach that we propose to deriving a lump sum estimate of full market value for licences for 900 MHz spectrum and for 1800 MHz spectrum?

No. See sections 3 and 5 of this response.

Question 2. Do you have any comments on our assessment of the lump sum value of (a) a licence for 900 MHz spectrum; or (b) a licence for 1800 MHz spectrum?

Yes. See section 3 of this response.

Question 3. Do you agree with our approach to annualising the proposed lump sum value, including the cost of capital which we propose to use?

No. See section 4 of this response.

Question 4. Do you agree that fees should be specified in constant real terms and should be adjusted annually in the light of changes to the Retail Prices Index (RPI)?

Yes.

Question 5. Do you agree that revised fees should be implemented in a manner which has an effect such that all licensees are charged higher fees simultaneously, even though payment dates of individual licensees may vary?

Telefonica believes that the impact of higher fees should affect mobile operators simultaneously.

Question 6. Do you agree it is appropriate that revised fees should be payable in full as soon as practicable after revised fee regulations are made.

No. Telefonica believes that there should be a two or three year "glidepath". Although it is the case that the industry was aware of the revision of the fees, as Ofcom describes, it is also the true that the level of ALFs was unknown and that there was a degree of uncertainty about that level. Accordingly, mobile operators may well have made medium terms plans on the basis of lower ALFs, in good faith. In Telefonica's case, [✂].

Question 7. Do you have any views about the minimum period that should elapse before we should consider revising fees again?

Ofcom's approach on this issue appears to be inconsistent. On the one hand, the Government's Direction requires Ofcom to "provide greater investment certainty" for mobile operators. On the other, Ofcom appears to be comforting itself that it doesn't really matter if it has over-priced the spectrum, because it can always review the matter later on. There is an asymmetric risk of higher ALFs (compared to lower ones) and Ofcom should set lower ALFs accordingly.