



# The estimated cost of capital for broadcast transmission 2015-2025

A report for Office of the Adjudicator - Broadcast  
Transmission Services

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## Executive Summary

Plum was asked to review the weighted average cost of capital (WACC) for broadcast transmission for the period 2015-2025. The long-duration of the WACC reflects the nature of the market for broadcast transmission which is dominated by long-term contracts. It also suggests that any revision to the WACC should apply on a forward looking basis i.e. to new contracts only.

The current WACC of 7.7% real pre-tax or 10.4% nominal pre-tax was estimated in 2006 by Ofcom. In 2010 an assessment concluded that a full review at the time was not justified, in part on grounds that more information would be available post the 2014 Arqiva debt refinancing and as the impact of the financial crisis became clearer. In addition, the rate of corporate tax will have fallen from 30% in 2006 to 20% by 2015, which acts to lower the estimated WACC.

Taking the above factors into account, and assessing available evidence from a long-term perspective, we conclude that the estimated WACC for broadcast transmission is in the range 6.6% to 7.5% on a real pre-tax basis (or 10.1% to 11.1% on a nominal pre-tax basis).

In addition to information regarding the cost of capital we have regard to the risk in relation to broadcast transmission which has increased since both 2006 and 2010 due to growing platform competition and changes in spectrum policy including the proposal to reallocate 700 MHz spectrum for mobile broadband by or before 2022 and uncertainty regarding the future of sub-700 MHz spectrum.

These considerations introduce an element of asymmetric risk regarding longer-term revenues for broadcast transmission which is partially, but not fully reflected, via the reduction of less expensive debt versus more expensive equity finance over the coming decade.

We propose, having regard to asymmetric risk, that an assumed return on capital at the upper end of the range i.e. of 7.5% real pre-tax, be utilised in setting new contract prices (equivalent to 11.1% nominal pre-tax before deflation as illustrated below).

### Building the cost of capital - Plum 2014 estimate



Source: Plum Consulting

We also propose, given the possibility that the corporate tax rate or spectrum or public service broadcast policy might change materially before the coming decade is out, that such changes could trigger a full review if they expected to impact required returns by 0.5 percentage points or more.

## 1 Context and introduction

An estimate of the weighted average cost of capital (WACC) for broadcast transmission was last determined by Ofcom in 2006. In 2010 Plum Consulting carried out a study to determine whether a review of the cost of capital is justified at this stage.<sup>1</sup> The study concluded that:

*“On the basis of available evidence, a review now of the cost of capital applying to broadcast transmission would be unlikely to result in a material change. However, depending on the decision by the Competition Commission on the Openreach WACC, developments in relation to sovereign risk and Arqiva’s cost of re-financing, a review might be appropriate in future.”*

The brief for this study was to carry out a forward looking review on the understanding that any revision of the WACC would apply for a period of 10 years from early 2015. Further, the wider context should be considered in assessing the WACC. In particular, broadcast transmission is subject to:

- Competition from other platforms which is evolving rapidly with the rollout of fibre and 4G and development of internet video and radio services.
- Long-term contracts with durations of 10-20 years.
- Adjudication rather than regulation with periodic review of price controls.

These characteristics differ from those applying to other regulated industries and form a key part of our assessment alongside the technical determination of a best estimate of the WACC.

In Section 2 we consider the characteristics of the broadcast transmission including competition and policy.

In Section 3 we consider the building blocks of the estimated WACC.

In Section 4 we set out our conclusion regarding the assumed return on capital for pricing purposes.

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<sup>1</sup> Plum. July 2010. “The cost of capital in relation to broadcast transmission,” [http://adjudicator-bts.org.uk/documents/Plum\\_July2010\\_Cost\\_of\\_capital\\_in\\_relation\\_to\\_broadcast\\_transmission.pdf](http://adjudicator-bts.org.uk/documents/Plum_July2010_Cost_of_capital_in_relation_to_broadcast_transmission.pdf)

## 2 The broadcast transmission market

The broadcast transmission market differs from other regulated services in the following ways:

- There are competing platforms for audio and video delivery including satellite, broadband and cable rather than monopoly provision, for example, in relation to gas and water distribution. In the case of broadband and internet protocol (IP) the platform has developed rapidly.
- The broadcast transmission market involves long-term contracts with durations of 10-20 years between Arqiva and broadcasters rather than short-term contracts with end users.
- The broadcast transmission market is in part funded indirectly via the BBC licence fee coupled with free to air delivery requirements which support funding of a high coverage terrestrial broadcast network.
- Broadcast transmission is subject to the Undertakings applying to the merger between Arqiva and National Grid Wireless including adjudication in case of disputes rather than ongoing *ex ante* regulation and 3-5-yearly periodic reviews of pricing.

We discuss these differences and their implications for assessing the WACC below.

### 2.1 Development of competing platforms

Digital Terrestrial Television (DTT) over the broadcast transmission network is the most widely used platform for TV viewing. The platform has coverage of 98.5% for the three Public Service Broadcasting (PSB) muxes<sup>2</sup> and 90% for commercial muxes.<sup>3</sup> PSB is also subject to specific requirements in terms of free to air transmission over the broadcast transmission platform. Terrestrial broadcasting is also the primary form of radio listening.

Competing platforms include cable, satellite including Sky and Freesat service and fixed and mobile broadband access for IP services. As cable coverage is limited to around 50% of households we focus on satellite and broadband access.

Ofcom estimate that Freesat household coverage is likely to be around 95% or less due to line-of-sight constraints and restrictions on installing a satellite dish.<sup>4</sup> As of September 2014 Freesat is available in 1.9 million UK households (about 8% of households).<sup>5</sup> Freesat is therefore a competitor with terrestrial transmission for commercial free-to-air broadcast TV. Whilst not a direct competitor, the penetration of pay satellite (Sky) potentially lowers the base on non-pay TV households, of whom most receive free-to-air TV via DTT.<sup>6</sup>

Fixed and mobile broadband, coupled with IP based delivery of video and audio, also offer competing platforms to terrestrial broadcasting. Broadband platforms and IP delivery have developed rapidly,

<sup>2</sup> PSB1 (BBC), PSB2 (Digital 3 and 4), PSB3 (BBC)

<sup>3</sup> COM4 (ITV), COM5 and COM6 (Arqiva). The planned coverage of the interim 600 MHz mux (COM7) is 70%.

<sup>4</sup> Ofcom. May 2014. "The future of free to view TV"

<http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/discussion/ftv.pdf>

<sup>5</sup> Freesat. October 2014. "Freesat winning new fans with freetime and mobile apps"

[http://cdn.freesat.co.uk/freesat/freesat\\_website/content/downloadables/freesat%20q3%20final.pdf](http://cdn.freesat.co.uk/freesat/freesat_website/content/downloadables/freesat%20q3%20final.pdf)

<sup>6</sup> However it should be noted that DTT is still commonly used for secondary sets. Ofcom estimates that 3 in 4 TV households use DTT on at least one of their sets. But there is growing evidence of these may increasingly be replaced by tablets.

and more rapidly than anticipated at the time the WACC was last considered in relation to broadcast transmission in 2010.

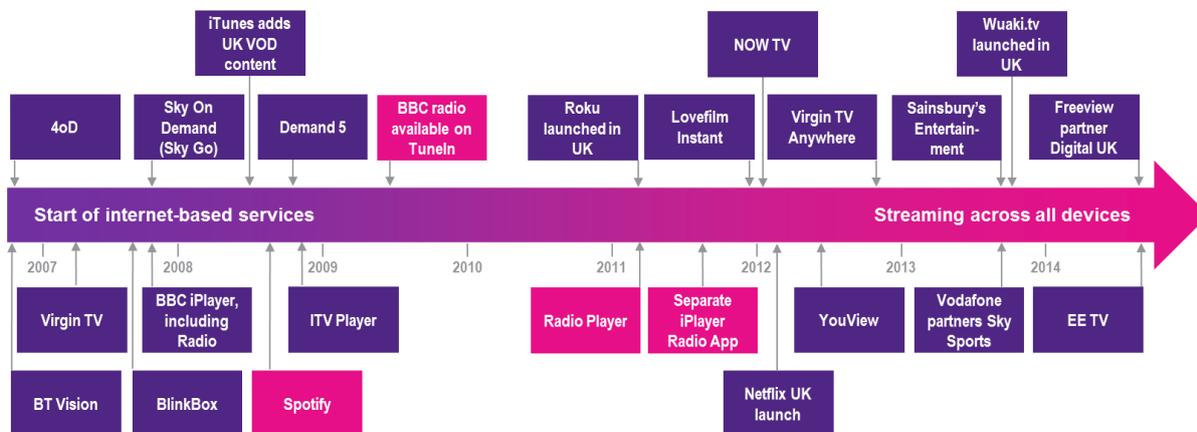
For radio, broadband has been a viable platform for some time, with 4G extending this to mobile delivery. Whilst video delivery over IP developed with basic broadband, superfast broadband supports higher definition video and multiple streams per household. Ofcom speculates that a fall in the total number of TV households from 26.3m in 2012 to 25.8m in 2013 may be attributable to households which watch audio-visual content via an IP connection only.<sup>7</sup>

Superfast fixed broadband – with speeds over 30 Mbps – was available to 73% of UK premises as of 2013 and BT is continuing to rollout fibre (predominantly fibre to the cabinet) with coverage to over 21 million households by Q2 2014.<sup>8</sup> The Government has made funding available to extend superfast broadband to 95% of homes and businesses by 2017, and is exploring options to ensure coverage of the ‘final 5%’.<sup>9</sup> The costs of carrying data over fixed networks are also progressively falling.

Mobile network operators are also extending 4G coverage from around 75% today to up to 98% by the end of 2015.<sup>10</sup> 4G not only offers higher speeds but also lower unit costs of data carriage. Additional radio spectrum availability will also increase speed, capacity and lower unit costs over time. Whilst mobile is comparatively expensive for sustained video streaming it is viable as a substitute for radio.

In parallel with the development of broadband access internet based services have also developed. Figure 2-1 shows the launch of such services in the UK.

Figure 2-1: Rise in internet-based services



TV development

Radio development

Source: Plum Consulting, Ofcom

<sup>7</sup> Ofcom. August 2014. “The Communications Market Report.” [http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/2014\\_UK\\_CMV.pdf](http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr14/2014_UK_CMV.pdf)

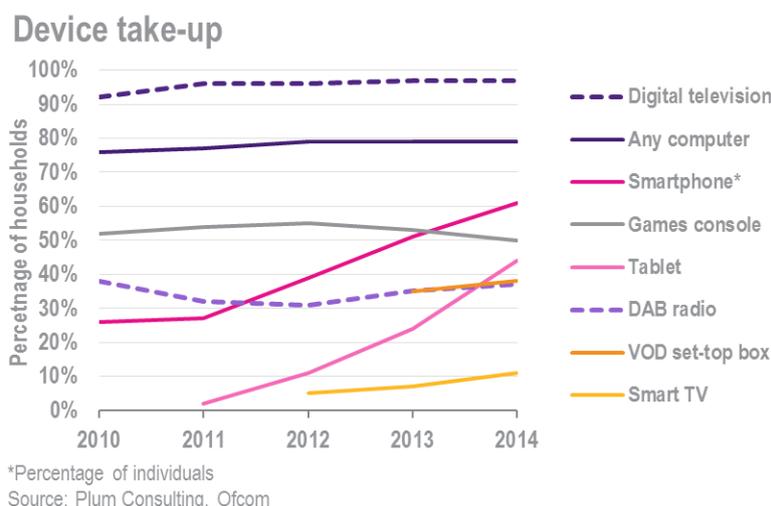
<sup>8</sup> <http://www.btplc.com/Sharesandperformance/Quarterlyresults/PDFdownloads/q214-slides.pdf>

<sup>9</sup> DCMS. August 2014. “Superfast broadband reaches 1 million more homes and businesses.” <https://www.gov.uk/government/news/superfast-broadband-reaches-1-million-more-homes-and-businesses>

<sup>10</sup> Ofcom. August 2014. “The Communications Market Report.”

The rapid adoption of smartphones and tablets (Figure 2-2) also supports a shift towards internet video and radio services.<sup>11</sup> Research by Ericsson<sup>12</sup> suggests that viewing of streamed video content is closing in on scheduled broadcast TV.<sup>13</sup>

Figure 2-2: Household take-up of connected devices and digital broadcast devices



Online services also offer expanded capabilities and flexibility for consumers (though broadcast content recorded on a personal video recorder also affords flexibility) and opportunities for broadcasters to use data collected through IP connectivity to enhance consumer propositions and improve the return from advertising.

Developments in relation to compression standards and spectrum allocation for mobile also tend to favour competing platforms relative to terrestrial broadcasting. Adoption of the more advanced H.265 compression standard offers the possibility of halving the bit rate over broadband for a given quality. Adoption of H.265 for DTT broadcast transmission would require coordination and involve longer lead times due to the replacement cycles for TV sets and set top boxes.

In relation to spectrum availability it was agreed at the World Radio Communications Conference 2012 (WRC-12) that the 700 MHz band (694-790 MHz) would be allocated to mobile on a co-primary basis with broadcasting services after WRC-15. In the UK, Ofcom has published its decision to make the 700 MHz available for mobile data use by 2022 and sooner if possible.<sup>14</sup> The funding of 700 MHz clearance is yet to be decided with Ofcom noting that:

*“It is for Government to decide whether to make public funding available to support this programme. We are discussing this question with Government at the moment, having regard to consultation responses and to our duties to citizens and consumers.”*

<sup>11</sup> Ofcom. October 2014. “One in three children now has their own tablet computer.”

<http://media.ofcom.org.uk/news/2014/media-lit-audit-oct2014/>

<sup>12</sup> Ericsson. September 2014. “TV and Media 2014: changing consumer needs are creating a new media landscape.”

<http://www.ericsson.com/res/docs/2014/consumerlab/tv-media-2014-ericsson-consumerlab.pdf>

<sup>13</sup> While scheduled broadcast TV tends to be delivered over over-the-air broadcast and cable transmission, it is increasingly also being available over broadband delivery (IPTV and OTT).

<sup>14</sup> Ofcom. November 2014. “Decision to make the 700 MHz band available for mobile data - statement”

<http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/statement/700-mhz-statement.pdf>

Further, whilst broadcasting is not currently subject to opportunity cost-based spectrum fees, such fees may apply from 2020.<sup>15</sup>

The development of competing platforms is increasing the choice available for video and radio services. The increased competitive pressure will impact on the terrestrial broadcast platform. Decreasing distribution costs of IP relative to DTT and better discoverability may make OTT delivery an increasingly attractive alternative for smaller commercial channels. Whilst long-term contracts offer some protection over time the development of alternative platforms, particularly with high coverage, involve longer-term risks for the terrestrial broadcasting platform.

## 2.2 Future of terrestrial broadcasting

The longer term allocation of both 700 MHz and sub-700 MHz spectrum is also under review in Europe. The High Level Group comprising senior executives from the mobile and broadcast sectors under the chairmanship of Pascal Lamy reported in August 2014 outlining the following proposals for the UHF band:<sup>16</sup>

- The 700 MHz band (694 to 790 MHz) should be released for mobile broadband use by 2020.
- The sub 700 MHz band should remain available for DTT use until at least 2030.
- The long-term position of the sub-700 MHz band should be reviewed before 2025.

PSB policy will also be reviewed. The current BBC Charter expires in December 2016 along with the 2010 licence fee settlement which freezes the fee level at £145.50. Formal negotiations on the charter renewal are not anticipated before the general election in 2015.

A report by Mediatique on the development of free-to-view TV forecasts a decline in DTT penetration from 43% in 2013 to 34% in 2024.<sup>17</sup> On the longer-term future of terrestrial broadcasting Ofcom note:

*“...while we cannot exclude the potential for more radical changes, our central view remains that DTT will continue to be a very important delivery technology for FTV television over the next decade. Furthermore, we do not currently expect a full switch-off of DTT until post 2030, unless there was significant policy intervention to support a more aggressive timetable for change.”<sup>18</sup>*

The Culture, Media and Sport committee is currently looking into the future of BBC, including the role of the BBC in developing technology and new ways of distributing content.<sup>19</sup> Ofcom is also conducting

<sup>15</sup> Ofcom. July 2013. “Spectrum pricing for terrestrial broadcasting - statement.”

<http://stakeholders.ofcom.org.uk/binaries/consultations/aip13/statement/statement.pdf>

<sup>16</sup> Pascal Lamy. August 2014. “Report to the European Commission - results of the work of the High Level Group on the future use of the UHF band (470-790 MHz).” <http://ec.europa.eu/digital-agenda/en/news/report-results-work-high-level-group-future-use-uhf-band>

<sup>17</sup> Mediatique. May 2014. “The development of free-to-view television in the UK by 2024.”

<http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/discussion/Mediatique.pdf>

<sup>18</sup> Ofcom. May 2014. “The Future of Free to View TV”. Page 24.

<http://stakeholders.ofcom.org.uk/binaries/consultations/700MHz/discussion/ftv.pdf>

<sup>19</sup> Commons Select Committee. October 2013. “Future of the BBC: terms of reference.”.

<http://www.parliament.uk/business/committees/committees-a-z/commons-select/culture-media-and-sport-committee/news/131022-future-of-the-bbc-tor/>

the third PSB review.<sup>20</sup> This review will look at whether the PSBs will remain resilient to structural changes affecting viewing habits and TV advertising.

It is possible that the scope and scale of PSB may change in the future and this would inevitably have an impact on the role of DTT. However such changes are likely to be in the long term (post-2030). Whilst DTT medium-term future is assured the longer-term outlook is uncertain. Further, the timeframes in question are within the term of the longest contracts and within the life of some assets used for terrestrial broadcasting.

Terrestrial broadcast assets are also financed via long-term debt, and long-term prospects do impact on the scope to issue bonds (and the cost) in the nearer term since debt must be refinanced at maturity. In particular the ratings agency FitchRatings noted that:<sup>21</sup>

*“To compensate for mid- to long-term revenue risk (due to the expiry of the contracts and overall technology risk), Fitch assesses how rapidly the transaction’s debt levels reduce.”*

As comparatively less expensive debt levels are reduced the overall weighted average cost of capital will rise. Long-term uncertainty will, therefore, have an impact on the cost of capital over the coming decade.

## 2.3 Regulation of terrestrial broadcasting

Broadcast transmission is not subject to standard utility style regulation with periodic reviews every two to five years and price control resets based on estimated revenues and the estimated WACC. Rather broadcast transmission is subject to reference offer rates (for which the estimated WACC is a factor), long-term contracts and adjudication in case of disputes.<sup>22</sup>

These differences, coupled with growing platform competition for video and audio ‘transmission’, change the nature of risk and return in ways that are relevant to an assessment of the WACC, and in particular a comparison with determinations for regulated utilities.

Existing contracts were agreed given the circumstances and anticipated circumstances at the time. They also involve long-lived assets, with depreciation extending beyond the agreed contract period (and into a future in which renewal becomes uncertain). An element of risk therefore exists that may not have been apparent at the time existing contracts were entered into. Further, overall contract terms were agreed given the WACC agreed by Ofcom in 2006.

It would therefore arguably not be appropriate to reflect a revision of the forward looking WACC today in existing contract terms. In other words, the estimated WACC is applied on a forward looking basis to reference offer terms and new contracts only.

The estimated WACC should also reflect the longer period for which the estimated applies – a decade in the case of broadcast transmission. In contrast, utilities such as water have (in effect) ‘contracts’ with customers regarding prices determined for the duration of each price control, do not face

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<sup>20</sup> <http://stakeholders.ofcom.org.uk/broadcasting/reviews-investigations/public-service-broadcasting/psb-review-3/terms-of-reference>

<sup>21</sup> FitchRatings. July 2014. “Fitch revises Arqiva’s Bonds Outlook to Negative”. [https://www.fitchratings.com/creditdesk/press\\_releases/detail.cfm?pr\\_id=837495](https://www.fitchratings.com/creditdesk/press_releases/detail.cfm?pr_id=837495)

<sup>22</sup> <http://adjudicator-bts.org.uk/undertakings.htm>

competition risk, and may be compensated for changes in demand at each periodic review.<sup>23</sup> The appropriate WACC is then the WACC applicable to the relevant price control period and is applied to all “contracts”.

Broadcast transmission is also facing growing competition as TV and radio services, which are traditionally delivered over these networks, evolve towards broadband access and internet based delivery. Compounding this are two additional factors – the constrained capacity of the broadcast network which constrains the ability to offer higher definition formats, and the risk that further radio spectrum is reallocated for mobile broadband. In the longer term these considerations involve an element of risk for the platform which differs from other utilities.

## 2.4 Conclusions

The broadcast transmission market differs in fundamental respects from other markets for which the WACC has been assessed by regulators due to rapidly developing platform competition, the presence of long-term contracts and the nature of regulation of broadcast transmission. The following are therefore relevant considerations in estimating an appropriate WACC for broadcast transmission:

- The timeframe over which an estimate of the WACC will apply is around 10 years. A longer-term perspective should therefore be adopted in interpreting movements in the cost of debt and the cost of equity. Further, decisions by other regulators should be interpreted mindful of the fact that those decisions hold for between two and five years rather than a decade.
- Whilst terrestrial broadcasting is subject to long-term contracts this does not necessarily imply that the risks are lower than for other regulated industries with shorter term regulatory review periods. The reason for this is that in other industries with little or no competition and limited demand risk the regulator can compensate at review for changes in demand by rebasing prices.
- Broadcast transmission is subject to growing competition from competing platforms, in particular broadband access coupled with IP delivery. There is also ongoing pressure for the reallocation of spectrum utilised for broadcasting for mobile use. Whilst the risk to the platform is longer-term in nature it is reflected in the near term via expectations that debt – which is lower cost than equity finance - will be reduced given longer term refinancing risk.
- Finally given the nature of long-term contracts and expectations at the time these were entered into it would arguably be inappropriate to apply any change in the estimated WACC on a retrospective basis. In other words, any revision to the estimated WACC should apply on a forward looking basis to new contracts only.

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<sup>23</sup> Whilst water companies may face some risk in relation to industrial demand there is no prospect of competition in the residential market. Further, whilst there is some demand risk this is in any case mitigated by adjustment at subsequent price control reviews. In the telecommunications market there is competition and demand risk, though it is not anticipated that alternative platforms could substitute entirely for fixed network broadband access.

### 3 Building blocks of the estimated WACC

In this section we discuss the approach to estimating the WACC and draw on market data and decisions by other regulators in the UK (summarised in Appendix A) to estimate the components of the WACC. We also consider other estimates of the WACC for broadcast transmission in Sweden and Ireland (discussed in Appendix B).

#### 3.1 Methodology for estimating the cost of capital

We employ the CAPM framework in coming to our estimate of the WACC. The CAPM methodology was used by Ofcom in 2006 to estimate the WACC for site access. It is also widely used by both UK regulators and regulators in other countries. In relation to the choice of methodology the Competition Commission stated that: “CAPM remains the tool with the strongest theoretical underpinnings” and that “none of the alternative models helps to overcome the problems that CAPM has in dealing with limited market data.”<sup>24</sup>

#### 3.2 WACC formula

Under the CAPM, the pre-tax nominal WACC is calculated as follows:

$$WACC = \frac{K_e * (1 - G)}{(1 - t)} + K_d * G$$

Where  $K_e$  is the cost of equity,  $K_d$  is the cost of debt,  $G$  is gearing,<sup>25</sup> and  $t$  is the rate of tax. In turn, the cost of equity,  $K_e$ , and the cost of debt,  $K_d$ , are given by the following two formulae respectively:

$$K_e = RFR + ERP * \beta$$

$$K_d = RFR + dp$$

Where  $RFR$  is the risk-free rate,  $ERP$  is the equity risk premium,  $\beta$  is the equity beta and  $dp$  is the company’s debt premium.

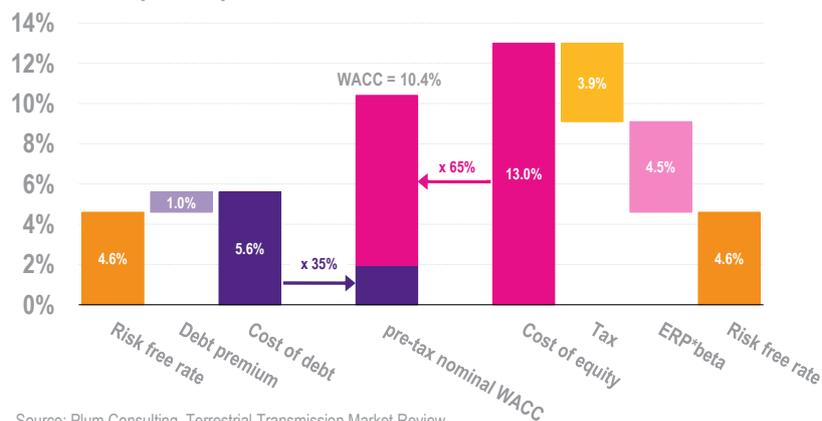
Figure 3-1 illustrates the relative magnitudes of each of these components in Ofcom’s 2006 estimate of the (nominal) pre-tax WACC, whilst Figure 3-2 discusses alternative measures of the WACC.

<sup>24</sup> Competition Commission. February 2010. “Bristol Water plc - Notice of Reference: Determination of Adjustment Factor for the period 2010-2015,” [http://webarchive.nationalarchives.gov.uk/20140402141250/http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep\\_pub/reports/2010/fulltext/558\\_appendices.pdf](http://webarchive.nationalarchives.gov.uk/20140402141250/http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/rep_pub/reports/2010/fulltext/558_appendices.pdf), pN4 para 19

<sup>25</sup> The proportion of debt funding over total debt and equity funding.

Figure 3-1:

### Building the cost of capital - Arqiva site access (2006)



Source: Plum Consulting, Terrestrial Transmission Market Review

#### Figure 3-2: A note on different versions of the WACC

There are a number of different versions of the WACC: real or nominal, and pre-tax, post-tax or 'vanilla'. The version of the WACC used, and the way it is calculated, has implications both for firms and for the value of the WACC itself.

In this paper we compute a nominal, pre-tax WACC, which we then deflate using our inflation assumption to derive a real, pre-tax WACC. The pre-tax WACC is the appropriate WACC to use for the determination of prices, and we provide both nominal and real estimates as per Ofcom (2006). In setting contract prices Arqiva utilise the real pre-tax WACC.

Further discussion on the issues relating to the various versions of the WACC can be found in the sections on inflation and tax (Sections 3.8 and 3.9 respectively).

We now examine each of the components of the WACC in turn.

### 3.3 Risk-free rate

The risk-free rate (RFR) is the rate of return required by investors from a risk-free investment. The RFR can be expressed in real or nominal terms. Regulators mostly estimate the real risk-free rate, and use it either as a building block of the WACC or to compute the nominal risk-free rate to be used in the WACC calculation.

The real RFR is usually estimated using yields on index-linked government bonds (gilts in the UK) where there is minimal risk of a government default.<sup>26</sup> However, recent yields may no longer be a good proxy for the RFR, because:

- Quantitative easing has depressed yields.<sup>27</sup>

<sup>26</sup> For example, Ofcom (June 2014), Ofwat (Jan 2014), Competition Commission (March 2014)

<sup>27</sup> [www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100101.pdf](http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb100101.pdf)

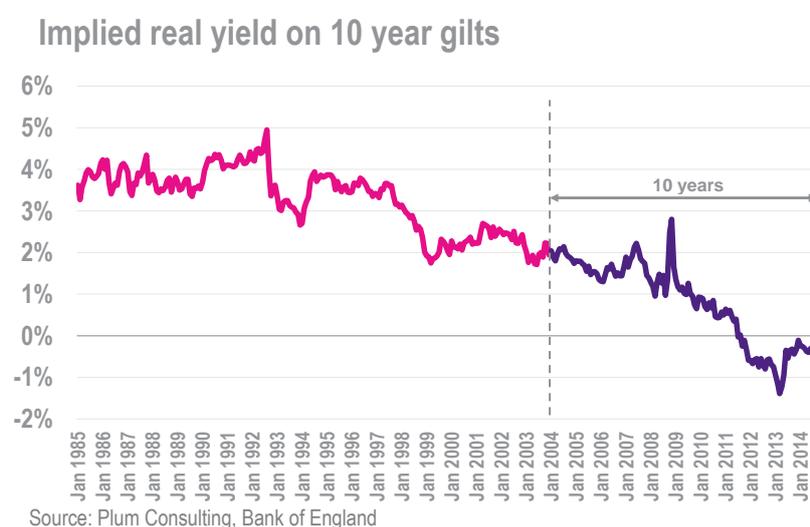
- Pension fund regulation has increased demand for ILGs, depressing yields.<sup>28</sup>

We are therefore cautious in interpreting recent data that may be affected by current market conditions, such as ILG yields. We also consider that taking a long-term view is important in this industry for the reasons set out in Section 2. Therefore, we examine regulatory decisions, historic gilt yields and forecast bank rates from a medium term perspective in coming to an estimate.

### 3.3.1 Historical gilt yields

Figure 3-3 shows 10 year gilt yields from 1985 to today.<sup>29</sup> The historical data suggest that the recent negative real yields are an anomaly, and that a long-term RFR would be higher.

Figure 3-3:



In a report for Scottish Power, NERA (2014) uses the Dimson, Marsh and Staunton database to calculate a long-run average estimate of the UK government bond rate, which implies a long-run real risk-free rate of 2.1%.<sup>30</sup>

### 3.3.2 Regulatory decisions

In recent years regulators' estimates have diverged from index-linked gilt (ILG) yields. Figure 3-4 shows ILG yield data for the past decade overlaid with recent regulatory estimates of the RFR.

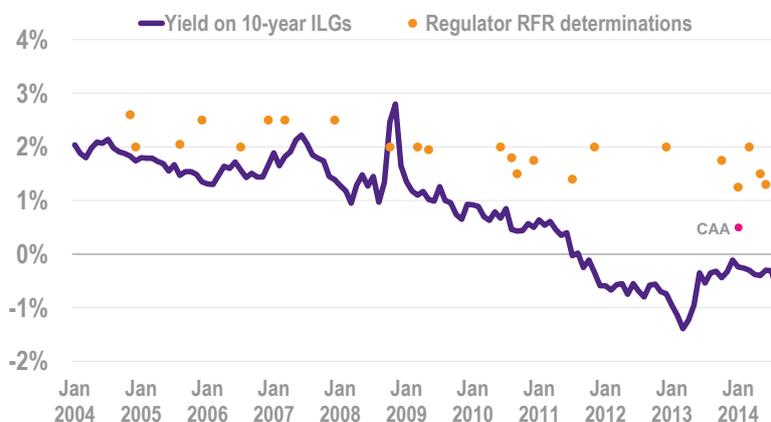
<sup>28</sup> <http://www.bankofengland.co.uk/publications/Documents/quarterlybulletin/qb060402.pdf>

<sup>29</sup> Bank of England data. <http://www.bankofengland.co.uk/statistics/pages/yieldcurve/default.aspx>

<sup>30</sup> NERA. March 2014. "The Cost of Equity for Scottish Power's Distribution Network Operators at RIIO-ED1," [http://www.spenergynetworks.co.uk/userfiles/file/201403\\_NERA\\_CostOfEquitySP\\_ED1.pdf](http://www.spenergynetworks.co.uk/userfiles/file/201403_NERA_CostOfEquitySP_ED1.pdf) p12

Figure 3-4:

### Regulator decisions on the RFR, past 10 years



Source: Plum Consulting, Bank of England, regulator websites

The revealed ‘regulatory inertia’ indicates that regulators are taking a longer-term view in their decision-making. For example, in the 2014 FAMR consultation, Ofcom was asked to provide more detail on how it arrived at its estimate of the RFR, given that observed ILG yields were low. In response, Ofcom stated that:

*“We considered that, given the current market conditions, we should exercise regulatory judgement in order to balance observed data about past or future conditions, with the need to estimate a real RFR appropriate for estimating costs in 2016/17. We said we continued to believe it was appropriate to exercise caution when interpreting data that may be distorted by current market conditions, for example, the impact of quantitative easing. In estimating the WACC, we take account of a range of data sources and in particular consider movements in the trend to assist us in exercising our regulatory judgement.”<sup>31</sup>*

Recent regulatory decisions on the RFR mostly range between 1-2%. The exception is the CAA’s January 2014 estimate of 0.5% for Heathrow and Gatwick airports. However, this is because the CAA revised their total market return (TMR) estimate downward and decided to reflect the difference via changing the RFR rather than the equity risk premium (ERP) - the CAA notes that the low RFR is:

*“...to ensure consistency and is a consequence of the reduction in the TMR [Total Market Return], and should not be viewed in isolation from the TMR and ERP”<sup>32</sup>*

In relation to terrestrial broadcasting we note that we take a longer-term view than would be appropriate in other regulated sectors with five yearly, or more frequent, reviews.

### 3.3.3 Forecast bank rate

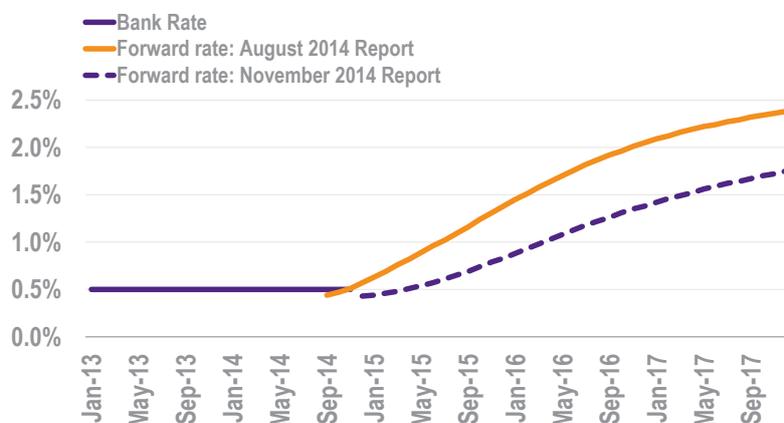
The Bank of England forecasts a rise in the bank rate to around 1.75% by 2017 (a smaller increase in comparison with the August inflation report).<sup>33</sup>

<sup>31</sup> Ofcom. June 2014. FAMR, Annex 14, A14.36-37 <http://stakeholders.ofcom.org.uk/telecoms/ga-scheme/specific-conditions-entitlement/market-power/fixed-access-market-reviews-2014/statement/>

<sup>32</sup> <http://www.caa.co.uk/docs/33/CAP%201140.pdf>

Figure 3-5: Expectations for interest rates (Bank Rate)

### UK forward interest rates



Source: Plum Consulting, Bank of England Inflation Reports, August 2014 and November 2014

### 3.3.4 Conclusion

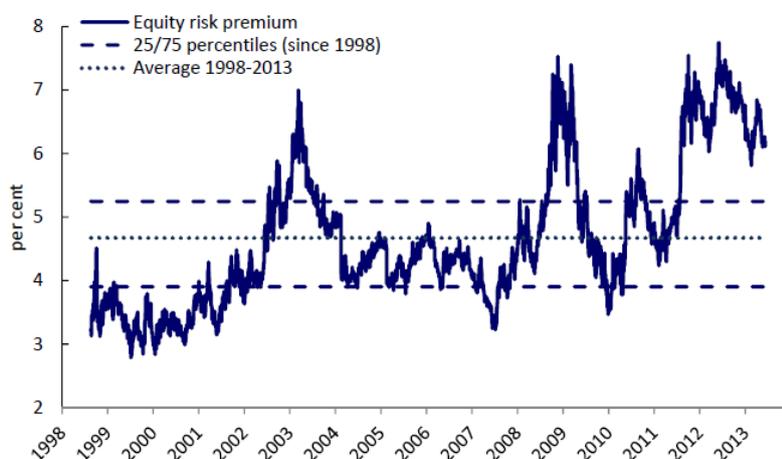
After considering the above information sources we conclude that the appropriate value for the RFR is between 1.5% and 2%. Both historical data and by the Bank of England's bank rate forecasts suggest that this is an appropriate figure.

## 3.4 Equity risk premium

The equity risk premium (ERP) is the additional return investors require to invest in the equity market, as opposed to investing in a risk-free asset. The ERP is calculated as the difference between total market returns (TMR) and the risk-free rate (the ERP therefore represents the market as a whole, and is not company-specific). The estimated ERP has been trending upward over the past decade (Figure 3-6).

<sup>33</sup> Bank of England. November 2014. "Inflation Report."  
<http://www.bankofengland.co.uk/publications/Documents/inflationreport/2014/ir14nov.pdf>

Figure 3-6: ERP estimates from the dividend discount model



Source: Bank of England<sup>34</sup>

We look at both the market data and regulatory decisions to formulate our estimate of the ERP.

### 3.4.1 Market data

The data presented in Figure 3-6 suggest an average ERP over 1998-2013 of 4.5% to 5%. Furthermore, Dimson, Marsh Staunton (2011) provide evidence on long-term equity premia relative to bonds.<sup>35</sup> They find that the UK equity risk premia over 1900-2010 have an arithmetic mean<sup>36</sup> of 5.2% and a geometric mean of 3.9%.

NERA (2014) argue that arithmetic mean is suitable when *“the forecasting period is short relative to the observation period for the historical average and there is no negative auto-correlation in returns”*.<sup>37</sup> Since we have a long observation period for historical premia (110 years) and the evidence for mean reversion *“is at best weak”*<sup>38</sup>, more weight should be placed on the arithmetic mean figure of 5.2%.

### 3.4.2 Regulatory decisions

Recent regulatory decisions have estimated an ERP of around 5% (Figure 3-7)

<sup>34</sup> Speech given by David Miles. June 2013. *“Central bank asset purchases and financial markets”*, p5 <http://www.bankofengland.co.uk/publications/Documents/speeches/2013/speech671.pdf>

<sup>35</sup> Dimson, Elroy, March, Paul, and Staunton, Mike. 2011. *“Equity Premia Around the World”*, London Business School, [http://papers.ssrn.com/sol3/Delivery.cfm/SSRN\\_ID1940165\\_code937.pdf?abstractid=1940165&mirid=1](http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1940165_code937.pdf?abstractid=1940165&mirid=1)

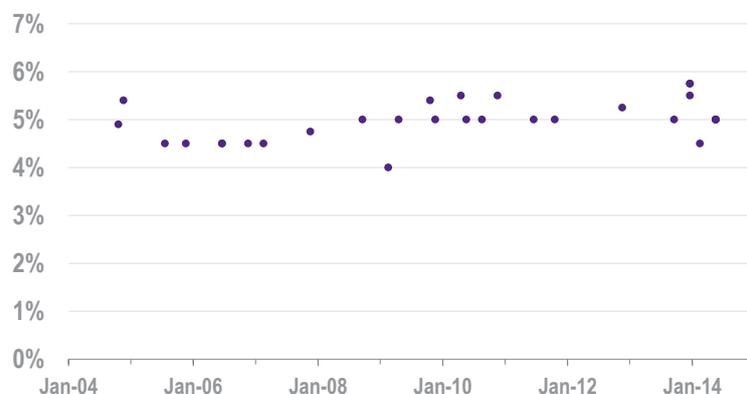
<sup>36</sup> The arithmetic mean is sum of  $n$  numbers divided by  $n$  – for example, for 2 and 8 the arithmetic mean is  $(2+8)/2 = 5$ . The geometric mean is the  $n$ th root of the product of  $n$  numbers – for example, for 2 and 8 the geometric mean is  $\sqrt{(2*8)} = 4$

<sup>37</sup> [http://www.spenergynetworks.co.uk/userfiles/file/201403\\_NERA\\_CostOfEquitySP\\_ED1.pdf](http://www.spenergynetworks.co.uk/userfiles/file/201403_NERA_CostOfEquitySP_ED1.pdf), p15

<sup>38</sup> Dimson et al (2011), p13

Figure 3-7:

### Regulator determinations: ERP



Source: Plum Consulting, regulator websites

Some regulators have estimated an ERP above 5% in recent years. However, we need to consider both the ERP and RFR estimates in tandem to ensure that they are consistent with total market returns, since ERP and RFR tend to move in opposite directions.<sup>39</sup>

We note that those regulators estimating higher ERPs (for example, the CAA, which estimated an ERP of 5.75% in 2014) have tended to counterbalance the higher ERP with a comparatively low RFR. We therefore need to keep our estimate of the longer-term RFR in mind when estimating the ERP.

Considering historical market data, regulatory decisions and our estimate of the RFR, we conclude that a range of 4.5% to 5% for a longer-term ERP is appropriate. Taken together, our estimates of the RFR and ERP imply a total equity market return of between 6% and 7%.

## 3.5 Debt premium

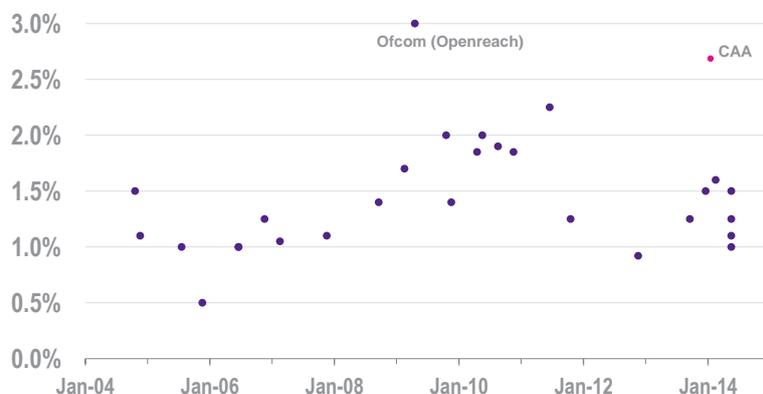
The cost of debt is the sum of the RFR and a premium reflecting the additional risk of corporate debt over government debt. A company's premium will represent a number of factors, including the company's credit rating and the outlook for the industry.

Regulators' estimates of the debt premium are shown in Figure 3-8. The CAA estimate is highlighted again since the high level of the debt premium (as inferred by Plum) is likely a consequence of the CAA's low RFR estimate.

<sup>39</sup> Ofcom noted in 2014: "...in the 2013 BCMR Statement, we considered the link between the ERP and the risk-free rate. We noted that the risk-free rate and the ERP tended to move in opposite directions." Ofcom FAMR 2014, Annex 14, para 14.131

Figure 3-8:

### Regulator determinations: debt premium



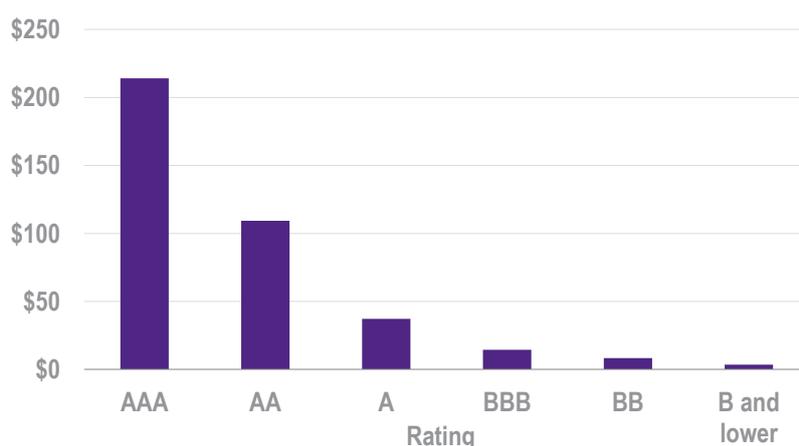
Source: Plum Consulting, regulator websites

Note: some regulators did not directly report their assumed debt premium. In those cases we have inferred a debt premium based on their total cost of debt and risk free rate estimates.

We assume that a BBB credit rating is the appropriate credit rating for terrestrial broadcasting. Terrestrial broadcasting is too small to achieve an A rating (credit ratings partly reflect company size as shown in Figure 3-9), and while a BBB+ rating could lower the cost of debt it would reduce the potential gearing achievable. On the other hand, a BBB- rating (or lower) would make it harder to fund new investments. We note that Arqiva is currently rated BBB.

Figure 3-9:

### Average market cap for S&P 500 companies (\$bn)

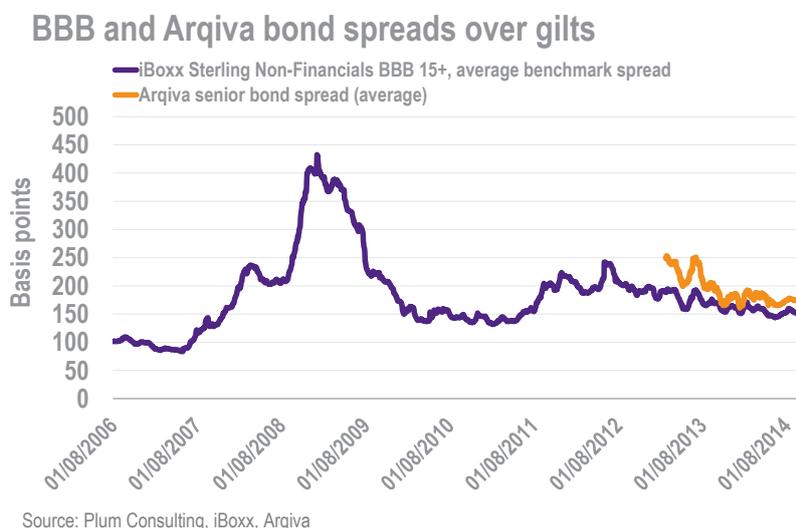


Source: Plum Consulting, Standard & Poor's

Accordingly, we examine the spread of BBB-rated bonds over gilts. We note that the 8-year spread (Figure 3-10) average is 185 basis points over gilts. However, Arqiva's bonds have shown spreads on average 20 basis points higher than this (Figure 3-10). We also allow an additional 15 basis points to

cover debt issuance fees and the new issuance premium (following discussions with Arqiva). We conclude an appropriate value for the debt premium is 2.2%.

Figure 3-10:



### 3.6 Gearing

The assumed percentage of debt used in calculating the WACC is known as the gearing. Ofcom (2006) state that:

*“Under the CAPM a firm can potentially lower its overall cost of capital by increasing its gearing ratio. This is because debt is generally cheaper than equity as a result of tax advantages to debt. It is not, however, optimal for a firm to increase its level of gearing indefinitely. This is because, as the amount of debt in the business increases, so does the risk that the firm will not be able to pay all of its debtholders. As this happens, debtholders will demand a higher return”<sup>40</sup>*

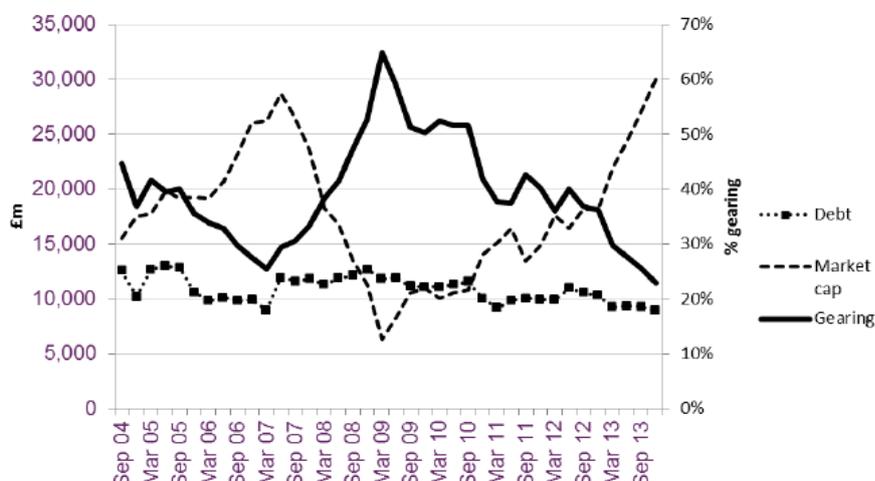
A firm that faces low levels of risk will therefore be more able to sustain a high gearing ratio. It can commit to taking on more debt as there is a low probability it will be unable to repay its debt.

Regulators’ estimates of gearing depend on the industry they are regulating. Utility companies are estimated to have high gearing ratios - future demand for their services is relatively certain. On the other hand, BT has generally had a lower gearing ratio (see Figure 3-8) as have mobile operators.<sup>41</sup>

<sup>40</sup> Ofcom. July 2006. “Terrestrial Transmission Market Review”, Annex 1, IX

<sup>41</sup> Ofcom, June 2014, “Mobile call termination market review 2015-18,” <http://stakeholders.ofcom.org.uk/consultations/mobile-call-termination-14/> Annex 14 Figure A14.2 for estimates of the gearing level of MCPs

Figure 3-11: BT's gearing over the last ten years



Source: Data provided by Brattle.

In 2006, Ofcom estimate a gearing of 35% for site access, on the grounds that (a) 35% falls in between utility companies' gearing ratios (typically 50%) and Crown Castle's estimates of the gearing ratios for Macquarie Communications Infrastructure Group and Crown Castle International (around 20%) and (b) 35% was "approximately equal to BT's current level of gearing".<sup>42</sup>

We now look specifically at Arqiva's business to inform our gearing estimate. Arqiva's business consists of terrestrial broadcasting, satellite, digital platforms, telecoms and smart metering/M2M divisions (terrestrial broadcasting accounts for c.30% of Arqiva's revenues).

Table 3-1: Arqiva Broadcast Holdings Limited financing

	£m
Shareholder financing (equity)	2,243.3
Bank loans	1,023.5
Senior bonds	1312.5
Junior bonds	600
Finance lease obligations	14
Accretion on inflation-linked swaps <sup>43</sup>	59.9
<b>Total</b>	<b>5253.2</b>
<i>Of which, investment-grade debt</i>	<i>2,409.9</i>
<i>Investment-grade debt / (investment-grade debt + equity)</i>	<i>53%</i>

Source: Arqiva Broadcast Holdings Limited Annual Report 2014

<sup>42</sup> Ofcom. July 2006. "Terrestrial Transmission Market Review", Annex 1, XI

<sup>43</sup> From discussions with Arqiva

As discussed in Section 3.5, we consider that a BBB credit rating is appropriate for a terrestrial broadcaster. Accordingly, to estimate gearing we consider Arqiva's investment-grade debt (i.e. debt BBB and higher) only. This is because terrestrial broadcasting alone would not be able to support sub-investment grade debt. In our calculation we therefore we exclude Arqiva's junior bonds (rated B-). We estimate the resulting investment-grade gearing to be 53%.

Fitch has stated that it would expect to see the business deleveraging to around 3x earnings over the next ten years.<sup>44</sup> With Arqiva's EBITDA of £407m in 2014 this implies an investment grade debt of c. £1.2bn. Assuming the enterprise value remains the same this would suggest a gearing of 26% in ten years. With a steady deleveraging, the average gearing over the 10 years would therefore be c. 39%.

We do not consider that a broadcast transmission business would be able to maintain a higher gearing than Arqiva as a whole. Such a business would face specific technology and competition risks. For these reasons it is likely that the 39% figure represents an upper limit of the achievable gearing by a broadcast transmission business over the coming ten years.

We therefore conclude that an appropriate value for the gearing is 35%. This is consistent both with the historic review and a forward-looking view of Arqiva's business.

### 3.7 Equity beta

A company's equity beta measures the movement in returns from its shares relative to the movements in the return from a market portfolio. The average company in the market would have an equity beta of 1.0. A beta greater than 1.0 would imply that the investment's returns respond more than one-for-one with market returns.

In the 2006 review of the cost of capital for site access, Ofcom used an equity beta estimate of 1.0 (the average for the market). We do not believe there is a compelling case for deviating from Ofcom's estimate.

If we use the average asset beta of tower and mast companies and apply our estimate of gearing, we derive an equity beta estimate close to 1.0. These parameters are related via the following formula:

$$Equity\ beta = \frac{Asset\ beta}{(1 - gearing)}$$

Using Europe Economics' estimate of the two-year asset beta (0.55) along with our estimate of gearing, we compute an equity beta of 0.85. However, a longer term view of tower and mast asset betas (such as the five-year asset beta) suggests a higher asset beta (e.g. 0.6 or 0.65) in which case the derived equity beta approaches 1.0.

Further, although we consider that the risks of broadcast transmission have increased due to platform competition and reduced expectations regarding spectrum availability, we note that these risks are not necessarily reflected via the equity beta (which is a measure of covariance with the market as a whole), or have an impact which may be ambiguous.

For example, the risk to future revenue may be greater in a better performing economy if higher incomes encourage more adoption of, and investment in, high speed broadband, new devices including tablets and IP set top boxes and in IP video services. This could imply a negative correlation

<sup>44</sup> [https://www.fitchratings.com/creditdesk/press\\_releases/detail.cfm?pr\\_id=837495](https://www.fitchratings.com/creditdesk/press_releases/detail.cfm?pr_id=837495)

between GDP growth, the stock market generally and the value of broadcast transmission i.e. a reduced beta.

Rather such risks may be reflected through (a) the debt premium, and (b) a lower accepted level of future gearing. Additional risk not adequately captured by these elements, such as the risk that assets will not be fully recovered via future contract revenues, may be compensated for outside of WACC estimation by aiming up in setting the estimated return used for price setting to reflect asymmetric risk.<sup>45</sup>

### 3.8 Inflation

A number of regulators use the real risk-free (i.e. the rate without accounting for inflation) rate as a building block in the CAPM formula to generate a real WACC estimate. Ofcom adopts an alternative approach (used both in 2006 and in the 2014 FAMR consultation), which is to compute a nominal pre-tax WACC (using the nominal risk-free rate) and then deflate this to derive a real pre-tax WACC.

Figure 3-12 contains a discussion of the approach to nominal versus real WACC estimation. We use the Ofcom approach of deflating the nominal pre-tax WACC to derive the real equivalent using the Fisher relationship<sup>46</sup>.

#### Figure 3-12: Real vs. nominal WACC: dealing with inflation

A nominal WACC will allow for inflation, and is calculated by using the nominal risk-free rate as a building block when constructing a WACC estimate. In turn, the nominal risk-free rate can be calculated in two ways: either by estimating a real risk-free rate and combining it with an estimate of inflation, or by estimating the nominal risk-free rate directly (we adopt the former approach).

A real WACC can be computed either by deflating the nominal WACC (an approach used by Ofcom and in this paper) or directly, by using the real risk-free rate as a building block when constructing the WACC estimate (favoured by other regulators including the CAA<sup>47</sup>). The two methods can give different results, but, as Oxera demonstrate, the former is less likely to lead to under-recovery.<sup>48</sup>

In the 2014 FAMR, Ofcom assumes an RPI forecast of 3.2%, based on the three sources in Table 3-2.

Table 3-2: Sources for Ofcom’s RPI estimate in the FAMR 2014

Forecast based on:	HMT 2016/2017 (forecasts as at Feb 2014)	Implied inflation on forward rates for 5 and 10 year bonds	Long run RPI-CPI wedge
RPI estimate	3.2%	3.2 to 3.5%	3.3 to 3.5%

Source: Ofcom, FAMR 2014 Table A14.9

<sup>45</sup> Competition Commission, [https://www.caa.co.uk/docs/5/erqdocs/ccreport\\_appf.pdf](https://www.caa.co.uk/docs/5/erqdocs/ccreport_appf.pdf), para 150-155

<sup>46</sup> The Fisher relationship:  $\text{real rate} = [(1 + \text{nominal rate}) / (1 + \text{inflation rate})] - 1$

<sup>47</sup> <http://www.caa.co.uk/docs/33/CAP%201140.pdf>

<sup>48</sup> Oxera. 2005. “Which WACC when? A cost of capital puzzle”, <http://www.oxera.com/Latest-Thinking/Agenda/2005/Which-WACC-when-A-cost-of-capital-puzzle.aspx>

However, in the 2014 mobile call termination market review,<sup>49</sup> Ofcom computes a long-run estimate of RPI inflation using just the long-run RPI-CPI ‘wedge’ (that is, the Bank of England’s target CPI inflation rate of 2% plus the estimated long-run difference between RPI and CPI of 1.3%<sup>50</sup>). In the mobile call termination market review Ofcom states that:

*“We note that our RPI assumption of 3.3% differs slightly from the 3.2% rate used in the 2014 FAMR Draft Statement, which was concerned with forecasting out to 2016/17. Given the long-run nature of the 2014 MCT model we consider that we should use the best available long-run estimate of RPI consistent with the long-run CPI estimate of 2%.”*

Similarly, we use the Bank’s long-run estimates for the RPI of 3.3%.

### 3.9 Tax

The tax rate has a material impact on the estimated WACC, as set out in Figure 3-13

#### Figure 3-13: The impact of tax on the WACC

The WACC is computed using the cost of equity and the cost of debt. The cost of equity is a post-tax measure – it is the return required by equity investors *after* corporation tax deductions. The cost of debt, on the other hand, is pre-tax, since interest on debt is tax-deductible. Calculating a WACC from the (post-tax) cost of equity and the (pre-tax) cost of debt gives the ‘vanilla’ WACC.

To compute a pre-tax WACC, we have to convert the post-tax cost of equity to a pre-tax cost of equity. This is done by multiplying the post-tax cost of equity by a tax ‘wedge’ (in effect, adding an increment onto the cost of equity). Note that this will increase the cost of equity (and hence the WACC). This is because companies pay taxes on profits, so the pre-tax cost of equity must be larger to account for a company’s tax liabilities.

For example, say a company’s equity investors require a return of 7%. This is the return a company must deliver to those investors *after* paying tax on its profits. The pre-tax cost of equity is given by:

$$\text{Pre – tax cost of equity} = \text{Post – tax cost of equity} \times \frac{1}{(1 - \text{tax rate})}$$

If the tax rate is 30%, then the pre-tax cost of equity will therefore be  $7\% \times 1/(1-30\%) = 10\%$ . From this 10% the company must fund both its tax commitments and still provide equity investors with a return of 7%. A lower tax rate will therefore mean a lower pre-tax WACC, since a lower return is required to meet both tax liabilities and equity investors’ requirements. The CAA also observed a fall in their estimated (real) pre-tax WACC for Heathrow and Gatwick, which they largely ascribe to the tax rate reduction:

*“The WACCs for both airport operators have reduced compared to the Q5 settlement of 6.2% for HAL and 6.5% for GAL. The reductions mainly reflect reductions in corporate tax, the cost of debt and TMR since the previous settlement (2008/9 to 2013/14).”*

A reduction in the tax rate from 30% in 2006 to 20% in 2015 would, considered in isolation, result in a reduction of the 2006 Ofcom estimate of the real pre-tax WACC for broadcast transmission from 7.71% to 6.64%.

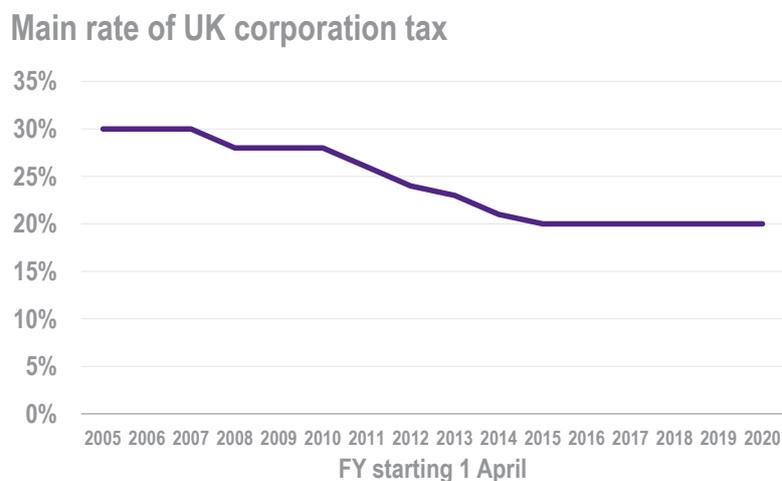
Since 2007, corporation tax rate has fallen from 30% and to an anticipated 20% in 2015 (Figure 3-14).

<sup>49</sup> <http://stakeholders.ofcom.org.uk/consultations/mobile-call-termination-14/>

<sup>50</sup> Bank of England Inflation Report. Feb 2014.

<http://www.bankofengland.co.uk/publications/Documents/inflationreport/2014/ir14feb.pdf>

Figure 3-14:



Source: Plum Consulting, IFS, HMRC

In estimating the WACC we assume that corporate tax rate will remain at 20%. However, given the duration of WACC estimate flowing from this review we propose that any future movement in the corporate tax rate that would impact the WACC by ½ percentage point or more be considered as grounds for a further review of the WACC prior to 2025.

## 4 Conclusion regarding the assumed return on capital

Having considered the market and regulatory context, market data and other recent regulatory decisions we now come to a view regarding the appropriate WACC for broadcast transmission to apply during the period 2015-2025. Before reaching a conclusion based on our assessment of financial market data and decisions by other regulators we consider overall anticipated risk and return over the period 2015-2025 and the balance of costs in relation to upside and downside risk in setting the WACC.

### 4.1 The nature of risk, overall risk and return

The opportunity cost of capital which investors would expect to be met when investing in broadcast transmission depends on market returns, the mix of debt and equity and the extent of non-diversifiable risk associated with broadcast transmission business. However, the actual return to investors depends on anticipated cash flows - revenues less costs - associated with broadcast transmission; and the duration of cash flows. Risk therefore enters into consideration of whether investment is justified in a number of ways:

- Non-diversifiable or systemic risk relates to risk that is correlated with the market as a whole and cannot therefore be mitigated by holding a portfolio of stocks. Systemic risk is reflected via the beta coefficient in the WACC formula. An example of a non-diversifiable risk would be a revenue or cost element which is correlated with GDP, which in turn is correlated with equity returns generally. A diversifiable risk is specific to the business.
- Via the assessment by ratings agencies and bond holders of risk and therefore both the quantity of debt and the price of debt. Higher risk could see lower bond ratings and a higher price of debt, and/or pressure to reduce debt over time - thereby increasing the proportion of more expensive equity and the overall WACC. Both diversifiable and non-diversifiable risk may impact on price of debt or the share of debt and therefore the WACC.
- Finally there may be an element of risk that is not reflected via the WACC formula but nevertheless reduces expected revenues and returns. For example, if there is a probability that a business will be displaced by technological change and competition at some point in the future then this risk may be specific but nevertheless relevant to equity holders since it could truncate future returns. Such risk may be reflected via an adjustment to expected future cash flows and offset by higher prices in the near term. However, it is not necessary reflected in the WACC and may therefore be neglected in assessing regulated returns.

We consider that the nature of specific technology and competition risk, and the changed nature of such risk over time, is a relevant consideration in relation to broadcast transmission. In particular the risk of reallocation of 700 MHz) and potentially sub-700 MHz) spectrum for mobile may have been considered low and the anticipated rollout of fibre slower and more partial than is now the case.

Further, we consider it reasonable to expect that steps were not taken in the past to offset such risk, for example via higher contract prices than an assessment based on expected revenues, likelihoods of future contract renewal, asset lives (prices were calculated assuming asset lives exceeded contract lives) and the WACC might have suggested at the time. This is both because expectations of risk have changed and because regulators are reluctant to allow for risk beyond their direct impact via the WACC.

We conclude that there is an element of risk in relation to future cash flows that is not fully reflected via the WACC formula and is better thought of as biasing cash flows downwards relative to an estimate based on a business as usual projection. One way of allowing for this risk is to use a cost of capital assumption in calculating prices which is higher than the best central estimate of the WACC.<sup>51</sup>

## 4.2 Upside and downside costs in relation to the WACC

In an unregulated market the WACC is endogenous and can respond dynamically to changes in market circumstances and in response to the portfolio of investments and returns comprising the business.

With regulation an estimate of the WACC is made and a number for the WACC (which may differ from the best estimate of the WACC) is then applied alongside other assumptions to determine allowed prices. Prices, with possible automatic adjustment for inflation and assumed efficiency gains, are then fixed for a period of time. There may also be provision for error correction, for example, if volumes differ materially from those assumed when the price control was set.

This implies that the actual opportunity cost of capital may differ from the WACC (since estimation is approximate) and that the actual WACC and estimated WACC – even if initially the same - may diverge before subsequent review. The fact that the WACC is exogenous may also imply that there is “right” WACC that could incentivise efficient investment when there is a portfolio of options (which is almost always the case particularly if there is flexibility over the timing of investment).<sup>52</sup>

The combination of uncertainty and possible asymmetry in terms of the costs of upside and downside errors in setting the WACC implies that the best (economically efficient) WACC may differ from the best estimate of the WACC.

Whether regulators allow for upside and downside costs depends on the nature of the business and the nature of regulation i.e. whether there is scope for correction of errors between reviews. In relation to airports the Competition Commission concluded that (paragraphs 150 to 152):<sup>53</sup>

*“Given the uncertainties in cost of capital estimates, we considered the cost of setting an allowed WACC that was too high or too low. If the WACC is set too high then the airports’ shareholders will be over-rewarded and customers will pay more than they should. However, we consider it a necessary cost to airport users of ensuring that there are sufficient incentives for BAA to invest, because if the WACC is set too low, there may be underinvestment from BAA or potentially costly financial distress. Annex 5 illustrates how the weight to be put on these costs will flow into the decision-making process.*

*Given the significance to customers of timely investment at Heathrow and Gatwick, we have given particular weight to the cost of setting the allowed WACC too low. Most importantly, we note that it is difficult for a regulator to reduce the risks of underinvestment within a regulatory period.*

<sup>51</sup> Ruback, Richard S. October 2010. “Valuation when Cash Flow Forecasts are Biased,” <http://www.hbs.edu/faculty/Publication%20Files/11-036.pdf>

<sup>52</sup> Williamson. 2009 “The regulation of next generation access networks and the draft Commission Recommendation”, In NEREC – Monitoring EU telecoms policy. [www.nerec.es/wpcontent/files/NEREC\\_report.pdf](http://www.nerec.es/wpcontent/files/NEREC_report.pdf)

<sup>53</sup> [https://www.caa.co.uk/docs/5/ergdocs/ccreport\\_appf.pdf](https://www.caa.co.uk/docs/5/ergdocs/ccreport_appf.pdf)

*Taking these factors into account, we concluded that the allowed WACC should be set close to the top of our range.”*

Given the nature of the broadcast transmission market and regulation of the market we consider that asymmetric costs apply in setting the WACC too low versus too high and that this is further reason to aim up in setting the WACC.

### 4.3 WACC estimate for 2015-2025

We have used our estimates of the WACC components in the previous section to estimate a WACC for broadcast transmission. The components and the resulting WACC are summarised in Table 4-1 below, along with Ofcom’s 2006 estimate.

Table 4-1: Estimated WACC for 2015-2025 versus Ofcom 2006 estimate

	Ofcom (2006)	Revised lower bound	Revised upper bound
Risk free rate (real)	2%	1.5%	2%
Risk free rate (nominal)	4.6%	4.8%	5.4%
Equity risk premium	4.5%	4.5%	5%
Equity beta	1.0	1.0	1.0
Gearing	35%	35%	35%
Debt premium	1%	2.2%	2.2%
Corporation tax rate	30%	20%	20%
Inflation	2.5%	3.3%	3.3%
Cost of debt (pre-tax)	5.6%	7.0%	7.6%
Cost of equity (post tax)	9.1%	9.3%	10.4%
<b>Nominal pre-tax WACC</b>	<b>10.4%</b>	<b>10.1%</b>	<b>11.1%</b>
<b>Real pre-tax WACC</b>	<b>7.7%</b>	<b>6.6%</b>	<b>7.5%</b>

Source: Plum Consulting

Our estimated real pre-tax WACC range (6.6%-7.5%) is below Ofcom’s 2006 estimate of 7.7%. This is due to the fall in the rate of corporation tax, partially offset by an increase in the estimate of the equity risk premium (if we consider only the impact of the tax fall on the 2006 Ofcom estimate the resultant real pre-tax WACC would be 6.6%).

### 4.4 Assumed return on capital for price setting purposes

The assumed return on capital for price setting purposes may differ from the estimated WACC in order to reflect other relevant considerations that would not necessarily be reflected via the CAPM formula. In particular, expected revenues may be lower than projected revenues due to asymmetric risk. In

relation to broadcast transmission longer-term risks, due to growing platform competition and competition for spectrum resources, are relevant considerations; particularly given the absence of the periodic price resetting mechanisms which exist for other regulated businesses.<sup>54</sup>

Having regard to the nature of the risks in the broadcast transmission market and the nature of regulation we propose that the WACC applied in price setting be at the upper end of the estimated range for the WACC i.e. 7.5% real pre-tax.

## 4.5 Possible triggers for review prior to 2025

Overall we consider it unlikely that developments in the capital markets would justify review of the WACC prior to 2025. In particular, whilst historically interest rates have fallen the estimated cost of equity has risen, lending a degree of stability to the overall market return.

However, policy decisions are a different matter and it may be appropriate to include triggers for review if significant changes which impact the risk environment in relation to broadcast transmission or the WACC via the corporate tax rate were to occur.

The reason the proposed WACC has been reduced relative to the WACC set in 2006 by Ofcom is the reduction in the corporate tax from 30% to 20% in 2015. Should the tax rate vary materially in future this might be grounds for review. We propose that a future variation in the corporate tax rate of around 5 percentage points or more (i.e. with triggers at 15% and 25%), which would change the pre-tax WACC by 0.5 percentage points, may be grounds for review.

We also propose that policy decisions that would impact on the longer term viability of terrestrial broadcasting, for example, further reallocation of spectrum below 700 MHz and/or a material change to public service broadcasting policy which impacted demand for terrestrial broadcasting, might be grounds for review.

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<sup>54</sup> Such price resetting would in any case be of limited value if a platform was progressing losing business due to platform competition.

## Appendix A: Recent UK regulatory estimates of the WACC

Regulator	Review	Date	Status	WACC (real, pre-tax)*	Real RFR	ERP	TMR
Ofwat	Price Control Determination	Dec 2014	Final	4.1% <sup>†</sup>	1.25%	5.5%	6.75%
Ofgem	RIIO-ED1 Electricity Transmission (Local)	Nov 2014	Final	4.3%	1.5%	5%	6.5%
Ofcom	Fixed Access Market Review (WACC for BT Group)	Jun 2014	Consultation	6.6%	1.3%	5%	6.3%
Ofcom	Mobile Call Termination Review	Jun 2014	Consultation	6.9%	1.3%	5%	6.3%
Competition Commission	Northern Ireland Electricity Limited	Mar 2014	Final	4.9%	1.25%	4.5%	5.75%
CAA	Heathrow and Gatwick Airports	Feb 2014	Final	5.35% (Heathrow) 5.7% (Gatwick)	0.5%	5.75%	6.25%
ORR	Network Rail	Oct 2013	Final	4.9%	1.75%	5%	6.75%
Ofgem	National Grid Electricity Transmission and National Grid Gas	Dec 2012	Final	5.2%	2%	5.25%	7.25%
Ofcom	LLU and WLR services (WACC for BT Group)	Mar 2012	Final	6.1%	1.4%	5%	6.4%
Ofgem	Gas and Electricity Transmission Price Controls (one-year rollover)	Nov 2011	Final	5.8%	2%	5%	7%
CAA	NATS	Dec 2010	Final	7%	1.75%	5.25%	7%
Competition Commission	Bristol Water	Sep 2010	Final	6.1%	2%	5%	7%
Ofcom	Site access	Jul 2006	Guidance	7.7%	2%	4.5%	6.5%

\* For some reviews, only vanilla WACCs were reported. We have adjusted them by calculating real pre-tax WACCs using the same inputs.

<sup>†</sup> Wholesale. Calculated by applying the 14 basis point retail margin adjustment to a pre-tax WACC.

## Appendix B: Other estimates in relation to broadcast transmission

Aside from the Ofcom review of 2006, we are aware of two other regulatory reviews of a WACC for broadcast transmission (though both were assessed for integrated broadcaster and broadcast transmission businesses):

- A 2007 study by Copenhagen Economics for PTS on the WACC for broadcasting operators in Sweden, which estimated a pre-tax nominal WACC of 8.37%.<sup>55</sup>
- A 2014 review of the WACC in three sectors (including broadcasting) by ComReg, which estimated a pre-tax nominal WACC for broadcasting of 8.68%.<sup>56</sup>

The more recent estimate in Ireland is summarised in Table B-1. Key differences in Ireland versus the UK include a lower corporate tax rate and lower assumed equity beta estimate (pushing the estimate down) and lower (notional) gearing estimate (pushing the estimate up).

Table B-1: ComReg estimate in Ireland

Component	Low estimate	High estimate	Point estimate
Risk free rate (real)	1.75%	2.5%	2.3%
Risk free rate (nominal)	3.28%	4.55%	4.09%
Equity risk premium	4.6%	5.25%	5%
Equity beta	0.53	0.80	0.73
Gearing	25%	25%	25%
Debt premium	1.5%	2.25%	1.75%
Corporation tax rate	12.5%	12.5%	12.5%
Inflation	1.5%	2%	1.75%
Cost of debt (pre-tax)	4.78%	6.8%	5.84%
Cost of equity (post tax)	5.73%	8.75%	7.76%
Nominal pre-tax WACC	6.11%	9.20%	8.11%
Nominal pre-tax WACC after "aiming up" <sup>57</sup>			8.68%
Real pre-tax WACC			6.8%

<sup>55</sup> Copenhagen Economics. Feb 2007. "WACC for Broadcasting – Teracom,"

<https://www.pts.se/upload/Documents/SE/WACCforBroadcasting.pdf>

<sup>56</sup> ComReg. April 2014. "Review of Cost of Capital (Mobile, Fixed Line, Broadcasting),"

<http://www.comreg.ie/fileupload/publications/ComReg1428.pdf>

<sup>57</sup> ComReg "aim up" their WACC estimate towards the upper end of the estimated range by increasing several components (the nominal risk free rate, the asset beta and the debt premium), to reflect "the asymmetry of consequences between those of setting the cost of capital too low and those of setting it too high". The "aiming up" implies an uplift of ~7% to the point estimate nominal pre-tax WACC.

Europe Economics, in their study into broadcast cost of capital for ComReg (2014)<sup>58</sup>, estimate an equity beta by estimating an asset beta and a debt beta. The asset beta is estimated from regulatory precedent and two-year asset betas for tower and mast companies and the debt beta is set to zero. The equity beta can then be computed as follows:

$$Equity\ beta = \frac{Asset\ beta}{(1 - gearing)}$$

Using their estimates of the asset beta (0.55) and gearing (25%) Europe Economics derive an equity beta of 0.73. We note that our estimate of gearing is higher (see 3.6), at 35%. Applying our estimate of gearing and using the same asset beta we derive an equity beta of 0.85. However, a longer term view of tower and mast asset betas (such as the five-year asset beta, shown in Figure B-1) might suggest a higher asset beta (say 0.6 or 0.65), in which case our derived equity beta approaches 1.

Figure B-1: Five year asset betas for tower and mast companies



Source: Bloomberg and Europe Economics calculations.

<sup>58</sup>Europe Economics. April 2014. "Cost of Capital for Mobile, Fixed Line and Broadcasting Price Controls," <https://www.comreg.ie/fileupload/publications/ComReg1428a.pdf>