

The cost of capital in relation to broadcast transmission

A report for Office of the Adjudicator - Broadcast Transmission Services

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Table of Contents

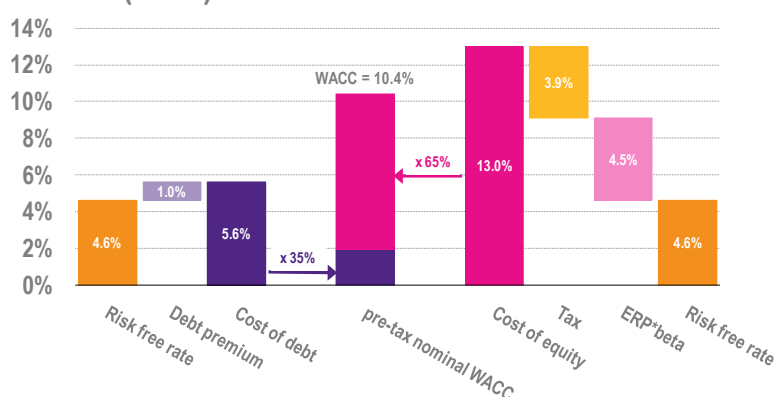
Executive Summary.....	1
1 Introduction.....	3
2 Purpose and nature of regulatory cost of capital	4
2.1 Purpose of the cost of capital estimate	4
2.2 Relationship to interest rates	4
2.3 Relationship to cash flows	5
2.4 Relationship to risk.....	6
2.5 Relationship to regulation	6
2.6 Conclusion	7
3 Broadcast transmission market.....	8
3.1 Extent of competition.....	8
3.2 Timing of debt issuance in relation to broadcast transmission	9
3.3 Contractual terms for broadcast transmission	9
3.4 Possible analogue radio switch off.....	12
3.5 Conclusion	13
4 Capital markets	14
4.1 Cost of debt.....	14
4.2 Cost of equity and the WACC	15
4.3 Comparison of regulators' estimates of the WACC	16
4.4 Comparison of regulators' estimates of the common inputs to the WACC.....	17
4.5 Regulators' comments on the impact of the financial crisis	18
4.6 Comparison of Ofcom decisions regarding copper access and broadcast transmission	19
4.7 Conclusion	21
5 Is a review of the estimated cost of capital now justified?	23
5.1 Might the estimated WACC differ materially?	23
5.2 Would a change in the WACC have a material impact?	24
5.3 Would a review in the near term future involve materially lower uncertainty?	24
5.4 Conclusion	24
Appendix A: WACC estimates by regulators.....	25

Executive Summary

Ofcom last published the estimated pre-tax nominal cost of capital for broadcast transmission in 2006. This report explains the role of the cost of capital in regulatory decisions and the basis for the 2006 published estimate. It considers the market and regulatory context within which the cost of capital is estimated and addresses whether it should be reviewed now in light of changed circumstances.

We first set out the building blocks for the 2006 estimate (see figure below).

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



Source: Plum Consulting, Terrestrial Transmission Market Review

The following observations relate to the above figure:

- The estimate of 10.4% is a weighted average cost of capital (or WACC) derived from the estimated cost of debt (on the left) and estimated cost of equity (on the right).
- The relevant interest rate in estimating the cost of debt is not the short-term Bank of England gilt rate (which has been 0.5% since March 2009), but longer term corporate bond rates comprising “risk free rate” and “debt premium” components.
- The cost of equity is higher than the cost of debt because equity is more risky (reflected in the equity risk premium or “ERP” which relates to the market as a whole and the so-called beta factor which is company specific).
- Equity makes up a greater share of Arqiva’s overall balance sheet than debt so the cost of equity contributes more to the overall WACC.

Considering evidence in terms of developments in capital markets we do not find any clear and compelling evidence that a review of the WACC now would produce a materially different WACC estimate. Recent WACC decisions by other regulators also suggest that a material revision would be unlikely (though Ofcom’s 2009 decision on Openreach is under appeal, and should be decided in a Competition Commission report due by 31 August 2010).

Turning to the broadcast transmission market, we conclude that there is greater risk now than in 2006 due to increased competition for audio and video transmission from other platforms, uncertainty over the future of analogue radio and the Arqiva-NGW merger Undertakings which introduced asymmetric risk via the option to roll-over existing (and discounted) contract terms at renewal.

Whilst these considerations of risk might suggest that a higher cost of capital would be appropriate in future, Arqiva is to an extent protected by existing long-term contracts, which would limit any impact on

prices. Changes in the market may also be better addressed via other commercial or policy changes, rather than a change to the WACC estimate. For example by changes to contract terms to better reflect risk, via resolution of policy uncertainty and potentially via changes to depreciation policy.

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 framework developed in this paper provides a basis for making such an assessment.

1 Introduction

The cost of capital assumption which should apply to setting broadcast transmission prices was estimated by Ofcom to be 10.4% nominal pre-tax in 2006.¹

In January 2009 Ofcom provided guidance to the Adjudicator which, amongst other things, considered the cost of capital. In response, the BBC commented that Ofcom should provide guidance to the Adjudicator towards a review of the WACC in light of the new market situation (the financial crisis). In the final guidance Ofcom concluded that:²

"Ofcom does not however intend to modify the sectoral position at this stage." Paragraph 2.45.

"We suggest that Arqiva should continue using this rate until such time as the Adjudicator thinks it appropriate to revise the rate." Paragraph 5.36.

We have been asked by the Adjudicator to explain the cost of capital, put it in context and review evidence on the cost of capital including capital market evidence and historic decisions by UK regulators; to consider the specific circumstances of the broadcast transmission market, particularly competition, risk, long-term contracts and the 2008 Competition Commission Undertakings; and to recommend whether a review of the assumed cost of capital is justified at this stage.

Our report is structured as follows:

Section 2 discusses the purpose and nature of the regulatory cost of capital and its relationship to market interest rates, cash flows, risk and regulation.

Section 3 discusses the broadcast transmission market including the extent of competition, long-term contracts, the Undertakings and the possibility of analogue radio switch-off.

Section 4 considers capital market evidence related to the cost of capital, historic decisions by other regulators on the cost of capital and their views on the impact of the financial crisis and changed market circumstances. Supporting empirical evidence is provided in Appendix A.

Section 5 concludes by setting out relevant considerations as to whether the estimated cost of capital should be reviewed at this stage.

¹ Ofcom. July 2006. Terrestrial transmission market review – updated general guidance for setting of charges and review mechanism.

² Ofcom. January 2009. "Guidance for the Adjudicator: The Arqiva undertakings - statement."
<http://www.ofcom.org.uk/consult/condocs/arqiva/statement/statement.pdf>

2 Purpose and nature of regulatory cost of capital

2.1 Purpose of the cost of capital estimate

The purpose of a regulator-determined cost of capital estimate is to act as an agreed input to price setting, reflecting the return expected by investors on capital invested. An estimated cost of capital of 10.4% nominal pre-tax has been assumed in the Arqiva rate card for radio³ and reference offer for broadcast transmission in relation to TV.⁴

Since capital invested generally takes two forms – debt and equity – the overall cost of capital is a weighted average of the return required to attract a mixture of debt and equity investment known as the weighted average cost of capital (“WACC”).

A regulator cannot set the actual cost of capital; it is determined by the market. Nor do regulators in general aim to constrain actual returns narrowly in-line with the estimated cost of capital – actual outcomes may have returns that are higher or lower than the estimated cost of capital.⁵

The nature and balance of regulatory duties can impact on the approach to estimating the cost of capital. For regulated utilities such as water there is a duty to ensure that companies are able to finance the carrying out of their functions. The Communications Act does not include an equivalent clause, but refers instead to a principal duty of Ofcom to further the interests of consumers and to have regard to the desirability of encouraging investment and innovation. The approach under the Communications Act is therefore more explicitly forward looking than that applying to utilities.

The duration of price controls may also impact on the cost of capital estimate. The Competition Commission, in relation to an appeal by Bristol Water plc, have stated that the expected cost of capital in the price control period (5 years) is the appropriate cost of capital estimate to utilise in price setting.⁶ For broadcast transmission the “control period” is much longer given long-term contracts and the Competition Commission Undertakings.

2.2 Relationship to interest rates

The estimated pre-tax nominal WACC for broadcast transmission in 2006 was 10.4%.⁷

Figure 2-1 illustrates the components of this estimate of the WACC for Arqiva in 2006. The pre-tax nominal WACC of 10.4% is shown in the middle of the figure, whilst the left and right sides of the graphs show the contributions of debt and equity respectively.

³ Arqiva. 2009-10. http://www.arqiva.com/terrestrial/pdf/NA_Rate_Card_2010_publication_version.pdf

⁴ Arqiva. 29 September 2006. Reference Offer for the Provision of Network Access. http://www.arqiva.com/terrestrial/pdf/arqiva_reference_offer_version_3.pdf

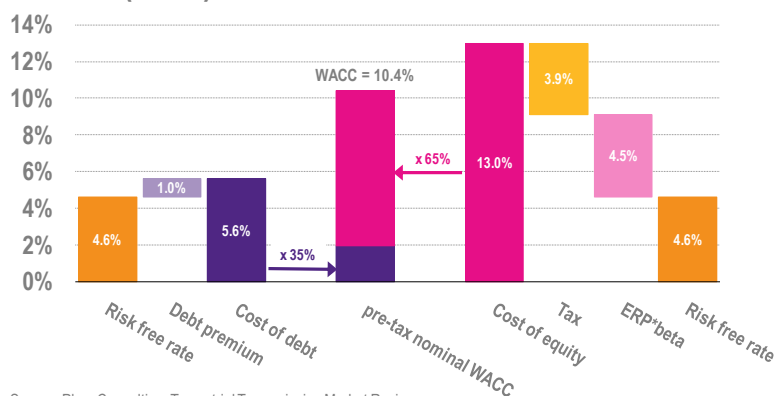
⁵ The potential for returns to vary from what is assumed in setting prices is a key element of the incentive for cost efficiency since if no variation in returns were allowed there would be little if any incentive to control costs.

⁶ Competition Commission. 18 June 2010. “Bristol Water Plc – provisional findings report.” Appendix N - cost of capital. http://www.competition-commission.org.uk/inquiries/ref2010/bristol/pdf/appendices_and_glossary_merged.pdf

⁷ Ofcom. 31 July 2006. “Terrestrial transmission market review – updated general guidance for setting of charges and review mechanism.”

Figure 2-1

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



Source: Plum Consulting, Terrestrial Transmission Market Review

On the left-hand side, the cost of debt is shown comprised of two components – the risk free rate and debt premium for commercial debt. The estimated cost of debt of 5.6% is then weighted by 35%, its assumed share of the capital structure.

On the right-hand side the higher cost of equity is shown, comprised of the risk free rate (the same as used when calculating the cost of debt), the equity risk premium (ERP) multiplied by beta (a technical adjustment reflecting the extent to which risk is non-diversifiable) and finally an adjustment for tax. The estimated pre-tax cost of equity of 13% is then weighted by 65%, its assumed share of the capital structure.

The following three observations relate to the above figure:

- The estimate of 10.4% is a weighted average cost of capital (or WACC) derived from the estimated cost of debt (on the left) and estimated cost of equity (on the right).
- The relevant interest rate in estimating the cost of debt is not the short-term Bank of England gilt rate (which has been 0.5% since March 2009), but longer term corporate bond rates which have not changed substantially over the past five years.
- The cost of equity is higher than the cost of debt because equity is more risky. Equity also makes up a greater share of the contribution to the overall WACC than debt in Arqiva's case.

2.3 Relationship to cash flows

The estimated cost of capital is one input into price setting, while other inputs include estimates of capital invested and future investment requirements, depreciation, future operating costs and future demand. Variations in all of these factors, not just the estimated cost of capital, may therefore determine actual returns.

An implication of this is that risk may impact on not only the cost of capital, but also on expected cash flows which may differ from assumed cash flows. In particular, if some of the risks applying to cash flows are asymmetric, these may act to reduce (or increase) expected returns compared to a central or best estimate of anticipated cash flows. We note that for broadcast transmission, the risk

associated with digital switchover costs was assessed by Ofcom and Scientific Generics Limited using Monte Carlo analysis. As a result, an uplift to estimated costs of 15% was allowed.⁸

2.4 Relationship to risk

The cost of capital, cash flows and risk are interrelated. Put simply, returns should reflect the level of riskiness. However, the correct treatment of risk unfortunately involves some complexity:

- Risk may be reflected in the cost of capital and/or in the estimation of cash flows when setting prices. From a customer and investor point of view, prices and returns matter respectively, not necessarily where risk is reflected in price setting.⁹
- There are two types of risk: risk that is specific to the business in question (and the associated underlying portfolio of investments held by the business) and risk that is common to other investment opportunities in the market as a whole. The latter is known as systematic risk and is non-diversifiable because the market as a whole is also subject to such risk. For example, the risk of an economic downturn may represent systematic risk whereas a risk specific to terrestrial broadcasting would be non-systematic.
- The estimated return required on equity should reflect systematic risk (not company-specific risk) since systematic risk cannot be diversified by investors holding a portfolio of different stocks. However, it is not the case that diversifiable risks are not relevant, for two reasons:
 - First, both systematic and non-systematic risk impact on default risk when looking at debt and the debt premium over government or gilt rates (gearing or the extent to which a company is financed by debt will also impact on the risk of default).
 - Second, non-systematic risk may involve asymmetries, for example, the possible intensification of competition. Such risk should be reflected in prices somehow. In practice, it might be reflected in assumed cash flows via accelerated depreciation, reflecting the risk that an asset will no longer be used or useful in future.

2.5 Relationship to regulation

The way in which a business is regulated impacts on the market cost of capital for the business. Regulators generally periodically (typically every five years) reset “allowed” revenues and/or prices, with more limited adjustments between such reviews. In the case of broadcast transmission, the period in which prices are fixed with an adjustment for the RPI alone is longer. In contrast, in a competitive unregulated sector changes in input prices that apply to all competing businesses tend to be reflected in output prices. The capping of output prices may therefore increase non-systematic risk and raise the cost of capital in relation to equity since specific input price changes are only reflected in

⁸ Ofcom. July 2006. Terrestrial transmission market review – updated general guidance for setting of charges and review mechanism. Issue 13 and Annex 6.

⁹ Where risk is reflected may nevertheless impact incentives to invest even if overall returns are expected to be the same. For example, if risk were rewarded through an adjustment to expected cash flows in setting allowed prices rather than through an adjustment to the WACC then incentives to invest would be impacted since incremental investment would earn a higher or lower return.

output prices with a significant lag (other than the general annual RPI adjustment).¹⁰ These considerations are relevant when comparing returns that may be appropriate for broadcast transmission with other regulated businesses and potentially with firms in competitive industries.

2.6 Conclusion

The cost of capital should not be considered in isolation. The appropriate cost of capital estimate to apply in setting regulated prices is related to the approach to cash flow estimation, to risk and to the extent and nature of competitive and regulation. The specific circumstances of the broadcast transmission market in the UK can be expected to impact on each of these factors, and these impacts may change over time. They are therefore considered in the following section.

¹⁰ Ian Alexander and Timothy Irwin. World Bank. "Price caps, rate-of-return regulation, and the cost of capital." Note no 87. <http://rru.worldbank.org/documents/publicpolicyjournal/087irwin.pdf>

3 Broadcast transmission market

The broadcast transmission market has specific characteristics in terms of competition, risk and regulation that impact both on the market cost of capital and on the way in which a change in the estimated cost of capital would impact on prices. Further, the nature and characteristics of the broadcast transmission market may have changed since 2006, when the cost of capital was last estimated.

3.1 Extent of competition

In April 2005 Ofcom published its review of the broadcast transmission market and concluded that Crown Castle UK Limited and National Transcommunications Ltd (now merged and part of Arqiva) each held positions of significant market power in the market for the provision of access to mast and site networks and shared or shareable antenna systems.¹¹

In March 2008 the Competition Commission published its final report on the acquisition by Macquarie UK Broadcast Ventures Limited (MUKBV) of National Grid Telecoms Investment Limited.¹² The Competition Commission found that:

“...the merger may be expected to lead to an SLC [substantial lessening of competition] as a result of the loss of rivalry between Arqiva and NGW, leading to a worsening in the price and non-price factors on which the parties compete in the provision of MTS/NA to television broadcasters and to radio broadcasters.”

The Competition Commission found that Arqiva and NGW were the only active providers of Managed Transmission Services (MTS) and Network Access (NA) to UK television broadcasters and were also the most significant providers of national MTS/NA to UK radio broadcasters, with a combined market share of more than 85%.

Whilst the provision of broadcast network access remains concentrated, competition from other platforms for video and audio distribution has intensified since 2008 and can be expected to grow significantly in the near to medium term, in particular:

- A shift towards internet-based entertainment including on-demand and catch-up services (e.g. internet radio and a proposed UK radioplayer platform for all UK radio stations¹³, Podcasts, iPlayer, etc) is facilitating a shift towards non-broadcast distribution.¹⁴ A growing range of devices are also internet enabled.

¹¹ Ofcom. April 2005. “Broadcasting Transmission Services: a review of the market - Final statement.” http://www.ofcom.org.uk/consult/condocs/bcast_trans_serv/final/mastsites.pdf

¹² Competition Commission. March 2008. “Macquarie UK Broadcast Ventures Limited/ National Grid Wireless Group Completed acquisition - Final report”. http://www.competition-commission.org.uk/rep_pub/reports/2008/fulltext/537.pdf

¹³ http://www.bbc.co.uk/pressoffice/pressreleases/stories/2009/11_november/19/radio.shtml

¹⁴ Ofcom. 2009. “Entertainment in the UK in 2028.” <http://www.ofcom.org.uk/research/technology/research/sectorstudies/entertainment/>

See also Erik Huggers (BBC). Keynote address to Guardian Changing Media Summit March 2010:

“...as the internet comes to the living-room through television sets, it will become more important still - and indeed, one day, may be the only platform and delivery system that the BBC needs to fulfil its public purposes. The internet is not an optional extra then; it is the future for the BBC just as it is for the rest of the broadcasting and communications sectors.”

http://www.bbc.co.uk/blogs/bbcinternet/2010/03/erik_huggers_at_the_guardian_c.html

- A shift towards HDTV alongside the limited capacity of terrestrial broadcast networks to accommodate HDTV channels (compared to satellite and fibre) may increase competitive pressure.
- Investment in enhanced broadband speed and coverage, including Virgin Media's cable upgrade to DOCSIS 3.0, BT's upgrade to a mix of fibre to the cabinet and fibre to the home to 40% of households by 2012 and potentially 67% by 2015,¹⁵ and ongoing enhancements to wireless with an upgrade to long term evolution (LTE) anticipated and increased coverage utilising UHF spectrum.¹⁶ These will provide alternative video and audio distribution networks.

The focus on universal delivery of public service TV broadcasting via the terrestrial platform may limit risk in the near term, even as platform competition intensifies. However, the risk in relation to commercial demand for TV transmission can be expected to increase.

A further consideration is the competition with mobile broadband for UHF frequency inputs currently utilised for TV broadcasting, given the attractiveness of this spectrum for increasing the speed and extending the rural and in-building coverage of mobile broadband. The European Commission has recognised the importance of UHF spectrum for mobile broadband.¹⁷ The US FCC has also set out a goal of further (post digital switchover) reallocation of 120 MHz of UHF spectrum from TV broadcasting for mobile broadband use.¹⁸

3.2 Timing of debt issuance in relation to broadcast transmission

Arqiva has a significant share of long-term (10-year) bond finance which falls due in 2014. This debt will need to be re-financed and the relevant cost will be the cost of debt at the time new bonds are issued prior to 2014. We note re-financing could also coincide with a period in which UK banks are expected to require substantial re-financing, in part because of the closure of the Special Liquidity Scheme in 2012.¹⁹

3.3 Contractual terms for broadcast transmission

The broadcast transmission market is governed by adjudication rather than by regulation and is dominated by long-term contracts which the Undertakings accepted as a condition of merger. The circumstances differ from other regulated sectors in the following important respects:

¹⁵ BT. 3 May 2010. Investor day – Part 2.

<http://www.btplc.com/Sharesandperformance/Quarterlyresults/Financialpresentations/q410Investor2.pdf>

¹⁶ LTE will offer higher speeds, lower latency and lower costs per MB. Combined with lower frequency 900 MHz and UHF spectrum coverage should also improve and coverage extensions will be less costly.

¹⁷ European Commission. 9 May 2010. "A Digital Agenda for Europe." The communication notes that: "A forward-looking European spectrum policy should, while accommodating broadcasting, promote efficient spectrum management, by mandating the use of certain digital dividend frequencies for wireless broadband by a fixed future date, by ensuring additional flexibility (also allowing spectrum trading) and by supporting competition and innovation."

http://ec.europa.eu/information_society/digital-agenda/documents/digital-agenda-communication-en.pdf

¹⁸ FCC. March 2010. "The National Broadband Plan". <http://www.broadband.gov/plan/>

¹⁹ Bank of England. June 2010. "Financial Stability Report."

<http://www.bankofengland.co.uk/publications/fsr/2010/fsrfull1006.pdf>

- Customers are on long-term contracts which may not be affected by a change in the estimated cost of capital.
- Customers have the option of remaining on existing (discounted) contract terms at renewal under the Undertakings. This introduces an asymmetric risk since customers can choose the most attractive option between cost-reflective reference offer terms and contract rollover at renewal.

We consider the impact of these aspects in the following sub-sections.

3.3.1 The existence of long-term contracts may impact on the cost of capital

As discussed in Section 2, price caps may raise the cost of capital by increasing the volatility of returns (since output prices are fixed whilst input prices may vary). Long-term contracts with durations of 10-20 years might be expected to amplify such effects as opposed to price controls with five year durations (though electricity is a pass-through item for broadcast transmission).

The existence of long-term contracts may also increase the relevant period for which the cost of capital should be estimated. The Competition Commission stated that the expected cost of capital in the price control period is the appropriate cost of capital estimate to utilise in price setting (in its decision on Bristol Water).²⁰ In the case of broadcast transmission, the relevant period is much longer than the five years in other sectors, given the existence of long-term contracts. Longer-term indications of the cost of capital may therefore be appropriate. Further, one would expect the cost of capital estimate to be less subject to short-term variations in capital markets.

3.3.2 Existing reference offers limit the scope for a change in the estimated cost of capital to impact prices

TV reference offers published in 2006 and 2007 explicitly include a real pre-tax WACC of 7.71% (equivalent to the 10.4% pre-tax nominal WACC mentioned before) and note that the cost of capital estimate used to calculate prices might change in response to “*material and prolonged fluctuations in interest rates*”. More recent reference offers for TV and radio do not include an explicit WACC and note that charges will “*include an appropriate return*.” They also include an exceptional items clause in relation to “*any prolonged and material deviation in long-term interest rates*”. Box 3.1 summarises the relevant details.

²⁰ Competition Commission. 18 June 2010. “Bristol Water Plc – provisional findings report.” Appendix N - cost of capital. http://www.competition-commission.org.uk/inquiries/ref2010/bristol/pdf/appendices_and_glossary_merged.pdf

Box 3.1: Network access reference offer terms

The reference offers for network access for TV published by Arqiva in 2006 and ex-National Grid Wireless in July 2007 (applicable only to agreements entered into prior to 1st September 2008) make provision for the possibility of a change to the assumed cost of capital used to calculate prices as a result of “*material and prolonged fluctuations in interest rates*” and note that in calculating charges, the return on assets will be calculated using the “*real pre-tax Applicable WACC which at the date of publication of this Reference Offer is calculated at 7.71%*”.²¹

The more recent reference offers covering Manchester and Cardiff (TV) and radio network access note that charges will “*include an appropriate return*” (without specifying what an appropriate return is) and state that Arqiva “shall be entitled” to adjust the Annual Fee to take account of:^{22 23}

“any other matter outside the reasonable control of Arqiva (including without limitation any change in Law, any failure to obtain any required Consent, any act or omission of the Customer, any guidance issued by Ofcom, the Adjudicator (as such term is defined in the Undertakings), any successor bodies or other competent bodies, and any prolonged and material deviation in long-term interest rates from levels pertaining in June 2009).”

The clause in the radio network access reference offer differs slightly:²⁴

“any other matter outside the reasonable control of Arqiva (including without limitation any change in Law, any failure to obtain any required Consent, any act or omission of the Customer and any prolonged and material deviation in long-term interest rates from levels pertaining in December 2008).”

The published radio rate card for 2009/10 does include an explicit reference to the real WACC of 7.71% and states that the rate card only applies for new contracts.²⁵

Reference offer terms therefore focus on the possible change of only one element of the estimated cost of capital – long term interest rates. Further, while a WACC of 7.71% is specified in reference offers published prior to the Undertakings, it is not specified in more recent reference offers.

A change in the estimated WACC would therefore only impact new contracts, a situation that would apply to a seventh or eighth digital TV multiplex or to significant investment in DAB radio broadcast transmission.²⁶

²¹ <http://www.arqiva.com/terrestrial/pdf/national-grid-reference-offer-v.5-july-2007.pdf>

²² Arqiva. 8 June 2009. “Reference Offer for the provision of Transmission Services in respect of Ofcom’s recent award of a licence in the frequency band 758 to 766 MHz covering Manchester.” <http://www.arqiva.com/terrestrial/pdf/rsl-ro-ts-manchester-v.2.pdf>

²³ Arqiva. 8 June 2009. “Reference Offer for the provision of Transmission Services in respect of Ofcom’s recent award of a licence in the frequency bands 742 to 750 MHz (transitional arrangement) and 542 to 550 MHz (final arrangement) covering Cardiff.” <http://www.arqiva.com/terrestrial/pdf/rsl-ro-ts-cardiff-v.2.pdf>

²⁴ Arqiva. 1 June 2010. Framework Reference Offer for the Provision of Radio Network Access.” http://www.arqiva.com/terrestrial/pdf/Arqiva_-_Framework_Radio_NA_RO_-_v2%202010.pdf

²⁵ Arqiva. 2009-10. http://www.arqiva.com/terrestrial/pdf/NA_Rate_Card_2010_publication_version.pdf

²⁶ A change in the WACC would not impact on prices via capital expenditure required for clearance of broadcast Channels 61 and 62 since clearance costs including capital expenditure are to be directly reimbursed by government. A change in the WACC could however impact on the cost to government if there is a change in operating expenditure associated with clearance since the WACC is likely to be used to calculate a net present value equivalent of any ongoing cost change for compensation purposes.

3.3.3 The Undertakings limit the relevance of reference offer terms

On 11 March 2008 the Competition Commission announced their decision to allow the merger of Arqiva and National Grid Wireless to take place, subject to the agreement of Undertakings designed to protect customers. Following consultation, the Competition Commission accepted a set of Undertakings from Arqiva in September 2008.²⁷ Box 3.2 summarises key aspects of the Undertakings.

Box 3.2: Price reductions agreed in relation to Undertakings

In relation to existing agreements:

- For each Analogue TV Agreement and each Low Power DTT Agreement, the applicable percentage discount shall be 3.25 per cent.
- For each Analogue Radio Agreement and each Digital Radio Agreement, the applicable percentage discount shall be 17 per cent.
- Changes to digital agreements which offer guaranteed price reductions (these were confidential) to the BBC, SDN and D34, including an element which is equivalent, in aggregate, to a £50 million reduction in the budgeted total Network Access capital expenditure for digital switchover.
- The option to renew existing agreements on the same prices and terms as the existing contract (as amended pursuant to the Undertakings), or to be determined on cost-oriented and fair, reasonable and non-discriminatory (FRND) terms.

For new transmission agreements charges shall be adjusted on an annual basis by a percentage equal to the annual percentage increase in RPI-1%.

The Undertakings therefore act to reduce returns below what they would otherwise be if equivalent cost efficiencies cannot be found. We also note that the application of the RPI-1% formula assumes greater annual efficiency gains than those achieved in the economy as a whole since such economy wide productivity gains are already reflected in retail prices.

Finally, the option to renew existing contracts perpetuates the savings expected under the Undertakings and makes it less likely that a change in the estimated cost of capital would have any impact on prices under contracts entered into prior to the Undertakings.

3.4 Possible analogue radio switch off

A further consideration is the uncertainty surrounding the possible phase-out of all national and many local analogue radio broadcast transmitters. The Digital Britain report proposed a target of 2015, whilst the Digital Economy Bill sets up an enabling framework but does not specify a date. Uncertainty over the future of analogue radio is an additional risk, particularly in relation to any future investment in analogue transmission which might not be recovered by the phase-out date. However, the reference

²⁷ Competition Commission. September 2008. "Notice of acceptance of final Undertakings pursuant to section 82 of and Schedule 10 to the Enterprise Act 2002." http://www.competition-commission.org.uk/inquiries/ref2007/macquarie/pdf/notice_undertakings.pdf

offer for radio published in 2010 includes scope to change prices in relation to the following exceptional risks:²⁸

“any change in the number of users of a shared Antenna

any change in the number of users of other broadcast radio platforms (for example, but without limitation, upon the cessation or partial cessation of any radio platform)”

For new contracts these clauses will limit exposure to demand risk.

3.5 Conclusion

Risk in relation to broadcast transmission has increased substantially since 2006 for a number of reasons. Platform competition is increasing, mobile broadband will in future compete for the UHF spectrum currently utilised for TV broadcasting, analogue radio switch-off has been introduced as a possibility by the Digital Economy Bill, and the takeover Undertakings introduced asymmetric risk by allowing customers to choose between contract rollover and a new reference offer.

However, whilst market and regulatory changes have increased risk, there is limited scope for a change in the estimated cost of capital (or other input prices) to be reflected via access prices. This is because customers are on long-term contracts and have the option of rolling such contracts over at renewal. In effect, the combination of long-term contracts and regulation offers customers a form of insurance against price changes.

²⁸ Arqiva. 1 June 2010. Framework Reference Offer for the Provision of Radio Network Access.”
[http://www.arqiva.com/terrestrial/pdf/Arqiva - Framework Radio NA RO - v2%202010.pdf](http://www.arqiva.com/terrestrial/pdf/Arqiva_-_Framework_Radio_NA_RO_-_v2%202010.pdf)

4 Capital markets

Capital markets have gone through a period of increased volatility following the financial crisis of 2008. Further, since 2006 the Bank of England base rate has reduced from over 4.5-4.75% to 0.5%. The question we consider is whether the estimated weighted average cost of capital for broadcast transmission is likely to have changed materially since 2006 (when it was last reviewed by Ofcom). To answer this question we consider the cost of debt and the cost of equity (which comprise the WACC) and decisions by other regulators (detailed in Appendix A).

4.1 Cost of debt

On the face of it, the reduction in the Bank of England base rate from over 4.5-4.75% in 2006 to 0.5% in the first half of 2010 might suggest that the cost of capital has fallen. However, the cost of debt should be considered over the medium to long term (given the duration of contracts and the forward looking nature of a requirement to ensure incentives for investment and innovation).

Figure 4-1 shows that although the Bank of England base rate has fallen, forward rate estimates show an anticipated increase in short term rates.²⁹ Figure 4-2 shows that interest rates for longer term government bonds are significantly higher than short term interest rates.³⁰

Figure 4-1: Bank rate and forward rates

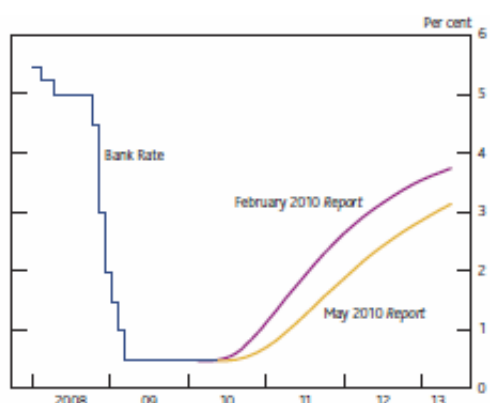
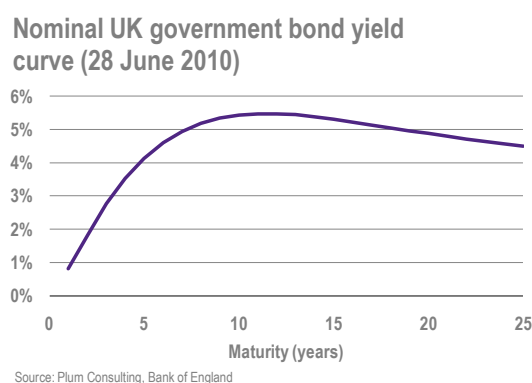


Figure 4-2:



However, Arqiva would have to pay a premium over Bank of England interest rates and Government bond rates for debt.

Figure 4-3 shows the risk (or spread) on corporate bond rates relative to government bond rates for investment grade financials and non-investment grade (top two and right and left hand axes respectively) and investment grade non-financial companies (bottom line and right hand axis).³¹

²⁹ Bank of England. May 2010. "Inflation Report". Chart 1.1.

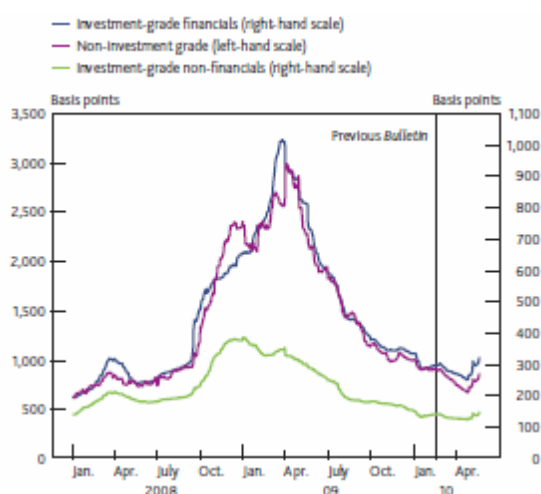
<http://www.bankofengland.co.uk/publications/inflationreport/ir10may.pdf>

³⁰ Bank of England. 28 June 2010. Bank of England UK Yield Curve Data.

<http://www.bankofengland.co.uk/statistics/yieldcurve/index.htm#chart3>

³¹ Bank of England. June 2010. "Quarterly Bulletin". <http://www.bankofengland.co.uk/publications/quarterlybulletin/qb1002.pdf>

Figure 4-3: Investment grade bond spread



Focussing on rates for investment grade non-financials, these peaked at over 3% and have fallen back to a little over 1%. In April/May 2010, spreads rose again, driven by concern regarding sovereign risk in the Euro zone.³² In addition, between now and 2012, anticipated high volumes of bond issuance by major banks in the UK may impact on bond markets.³³

In conclusion, the cost of corporate debt is significantly above the Bank of England base rate and the interest rate margin of corporate over government debt has been volatile since the financial crisis in 2007. The corporate bond margin over government bonds has recently risen, driven by sovereign debt risk in the Euro zone. The medium term outlook is, as always, unclear. However continued high government debt funding requirements and a substantial increase in funding requirements for financial institutions out to 2012 may increase the cost of bond finance.

4.2 Cost of equity and the WACC

As discussed earlier, the cost of equity is more difficult to estimate than the cost of debt as there is no directly observable equivalent of interest rates. However, we can examine decisions by regulators in other sectors over time to see if they have changed their opinion regarding the cost of capital. We can also consider decisions regarding the inputs that make up the cost of equity and the WACC across sectors.

4.2.1 Ofcom broadcast transmission WACC estimate

Ofcom published a general analysis of their approach to assessing the cost of capital in 2005.³⁴ Their (and other UK regulators') preferred methodology is to use the Capital Asset Pricing Model (CAPM).

³² The market is volatile with the volume of corporate bond issues falling in Europe in May 2010 to the lowest level since December 1999. <http://ftalphaville.ft.com/blog/2010/05/24/240091/whither-corporate-bond-issuance/>

³³ Bank of England. 25 June 2010. "Financial stability report." <http://www.bankofengland.co.uk/publications/fsr/2010/fsr27.htm>

³⁴ Ofcom. August 2005. "Ofcom's approach to risk in the assessment of the cost of capital – Final statement". http://www.ofcom.org.uk/consult/condocs/cost_capital2/statement/final.pdf

Using this methodology, Ofcom published the final estimate of 10.4% nominal pre tax for broadcast transmission in July 2006 - as set out in Table 4-1. The methodology notes in Table 4-1 summarise the discussion in the Ofcom document (which responded to the contrasting views of broadcasters and Arqiva and Crown Castle).

Table 4-1: Ofcom 2006 WACC estimate for broadcast transmission

Parameter	Estimate	Methodology notes (blank fields reflect numbers calculated using other parameters in the table)
Risk-free rate	4.6%	Based on current returns on government debt with maturities in the range 1-15 years (which were similar in 2006). Estimate based on real rate of 2% plus assumed inflation of 2.5%.
Equity risk premium (ERP)	4.5%	Based on range from 4.0% to 5.0% reflecting forward looking and historical estimates
Equity beta	1.0	Direct company specific estimate not available as neither Crown Castle nor Arqiva were listed. Market average beta is by definition 1 and on balance Ofcom considered this to be an appropriate value.
Small firm risk premium	-	Beta estimate considered to err sufficiently on the side of safeguarding investment to reflect any additional risk associated with company size. Proposed that any future equity trading costs be added to operating cost forecasts.
Cost of equity (post tax)	9.1%	
Debt premium	1.0%	Ofcom considered yields over time for a gilts, A and BBB rated bonds and put particular weight on current market values and recent historical values in coming to a judgment that 1.0% was an appropriate premium.
Cost of debt (pre tax)	5.6%	
Corporate tax rate	30%	Standard corporate tax rate at the time ³⁵
Cost of debt (post tax)	3.9%	
Gearing	35%	Ofcom view on balance considering range of evidence on gearing
WACC (post tax)	7.3%	
WACC (pre tax)	10.4%	

Source: Ofcom. 31 July 2006. "Terrestrial transmission market review – updated general guidance for setting of charges and review mechanism."

Note: the equivalent real pre tax WACC of 7.71% is utilised in price setting.

4.3 Comparison of regulators' estimates of the WACC

Appendix A details other UK regulators' decisions regarding the estimated cost of capital since 2005. We report both the headline estimates in the respective decision documents and a consistent set of real pre-tax WACC estimates as a basis for comparison.

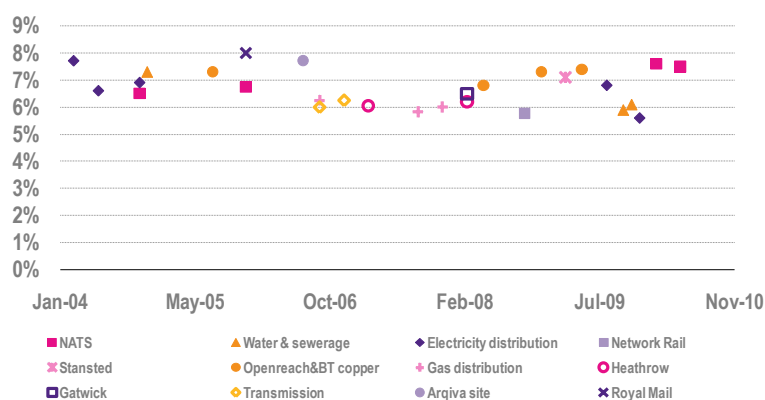
³⁵ In the 23 June 2010 Budget a reduction in the standard corporate tax rate by 1% per annum is proposed, reducing the rate to 24% by 2014. This would leave the post tax WACC of 7.3% unchanged but reduce the equivalent pre-tax WACC to 9.6%.

Whilst some of the inputs to WACC estimation are in principle common across industries since they reflect common market parameters (the risk free rate, equity risk premium and tax rate) others are industry-specific (the debt premium, equity beta and ratio of debt to equity).³⁶ Comparisons across industries of the estimated WACC should not therefore be made without considering all of the factors that might contribute to differences.

Nevertheless, an overview of decisions provides a feel for the range of regulatory estimates of the WACC and also allows for a comparison, within a given industry, of changes in the estimated WACC over time. Figure 4-4 illustrates the range and variation over time.³⁷ Both upward and downward changes in the estimated WACC are apparent within industry groups over time.

Figure 4-4: Variation over time and by industry

Interim and final (real, pre-tax) WACC decisions over time in the UK



Source: Plum Consulting, regulator websites

4.4 Comparison of regulators' estimates of the common inputs to the WACC

As noted above, the risk free rate and equity risk premium are common market factors that might in principle be expected to be the same across sectors. Figure 4-5 and Figure 4-6 show regulators' final decisions (and interim decisions for two recent cases: the CAA on NATS and the Competition Commission on Bristol Water plc) on these parameters over time.

³⁶ Whilst these may vary over time they are in principle common at a point in time. Further, since long term data is used to estimate the equity risk premium such estimates would not be expected to vary by much.

³⁷ We have excluded mobile call termination (since the sector is competitive) and the Competition Commission provisional decision in relation to Bristol Water (since this is for a water only company and Figure 4-4 shows the WACC for water and sewerage companies which differs from that for water only companies).

Figure 4-5

Real risk free rates in WACC decisions over time in the UK

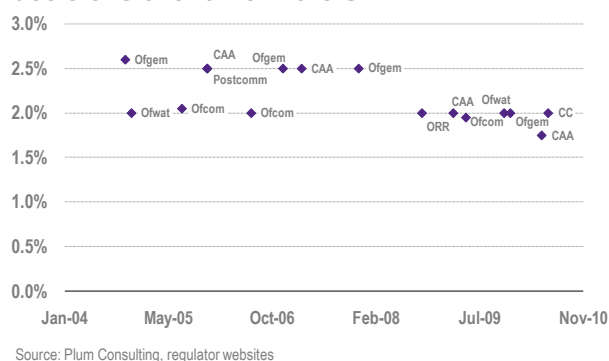
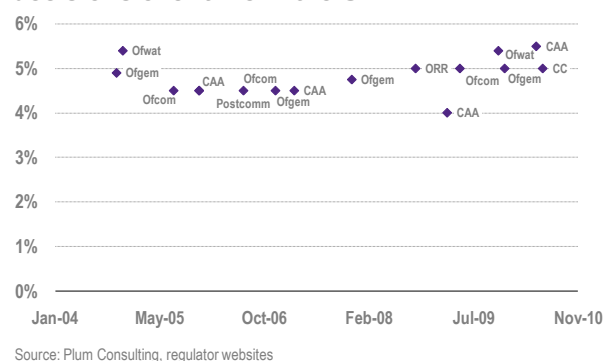


Figure 4-6

Equity risk premiums in WACC decisions over time in the UK



There is a slight tendency for recent estimates of the risk free rate to be lower and for the equity risk premium to be higher than historical estimates, with recent values clustered around 2% and 5% respectively. The financial crisis may therefore have had two more or less offsetting impacts on regulatory estimates of the WACC.

4.5 Regulators' comments on the impact of the financial crisis

We have also considered qualitative comments made by other regulators on the financial crisis's impact on the WACC. Box 4.1 summarises these comments. The comments by Ofwat regarding the water industry highlight the importance of considering the approach to regulation alongside the WACC. The comments by Ofcom predate the emergence of sovereign risk.

The comments by CAA in relation to national air traffic services (NATS) were made after sovereign debt risk and contagion effects in relation to Greece and other Euro zone countries became widespread areas of concern. To take account of these effects, the CAA proposed an increase in the equity risk premium from 4.75% to 5.5%.

Box 4.1: Comments by regulators on the impact of the financial crisis

CAA on NATS (May 2010)³⁸

"..Given continued uncertainty in financial markets and, in particular, concerns over sovereign risk which have sharpened in recent weeks, the CAA is proposing to use a slightly higher ERP".

Ofwat on water industry (December 2009)³⁹

"...our approach to regulation includes risk mitigations that limit the effect of this uncertainty and we consider it is important to companies, their investors and consumers that we provide certainty for the five-year price review period. This is a low risk industry with a well understood, tried and tested package of risk mitigating measures that provide additional protection to investors in uncertain times."

Ofcom on Openreach (May 2009)⁴⁰

"Since the latter half of 2007 there has been increased uncertainty and volatility in world credit markets, and we have been mindful of this when considering our estimates of debt parameter values. In the First Consultation we noted two recent effects, which are partially offsetting for the purposes of our calculations:

- *As volatility and uncertainty in credit (and also in property) markets increased, central bank interest rates fell and the risk-free rate also dropped.*
- *The demand for corporate debt diminished and the required spreads on corporate debt issues increased, pushing up BT's debt premium.*

Between the First and Second Consultations, the financial crisis worsened...our expectation is that the current high levels of corporate bond spreads (~4.5% for BT Group), are unlikely to remain at such elevated levels for the period of this charge control."

4.6 Comparison of Ofcom decisions regarding copper access and broadcast transmission

We focus here on decisions regarding the estimated WACC in relation to BT copper access (now Openreach) and Arqiva network access. The reason for this is that both sets of decisions were made by Ofcom under a common framework and can therefore be compared on a like-for-like basis⁴¹ and that a degree of consistency might be anticipated if the assumed WACC for broadcast transmission were reviewed now. We also consider a provisional decision by the Competition Commission in relation to Bristol Water since elements of the decision provide an indication of the possible outcome of the Openreach decision.

These decisions include elements which one would expect to be consistent (the risk free rate, equity risk premium and tax rate) and other elements that are sector specific and therefore may be less consistent. However, there is an element of commonality in the assumed gearing of 35%. Finally, we

³⁸ CAA. May 2010. "NATS (En Route) plc CAA price control proposals (2011-2014)."

<http://www.caa.co.uk/docs/5/ergdocs/20100527NERLCP3Proposals.pdf>

³⁹ Ofwat. November 2009. "Future water and sewerage charges 2010-15: Final determinations."

http://www.ofwat.gov.uk/pricereview/pr09phase3/det_pr09_finalfull.pdf

⁴⁰ Ofcom. May 2009. "A new pricing framework for Openreach – Annexes."

<http://www.ofcom.org.uk/consult/condocs/openreachframework/statement/annexes.pdf>

⁴¹ Ofcom. August 2005. "Ofcom's approach to risk in the assessment of the cost of capital – Final statement".

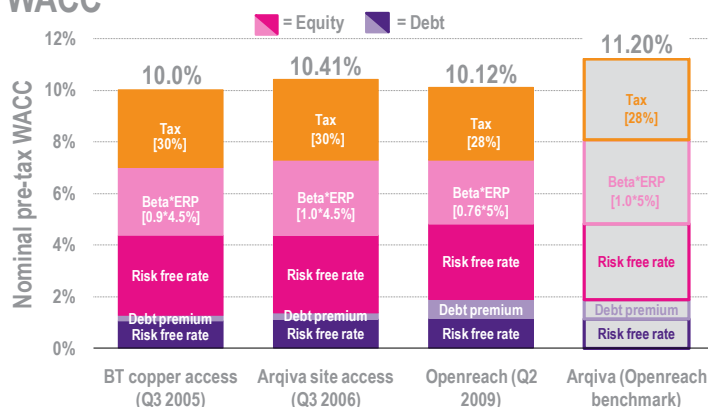
http://www.ofcom.org.uk/consult/condocs/cost_capital2/statement/final.pdf

note that the rationale for setting beta equal to 1.0 in 2006 for Arqiva arguably continues to apply, namely that in the absence of a market estimate or a compelling argument to err one way or the other, this is the most defensible assumption to make.⁴²

We therefore have sufficient information to estimate the WACC for broadcast transmission on a basis consistent with the assumptions underlying the Q2 2009 Ofcom determination on Openreach. Figure 4-7 shows the components of the actual decisions on BT copper access in 2005, broadcast transmission in Q3 2006, Openreach in Q2 2009 and an estimate for Arqiva consistent with the parameters in the Openreach decision and the historical assumption that Arqiva's beta is 1.

Figure 4-7

Ofcom decisions on nominal pre-tax WACC



Source: Plum Consulting, Ofcom

This gives a higher WACC estimate of 11.2%, however the Openreach determination has been appealed (see Box 4.2). If the Competition Commission reaches a different view regarding the risk free rate or equity risk premium, then a consistent estimate of the WACC for Arqiva would differ from that shown in Figure 4-7.

An indication of the possible outcome of the appeal is provided by the Competition Commission provisional decision of June 2010 regarding Bristol Water plc – summarised in the Box 4.1. The provisional decision in relation to common markets elements of the WACC calculation, the risk free rate and equity risk premium, implies that the likelihood of a change to these elements of the Ofcom Openreach decision at appeal appears low.

⁴² A more sophisticated version of this argument involves a "Bayesian adjustment" whereby weight is placed on both the market beta (1 by definition) and the company beta estimate according to the certainty of the two estimates. If the company estimate is highly uncertain then the Bayesian adjustment will move a high or low company specific estimate towards 1. See study for UK regulators jointly by Wright, Mason and Miles. February 2003. "A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K." http://www.ofwat.gov.uk/regulating/pap_rsh_costofcaputiluk.pdf

Box 4.2: Competition Commission reviews of Ofcom and Ofwat cost of capital estimates

Ofcom and Openreach

Carphone Warehouse Group plc appealed to the Competition Appeals Tribunal (CAT) against the Ofcom determination in July 2009. The summary of appeal, among other things, stated that:⁴³ *“OFCOM’s calculation of the true cost of capital for local loop unbundling and WLR services is flawed and inappropriately high.”* In November 2009 aspects of the appeal, including the estimated cost of capital, were referred to the Competition Commission for determination.⁴⁴ The Competition Commission has until 31 August 2010 to determine the pricing issues.

Ofwat and Bristol Water plc

Ofwat referred an appeal from Bristol Water plc to the Competition Commission in February 2010, following the water supply company’s decision to reject the regulator’s final determination on price limits for the period 2010–2015. The Competition Commission released a provisional decision on June 2010 including analysis of the estimated cost of capital.⁴⁵ The approach differs in two important respects from that which might apply to Arqiva.

- First, the approach must be consistent with the duty under the Water Industry Act to ensure that the company is able to finance the proper carrying out of its functions (a requirement that does not apply under the Communications Act). The approach adopted by the Competition Commission may therefore give greater weight to the historical cost of capital and imbedded debt costs than would be appropriate for Arqiva.
- Second, the Competition Commission focussed on the price control period 2010-2015 as the relevant period for assessing the expected cost of capital. In the case of Arqiva, prices are fixed for a much longer period by contracts and, in effect, the Undertakings.

Three elements of the decision are however relevant to Arqiva. The Competition Commission proposes a risk free rate of 2%, an equity risk premium of 5% and no small company premium for the estimated WACC. The risk free rate is consistent with the estimate for Arqiva in 2006 (and marginally higher than the Ofcom estimate for Openreach of 1.95%), whilst the equity risk premium is higher than the 4.5% estimate for Arqiva in 2006 and consistent with the Ofcom estimate for Openreach.

4.7 Conclusion

Changes in short-term interest rates, particularly given that broadcast transmission is a business with long lived assets and long-term contracts, are not a relevant consideration. Further, the cost of debt makes a small overall contribution to the WACC and movements in the debt premium have in the past tended to offset movements in the risk free rate. There is no clear evidence that the cost of equity has changed since 2006. However, uncertainty remains with sovereign risk in some euro zone countries, replacing banking sector risk as a source of uncertainty and market volatility.

After considering regulators’ decisions over the past five years, we find no clear and systematic evidence that the estimated WACC in other sectors has substantially changed. The most recent decision by Ofcom on Openreach in January 2009 resulted in a marginal increase in the estimated WACC compared to their previous 2005 decision on BT copper access (though the Openreach

⁴³ Competition Appeal Tribunal. 22 July 2009. http://www.catribunal.org.uk/files/Summary_1111_Carphone_27.07.09.pdf

⁴⁴ Competition Appeal Tribunal. 27 November 2009. http://www.catribunal.org.uk/files/1111_Carphone_Warehouse_Order_271109.pdf

⁴⁵ Competition Commission. 18 June 2010. “Bristol Water plc – provisional findings report.” http://www.competition-commission.org.uk/inquiries/ref2010/bristol/provisional_findings.htm

decision is currently subject to an appeal). However, the Competition Commission's preliminary findings in the Bristol Water plc case suggest that the likelihood of a material change in the common market input assumptions to the WACC in the Openreach appeal is low. If the Ofcom assumptions are upheld at appeal, their consistent application to broadcast transmission would imply a small increase in the WACC (assuming sector specific assumptions applied in 2006 are held constant).

5 Is a review of the estimated cost of capital now justified?

In considering whether a review of the estimated WACC now is justified, the following considerations are relevant (in addition to the fact that a full review at any time is likely to involve a significant commitment of resources by stakeholders):

- Are there prior reasons for believing that the estimated WACC might differ materially from the estimate in 2006 based on market developments and decisions by other regulators?
- Would a change in the estimated WACC have a material impact on prices and/or investment incentives?
- Would a review at some point in the near term involve materially reduced uncertainty compared with a review now?

We consider each of these questions in turn in coming to a view on the merits of a review of the WACC now for broadcast transmission.

5.1 Might the estimated WACC differ materially?

Short-term market indicators have changed profoundly since the cost of capital applicable to broadcast transmission was last estimated in 2006. However, long-term indicators of the cost of capital have changed little and broadcast transmission is a business involving long lived assets and long-term contracts.

Whilst the short term Bank of England rate has been lowered to 0.5%, long-term government bonds rates have remained higher at around 4%. Further, the risk premium over gilt rates has risen compared to 2006. In addition, there are no grounds for materially revising the estimated cost of equity, which makes up the greatest proportion of the WACC.

Other regulators have reviewed the estimated cost of capital as part of their periodic price reviews (typically every five years). Changes in the capital market following the financial crisis have been considered in recent reviews and have in general been found to have little impact on the estimated cost of capital (with offsetting changes in the risk free rate and the equity risk premium). In particular, the decision by Ofcom in January 2009 on the estimated WACC for Openreach involved a small upward revision from 10% pre-tax in 2005 in relation to BT copper access to 10.12% in 2009.

If the common market assumptions underlying this decision were applied in estimating the WACC for broadcast transmission alongside unchanged sector-specific assumptions, then a modest upward revision of the WACC would result. Whilst the Openreach decision is currently under appeal and the Competition Commission is not due to report until 31 August 2010, a provisional decision by the Competition Commission in relation to Bristol Water plc suggests little likelihood of change in the estimated risk free rate or equity risk premium.

We conclude that there are no clear and compelling grounds for expecting a material change in the WACC applying to broadcast transmission if the WACC were reviewed now.

5.2 Would a change in the WACC have a material impact?

A change in the WACC would have a limited impact on prices due to the existence of long-term contracts. A change in the WACC could however impact on incentives for new investment which is in turn more closely related to new contracts where prices might change.

5.3 Would a review in the near term future involve materially lower uncertainty?

Whilst new sources of uncertainty may arise, there are a number of areas where uncertainty will be resolved or reduced materially over the next two years. First, the Competition Commission will report by 31 August 2010 on the WACC (and other considerations) in relation to Openreach. Second, the impact of sovereign debt risk on markets might become clearer. Third, at some point before 2014 Arqiva must refinance existing 10-year bonds which fall due in 2014 and the cost of refinancing this debt will be known.

5.4 Conclusion

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 in relation to Openreach, developments in relation to sovereign risk and the cost of re-financing by Arqiva a review might be appropriate in future. The framework developed in this paper provides a basis for making such an assessment.

Appendix A: WACC estimates by regulators

Table A-1 provides a summary of regulators' decisions regarding the estimated WACC. We report both raw headline WACC estimates (which are not provided on a consistent basis – definitions are provided after the table) and the equivalent real pre-tax WACC. For comparative purposes the real pre-tax WACC for broadcast transmission was estimated to be 7.71% in 2006. However, there are a number of caveats in relation to any direct comparison including differences in the industries in question, the approach to regulation and the time when the estimate was made.

Table A-1: Regulator decisions on WACC

Regulator	Case	Date	Headline WACC from report	Real pre-tax WACC
CAA	NATS CP3 ⁴⁶	2010 – incomplete	real pre-tax: 7.5%	7.50%
Ofwat	Water Industry ⁴⁷	Q4 2009	real vanilla: 5.1%	6.10%
Ofgem	DPCR5 –electricity distribution network operators ⁴⁸	Q4 2009	real vanilla: 4.7%	5.60%
Competition Commission and CAA	Stansted price control ⁴⁹	Q1 2009	real pre-tax: 7.1%	7.10%
Office of Rail Regulation	Periodic review 08 - Network Rail ⁵⁰	Q4 2008	real vanilla: 4.75%	5.77%
Ofcom	Openreach (subject to appeal) ⁵¹	Q2 2009	nominal pre-tax for Openreach: 10.1%	7.43%
			nominal pre-tax for rest of BT: 11%	8.30%

⁴⁶ NATS (En Route) plc CAA price control proposals (2011-2014). <http://www.caa.co.uk/docs/5/ergdocs/20100527NERLCP3Proposals.pdf>

⁴⁷ Future water and sewerage charges 2010-2015: Final determinations. http://www.ofwat.gov.uk/pricereview/pr09phase3/det_pr09_finalfull.pdf

⁴⁸ Electricity Distribution Price control Review. Final proposals. http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR5/Documents1/FP_1_Core%20document%20SS%20FINAL.pdf

⁴⁹ Airport Regulation. Economic Regulation of Stansted Airport 2009-2014. CAA Decision. <http://www.caa.co.uk/docs/5/ergdocs/20090313StanstedPriceControl.pdf>

⁵⁰ Periodic review 2008. Determination of Network Rail's outputs and funding for 2009-14. <http://www.rail-reg.gov.uk/upload/pdf/383.pdf>

⁵¹ A New Pricing Framework for Openreach: Statement. <http://www.ofcom.org.uk/consult/condocs/openreachframework/statement/statement.pdf> and Annexes <http://www.ofcom.org.uk/consult/condocs/openreachframework/statement/annexes.pdf>

Regulator	Case	Date	Headline WACC from report	Real pre-tax WACC
Ofgem	GDPCR 2007-13 – gas distribution price control review ⁵²	Q4 2007	real vanilla: 4.94%	6.00%
Ofcom	Mobile Call Termination ⁵³	Q1 2007	real pre-tax: 11.5%	11.50%
Competition Commission and CAA	Heathrow & Gatwick price control ⁵⁴	Q1 2007	real pre-tax: 6.2% (Heathrow)	6.20%
			real pre-tax: 6.5% (Gatwick)	6.50%
Ofgem	TPCR4 – transmission price control review ⁵⁵	Q4 2006	real vanilla: 5.05%	6.25%
Ofcom	Arqiva Site Access	Q3 2006	nominal pre-tax: 10.4%	7.71%
Postcomm	Royal Mail ⁵⁶	Q4 2005	real pre-tax: 8%	8.00%
CAA	NATS Price Control Review 2006-10 (CP2) ⁵⁷	Q4 2005	Real pre-tax: 6.75%	6.75%
Ofcom	BT copper access ⁵⁸	Q3 2005	nominal pre-tax for copper: 10%	7.30%
			nominal pre-tax for rest of BT: 11.4%	8.20%
Ofgem	Electricity Distribution Price Control Review 4 (DPCR4) ⁵⁹	Q4 2004	Real pre-tax: 6.90%	6.90%
Ofwat	Water and sewerage charges 2005-10 ⁶⁰	Q4 2004	Real pre-tax: 7.3%	7.3%

⁵² Gas Distribution Price Control Review. Final proposals. <http://www.ofgem.gov.uk/NETWORKS/GASDISTR/GDPCR7-13/Documents1/final%20proposals.pdf>

⁵³ Ofcom's approach to risk in the assessment of the cost of capital. http://www.ofcom.org.uk/consult/condocs/cost_capital2/statement/final.pdf

⁵⁴ Economic regulation of Heathrow and Gatwick airports 2008-2013. CAA decision. http://www.caa.co.uk/docs/5/ergdocs/heathrowgatwickdecision_mar08.pdf

⁵⁵ Transmission price control review: Final proposals. http://www.ofgem.gov.uk/Networks/Trans/PriceControls/TPCR4/ConsultationDecisionsResponses/Documents1/16342-20061201_TPCR%20Final%20Proposals_in_v71%206%20Final.pdf

⁵⁶ Royal Mail Price and Service Quality Review. Final Proposals for Consultation. http://www.psc.gov.uk/postcomm/live/policy-and-consultations/consultations/price-control/Final_proposals_061205.pdf

⁵⁷ NATS Price Control Review 2006-10. CAA Decision. http://www.caa.co.uk/docs/5/ergdocs/erg_erdp_natsdecision_dec05.pdf

⁵⁸ Ofcom's approach to risk in the assessment of the cost of capital. http://www.ofcom.org.uk/consult/condocs/cost_capital2/statement/final.pdf

⁵⁹ Ofgem. Distribution Price Control Review 4. <http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR4/Pages/DPCR4.aspx>

WACC definitions: The risk free rate can either be nominal (usually based on the yields on treasury bills and government bonds) or real (usually based on index-linked government bonds), making the WACC either nominal or real. To convert between the two: $\text{Nominal} = (1 + \text{real}) \times (1 + \text{inflation rate}) - 1$. The cost of debt is usually expressed as pre-tax (adjusted to allow for corporation tax), while the cost of equity is usually expressed as post-tax. The WACC can be expressed as:

- Pre-tax: Both the cost of debt and the cost of equity are expressed as pre-tax. (This will be the largest as it includes a tax wedge.)
- Post-tax: both the cost of debt and the cost of equity are expressed as post-tax. (This will be the smallest as it does not include any tax consideration).
- “Vanilla”: A combination of the two. It uses the pre-tax cost of debt and the post-tax cost of equity.

The conversion formula is as follows: $\text{Nominal pre-tax WACC} = \text{Nominal post-tax WACC} / (1 - \text{tax})$.

Table A-2 provides a summary of interim regulator estimates of the WACC leading up to the final decisions listed in Table A-1.

Table A-2: Interim WACC estimates

Regulator	Case	Date	Real pre-tax WACC
Competition Commission	Appeal by Bristol Water plc – provisional findings (small WoCs only)	Jun-10 ⁶¹	6.0%
CAA	NATS at CP3	Feb-10 ⁶²	7.60%
		May-10 ⁶³	7.50%
Ofwat	Water & sewerage price control 2010-15	Oct-09 ⁶⁴	5.90%
Ofgem	DPCR5	Aug-09 ⁶⁵	6.80%
Ofcom	Openreach	May-08 ⁶⁶	6.30%

⁶⁰ Ofwat. Future water and sewerage charges 2005-10. Final determinations. [http://www.ofwat.gov.uk/legacy/aptrix/ofwat/publish.nsf/AttachmentsByTitle/pr04FD_all.pdf/\\$FILE/pr04FD_all.pdf](http://www.ofwat.gov.uk/legacy/aptrix/ofwat/publish.nsf/AttachmentsByTitle/pr04FD_all.pdf/$FILE/pr04FD_all.pdf)

⁶¹ Competition Commission. 18 June 2010. “Bristol Water plc – provisional findings report.” http://www.competition-commission.org.uk/inquiries/ref2010/bristol/provisional_findings.htm

⁶² NATS (En Route) plc price control review for control period 3. CAA Consultation. <http://www.caa.co.uk/docs/5/erqdocs/20100209NATSPriceControl.pdf>

⁶³ NATS (En Route) plc CAA price control proposals (2011-2014). <http://www.caa.co.uk/docs/5/erqdocs/20100527NERLCP3Proposals.pdf>

⁶⁴ Cost of Capital and Financeability at PR09. Updated Report by Europe Economics. http://www.ofwat.gov.uk/pricereview/pr09phase3/rpt_com_20091126fdcc.pdf

⁶⁵ Electricity Distribution Price Control Review. Initial proposals. http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR5/Documents/1/Initial%20Proposals_1_Core%20document.pdf

Regulator	Case	Date	Real pre-tax WACC
		Dec-08 ⁶⁷	6.80%
Ofgem	GDPCR 2007-13	Sep-06 ⁶⁸	6.25%
		Sep-07 ⁶⁹	5.83%
Ofcom	Mobile termination	Dec-03 ⁷⁰	13.23-17.56%
		Jun-04 ⁷¹	11.89%
		Jun-05 ⁷²	11.00%
		Sep-06 ⁷³	11.30%
CAA	Heathrow	Mar-07 ⁷⁴	5.9-6.2%
CAA	Gatwick	Mar-07 ⁷⁵	6.3-6.7%
Ofgem	TPCR4	Sep-06 ⁷⁶	6.00%

⁶⁶ A New Pricing Framework for Openreach: Developing new charge controls for wholesale line rental, unbundled local loops, and related services. Annex 10.

<http://www.ofcom.org.uk/consult/condocs/openreach/openreachcondoc.pdf>

⁶⁷ A New Pricing Framework for Openreach: Second consultation. Annex 12. <http://www.ofcom.org.uk/consult/condocs/openreachframework/off.pdf>

⁶⁸ Gas Distribution Price Control Review One Year Control Initial Proposals. <http://www.ofgem.gov.uk/NETWORKS/GASDISTR/GDPCR7-13/Documents1/15556-169a.pdf>

⁶⁹ Gas Distribution Price Control Review. Updated proposals document. <http://www.ofgem.gov.uk/NETWORKS/GASDISTR/GDPCR7-13/Documents1/GDPCR%20Updated%20Proposals%20Final.pdf>

⁷⁰ Wholesale mobile voice call termination consultation. Proposals for the identification and analysis of markets, determination of market power and setting of SMP conditions. Annex E. http://www.ofcom.org.uk/consult/condocs/mobile_call_termination/mct_consultation/

⁷¹ Statement on wholesale mobile voice call termination. Annex B. http://www.ofcom.org.uk/consult/condocs/mobile_call_termination/wmvct/

⁷² Wholesale mobile voice call termination markets – a proposal to modify the charge control conditions. <http://www.ofcom.org.uk/consult/condocs/wholesale/>

⁷³ Mobile call termination: Proposals for consultation. Annex 18. http://www.ofcom.org.uk/consult/condocs/mobile_call_term/new_mobile.pdf

⁷⁴ Airport price control review – recommendations to the Competition Commission for Heathrow and Gatwick Airports. http://www.caa.co.uk/docs/5/ergdocs/ccreference_march07.pdf

⁷⁵ Airport price control review – recommendations to the Competition Commission for Heathrow and Gatwick Airports. http://www.caa.co.uk/docs/5/ergdocs/ccreference_march07.pdf

⁷⁶ Gas Distribution Price Control Review One Year Control Initial Proposals. <http://www.ofgem.gov.uk/NETWORKS/GASDISTR/GDPCR7-13/Documents1/15556-169a.pdf>

Regulator	Case	Date	Real pre-tax WACC
Ofgem	DPCR4	Mar-04 ⁷⁷	7.70%
		Jun-04 ⁷⁸	6.60%
CAA	NATS at CP2	Nov-04 ⁷⁹	6.50%

Table A-3 focuses on the inputs to WACC estimation that are in principle common to the market and therefore common across industries – the real risk free rate and the equity risk premium – at least at a point in time.

Table A-3: Regulators assumptions regarding the common market inputs to the WACC

Regulator	Case	Date	Real risk free rate	Equity risk premium
Competition Commission	Bristol Water plc	Q2 2010 (provisional)	2.0%	5.0%
CAA	NATS CP3	2010 (not final)	1.75%	5.5%
Ofwat	Water Industry	Q4 2009	2.0%	5.4%
Ofgem	DPCR5 –electricity distribution network operators	Q4 2009	2-2.25%	4.5-5.5%
Competition Commission & CAA	Stansted price control	Q1 2009	2%	3-5%
Office of Rail Regulation	Periodic review 08 - Network Rail	Q4 2008	2%	5%
Ofcom	Openreach (subject to appeal)	Q2 2009	2%	5%
Ofgem	2007 gas distribution price control review	Q4 2007	2.5%	4.5%
Ofcom	Mobile Call Termination	Q1 2007	2%	4.5%

⁷⁷ Ofgem. Electricity Distribution Price Control Review. Policy document. <http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR4/Documents1/6597-Consultation%20Final.pdf>

⁷⁸ Ofgem. Electricity distribution price control review. Initial proposals. <http://www.ofgem.gov.uk/Networks/ElecDist/PriceCtrls/DPCR4/Documents1/7489-14504.pdf>

⁷⁹ NATS Price Control Review 2006-10. CAA's Initial proposals. http://www.caa.co.uk/docs/5/ergdocs/erg_ercp_natsinitialnov04.pdf

Regulator	Case	Date	Real risk free rate	Equity risk premium
Competition Commission & CAA	Heathrow & Gatwick price control	Q1 2007	2.5%	4.5%
Ofgem	TPCR4 – transmission price control review	Q4 2006	2.5%	4.5%
Ofcom	Arqiva Site Access	Q3 2006	2%	4.5%
Postcomm	Royal Mail	Q4 2005	2.5%	3.5-5%
CAA	NATS Price Control Review 2006-10 (CP2)	Q4 2005	2.5%	3.5-5%
Ofcom	BT copper access	Q3 2005	2.1%	4.5%
Ofgem	Electricity Distribution Price Control Review 4	Q4 2004	2.6%	4.9%
Ofwat	Water and sewerage charges 2005-10	Q4 2004	2%	5.4%