BT supplementary report to Ofcom's consultation on promoting competition and investment in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26 – The WACC for FTTP

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Non-Confidential version

Contents

1. Summary

1.1. In this report, we set out why Ofcom should recognise that investment in new fibre to the premise ('FTTP') networks has a different risk profile than for legacy networks. This is due to the high degree of fixed costs incurred upfront which amplifies the effect of revenue volatility (or 'operating leverage'), and more pronounced variability of demand with income (or 'income elasticity of demand') which means that FTTP investors are exposed to higher risk.

1.2. Market risk is an input to an estimate of the weighted average cost of capital ('WACC'), with higher risk implying a higher WACC. If the WACC for FTTP investments is under-estimated, this will send the wrong signal to all investors who are considering investments in FTTP today, making them less willing to invest in these networks. This would have adverse effects on Ofcom's and Government's ambitions for achieving world-class digital connectivity in all parts of the UK.

1.3. Market risk is represented in the framework for estimating the WACC by the asset beta. In the absence of pure-play FTTP comparators, or indeed any reasonable comparators to BT's fibre wholesale activities, a direct quantification of FTTP market risk is more reliable than using unsuitable comparators (as Ofcom does).

1.4. Using an approach based on robust financial theory, we have quantified the impact of higher operating leverage on the FTTP asset beta using data on the actual cost structure of FTTP relative to legacy services. Oxera has independently reviewed our adjustment and consider it has merit in providing a reasonable approach for adjusting the asset beta for operating leverage. We have also asked Oxera to provide an independent estimate of the impact of higher income elasticity on the FTTP asset beta using data from a behavioural study commissioned by BT of demand for FTTP and legacy services. Taken together, these two effects indicate an estimated range for the FTTP asset beta of [✂], significantly higher than Ofcom's current FTTP asset beta estimate of 0.65.

1.5. This estimate of the FTTP asset beta can be reconciled back to BT Group's observed market beta. This can be achieved by disaggregating the BT Group beta into four rather than three categories (a framework Ofcom has used to reflect different systematic risk in parts of the business compared to the overall company). Otherwise, it could be achieved by placing FTTP within Ofcom's existing 'Rest of BT' category.

1.6. Our estimate of the FTTP asset beta implies a premium over the WACC for legacy copper services within the range set by other European regulators. Ofcom's current proposals, in contrast, represent the outlying position with a premium over the legacy WACC that is much lower than comparator countries.

1.7. Finally, any pre-tax view of the WACC must reflect future corporate tax rates. Given the pressure on government finances following COVID, Ofcom should recognise that increases in tax rate are more likely than decreases. This could be achieved by using a [✂] rather than the current rate of 19%.

1.8. Based on the analysis in this report and in our WFTMR consultation response, we estimate an FTTP WACC of [✂], significantly higher than Ofcom's estimate of 7.9%. This 'ex ante' WACC captures all the systematic risk which BT faces at the time of investing in FTTP. Ofcom should commit to applying an estimate of the ex ante FTTP WACC within the fair bet framework which reflects the upfront systematic risk facing FTTP investors. Ofcom might also recognise, and state, that the FTTP WACC applied in this context is different to the WACC used for setting charge controls.

2. Introduction

2.1. Ofcom's Wholesale Fixed Telecoms Market Review (WFTMR) sets out its intent to ensure that BT has a 'fair bet' on investments in full fibre.[1] Ofcom states in its consultation that, if there are circumstances in which it imposes further price regulation on full fibre services, it will take account of the fair bet principle.[2]

2.2. The fair bet principle recognises that investors in telecoms infrastructure face a wide range of risks when they invest. In a scenario where the firm making the investment is found to have market power, the regulator may cap returns to prevent consumer harm. The fair bet principle requires that any such cap on returns does not result in the expected return for the project falling below a fair return which reflects the upfront risk of downside. Under-stating the upfront risk when imposing further price regulation could result in investors being unwilling to commit their capital (if they anticipate the error).

2.3. In applying the fair bet principle to FTTP investment, one of the key parameters is the WACC for FTTP. This estimate of the WACC for FTTP is not the same as the WACC used for setting cost-based charge controls in any particular five-year regulatory period. The WACC applied as part of the fair bet framework should capture the upfront risk that an investor bears when committing capital today towards a project that will only provide pay-offs in the long run, and where those pay-offs are uncertain. For such a project, the investor is exposed to risks over a long period of time, much greater than a single 5-year regulatory period, and the WACC should reflect this full set of risks.

2.4. We ask Ofcom to recognise in its final statement on the WFTMR that the FTTP WACC it applies in the fair bet framework is different to the FTTP WACC that it applies in any given 5-year charge control period. Ofcom made precisely such a statement in applying the fair bet to BT's investment in superfast broadband as part of the 2018 Wholesale Local Access review. It stated '[a]*s to when that assessment of systematic risk is made, we agree with Oxera that the relevant cost of capital to use in assessing the fair bet would be that associated with fibre access at the time of the original investment rather than the forward-looking cost of capital determined in this review*.'[3]

2.5. Such a statement would provide investors with valuable reassurance that, as part of the fair bet assessment, Ofcom will capture the *upfront* risk that investors face over the full life of the project. If the *upfront* risk associated with FTTP investment is not properly reflected, there is a risk that further FTTP price regulation may be imposed too early, the expectation of which may damage the case for investing in full fibre at scale. Other firms with FTTP investment plans, including Virgin Media and CityFibre, have noted the importance of a fair bet approach which provides an opportunity to earn upside returns relative to a fair cost of capital which fully reflects upfront risk

2.6. In this report, we set out why Ofcom's estimate of the FTTP WACC of 7.9% in its January 2020 WFTMR consultation (the Consultation) does not capture the upfront systematic risk over the full life of BT's FTTP investment. Ofcom has not accurately captured two elements of risk that it accepts are higher for FTTP than for FTTC: income elasticity of demand and operating leverage.

[1] Ofcom, 8 January 2020. Promoting competition and investment in fibre networks: Wholesale Fixed Telecoms Market Review 2021-26. Volume 4. Paragraph 1.87. p19.
[2] Ibid. Paragraph 1.89. p20.
[3] Ofcom, 28 March 2018. Wholesale Local Access Statement. Annex 6. Paragraph A6.76.

2.7. We have updated our estimate of the impact of higher operating leverage on the FTTP asset beta (contained in our May 2020 response to the Consultation) to reflect the FTTP financial model which underpinned the assessment and conditional approval of the case in July 2020.[4] We have also asked Oxera to prepare an independent expert report which describes the finance theory relating to the FTTP systematic risk factors, and which quantifies the differences in income elasticity of demand between FTTP and existing Openreach services. Oxera then quantifies the impact of these differences on the asset beta for FTTP. We have also considered whether the implied asset beta for FTTP can be reconciled back to the BT Group WACC (in line with Ofcom's approach to beta disaggregation) as well as the appropriate corporate tax rate assumptions that should be used.

2.8. This report is structured as follows:

- Section 3 observes that Ofcom's estimate of the FTTP asset beta contained in the January 2020 WFTMR consultation is too low, and risks sending the wrong signal to investors in full fibre infrastructure;
- Section 4 sets out our proposed method for quantifying the impact of differences in operating leverage and Oxera's method for quantifying the impact of higher income elasticity of demand on the FTTP asset beta;
- Section 5 shows that the implied FTTP asset beta estimates can be reconciled back to the BT Group asset beta;
- Section 6 considers Ofcom's approach to estimating the tax rate in the WACC calculation in light of the change in risks due to the global pandemic; and
- Section 7 summarises our FTTP WACC estimate.

2.9. The annex to this report provides details of our latest calculations of the FTTP asset beta based on our adjustment for the systematic risk relating to operating leverage and Oxera's adjustment for income elasticity of demand for FTTP.

[4] BT, 29 May 2020. Annex to the BT response to Ofcom's consultation on promoting competition and investment in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26. Annex 6.

3. Ofcom's FTTP asset beta is too low, sending the wrong signal to FTTP investors

3.1. In the Consultation, Ofcom estimated a WACC for FTTP of 7.9% (in pre-tax, nominal terms).[5] Ofcom categorised FTTP in the 'Other UK Telecoms' category (one of three categories into which Ofcom disaggregates the BT Group WACC), the same category in which it placed Fibre-to-the-Cabinet (FTTC) services at the time of the 2019 Business Connectivity Market Review (BCMR).

Ofcom accepts that FTTP investment is associated with more systematic risk than FTTC

3.2. In the Consultation, Ofcom concludes that the systematic risk associated with FTTP is greater than it is for FTTC today, because of its higher income elasticity of demand and higher operating leverage.[6]

3.3. As regards **income elasticity of demand** for FTTP, Ofcom notes that speeds delivered via FTTP currently attract a retail price premium, implying that these services could be perceived as a luxury product, with a higher asset beta.[7] Ofcom believes that demand risk for FTTP will decline over time, particularly after copper switchover once Openreach has additional levers to migrate customers to the FTTP platform.[8]

3.4. Whilst Ofcom's proposals on copper switchover help with migration of customers to the FTTP platform, this doesn't remove demand risk for FTTP. A key portion of demand risk for FTTP relates to the demand for higher speed FTTP products, which are crucial in allowing BT to earn a fair return on its investment. The changes to regulation Ofcom is proposing may assist in moving customers to FTTP entry-level products,[9] but the risk remains that take-up of higher speed FTTP products is more sensitive to economic conditions. This contributes to a higher FTTP systematic risk than for FTTC, which is the case even with switchover support.

3.5. Ofcom also notes that **operational leverage** for FTTP is higher than it is for FTTC, because of the large capital expenditure to be undertaken early in the FTTP investment life, which amplifies the risk of volatility in returns.[10] We agree with Ofcom that higher operating leverage for FTTP should be reflected in the asset beta. In our May 2020 response to the Consultation, we proposed a method for reflecting differences in operating leverage in the asset beta, and, using this method, estimated an FTTP asset beta of [✂].[11]

3.6. Whilst Ofcom accepts that FTTP has both higher operating leverage and income elasticity of demand than FTTC, it has not attempted to quantify this difference, or tried to directly assess the impact on the asset beta.

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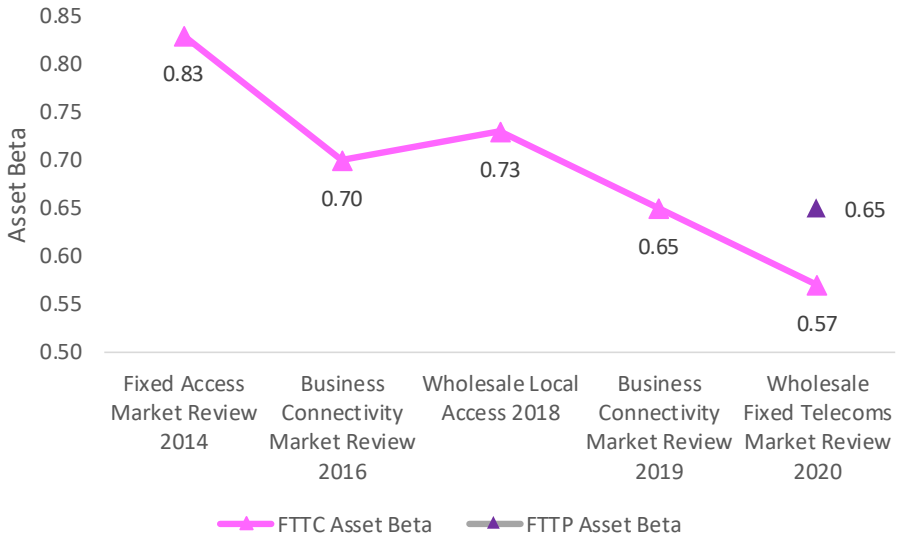
[5] Ibid. Annex 21. Paragraph A21.58. p226. Table A21.9. p231.
[6] Ibid. Annex 21. Paragraph A21.54-21.56. p226.
[7] Ibid. Annex 21. Paragraph A21.54. p226.
[8] Ibid. Annex 21. Paragraph A21.53. p226.
[9] The effectiveness of Ofcom's support for switchover remains unclear as Ofcom has set high thresholds (e.g. complete ultrafast coverage in an exchange area before copper charge controls can be removed).
[10] Ibid. Annex 21. Paragraph A21.56. p226.
[11] BT, 29 May 2020. Annex to the BT response to Ofcom's consultation on promoting competition and investment in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26. Paragraph A6.82-A6.104. p37-41.

Ofcom has lowered its FTTC asset beta, implying that FTTP at project outset is as risky as FTTC was thought to be less than two years ago

3.7. Instead of a direct measurement of higher operating leverage and income elasticity of demand and their impact on the FTTP asset beta, Ofcom has achieved a wedge (of 0.08) between the FTTP and FTTC asset betas by re-categorising FTTC services to the lower risk 'Openreach' category, whilst assigning FTTP, for the first time, to the mid-risk 'Other UK Telecoms' category,[12] where FTTC formerly sat. This is shown in Figure 1 below.

Figure 1 – Ofcom estimates of the FTTC and FTTP asset betas in market reviews



Source: (1) Ofcom, 26 June 2014. Fixed access market reviews. Annex 13. A14.262. p225. A14.293. p233. (2) Ofcom, 28 April 2016. Business Connectivity Market Review. Annex 30. A30.246. p112. Ofcom, 28 March 2018. Wholesale Local Access Market Review. Annex 20. A20.6-A20.7. p74-75. Ofcom, 28 June 2019. Promoting competition and investment in fibre networks: review of the physical infrastructure and business connectivity markets. Annex 21. A21.223. p366. Ofcom, 8 January 2020. Promoting competition and investment in fibre networks: Wholesale Fixed Telecoms Market Review 2021-26. Annex 21. A21.58. p226. Table A21.9. p231.

3.8. Ofcom's estimate of the asset beta for FTTP is the same as its estimate for FTTC in 2019 as part of the BCMR (less than two years ago), and significantly less than any of its prior estimates for FTTC, which were judged appropriate when FTTC was in the earlier and riskier phase of its investment cycle.

3.9. Ofcom's approach (which gets to a risk differential through category assignment and re-assignment) bears no relation to the *actual* difference in systematic risk between FTTC and FTTP based on the inherent characteristics of these services and the investments undertaken to supply them. The asset betas for each of the disaggregated categories are based on comparators that are not pure-play comparators for FTTC or FTTP.

[12] Ofcom WFTMR Consultation, January 2020. Annex 21. Figure A21.6. p228.

3.10. For the 'Other UK Telecoms' category, to which Ofcom assigns FTTP, the asset beta is based on the betas for UK listed telecoms operators, including BT Group, TalkTalk and Vodafone.[13] None of these firms are pure play FTTP operators.

3.11. TalkTalk advertises itself as a 'value broadband' provider,[14] implying that it targets customers that are willing to pay lower prices for entry-level or lower speed broadband products. It has also exited from infrastructure provision following the sale to CityFibre of a small, York-based fibre deployment in 2020. TalkTalk currently supplies its retail customers primarily with broadband provided over Openreach's copper ADSL or FTTC network, rather than FTTP. As Ofcom's reasoning on income elasticity of demand implies, lower speed entry-level broadband products should be associated with a lower income elasticity of demand, and this should be reflected in TalkTalk's market beta.

3.12. TalkTalk is not a pure-play FTTP operator, and Ofcom should not use it as a comparator for setting the FTTP asset beta. In any event, the business will be taken private in 2021 by Toscafund, removing it as a comparator and highlighting the challenge of using an unstable comparator group for setting key regulatory parameters within a framework which requires stability. It may also be the case that rumours of the deal may have made TalkTalk's beta in recent months even less suitable as a comparator for the 'Other UK Telecoms' category.

3.13. Vodafone is also not a pure-play FTTP operator. Vodafone is a global telecoms operator, primarily serving its customers using mobile networks.[15] The demand risk associated with mobile services does not have a direct relationship with FTTP, and is likely to be lower. Customer penetration for mobile services in the UK is very high,[16] much greater than FTTP take-up today. FTTP services (particularly the higher speed variants) are likely to be viewed as a luxury product, as demonstrated by their retail price premium (and Oxera's empirical estimate of this effect) over other types of fixed broadband. The demand for mobile services, in contrast, is more stable given its maturity as a technology.[17] This indicates that the income elasticity of demand for FTTP should be higher than for mobile services, resulting in a higher asset beta. We therefore do not see Vodafone as a valid comparator for FTTP either.

3.14. Finally, BT Group is a converged operator providing fixed, mobile and other types of digital services. There is no reason to believe BT Group's market beta accurately reflects the asset beta for FTTP. Ofcom has not provided any evidence to show why the high income elasticity of demand and operating leverage for FTTP implies that the asset beta for FTTP can be reasonably approximated by BT Group's market beta.

3.15. Given the absence of a pure-play FTTP operator, Ofcom should not assume that its asset beta for 'Other UK Telecoms', derived from the average of the betas for UK telecoms operators, is appropriate for FTTP. Instead it should directly measure the

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[13] Ofcom's choice of comparators for estimating the beta for 'Other UK Telecoms' is set out in its Business Connectivity Market Review. Source: Ofcom, 28 June 2019. Promoting competition and investment in fibre networks: review of the physical infrastructure and business connectivity markets. Annex 21. A21.215-A21.216. p365.
[14] TalkTalk. Why TalkTalk.
[15] Ofcom has previously noted that Vodafone is predominantly focussed on mobile services. Source: Ofcom, 28 June 2019. Promoting competition and investment in fibre networks: review of the physical infrastructure and business connectivity markets. Annex 21. A21.216. p365.
[16] Ofcom finds that 98% homes take a mobile service, whereas only 3% of homes that take fixed broadband have an ultrafast service (at speeds above 300Mbps). Source: Ofcom, 30 September 2020. Communications Market Report 2020. p3.
[17] We note that investment in 5G mobile services might result in some increase in mobile operators' betas, since 5G mobile services are regarded as a premium service, and mobile operators may charge a premium for them. However, 5G rollout is currently in its early stages, and so Vodafone's market beta based on historical data is unlikely to be materially affected by 5G investment.

impact of higher operating leverage and income elasticity of demand for FTTP on the asset beta.

Setting such a low FTTP asset beta sends the wrong signal to FTTP investors

3.16. The approach Ofcom takes to measuring the FTTP asset beta indirectly, by categorising it in 'Other UK Telecoms', risks setting too low an asset beta for FTTP. This may undermine Ofcom's policy goal of promoting competitive investment in full fibre networks.

3.17. By setting too low an asset beta for FTTP, Ofcom may apply further price regulation too early on the basis that it thinks BT has (and will likely) earn sufficient upside return relative to an under-stated cost of capital. In reality, such perceived upside may not be a true upside, because the return relative to the correct benchmark cost of capital (using the correct asset beta) would be lower. In such an instance, Ofcom may introduce price regulation too early, which, if known by fibre investors today, may reduce their willingness to commit capital.

3.18. A number of stakeholders have asked Ofcom to capture the higher risk of FTTP when applying the fair bet principle in future. For example, Virgin Media has noted the higher demand risk of FTTP even with regulatory support for migration from copper, and that this should be reflected in the application of the fair bet principle.[18]

3.19. We also note that the Competition and Markets Authority (CMA) has recently estimated the cost of capital in the appeal by selected UK water companies of Ofwat's 2019 price review. Given the potential costs of setting a cost of capital too low for an industry facing significant investment requirements, the CMA believes it should reflect the risk of error by selecting a point estimate in its cost of equity range above the mid-point (at the 75th percentile).[19]

3.20. Ofcom is setting the WACC for FTTP in a context where there is even more at stake for investment in full fibre networks. Given Ofcom's ambition to promote full fibre deployment at scale and at pace by all operators, we see even more reason for Ofcom to ensure its FTTP WACC estimate (and particularly the underlying FTTP asset beta) is accurate and based on reliable evidence; specifically by directly quantifying the impact of higher operating leverage and income elasticity of demand on the FTTP asset beta. This would help avoid the damaging effects on investment of setting the WACC too low.

[18] Virgin Media, 2020. Promoting competition and investment in fibre networks: Wholesale Fixed Telecoms Market Review 2021-26. Paragraph 37-38. p19-20.

[19] "…it is appropriate to reflect the risk of error in our cost of capital component metric estimates when choosing a point estimate for the WACC, given the potential costs of setting the cost of capital too low. We also consider that there are reasons specific to this determination, related to asymmetry and financeability, which justify a degree of caution against setting the cost of capital too low." Competition and Markets Authority, 29 September 2020. Anglian Water Services Limited, Bristol Water plc, Northumbrian Water Limited and Yorkshire Water Services Limited price determinations. Provisional findings. Paragraph 9.674. p673.

4. The impact of higher operating leverage and income elasticity on the asset beta can be directly quantified

4.1. In BT's May 2020 response to the Consultation, we provided Ofcom with a method for quantifying the impact on asset beta of higher operating leverage for FTTP.[20] Our method was based on established financial theory, and formulated the relationship between the degree of operating leverage for a particular asset, the asset beta of the revenues generated by the asset and its overall asset beta. Using this approach, we estimated that, assuming an FTTC asset beta of 0.65, the higher operating leverage of FTTP indicates an FTTP asset beta of [✂]. Our estimate of the FTTP asset beta was conservative because it did not account for the higher income elasticity of demand for FTTP services relative to FTTC.

4.2. We have updated our estimate and commissioned Oxera to provide an independent view on the theory relating to systematic risk measurement, as well as a direct estimate of the impact of higher income elasticity of demand for FTTP. The approach we describe below offers a reliable and direct method for quantifying the impact of operating leverage and income elasticity of demand factors on the FTTP asset beta resulting in an asset beta differential between FTTP and FTTC of [✂].[21] This range is more than [✂] times Ofcom's current asset beta differential between FTTP and FTTC of 0.08 (which we find to be exceptionally low compared to the differentials set by European regulators in comparator countries).

A higher asset beta for FTTC than standard copper is justified given its higher income elasticity of demand

4.3. In our consultation response, we presented evidence of why FTTC has a higher income elasticity of demand than standard copper broadband services.[22] This included evidence of a retail price premium for FTTC and substantial demand for standard copper services that many customers consider to be sufficient for their needs. This evidence suggests that Ofcom has underestimated the FTTC asset beta, and by implication has also underestimated the FTTP asset beta.

4.4. We continue to believe Ofcom should set a higher asset beta for FTTC than standard copper services, based on its higher income elasticity of demand. Our analysis of FTTC take-up shows that in areas where FTTC is available, take-up of FTTC is higher in 'high affluence' areas relative to 'low affluence' areas. By contrast, take-up of ADSL broadband (i.e. standard copper broadband) does not vary between low, medium and high affluence areas, showing that the demand for ADSL broadband is relatively insensitive to customer income.

[20] BT, 29 May 2020. Annex to the BT response to Ofcom's consultation on promoting competition and investment in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26. Paragraph A6.68-A6.71. p34.
[21] Note that the adjustments to the asset beta for operating leverage and income elasticity of demand are not additive. They are combined based on the framework set out in the annex of this report.
[22] Ibid. A6.53-A6.60. p31-33.

Figure 2 – FTTC broadband take-up in areas with different levels of affluence

[✂]

Figure 3 – ADSL broadband take-up in areas with different levels of affluence

[✂]

Source: Openreach, Acxiom; Note: The data on affluence is provided by Acxiom, who provide postcode level data on consumers. The Acxiom dataset categorises postcodes into three different categories of average affluence in that postcode, based on the average household income in that postcode. Of the total homes passed in postcodes where FTTC is available, [✂] are categorised as being in high affluence postcodes, [✂] in medium affluence, and [✂] in low affluence. We map the Acxiom data on affluence to Openreach data on the number of FTTC and ADSL lines in each postcode to derive the relationship above.

4.5. This provides clear evidence that consumers see FTTC broadband as a more premium product than standard copper broadband, and that the higher the customer's income, the more likely they are to choose FTTC over standard copper. This has clear implications for the asset beta. Fluctuations in macroeconomic conditions, and hence customer income, will result in a greater impact on demand for FTTC broadband than it will for standard copper broadband. As a result, the asset beta for FTTC is expected to be higher.

4.6. We note that the evidence above shows that the gap in FTTC take-up between high and low affluence households shows no sign of declining.[23] Even in a forward-looking regulatory period of five years, there is no evidence to show that demand risk between FTTC and standard copper broadband is likely to converge, given that the past five years show no convergence whatsoever. This points strongly to setting a WACC for FTTC which reflects a higher asset beta than standard copper.

We have directly quantified the impact of higher operating leverage on the FTTP asset beta

4.7. In our May 2020 response to the Consultation, we provided a theoretical framework for quantifying the effect of operating leverage differences on the asset beta. Under this framework, the FTTP asset beta can be decomposed into its revenue beta and the degree of operating leverage, both of which can be estimated directly. Using data from BT Group's FTTP business case model at the time, we estimated a FTTP asset beta of [✂].

4.8. We have updated our estimation of the FTTP asset beta using the FTTP financial model which underpinned the assessment and conditional approval of the case in July 2020.[24] Using this model, we have quantified the difference in operating leverage between FTTP, FTTC and copper. We then apply the framework described in our May 2020 response to quantify the impact on the asset beta of higher operating leverage for FTTP.

4.9. As part of this update, we have reconsidered the classification of costs as fixed or variable. In our May 2020 response, we categorised all capex as fixed costs and all opex as variable costs. Following a more granular assessment of capex, we have now categorised [✂] capex as a variable cost,[25] as these costs are principally driven by demand for FTTP. We have also classified [✂] opex as a fixed cost, as these primarily relate to overhead costs that are independent of FTTP demand.

4.10. Based on this analysis, we estimate an asset beta range of [✂], solely reflecting FTTP's higher operating leverage.[26]

4.11. Oxera has independently reviewed our adjustment for operating leverage and consider it reasonable:[27]

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[23] We note that the take-up of FTTC remains higher in more affluent areas even after the introduction of Openreach's GEA offer, in which Openreach offers discounts for higher speed FTTC products if CPs meet certain volume targets. Despite the reduction in higher speed FTTC prices as a result of this offer, the difference in take-up of FTTC between high and low affluence areas remains relatively stable. Source: Openreach, 24 July 2018. GEN036/18 Volume commitment special offer on GEA-FTTC, G.fast and GEA-FTTP.

[24] We have provided our FTTP business case model to Ofcom during the WFTMR consultation, and this contains the assumptions on costs used as part of our analysis.

[25] Provisions capex relates to the capital costs incurred in provisioning a new fibre line for use by a customer, in particular, connecting their home or business premise.

[26] This corresponds to an asset beta uplift of between [✂] for FTTP over an FTTC asset beta of 0.65, solely based on differences in operating leverage.

[27] Oxera, 14 January 2021. Quantifying the relative risk differences between FTTP and FTTC. Section 1.1.

"This adjustment builds on standard corporate finance theory (as set out in Brealey and Myers), and has merit in providing a reasonable approach for adjusting for operating leverage, compared to Ofcom's approach, which has not attempted a direct quantification of the impact of higher operating leverage on the asset beta."

4.12. Our estimated range for the FTTP asset beta of [✂] is slightly lower than the estimate of [✂] we presented in our May 2020 response reflecting the latest financial model and the re-classification of certain cost categories.

Oxera quantifies the impact of higher income elasticity on the FTTP asset beta

4.13. BT has requested Oxera to provide an independent expert report on the impact of higher income elasticity of demand on the FTTP asset beta.[28]

4.14. To calculate the income elasticities for FTTP and FTTC, Oxera uses the results of a customer demand simulation commissioned by BT in December 2019 to assess retail broadband demand for FTTC and likely future demand for FTTP. It then considers the empirical relationship between income elasticities of demand and asset betas based on a cross-industry dataset. Based on this empirical relationship, Oxera maps the estimated income elasticities of demand for FTTP and FTTC to the cross-industry dataset to calculate the asset beta adjustments for FTTP and FTTC. The results suggest an additional asset beta wedge between FTTP and FTTC of [✂], driven solely by relative income elasticities.

4.15. BT's estimate of the impact on the FTTP asset beta of higher operating leverage and Oxera's quantification of higher income elasticity of demand are based on sound financial theory and robust evidence. This includes data used internally by BT to assess and decide on our planned FTTP investment and a behavioural investigation of demand across a significant sample of customers. We believe this offers the most reliable and direct method for quantifying the impact of these factors on the FTTP asset beta.

4.16. Combining the analysis of operating leverage and income elasticity of demand, the asset beta differential between FTTP and FTTC is [✂].[29] This range is between more than [✂] times Ofcom's current asset beta differential between FTTP and FTTC of 0.08, arrived at using the comparator methodology and a re-designation (since 2019) of FTTC as a lower risk activity, rather than directly estimating FTTP systematic risk.[30]

[28] Oxera, 12 January 2021. Quantifying systematic demand risk differences between FTTP, FTTC and copper.
[29] Note that the adjustments to the asset beta for operating leverage and income elasticity of demand are not additive. They are combined based on the framework they set out in the annex of this report.
[30] We note that Ofcom can apply the framework described above using its own dataset to verify our FTTP asset beta estimates. Ofcom has prepared an FTTP cost model, which it can use to estimate the cost structure and operating leverage for FTTP. Similarly, as the industry regulator, Ofcom has powers to collect data from operators on variations in demand for broadband speeds based on differences in customer income. Together, such data can allow Ofcom to quantify the differences in operating leverage and income elasticity between FTTP and FTTC.

5. Our FTTP asset beta estimate can be reconciled back to the BT Group asset beta

5.1. In the section above, we estimate an FTTP asset beta uplift of between [✂] relative to FTTC, implying an FTTP asset beta of [✂].

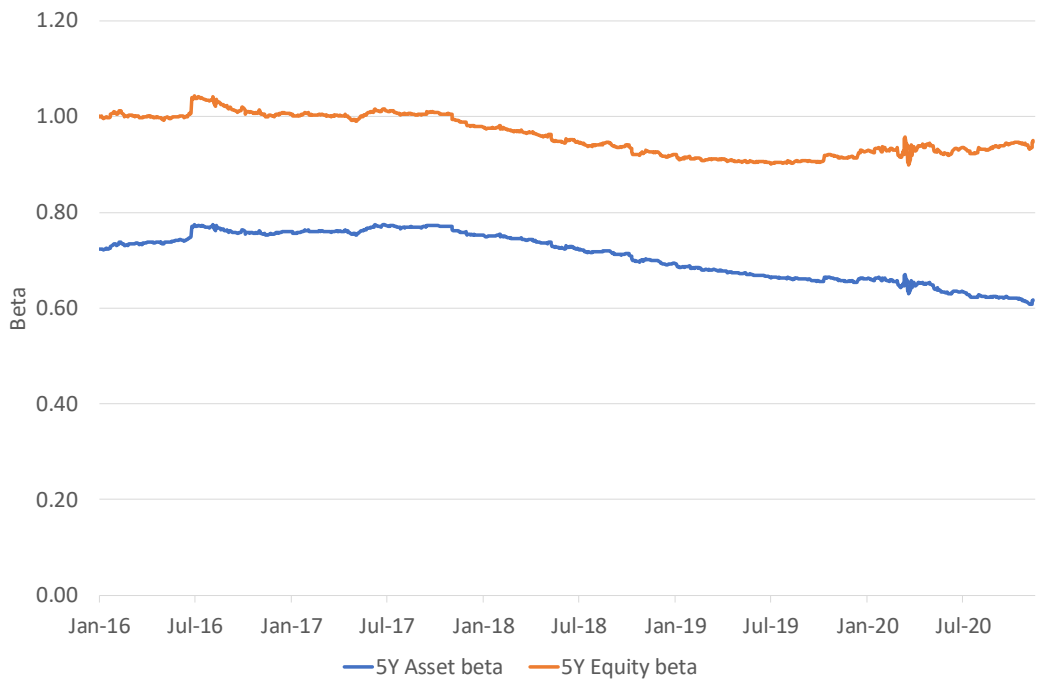
5.2. In this section, we consider whether this range for the FTTP asset beta of [✂] can be reconciled back to the BT Group asset beta.

The BT Group asset beta can be updated based on latest market data

5.3. In the Consultation, Ofcom did not update its beta calculations for the latest market evidence, and instead used placeholders from its 2019 BCMR final determination.

5.4. We have updated the beta estimates for BT Group to reflect the latest market evidence. Figure 4 shows rolling asset and equity beta estimates for BT Group using a 5-year estimation window, the same estimation window that Ofcom applied in the BCMR.

Figure 4 – Rolling equity and asset betas for BT Group using a 5-year estimation window



Source: Bloomberg; Note: The equity beta is measured by regressing daily stock returns for BT Group against returns for the FTSE All Share Index, using a 5-year estimation window. The asset beta is then calculated using the Miller formula, where we calculate the gearing as gross debt over the sum of gross debt and market capitalisation.

5.5. Figure 4 shows that the 5-year asset beta for BT Group has declined over the last year, and is currently at 0.62,[31] relative to Ofcom's BCMR estimate of 0.68.

5.6. The asset beta for FTTP is not being used to estimate a WACC for charge control setting purposes. Rather, an estimate of the FTTP asset beta is needed today so that appropriate regard is given to upfront systematic risks borne by investors before any further price regulation is imposed in the future (in accordance with the fair bet).

5.7. The asset beta for FTTP should therefore reflect the systematic risk borne by investors over the relevant time horizon (which will be decades). Equally, when reconciling the FTTP asset beta back to the BT Group asset beta, the latter should also reflect a longer-term investor horizon. Such an estimate of the BT Group asset beta may be different from the asset beta estimated for a five-year regulatory period for charge control setting purposes.

5.8. Specifically, Ofcom should use a long-term estimation window for BT Group to reflect the cyclical movements in asset betas. The BT Group asset beta has changed with the economic cycle. In 2014, the BT Group 2Y asset beta was close to current levels of 0.62-0.66; it subsequently increased to a peak of 0.77 in 2017, before declining to its current levels. These cyclical movements in the BT Group asset beta support using a long estimation window when determining a WACC to be applied within the fair bet framework to assess the reasonableness of project returns.

5.9. A longer 10-year estimation window is therefore more appropriate, capturing the cyclical movements in the BT Group asset beta, and better reflecting the systematic risk an investor in FTTP may face today over their investor horizon of at least 20 years.

5.10. The current 10-year asset beta for BT Group is 0.66, slightly below Ofcom's estimate of the BT Group asset beta of 0.68 in the BCMR. Our estimate based on a 10-year window is reasonable and ensures that the FTTP asset beta reconciles back to a BT Group asset beta that *also* reflects BT's systematic risk over the longer term.[32]

Our FTTP asset beta estimate reconciles back to an accurate estimate of the BT Group asset beta

5.11. We now consider whether our FTTP asset beta range of [✂] can be reconciled back to our estimate of the BT Group asset beta of 0.66.

5.12. Under Ofcom's beta disaggregation approach, Ofcom checks whether its asset beta estimates for each of its three categories reconciles back to the BT Group asset beta, once weighted by a measure of their respective share of the business. Ofcom has previously used weights based on each business segment's mean capital employed (MCE) or EBITDA, as a share of BT Group's MCE or EBITDA.

[31] BT applied an accounting change on 1st April 2019 based on IFRS 16, based on which it reflected lease liabilities within its net debt calculation. Bloomberg reports BT's debt including these lease liabilities from June 2019, but excludes them prior that date, when Ofcom last updates its beta estimates for BT Group. For consistency with Ofcom's previous approach to beta estimation, it should continue to exclude these lease liabilities arising out of the changes from IFRS 16. Source: BT, 31 October 2019. Results for the half year to 30 September 2019. p8.

[32] Whilst we think it appropriate for Ofcom to reconcile its FTTP asset beta estimate to a 10-year BT Group asset beta, to account for the long-term systematic risk that investors in FTTP bear, we acknowledge that for other regulated services that are subject to a 5-year charge control during 2021 to 2026, a different beta estimation window may be appropriate. For such services subject to a 5-year charge control, a shorter estimation window of 5 years may be more appropriate to capture the systematic risk over the period. A different beta estimation window for long-term investments compared to products that are subject to immediate charge controls is not inconsistent because each beta estimate then captures the systematic risk over the period in which investors are bearing risk – long-term in the case of FTTP, and a shorter 5-year period for products like DPA and dark fibre that are subject to a charge control.

5.13. FTTP today represents a small proportion of BT Group's MCE and EBITDA. BT's FTTP MCE at the end of FY20 was [✂], only [✂] of overall BT Group MCE of £37.4bn.[33] Whilst we intend to increase our deployment of FTTP in the coming years, the asset beta of BT today (based on historical data) reflects very little of the systematic risk associated with future FTTP investment.

5.14. This is particularly the case given Ofcom estimates the BT Group asset beta using historical data. An asset beta estimate based on a 5-year or 10-year historical window is likely to be even less impacted by the future FTTP risk we will bear. We therefore believe our FTTP asset beta range of [✂] should receive a low weight when reconciling to our BT Group asset beta estimate of 0.66.

5.15. We have assumed Ofcom continues to apply its current relative weightings for its existing three WACC disaggregation categories, but we adjust its current weight for 'Other UK Telecoms' to account for our removal of FTTP from 'Other UK Telecoms' to placement in a separate standalone category. We assume a weight of [✂] for FTTP, based on its existing MCE as a proportion of total BT Group MCE.

5.16. Given our asset beta estimates for BT Group and FTTP, Ofcom's estimates for the asset betas for Openreach (0.57) and 'Other UK Telecoms' (0.65) and our assumed weights, we have calculated the implied asset beta for 'Rest of BT', the final category in Ofcom's WACC disaggregation approach. Table 1 shows the implied asset beta range for 'Rest of BT'.

Table 1 – Reconciliation of our proposed beta disaggregation approach to the BT Group asset beta

	BT Group	Openreach	Other UK Telecoms	FTTP	Rest of BT
Asset beta	0.66	0.57	0.65	[✂]	[✂]
Weight	100%	25%	[✂]	[✂]	[✂]

Source: Ofcom Wholesale Fixed Telecoms Market Review consultation, BT analysis

5.17. Table 1 shows that our estimates of the asset betas for FTTP and BT Group imply an asset beta of [✂] for 'Rest of BT'.

5.18. 'Rest of BT' primarily consists of a range of ICT and managed network services. Ofcom's analysis in the BCMR gave a wide asset beta range of 0.70 to 1.25 for 'Rest of BT' given the uncertainty around the risk associated with these diverse activities.[34]

5.19. Our implied asset beta for 'Rest of BT' of [✂] falls within Ofcom's previous range based on its assessment of comparators. This shows that our asset beta estimates for FTTP can be reconciled back to the BT Group asset beta.[35]

5.20. Whilst our implied asset beta for 'Rest of BT' lies towards the bottom end of Ofcom's previous range, we note that these BT ICT services tend to have low operating leverage because they rely on an asset-light model with relatively low fixed costs. In our recent half-yearly results, we noted that for our Global business unit (which concentrates on these services):[36]

[33] Source: Openreach, BT Regulatory Financial Statements 2020. P25.
[34] Ofcom, 28 June 2019. Promoting competition and investment in fibre networks: review of the physical infrastructure and business connectivity markets. Annex 21. Paragraph A21.219. p366.
[35] Even if FTTP is given a [✂] weight, higher than its current share of overall BT MCE, the implied asset beta for Rest of BT would be [✂], still well above the range reported by Ofcom in its 2019 BCMR decision.
[36] BT, 29 October 2020. Results for the half year to 30 September 2020. P12.

"Covid-19 negatively impacted revenue in the half year but did not materially impact EBITDA as lower noncontracted business and milestone slippage were offset by higher conferencing volumes and cost mitigation."

5.21. Our ability to mitigate demand risk for these Global ICT activities by reducing costs demonstrates that a large portion of the costs are variable, which implies low operating leverage. This trend is likely to continue further due to BT Global's strategy of becoming more asset-light and software-enabled in future, with less spend on physical infrastructure that is associated with high fixed costs. It may be that BT's Global ICT activities have lower operating leverage than the comparators Ofcom has used to estimate the asset beta range for 'Rest of BT'. If so, our implied asset beta range for 'Rest of BT' is plausible as it sits towards the bottom end of Ofcom's previous range.[37]

5.22. Finally, we note that our FTTP asset beta range of [✂] aligns more closely with Ofcom's previous estimates for 'Rest of BT' than for 'Other UK Telecoms'. Therefore, if Ofcom wishes to place FTTP in one of its three existing WACC categories, rather than in a standalone fourth category, it should categorise FTTP in 'Rest of BT' rather than 'Other UK Telecoms'.

Our implied premium for the FTTP WACC over legacy services is in line with European regulatory precedent

5.23. Our estimate of the FTTP asset beta of [✂] implies an FTTP WACC (nominal, pre-tax) of [✂], keeping all of the other parameters in Ofcom's WACC calculation the same as the Consultation.[38] This range for the FTTP WACC represents a premium of between [✂] over Ofcom's estimate of the WACC for legacy copper services.

5.24. Such a differential is in line with that applied by other European NRAs as shown by BEREC, and in Figure 5 below.[39] For example, BEREC show that Denmark and the Netherlands apply a 2% differential; Switzerland and Luxembourg 2.5%; in Italy and Hungary the differential is over 3%. In Spain, BEREC show the differential is 4.8%.

[37] Our FTTP asset beta range of [✂] aligns more closely with Ofcom's previous estimates for 'Rest of BT' than for 'Other UK Telecoms'. Therefore, if Ofcom wishes to place FTTP in one of its three existing WACC categories, rather than in a standalone fourth category, it should categorise FTTP in 'Rest of BT' rather than 'Other UK Telecoms'.
[38] Note that we disagree with Ofcom's estimate of the total market return, cost of debt and tax rate parameters in its WACC calculation.
[39] Source: BEREC, 5 December 2019. BEREC Report Regulatory Accounting in Practice 2019 (including WACC chapter). Figure 61. P52.

Figure 5 – Comparison of Ofcom and other European regulators' WACC premium for NGA services relative to legacy copper

[✂]

Source: BEREC, 5 December 2019. BEREC Report Regulatory Accounting in Practice 2019 (including WACC chapter). Figure 61. p52.

5.25. Such a benchmarking assessment shows that Ofcom is an outlier being the only NRA to have a differential of less than 1%.

5.26. This benchmarking indicates that the approach we have adopted leads to a WACC risk premia which is broadly consistent with findings by other NRAs.

6. Ofcom must ensure the tax rate in its WACC estimate reflects the forward-looking risks on corporate taxes

6.1. In the Consultation, Ofcom estimated the WACC for all services assuming a corporate tax rate of 17%. In our consultation response, we noted that the UK corporate tax rate is 19%, and Ofcom should apply this estimate in its calculation of the pre-tax WACC.

6.2. The tax rate assumption in the WACC is intended to ensure BT has a fair opportunity to recover its tax liabilities through regulated prices. Adopting a tax rate in the WACC calculation equal to the current corporate tax rate assumes that the risks around future tax changes are symmetric, and that BT bears the risk associated with these tax changes.

6.3. However, since Ofcom's consultation was published, the global pandemic has created an asymmetric risk profile around future tax liabilities. The pandemic has led to the UK Government raising a large amount of new debt to support the economy and help boost the economic recovery. Public debt is now expected to be well above 100% of GDP from 2021 onwards;[40] and well above the historical level over the last few decades.[41]

6.4. Given this pressure on public sector finances, the Government is likely to consider some form of tax increases and spending cuts to reduce public sector net debt to a more sustainable level, closer to the level before the pandemic struck. We believe there is substantial risk that the Government chooses to increase the UK corporate tax following COVID as part of the plan to return public sector finances to a more sustainable footing. There is almost no equivalent offsetting risk of the Government lowering the corporate tax rate at this time.

6.5. Given this asymmetric risk around future tax changes, Ofcom should use a corporate tax rate in its ex ante WACC calculation that reflects its best expectation of the future corporate tax rate. We believe a [✂] of the UK corporate tax rate of [✂] may provide a reasonable estimate of the balance of risks to the future UK corporate tax rate. By allowing for this asymmetric risk, Ofcom's estimate of the WACC will capture the forward-looking risks investors face today, and is less likely to undermine investment incentives.

6.6. In addition to adjusting the tax rate assumption in the ex ante WACC calculation, Ofcom should adjust the tax rate in the WACC used to set regulated prices, if FTTP price regulation is introduced. To set regulated prices, Ofcom should use actual tax rates up to the point of regulation, and forecast tax rates from that point onwards (in the normal way). Were Ofcom minded to adopt such an approach, it should signal its intentions to this effect in its WFTMR statement.

[40] Office for Budget Responsibility, November 2020. Economic and fiscal outlook. Chart 1.9. p18.
[41] Office for National Statistics. Public sector finances time series.

7. Overall FTTP WACC Estimate

7.1. We consider that Ofcom has underestimated the ex ante FTTP WACC that should be applied in the fair bet framework. Based on the analysis presented in this report and in our May 2020 response to the Consultation, our estimate of the ex ante FTTP WACC is higher than Ofcom's estimate for the following reasons:

a) We use an FTTP asset beta of [✂] as explained above.
b) We estimate an equity market return of 7% based on long-run historical equity returns, compared to Ofcom's estimate of 6.7%, which places weight on subjective dividend growth model estimates.[42]
c) We estimate a cost of debt of [✂], compared to Ofcom's estimate of 3.5%. Ofcom's calculation places equal weight on BT's cost of existing debt and new debt, which does not take account of the maturity profile of BT's existing debt and expected new debt issuance over the regulatory period. We consider a [✂] weighting on existing and new debt to be more accurate given the maturity profile of our existing debt, which implies a higher cost of debt than Ofcom's estimate.[43]
d) Finally, we estimate a tax rate of [✂], compared to Ofcom's assumption of 17%. We assume a forward-looking UK corporate tax rate based on the [✂], because COVID-19 has increased the likelihood of an increase in the tax rate to help the Government manage public finances.

7.2. We estimate an FTTP WACC (nominal, pre-tax) of [✂], with a mid-point of [✂]. Table 2 compares our estimate of the FTTP WACC to Ofcom's estimate.

Table 2 – Comparison of Ofcom and BT view of ex ante FTTP WACC

	Ofcom View	BT View	Comment
CPI	2.0%	2.0%	-
Nominal risk-free rate	1.5%	1.5%	-
Nominal ERP	7.3%	7.6%	Calculation
Nominal TMR	8.8%	9.1%	BT view derived from upper end of long-run historical evidence
Debt beta	0.1	0.1	-
Asset beta	0.65	[✂]	BT analysis of op. leverage and income elasticity of demand
Forward-looking gearing	40%	40%	-
Equity beta	1.02	[✂]	Calculation
Cost of equity (post-tax)	9.0%	[✂]	Calculation
Tax rate	17%	[✂]	BT assumption based on [✂] corporate tax rate
Cost of debt	3.5%	[✂]	BT estimate (more weight placed on embedded debt and higher cost of existing debt)
WACC (nominal, pre-tax)	7.9%	[✂]	Calculation

[42] BT, 29 May 2020. Annex to the BT response to Ofcom's consultation on promoting competition and investment in fibre networks – Wholesale Fixed Telecoms Market Review 2021-26. A6.20. p25.
[43] Ibid. A6.37. p27.

Annex – Quantifying the impact of higher operating leverage and income elasticity on the asset beta

A1.1 In this section we describe the framework we have used to quantify the impact of higher operating leverage and income elasticity of demand on the FTTP asset beta based on principles of finance theory. We then use data from BT's FTTP business plan models to populate this framework and estimate a range for the appropriate asset beta uplift for FTTP to account for differences in operating leverage and income elasticity of demand.

A1.2 Note that the framework we apply to adjust for operating leverage is the same as the one we presented in our May 2020 response to the Consultation, albeit with some changes to the inputs and some assumptions.

A1.3 In order to relate the level of operating leverage to asset betas, we begin by observing the simple relationship: [44]

$$Cashflow = Revenue - Fixed\ cost - Variable\ cost$$

A1.4 Since the value of an asset can be considered to be the present value of the cashflows it generates, we can express this in present value (PV) terms:

$$PV(asset) = PV(revenue) - PV(fixed\ cost) - PV(variable\ cost)$$

A1.5 This can be re-arranged as follows:

$$PV(revenue) = PV(asset) + PV(fixed\ cost) + PV(variable\ cost)$$

A1.6 We can then reformulate the equation in terms of the betas of each component, as the beta for PV(revenue) is the weighted average of the betas of its components:

$$\beta_{(revenue)} = \beta_{asset}\, w_{asset} + \beta_{fixed\ cost}\, w_{fixed\ cost} + \beta_{variable\ cost}\, w_{variable\ cost}$$

where

$$w_{asset} = \frac{PV\ (asset)}{PV(revenue)};\ w_{fixed\ cost} = \frac{PV\ (fixed\ cost)}{PV(revenue)};\ w_{variable\ cost} = \frac{PV(variable\ cost)}{PV(revenue)}$$

A1.7 Given that there should be a low correlation between fixed costs with general market conditions, we can make the simplifying assumption that the beta of fixed costs is approximately zero. Furthermore, as variable costs and revenues both respond to the rate of output, and thus have similar drivers, we make the simplifying assumption that

[44] The relationship derived in this section is based on Brealey, R.A., Myers, S.C. and Allen, F. (2010), Principles of Corporate Finance (10th edition), McGraw-Hill Education, p. 223. The theory takes the value of an asset (revenues less costs) and identifies asset risk as a weighted average of the systematic risk of revenue and costs.

their betas would be roughly equal. With these assumptions, we can rearrange the previous equation to arrive at:

$$\beta_{asset} = \beta_{revenue}[1 + \frac{PV(fixed\ cost)}{PV(asset)}] \quad \textbf{[Equation 1]}$$

where:

$$[1 + \frac{PV(fixed\ cost)}{PV(asset)}] = Degree\ of\ operating\ leverage\ (DOL)$$

A1.8 Typically, the degree of operating leverage (DOL) measures how sensitive the operating income of a company is to changes in its revenues. In the equation above, DOL has a similar intuition and economic rationale, but is expressed in terms of PVs and betas. This equation therefore captures how sensitive the asset beta is to changes in the revenue beta. Equally, this equation also shows how assets or projects with larger fixed costs as a proportion of the value of an asset would have a higher asset beta, all else equal.

Assumptions

A1.9 To apply the framework described above we have used data from BT's FTTP business plan models, following the step-by-step methodology described below. We first describe a number of important considerations regarding data sources and assumptions that underpin the analysis.

A1.10 Our analysis relies on financial forecasts for copper, FTTC and FTTP services contained in BT Group's fibre business plans which we have already submitted to Ofcom as part of discussions regarding the application of the fair bet framework for FTTP. These inputs have changed relative to the ones we used to quantify the operating leverage adjustment in our May 2020 response to the Consultation. In line with the business plan, wherever we calculate present values, we do so assuming a [✂] time horizon for FTTP and a [✂] time horizon for copper and FTTC.[45]

A1.11 We classify all capex aside from [✂] capex as a fixed cost and all opex aside from [✂] opex as a variable cost. This is a change from the assumptions we adopted in our May 2020 response, where we assume all capex as a fixed cost and all opex as a variable cost. [✂]

A1.12 We apply the methodology above in two different ways. The first method assumes that the FTTP service operates as a standalone entity and will therefore finance all internal capex through future FTTP revenues ('the standalone method'), whereas the second method assumes that the FTTP capex will be financed via the combined revenues generated by copper, FTTC and FTTP ('the pooled-entity method'). The pooled-entity method effectively applies the operating leverage adjustment for a combined firm first, before deducing the implied impact on FTTP.

A1.13 We now describe the five steps of the methodology before presenting our results.

[45] To be consistent with the Fair Bet framework, a [✂] estimation window is considered for legacy products, covering 2021/22 to 2040/41. For FTTP, this is expanded to a [✂] estimation window covering 2021/22 to 2043/44 due to some investment tranches beginning after 2021/22. Taking a [✂] window allows each tranche, on average, to have [✂] of returns. Expanding the window of legacy products to [✂]-years does not materially change results. We have discounted copper cashflows at a rate of [✂], FTTC at [✂] and FTTP at [✂], in line with the BT Group fibre business plan.

Quantifying the impact of operating leverage on the FTTP asset beta

Step 1 – Derive the revenue beta for FTTC and copper

A1.14 In this step, we calculate the revenue beta for FTTC and copper, given Equation 1 above. In our May 2020 response to the Consultation, we undertook this step for two scenarios: one where the revenue beta is calculated for FTTC only, and the second where it is calculated for FTTC and copper together. For this report, we have only applied the second scenario, because there are challenges in allocating costs between FTTC and copper. Hence, we have calculated the revenue beta for FTTC and copper together.

A1.15 To derive the revenue beta, three components are needed: the asset beta, PV(fixed costs) and PV(asset).

A1.16 The asset beta for FTTC and copper is the weighted average of the asset betas for FTTC (which we consider to be 0.65 in line with the 'Other UK Telecoms' category') and copper (which we consider to be 0.57 in line with the 'Openreach' category). We weight these asset betas by the present value of their forecast EBITDA.[46]

A1.17 To estimate the present value of fixed costs and assets we use financial forecasts for each product based on our FTTP financial model, which includes forecasts for FTTC and copper platforms. We undertake this step by taking the combined fixed costs and assets of FTTC and copper together. Our baseline results are based on the most likely 'Do something' scenario in the BT model.

A1.18 Table A1 shows our revenue beta estimate for FTTC and copper is [✂].

Table A1 – Revenue Beta for FTTC and Copper

		FTTC and Copper
Asset beta	[A]	[✂]
PV (fixed cost)	[B]	[✂]
PV (asset)	[C]	[✂]
Degree of operating leverage (DOL)	[D] = 1+[B]/[C]	[✂]
Revenue beta for FTTC and Copper	[E]=[A]/[D]	[✂]

Step 2 – Calculate the operating leverage for standalone FTTP or for a pooled entity

A1.19 The second step involves calculating the forward-looking operating leverage of FTTP under the standalone method and for the pooled entity under the pooled-entity method using projected financials from BT Group's FTTP business plan. Recall that the standalone method assumes that the FTTP service operates as a standalone entity and will therefore finance all internal capex through future FTTP revenues ('the standalone method'), whereas the pooled-entity method assumes that the FTTP capex will be financed via the combined revenues generated by copper, FTTC and FTTP ('the pooled-entity method'). Consistent with steps above, this estimate is for the

[46] Weighting by EBITDA is one of the approaches followed by Ofcom's when weighting individual asset betas to calculate the BT Group combined asset beta. See, for example, Ofcom, 8 January 2020. Promoting investment and competition in fibre networks: Wholesale Fixed Telecoms Market Review 2021-26. Appendix A21.70 – A21.73, p228-229. The PV(EBITDA) is calculated as PV(revenues) less PV(opex).

most likely 'Do something' scenario in our FTTP financial model. This forward-looking operating leverage has been calculated as the PV(fixed costs) as a proportion of the PV(total costs).[47]

A1.20 Table A2 shows we calculate operating leverage of [✂] for standalone FTTP and [✂] for the pooled entity. As expected, the pooled entity has lower operating leverage than the standalone FTTP entity because FTTC and copper are forecast to have lower fixed costs than FTTP during the investment cycle.

Table A2 – Operating leverage for Standalone FTTP or for Pooled Entity

		Standalone FTTP	Pooled Entity
PV (fixed cost)	[A]	[✂]	[✂]
PV (total cost)	[B]	[✂]	[✂]
Operating leverage	[C]=[A]/[B]	[✂]	[✂]

Step 3 – Adjust the fixed costs of FTTC and copper to match the operating leverage for standalone FTTP or for a pooled entity

A1.21 To estimate the FTTP asset beta using equation 1, we need to adjust the degree of operating leverage (DOL) for FTTC and copper, to reflect the higher operating leverage of FTTP or the pooled entity.

A1.22 To calculate the adjusted DOL, we first calculate what the fixed costs of FTTC and copper would need to be in order for its cost structure (i.e. operating leverage) to match the cost structure of standalone FTTP or the pooled entity. In other words, keeping total cost constant, we adjust the level of fixed costs of FTTC and copper such that its operating leverage is equal to that of FTTP ([✂]) or the pooled entity ([✂]).

A1.23 These adjusted fixed costs for FTTC and copper can then be used to calculate the adjusted DOL to reflect the higher operating leverage of FTTP or the pooled entity.

A1.24 Table A3 shows the calculation of the adjusted fixed costs of FTTC and copper, and the resulting adjusted DOL for both the standalone FTTP or pooled entity methods.

Table A3 – Adjusted DOL for standalone FTTP and pooled entity methods

		Standalone FTTP	Pooled Entity
FTTC & copper PV (total cost)	[A]	[✂]	[✂]
Operating leverage	[B] (Step 2)	[✂]	[✂]
FTTC & copper adjusted PV (fixed cost)	[C]=[A]*[B]	[✂]	[✂]
FTTC & copper PV(asset)	[D]	[✂]	[✂]
Adjusted degree of operating leverage	[E]=1+[C]/[D]	[✂]	[✂]

[47] In our May 2020 response to the consultation, this was one of three ways that we calculated operating leverage.

Step 4 – Estimate the FTTP asset beta for the standalone FTTP or pooled entity methods using the adjusted DOL

A1.25 We can now apply Equation 1 using βrevenue of [✂] as calculated in step 1 and the adjusted DOL calculated in step 4. Here we initially make the assumption that the revenue beta of FTTP is equal to that of FTTC and copper, an assumption that we relax once we adjust for income elasticity differences. This provides an implied asset beta of [✂] for FTTP under the standalone method and a pooled-entity asset beta of [✂]. This is shown in Table A4 below. Note that the latter figure corresponds to the overall pooled entity and a further step is required to estimate the FTTP asset beta under this method (Step 4 below).

Table A4 – Asset Beta for FTTP under Standalone Method and Pooled Entity asset beta under Pooled Entity Method

		Standalone FTTP	Pooled Entity
Revenue Beta	[A] (Step 1)	[✂]	[✂]
Adjusted degree of operating leverage	[B] (Step 4)	[✂]	[✂]
Asset Beta	[C]=[A]*[B]	[✂]	[✂]

Step 4 – Calculate the FTTP asset beta under the pooled-entity method

A1.26 If we follow the pooled-entity method, there is an additional step required. The asset beta in step 4 would not calculate the respective asset beta of FTTP, but rather the combined asset beta of the entity that is simultaneously running copper, FTTC and FTTP whilst investing and expanding the FTTP network.

A1.27 Given that we know the individual asset betas of copper (0.57) and FTTC (0.65), as well as the combined asset beta of the pooled entity ([✂]), we can find the implied FTTP asset beta using the following relationship:

$$\beta_{Pooled} = (\beta_{FTTC} \times Weight_{FTTC}) + (\beta_{Copper} \times Weight_{Copper}) + (\beta_{FTTP} \times Weight_{FTTP})$$

A1.28 To weight each asset beta we use the contribution of each product to the pooled entity's overall present value of forecast EBITDA.

A1.29 Based on these inputs, we estimate the FTTP asset beta as [✂] under the pooled-entity method.

A1.30 Note that the asset beta range of [✂] only adjusts for the higher operating leverage of FTTP, before any adjustment for income elasticity of demand.

Adding the impact of income elasticity of demand on the FTTP asset beta

A1.31 Oxera's report estimates an asset beta wedge of [✂] between FTTC and FTTP that is solely due to differences in income elasticities. To incorporate this into our FTTP asset beta range, the wedge needs to be combined with our operating leverage adjustment, and is not simply additive. Specifically, the appropriate way to incorporate the effect of the income elasticity is to re-calculate the revenue beta estimated in Step 1.

A1.32 This involves adding [✂] to the FTTC asset beta to reflect the higher income elasticity of demand for FTTP relative to FTTC, and re-calculate the implied revenue beta.

A1.33 Previously, we had calculated one revenue beta in step 1. Now, because the revenue beta will be different under the standalone FTTP and pooled entity methods we must calculate separate revenue betas under each approach.

A1.34 Under the standalone FTTP method, FTTP is assumed to have an asset beta of [✂].[48] Under the pooled entity method, we still assume that FTTP's asset beta is [✂], which would then translate into a pooled entity asset beta of [✂].[49]

A1.35 In both cases we will use Equation 1 and the FTTC + copper DOL from Table A1 to derive a new revenue beta. As shown in Table A5, these new revenue betas are higher than the one calculated in Table A1, as they take account of the higher income elasticity of FTTP relative to FTTC.

Table A5 – Revenue Beta for FTTP and the pooled entity after adjusting for higher income elasticity of demand for FTTP

		Standalone FTTP	Pooled Entity
Asset beta incorporating FTTP income elasticity of demand premium of 0.03	[A]	[✂]	[✂]
FTTC & copper PV (fixed cost)	[B]	[✂]	[✂]
FTTC & copper PV (asset)	[C]	[✂]	[✂]
FTTC & copper degree of operating leverage (DOL)	[D] = 1+[B]/[C]	[✂]	[✂]
Revenue beta	[E]=[A]/[D]	[✂]	[✂]

A1.36 Following this adjusted step 1, the remaining steps 2 to 5 for the operating leverage adjustment follow exactly as before. Following these steps through, we estimate an overall FTTP asset beta range of [✂], which includes the impact of both higher operating leverage and income elasticity of demand.

[48] The asset beta of [✂] is derived from the assumed FTTC asset beta of [✂], and the asset beta wedge of [✂] estimated by Oxera. It is solely used as an intermediate step to calculate the combined effect of higher income elasticities and operating leverage.

[49] We calculated this by weighting the asset betas of copper (0.57), FTTC (0.65) and the intermediate FTTP asset beta ([✂]) by their PV(EBITDA).