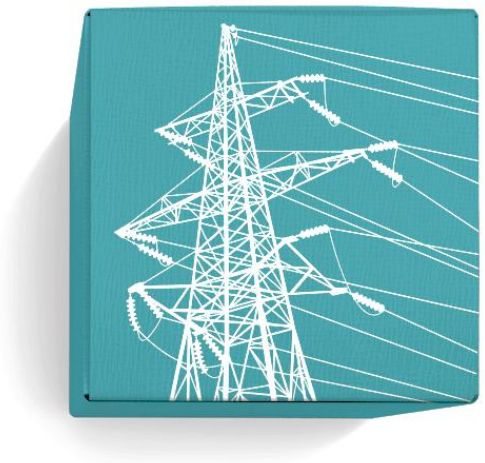
# Cost of Capital: Beta and Gearing for TAR 2026

## Ofcom

6 February 2025



**FINAL REPORT**

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# EXECUTIVE SUMMARY

The weighted average cost of capital (WACC) is an important input to Ofcom's regulatory determinations for the telecoms access review (TAR) 2026. Previously, including for the wholesale fixed telecoms market review (WFTMR) 2021, the WACC Ofcom has used has been informed by beta estimates for BT Group and benchmark companies. In this report we provide our independent view of relevant betas and other WACC parameters to support Ofcom in updating its assessment and for use in the TAR.

We have been asked to produce betas for the BT Group, UK and European telecoms companies, UK utilities and ICT companies.

## Approach

Ofcom has asked us to estimate betas for five different companies or company types: BT Group, UK and European telecoms companies, UK utilities and ICT companies. Beta is a coefficient that within the Capital Asset Pricing Model (CAPM) captures the systematic (i.e. non-diversifiable) risk exposure of a company.

Our preferred approach is informed by the UK Regulators Network (UKRN) Cost of Capital guidance. In particular, the UKRN recommends that:

> *"Regulators should estimate equity beta for the notional company using comparable listed companies and standard regression techniques (i.e. ordinary least squares (OLS)). Where the listed comparator has a different gearing to the notional company, regulators should continue to de-lever and re-lever the raw equity beta."*

Consistent with this guidance and the practice of sector regulators, we focus on estimating 'asset betas'. These are obtained by de-levering measured equity betas in order to control for the level of gearing and are more comparable across companies with differing capital structures than the raw equity betas.

Several methodological choices are required to estimate beta. Key decisions include:

- selecting an appropriate sample of comparable listed companies based on the extent to which they are representative of our target group in terms of activities and geographies and robust in terms of data quality;
- assessing the extent to which specific comparators are relevant to the groups for which Ofcom has asked us to produce an estimate; and
- selecting appropriate estimation techniques and, where alternatives are available, testing the sensitivity of our results to these.

We distinguish between the process of generating measurements of beta for specific comparators – which is a mechanistic exercise – and the process of estimating beta for particular companies or activity types – which requires the use of judgement. In particular, since beta measurements fluctuate, we must interpret the significance of changes in the evidence over time.

We do not seek to generalise our approach to moving from the evidence base to our recommended beta ranges. There may be times when more recent data is more suitable (for example, if there has been a material shift in sector risk); there may also be times when longer-term data is more informative (for example, if there has been a recent shock event that is unlikely to reflect future conditions). We must also recognise that the business mix and characteristics of companies can change over time.

We produce mechanistic base estimates of asset betas using the interquartile range of 2-year daily beta measurements. We cross-check this against a range of alternative estimation measures and consider broader contextual evidence to produce our proposed range. These changes are small for the asset beta, highlighting that our proposed ranges are centred on empirical results.

All beta evidence is produced using a data cutoff of 30 September 2024.

## Recommendations

A summary of our recommendations for each of the relevant comparator groups is shown in Table E.1.

*Table E.1: CEPA recommendations for asset betas*

| | Mechanistic base estimate | Proposed range |
|---|---|---|
| BT Group | 0.42 to 0.48 | 0.42 to 0.50 |
| UK Utilities | 0.29 to 0.34 | 0.30 to 0.35 |
| European Telecoms | 0.30 to 0.52 | 0.30 to 0.50 |
| UK Telecoms (Vodafone) | 0.29 to 0.51 | 0.30 to 0.50 |
| ICT companies | 0.65 to 0.93 | 0.65 to 0.93 |

*Source: CEPA analysis. Asset betas estimated using a debt beta of 0.075.*

Our estimates are, for telecoms companies, generally lower than those presented in the WFTMR 2021, reflecting a consistent and long-lasting reduction in measured asset betas for the telecoms comparators we have considered.

# Contents

# 1. INTRODUCTION

Ofcom has commissioned CEPA to produce betas for the BT Group, UK and European telecoms companies, UK utilities and ICT companies.

The report is structured as follows:

- Section 2 provides some limited discussion of the context for this analysis and relevant issues.
- Section 3 summarises our preferred methodology.
- Section 4 provides what we refer to as 'base estimates' of beta for our comparator groups; a mechanistic assessment of relevant evidence.
- Section 5 references additional evidence and a judgement on whether the base estimates remain appropriate as our proposed range.
- Section 6 sets out our conclusions from this study.

Ofcom's requirements are replicated in Appendix A. Appendices B and C provide further detail on the application of filtering to both a longlist and shortlist. Appendix D contains more information on our empirical results – namely beta estimates for individual companies. Appendix E provides further contextual evidence that informs our final beta ranges.

# 2. CONTEXT AND RELEVANT ISSUES

Our methodology draws on our prior experience estimating company and comparator group betas in a regulatory context and on guidance from the UK Regulators' Network (UKRN). We also recognise the value to Ofcom of consistency in estimation approaches. Where relevant, we refer to previous reports commissioned by Ofcom – this includes a report by Brattle for WFTMR 2021 and previous reports by NERA.

The UKRN published guidance on cost of capital estimation by regulators in 2023. In relation to beta, the UKRN makes the following primary recommendation:

> *"Recommendation 5: Regulators should estimate equity beta for the notional company using comparable listed companies and standard regression techniques (i.e. ordinary least squares (OLS)). Where the listed comparator has a different gearing to the notional company, regulators should continue to de-lever and re-lever the raw equity beta".*[1]

It also highlights a number of additional points supplementary to this main, high-level recommendation:

- Adjustments for relative risk should be considered where pure play comparators cannot be found.
- Comparators outside the market of interest may be relevant where there are no (or limited) relevant beta data points in the relevant market.
- It is preferable to:
  - consider a range of estimation windows;
  - focus on daily data; and
  - use the most diversified local index in the relevant currency as the reference market index.
- There will remain a role for "significant regulatory judgement", including in relation to combining evidence from comparators and trading off relevance and reliability in historic data. Specifically, "a 'one-size-fits-all' approach is unlikely to be appropriate."[2]

In our experience, this emphasis on the need for judgement is well-founded. Our methodology will not prescribe how we will use beta measurements to produce the estimates that Ofcom requires. However, where possible, our methodology will be transparent as to the way in which we generate those beta measurements and the considerations we take into account.

A few theoretical and practical characteristics of betas and their behaviour are relevant:

- In theory a beta is specific to a project with a particular exposure to systematic risks. Any company with diverse interests may therefore incorporate various projects with various different betas. Betas can be diverse even among companies apparently operating in similar sectors.

  These points underpin the need to consider relative risk when comparing or combining results from different companies, even those within the same broad comparator group. However, differences in relative risk may be intractable.
- Betas vary over time. In order to interpret that volatility, we can either rationalise it – or, if it cannot be rationalised, avoid over-reacting to it.

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[1] UK Regulators Network (2023), UKRN guidance for regulators on the methodology for setting the cost of capital, pp. 4, available here.

[2] UK Regulators Network (2023), UKRN guidance for regulators on the methodology for setting the cost of capital, pp. 23, available here.

Such volatility can be a function of:

- mix effects – a company shifting between different activities;
- changes in risk – activities becoming inherently more or less risky over time;
- the prevalence of different sources of risk – since betas are measured based on changes in valuations, depending on the 'risks of the day' those changes may be more or less sensitive to market movements; and
- simple statistical uncertainty arising from the econometric methods used to measure betas.

- Because we must adjust for changes in gearing, measurements of asset beta can also be affected by large but often short-lived movements in debt, often in turn resulting from movements in cash or cash equivalents. This can particularly be true around transactions and M&A activity.

These characteristics present an obstacle to prescriptive, mechanistic approaches to interpreting betas. Beta measurement is noisy, and these sources of noise can compound one another. Even relatively small fluctuations in companies' betas over time may mean that estimates that appeared to be consistent at one point in time generate inconsistent implications at a different point in time.

What does this mean for our methodology? Some aspects of beta are matters of interpretation and judgement. We do not propose to implement a fully prescribed, mechanistic approach. This applies to:

- evaluating relative risk differences between companies and comparator groups;
- interpreting evidence from different periods of time; and
- assessing the impact of statistical uncertainty on our overall judgement.

We do, however, recognise the value of transparency in certain aspects of our approach. In particular, to avoid comparability issues between our analysis and others', it is helpful to specify clearly:

- how we propose to generate measurements of beta for comparator companies;
- how we propose to select and group relevant comparators;
- the factors we propose to consider in our analysis of relative risk; and
- the statistical metrics we propose to calculate.

We also recognise that Ofcom has adopted an approach in previous decisions and there are benefits to regulatory predictability and stability of maintaining that methodology where appropriate. Where we have a clear preference for a particular approach, we have implemented it. Where there are multiple viable approaches, we have considered retaining features of the existing approach.

# 3. PREFERRED METHODOLOGY

In this section, we provide a summary of the key aspects of our methodology. We also consider sensitivities to our core methodology in presenting our results.

## 3.1. METHODOLOGICAL CHOICES

We set out in Table 3.1 a summary of the preferred methodological choices to obtain our core results.

*Table 3.1: Methodological choices for our core set of results*

| Choice | Preferred approach |
|---|---|
| Comparator selection | |
| Selection of long-list | Based on Bloomberg Industry Classification Standard (BICS) for larger comparator groups, specific companies for smaller comparator groups. |
| Geographical filtering | For EU telecoms and ICT comparators, we consider only companies domiciled in the EU or UK. See Appendix B for further details. |
| Liquidity screening | We apply three screening criteria to ensure comparators are sufficiently liquid:<br>• No more than 5% of sample dates have bid-ask spreads exceeding 2%.<br>• No more than 0.5% of sample dates have negative bid-ask spreads.<br>• No more than 5% of sample dates have low traded value (defined as fewer than 50,000 units of local currency). |
| Credit rating | We remove companies with a credit rating below BBB- (i.e., companies whose debt is not investment-grade). Where a credit rating is not available, we utilise Bloomberg default probabilities and exclude companies with a default probability of over 1%. |
| M&A activity | We identify comparators that have been party to large M&A transactions (>30% of market cap) and exercise judgment as to whether these transactions lead to bias. |
| Discretionary exclusions | We exclude companies that have been delisted (e.g., TalkTalk, Russian telecoms companies) when calculating our base estimates. |
| Raw equity beta estimation | |
| Return interval | We focus on daily betas, which we consider to be preferable to weekly or monthly betas in practice because of the so-called 'reference day bias.' |
| Estimation window | In our mechanistic base estimates we consider evidence from 1-, 2-, and 5-year betas, but place primary weight on 2-year betas. Section 5 discusses how evidence from 1- and 5-year estimates feeds into our proposed final ranges. |
| Relative index | For UK companies, we estimate betas with reference to the FTSE All-Share Index (ASX).<br>For EU companies, we focus on the Stoxx Total Market Ex-UK Index (BKXF Index).<br>We are aware that previous consultants' reports commissioned by Ofcom have compared European companies to the FTSE All-world Europe Ex-UK (FTAW12) Index. To our knowledge, this index is dollar-denominated, in contrast to euro-denominated stock valuations.<br>Our preferred index is highly diversified, as the Stoxx TMI covers 95% of free float in the EU Market[3]. |
| Estimation date range | We use 30 September 2024 as our estimation cutoff date. |

[3] ISS Stoxx, Index summary for the Stoxx Europe Total Market Index, available here.

| Choice | Preferred approach |
|---|---|
| | A significant and sustained downward movement in the level of estimated asset betas for BT Group occurs when the Brexit referendum falls out of the estimation sample, especially for 1- and 2-year estimation windows. Estimates after this point are likely to be more representative of forward-looking beta risk for BT Group. |
| Summarising the body of evidence | In Section 4, we construct a representative mechanistic range of betas and gearing for our comparator groups by<br>• Isolating the 2-year daily estimates between our data cutoff and the date on which the Brexit referendum falls out of the 2-year estimation window, for every comparator in the group.<br>• summarising the distribution of each comparator group's 2-year daily estimates over this period with the interquartile range (i.e. the range between the 25th and 75th percentile observations.<br>In Section 5, we discuss how these results vary when considering 1-year and 5-year betas. |
| Asset beta estimation | |
| Gearing measure | We unlever the equity betas using gross debt gearing for our base estimates, consistently with previous approaches to gearing in reports commissioned by Ofcom. We present and consider a sensitivity that uses net debt gearing, and one that excludes operating leases capitalised under IFRS 16. |
| Debt beta | We apply a debt beta of 0.075, in keeping with recent CEPA work for the UKRN[4]. |
| Gearing period | We unlever the equity betas using average gearing over the same period as the estimation window. |
| Statistical tests | |
| Standard errors | We consider a similar range of evidence on standard errors based on the interquartile range of estimated standard errors. |
| Heteroskedasticity Tests | We apply the Breusch-Pagan test for heteroskedasticity and report heteroskedasticity-robust standard errors where appropriate. |
| Autocorrelation Tests | We apply the Breusch-Godfrey test for autocorrelation. Where we find strong evidence for this, we consider a cross-check to our standard error estimates based on Newey-West standard errors and generalised least squares. |

## 3.2. ROLE FOR JUDGEMENT

We establish an initial estimate of asset beta results for comparator groups using an approach that directly uses empirical results – we refer to this as our base or mechanistic beta range. We utilise the lower quartile and upper quartile of asset beta estimates under our preferred approach. We focus on 2-year daily betas, but have cross-checked these results against results using different estimation windows and time periods.

A mechanistic approach may yield beta estimates that do not make intuitive sense or are impacted by particular events or methodological choices. Therefore, we look to better understand the results that would be derived using alternative approaches and how we would propose Ofcom should apply judgement. This involves looking at a range of evidence, both quantitative and qualitative.

This supplemental analysis and the discussion of those results is contained in Chapter 5. We set out whether the base estimate range should be adjusted or whether we consider a point estimate should be selected from a particular part of that range. We refer to the adjusted range as our 'proposed estimates'.

[4] Available here.

# 4. BETA ESTIMATION – BASE ESTIMATES

This section sets out mechanistic summary results under our preferred methodology. We refer to these outputs as our base estimates.

Each of the following subsections in Section 4 outlines summary asset beta and equity beta estimates, as well as gross-debt average gearing, for each of the four primary comparator groups we have been asked to consider.

In keeping with the UKRN cost of capital guidance[5], we estimate beta over a range of estimation windows (namely 1-year, 2-year, and 5-year windows). To further illustrate how these estimates have moved over time, the summary tables presented below report spot values (as of 30 September 2024) as well as average estimates over 1-, 2-, 5-, and 10-year lookback periods. Our approach acknowledges that spot betas, especially those estimated on short histories of data, can be volatile, and relying too heavily on them risks placing excessive weight on 'noise'. The inclusion of averages over multiple lookback periods further allows us to consider different views on how these betas have changed over time.

As we discuss below, estimates of beta for the BT Group have changed significantly over the past decade. In the case of two-year and one-year betas, this is marked by a step-change, which coincides with the date on which observations from the day of the Brexit referendum fall out of the estimation sample. For two-year betas, this date is 24 June 2018.

We treat estimates after this date as most relevant to an assessment of BT Group's forward-looking beta. The shift in measurements is pronounced and sustained. In the case of two-year beta estimates, there is almost no overlap in measurements before and after this date. Further, to ensure comparability with BT Group's beta estimates, which are the focus of this report, , we consider it appropriate to draw on the same recent time period for the other comparator groups (that is, our interquartile range covers beta estimates in the period between 24 June 2018 and our estimation cutoff of 30 September 2024 for all of the comparator groups we consider).

As explained in Table 3.1 above, we construct a representative mechanistic range by summarising the distribution of each comparator group's asset beta estimates as follows:

- We collect the 2-year daily asset beta estimates (one per business day, for each company in the comparator group) from 24 June 2018 to 30 September 2024 (between the date on which the Brexit referendum fell out of the estimation window for the 2-year daily beta and our cutoff date)
- We summarise these daily asset beta observations (across each comparator group) by computing their interquartile range (i.e. the range between the 25$^{th}$-percentile and 75$^{th}$-percentile observations).
- We follow an identical procedure to summarise the raw equity betas and 2-year average gearing over the same period. In Appendix E, we present standard error estimates that have been summarised in an identical manner.

In our view, 2-year estimation windows offer a balanced and representative view of beta risk, and the inclusion of 1- and 5-year estimates is considered as part of our assessment in Section 5. This section includes a review of cross-cutting evidence.

## 4.1. BT GROUP

Table 4.1 presents equity betas, asset betas, and gross debt gearing for BT group.

[5] UK Regulators Network (2023), UKRN guidance for regulators on the methodology for setting the cost of capital, pp. 23, available here.

*Table 4.1: Parameter estimates for BT Group, by estimation window and lookback period*

| | Estimation window | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity beta | 1-year | 0.95 | 0.98 | 0.94 | 0.97 | 0.92 |
| | 2-year | 1.00 | 0.93 | 0.93 | 0.94 | 0.93 |
| | 5-year | 0.98 | 0.97 | 0.96 | 0.95 | 0.96 |
| Average Gearing | 1-year | 66% | 66% | 63% | 61% | 45% |
| | 2-year | 66% | 63% | 61% | 58% | 43% |
| | 5-year | 63% | 61% | 58% | 49% | 38% |
| Asset beta | 1-year | 0.37 | 0.38 | 0.39 | 0.42 | 0.53 |
| | 2-year | 0.39 | 0.39 | 0.41 | 0.43 | 0.56 |
| | 5-year | 0.41 | 0.43 | 0.44 | 0.52 | 0.62 |

*Source: CEPA analysis of Bloomberg data*

Table 4.1 above shows that longer-run backward-looking averages of BT Group's asset betas are higher than shorter-run averages, suggesting that BT Group's asset betas have declined over the last decade.

Figure 4.1 below presents 1-, 2-, and 5-year asset beta estimates over time for BT Group.

*Figure 4.1: Asset beta estimates for the BT Group*


*Source: CEPA analysis of Bloomberg data*

As identified by Brattle (for Ofcom) in its consultancy report for WFTMR 2021, BT Group experienced a sharp decline in its asset beta estimates when the shock event of the Brexit referendum fell out of the sample window for

1-year and 2-year asset beta estimates[6]. We consider that this delineates a material step-change in BT Group's asset beta, and that estimates from before the referendum fell out of the sample are likely to be less representative of BT Group's forward-looking exposure to systematic risk. Furthermore, we note that the 1-, 2-, and 5-year estimates have largely converged in recent years, with the 5-year asset beta likely being elevated while the referendum remained within the estimation sample from roughly 2016-2021.

Table 4.2 below presents the results of our mechanistic summary of the evidence base for BT Group (again noting that this excludes data from before the Brexit referendum left the estimation sample):

*Table 4.2: Interquartile range of 2-year daily estimates for BT Group (24 June 2018 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.81 | 0.93 | 0.99 |
| **2-year Gearing** | 44% | 59% | 62% |
| **Asset Beta** | 0.42 | 0.45 | 0.48 |

*Source: CEPA analysis of Bloomberg data*

We consider the range between the lower and upper-quartile observations to be representative of most of the weight of the distribution of beta observations over the period, and adopt a mechanistic range of **0.42-0.48** for BT's group-wide asset beta.

## 4.2. UK Utilities

### Selected comparator sample

In this section, we present summary beta and gearing estimates for listed UK network utilities comparators. Our comparator selection process (detailed in Appendix C) suggests that the following four companies are useful comparators:

- National Grid PLC;
- Severn Trent PLC;
- Pennon Group PLC; and
- United Utilities Group PLC.

### Summary results for UK Utilities

Table 4.3 presents 2-year equity betas, gross debt gearing, and asset betas for the UK utilities comparators. Results based on 1-year and 5-year estimation windows may be found in Appendix D.

*Table 4.3: UK utilities 2-year estimates, company-level breakdown*

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | National Grid PLC | 0.58 | 0.58 | 0.53 | 0.58 | 0.62 |
| | Pennon Group PLC | 1.00 | 0.81 | 0.65 | 0.57 | 0.61 |
| | Severn Trent PLC | 0.67 | 0.62 | 0.55 | 0.55 | 0.61 |
| | United Utilities PLC | 0.71 | 0.64 | 0.57 | 0.57 | 0.63 |
| | National Grid PLC | 54% | 54% | 54% | 51% | 48% |

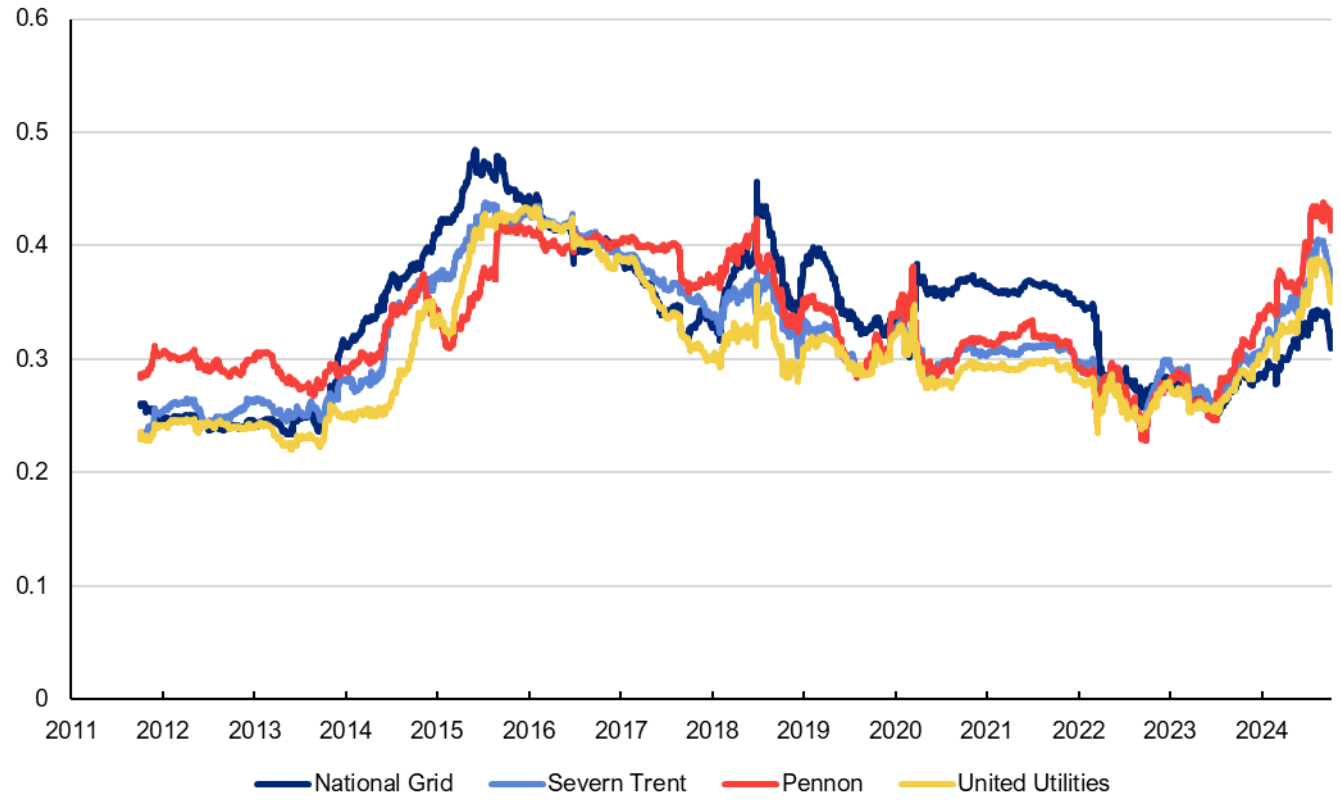
[6] Brattle Group (2021), Cost of Capital: Beta and Gearing for WFTMR 2021, pp. 19, available here

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| 2-year Gross Debt Gearing | Pennon Group PLC | 63% | 60% | 56% | 51% | 50% |
| | Severn Trent PLC | 52% | 51% | 50% | 52% | 51% |
| | United Utilities PLC | 56% | 55% | 55% | 57% | 55% |
| Asset Beta | National Grid PLC | 0.31 | 0.31 | 0.29 | 0.32 | 0.36 |
| | Pennon Group PLC | 0.41 | 0.37 | 0.32 | 0.31 | 0.34 |
| | Severn Trent PLC | 0.36 | 0.34 | 0.31 | 0.30 | 0.34 |
| | United Utilities PLC | 0.35 | 0.33 | 0.30 | 0.29 | 0.32 |

*Source: CEPA analysis of Bloomberg data*

These results suggest that asset betas for listed network utilities have been relatively stable over the last decade. Figure 4.2 below presents estimated 2-year asset betas for these comparators over time.

*Figure 4.2: 2-year asset beta estimates for UK utilities*




*Source: CEPA analysis of Bloomberg data*

The time series of beta estimates shows that, between 2015 and 2022-2023, asset betas for utilities slowly trended downward before rising sharply from mid-2023. These movements encompassed a relatively narrow range, which underscores the stability of these betas over time, as these recent elevated betas are in line with historical values.

Considering this high degree of stability and the absence of any events that would render periods of beta estimates unsuitable, we consider it appropriate to adopt a longer run of historical data when setting the mechanistic range for this comparator group. However, given that this report considers the asset beta estimates for other comparator groups exclusively in relation to BT Group's asset beta, we instead restrict ourselves to the period between 24 June

2018 – 30 September 2024 for consistency with the other comparator groups. In Section 5, we present a cross-check to our mechanistic ranges based on the full time-series of beta estimates for UK utilities companies.

Table 4.4 below presents the results of our mechanistic summary of the evidence base for UK utilities, which includes daily beta observations for the four comparators between 24 June 2018 and 30 September 2024.

*Table 4.4: Interquartile range of 2-year daily estimates for UK utilities (24 June 2018 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.51 | 0.57 | 0.63 |
| **2-year Gearing** | 50% | 52% | 55% |
| **Asset Beta** | 0.29 | 0.31 | 0.34 |

*Source: CEPA analysis of Bloomberg data*

As with BT Group, we adopt the interquartile range of **0.29-0.34** as our mechanistic range.

## 4.3. European Telecoms

### Selected comparator sample

In this section, we present summary beta estimates for listed EU telecoms company comparators. Our comparator selection process (detailed in Appendix C) suggests that fifteen listed comparator companies are suitable for inclusion in our estimation process. Appendix C presents a complete list of these fifteen companies.

### Summary results for European Telecoms

The summary table below presents 2-year asset betas for the European telecoms comparators. Results based on 1-year and 5-year estimation windows, as well as estimated equity betas and gearing, may be found in Appendix D.

*Table 4.5: European telecoms 2-year asset betas, company-level breakdown*

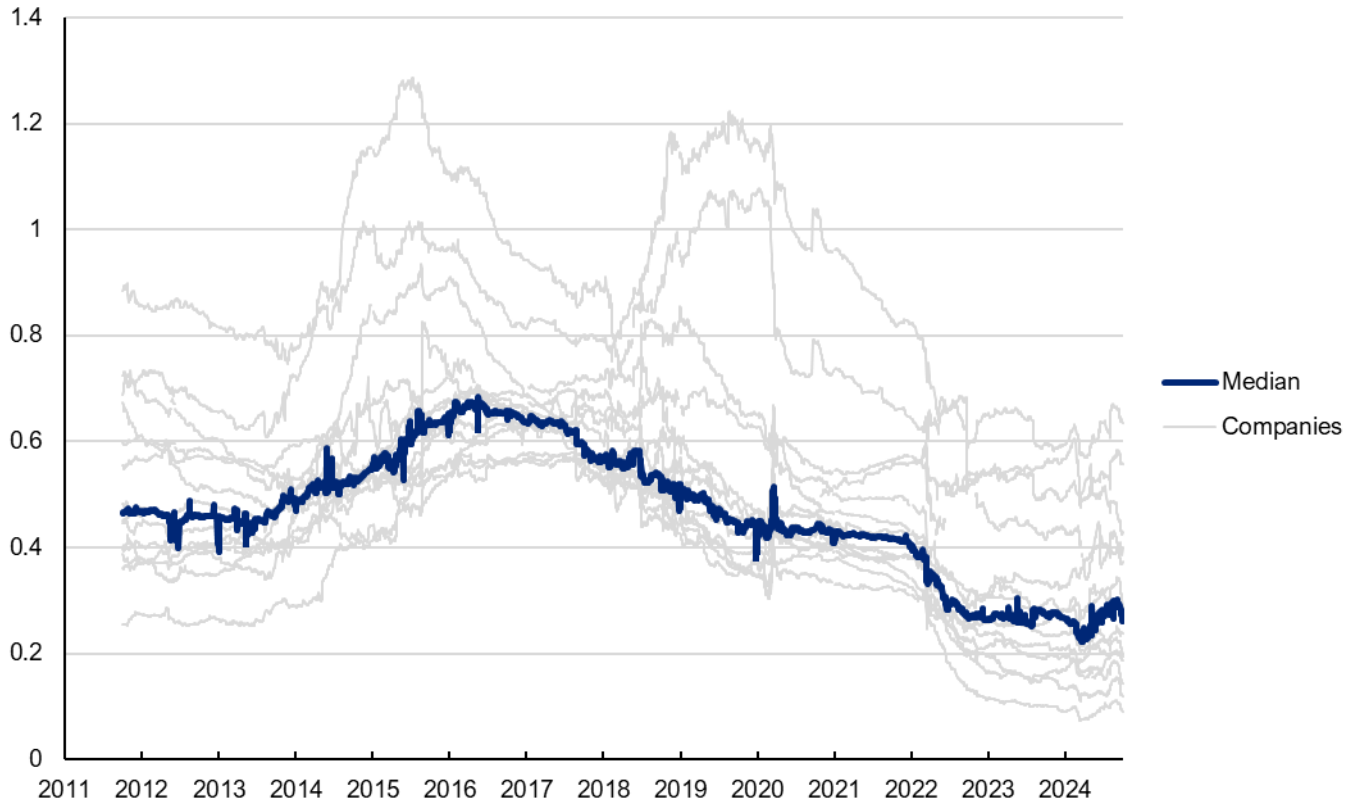
| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Asset Beta | Deutsche Telekom AG | 0.19 | 0.23 | 0.27 | 0.33 | 0.46 |
| | Elisa Oyj | 0.28 | 0.26 | 0.26 | 0.33 | 0.46 |
| | Freenet AG | 0.43 | 0.53 | 0.54 | 0.55 | 0.64 |
| | Helennic Telecommunications Organisation SA | 0.40 | 0.41 | 0.43 | 0.48 | 0.55 |
| | Koninklijke KPN NV | 0.12 | 0.13 | 0.15 | 0.29 | 0.40 |
| | NOS SGPS | 0.24 | 0.23 | 0.25 | 0.35 | 0.48 |
| | Telefonica Deutschland Holding AG | 0.26 | 0.29 | 0.28 | 0.35 | 0.48 |
| | Orange SA | 0.09 | 0.09 | 0.10 | 0.24 | 0.40 |
| | Proximus SADP | 0.37 | 0.37 | 0.35 | 0.38 | 0.47 |
| | Telefonica | 0.19 | 0.18 | 0.17 | 0.29 | 0.42 |
| | Telenor ASA | 0.14 | 0.18 | 0.19 | 0.27 | 0.39 |
| | Tele2 AB | 0.29 | 0.30 | 0.30 | 0.42 | 0.55 |
| | Telia Co AB | 0.20 | 0.21 | 0.22 | 0.34 | 0.44 |
| | United Internet AG | 0.63 | 0.61 | 0.62 | 0.70 | 0.80 |
| | 1&1 AG | 0.56 | 0.52 | 0.52 | 0.76 | 0.90 |

*Source: CEPA analysis of Bloomberg data*

These results show that European telecoms companies display a wide variety of estimated betas and capital structure choices, reflecting the different operational and risk profiles of companies in the sector.

Figure 4.3 below presents estimated 2-year asset betas for these comparators over time, as well as the median estimate across the comparator group.

*Figure 4.3: 2-year asset beta estimates for European Telecoms*




*Source: CEPA analysis of Bloomberg data*

Asset beta estimates for European telecoms companies have displayed a relatively consistent downward trend over the last decade. We consider this to be representative of a structural shift in investor perception of systematic risk exposure for these companies, with a number of possible explanations. We consider these factors when setting our final proposed range in Section 5 below.

Table 4.6 below presents the results of our mechanistic summary of the evidence base for European telecoms companies.

*Table 4.6: Interquartile range of 2-year daily estimates for European telecoms (24 June 2018 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.45 | 0.63 | 0.78 |
| **2-year Gearing** | 24% | 36% | 46% |
| **Asset Beta** | 0.30 | 0.42 | 0.52 |

*Source: CEPA analysis of Bloomberg data*

We adopt the interquartile range of **0.30-0.52** as our mechanistic range for European telecoms.

## 4.4. UK TELECOMS

### Selected comparator sample

In this section, we present summary beta estimates for other listed UK telecoms company comparators. Our comparator selection process (detailed in Appendix C) suggests that both Vodafone Group PLC and TalkTalk Telecom Group Ltd are useful comparators in principle. However, TalkTalk's 15 March 2021 delisting following its takeover by Tosca IOM Ltd (and its low current credit rating) limits its usefulness for informing the current value of beta among UK telecoms companies.

We therefore present summary results only for Vodafone, reserving TalkTalk's estimated betas for interpreting historical trends where appropriate.

### Summary results for Vodafone

Table 4.7 presents asset betas, equity betas, and gross debt gearing for Vodafone.

*Table 4.7: Parameter estimates for Vodafone, by estimation window and lookback period*

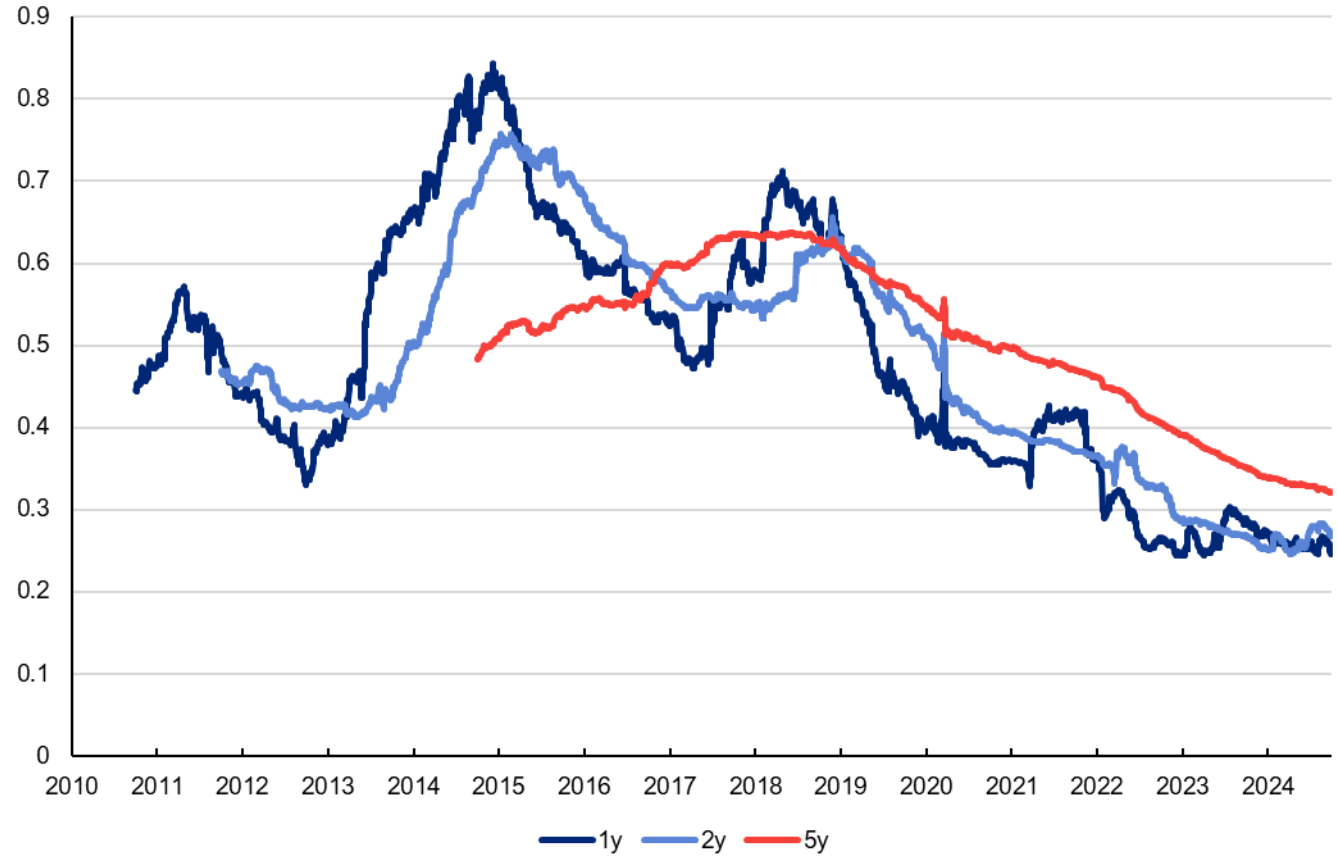
| | Estimation window | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity beta | 1-year | 0.79 | 0.86 | 0.80 | 0.87 | 0.96 |
| | 2-year | 0.86 | 0.78 | 0.77 | 0.88 | 0.95 |
| | 5-year | 0.90 | 0.90 | 0.91 | 0.94 | 0.93 |
| Average Gearing | 1-year | 76% | 76% | 74% | 69% | 57% |
| | 2-year | 76% | 73% | 71% | 66% | 55% |
| | 5-year | 70% | 69% | 66% | 59% | 49% |
| Asset beta | 1-year | 0.25 | 0.26 | 0.27 | 0.33 | 0.47 |
| | 2-year | 0.27 | 0.26 | 0.27 | 0.35 | 0.49 |
| | 5-year | 0.32 | 0.33 | 0.36 | 0.43 | 0.51 |

*Source: CEPA analysis of Bloomberg data*

Table 4.7 above shows that, compared to BT Group, Vodafone has a higher gearing ratio and slightly lower asset betas.

Figure 4.4 below presents 1-, 2-, and 5-year asset beta estimates over time for Vodafone.

*Figure 4.4: Asset beta estimates for Vodafone*




*Source: CEPA analysis of Bloomberg data*

Vodafone's beta estimates feature a strong downward trend since June 2018, similar to that observed for BT Group and European telecoms comparators above.

Table 4.8 below presents the results of our mechanistic summary of the evidence base for Vodafone.

*Table 4.8: Interquartile range of 2-year daily estimates for Vodafone (24 June 2018 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.79 | 0.96 | 0.99 |
| **2-year Gearing** | 54% | 66% | 69% |
| **Asset Beta** | 0.29 | 0.38 | 0.51 |

*Source: CEPA analysis of Bloomberg data*

We adopt the interquartile range of **0.29-0.51** as our mechanistic range for Vodafone.

## 4.5. ICT COMPANIES

### Selected comparator sample

In this section, we present summary beta estimates for listed EU and UK ICT company comparators. Our comparator selection process (detailed in Appendix C) suggests that 18 listed comparator companies are suitable for inclusion in our estimation process.

ICT companies in the context of this report relates to ICT activities consistent with those of BT Group. Brattle had previously selected companies whose operations include "Managed Networked IT Services, Unified

Communications/IT Infrastructure, and Professional Services/IT Consulting" and we have likewise looked at activities to help inform our sample list.

## Summary results for ICT Companies

Table 4.9 presents 2-year asset betas for the ICT comparators. Results based on 1-year and 5-year estimation windows, as well as estimated equity betas and gearing, may be found in Appendix D.

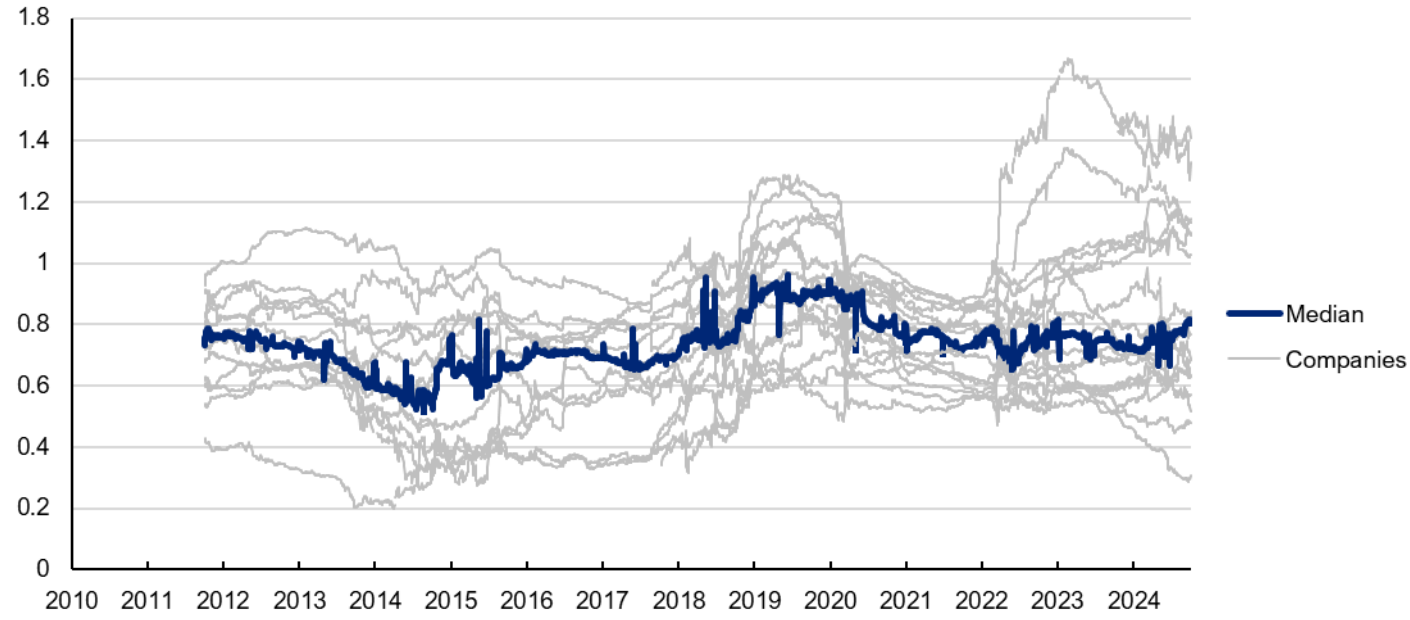
*Table 4.9: ICT company 2-year asset betas, company-level breakdown*

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Asset Beta | Atea ASA | 0.52 | 0.58 | 0.58 | 0.56 | 0.49 |
| | Capgemini SE | 1.03 | 1.06 | 1.05 | 1.00 | 0.98 |
| | Computacenter PLC | 1.09 | 1.07 | 1.01 | 0.89 | 0.81 |
| | Global Dominion Access SA | 0.48 | 0.49 | 0.54 | 0.64 | 0.63 |
| | Dassault Systemes SA | 1.13 | 1.13 | 1.07 | 0.94 | 0.85 |
| | KNOW IT AB | 0.84 | 0.81 | 0.80 | 0.85 | 0.70 |
| | Link Mobility Group Holding ASA | 0.57 | 0.66 | 0.78 | 0.78 | 0.78 |
| | Netcompany Group A/S | 1.10 | 1.22 | 1.26 | 1.01 | 1.01 |
| | NNIT A/S | 0.77 | 0.67 | 0.61 | 0.66 | 0.63 |
| | RaySearch Laboratories AB | 0.69 | 0.84 | 0.84 | 0.85 | 0.74 |
| | SAP SE | 0.81 | 0.74 | 0.73 | 0.82 | 0.80 |
| | Sage Group PLC | 0.63 | 0.62 | 0.60 | 0.63 | 0.73 |
| | Sinch AB | 1.41 | 1.40 | 1.49 | 1.14 | 0.99 |
| | Sopra Steria Group | 1.14 | 1.08 | 1.02 | 0.98 | 0.84 |
| | Serco Group PLC | 0.69 | 0.61 | 0.60 | 0.63 | 0.65 |
| | Teleperformance SE | 0.63 | 0.68 | 0.67 | 0.75 | 0.73 |
| | TietoEVRY Oyj | 0.83 | 0.73 | 0.70 | 0.65 | 0.70 |
| | Truecaller AB | 1.33 | 1.41 | - | - | - |

*Source: CEPA analysis of Bloomberg data*

Figure 4.5 below presents estimated 2-year asset betas for these comparators over time, as well as the median estimate across the comparator group.

*Figure 4.5: 2-year asset beta estimates for ICT comparators*




*Source: CEPA analysis of Bloomberg data*

As with the European telecoms comparators, we observe a variety of operational and risk profiles among the ICT comparators.

Table 4.10 below presents the results of our mechanistic summary of the evidence base for ICT companies.

*Table 4.10: Interquartile range of 2-year daily estimates for ICT comparators (24 June 2018 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.78 | 0.89 | 1.09 |
| **2-year Gearing** | 8% | 13% | 20% |
| **Asset Beta** | 0.65 | 0.79 | 0.93 |

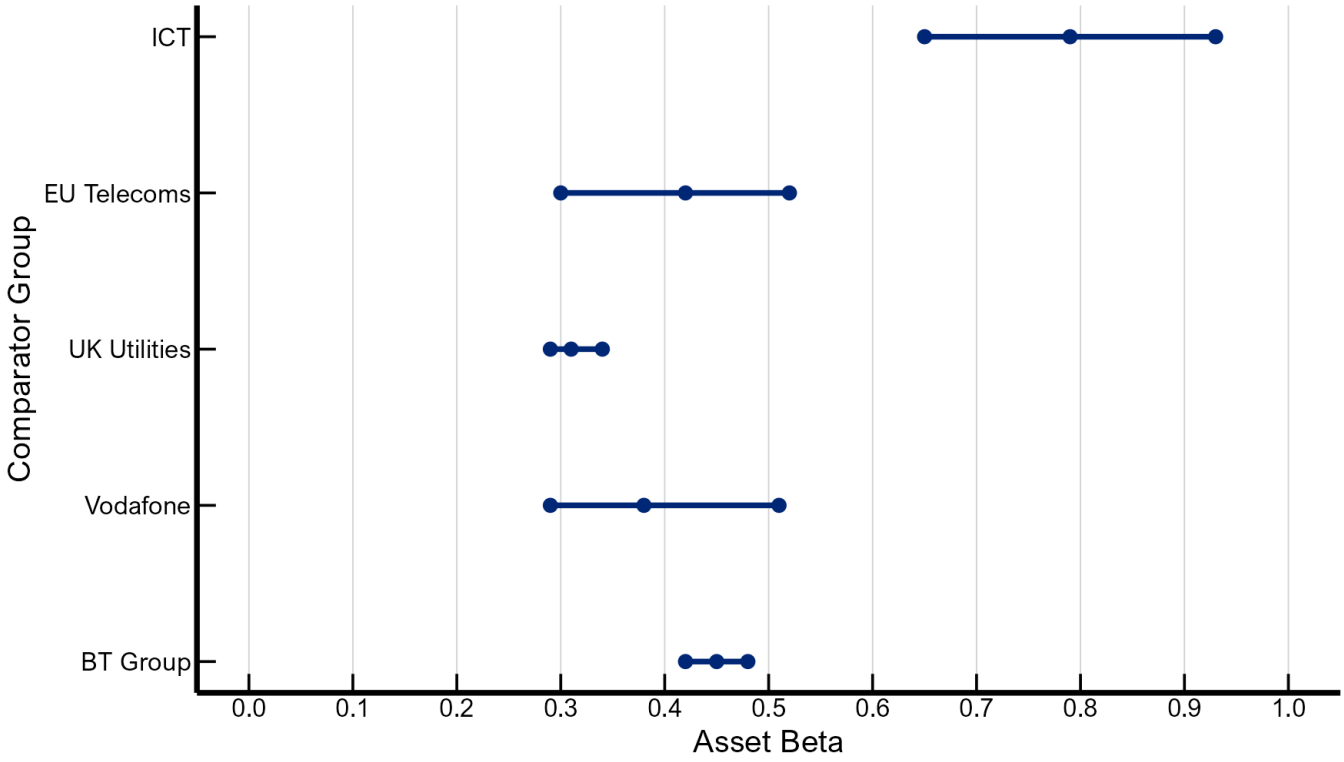
*Source: CEPA analysis of Bloomberg data*

We adopt the interquartile range of **0.65-0.93** as our mechanistic range for ICT comparators.

## 4.6. SUMMARY OF MECHANISTIC ASSET BETA RANGES

Figure 4.6 below summarises the mechanistic base ranges of asset betas for our four main comparator groups.

*Figure 4.6: Asset beta ranges for core comparator groups*




*Source: CEPA analysis of Bloomberg Data*

These results contextualise the ranges of exposure to systematic risk that we observe in the empirical evidence on these companies' stock returns.

# 5. BETA ESTIMATION – PROPOSED RANGES

In this section, we provide supplementary analysis and evidence to inform our proposed beta ranges. We discuss this evidence for each of the comparator groups, as well as implications for our proposed asset beta ranges, after we have presented cross-cutting evidence.

## 5.1. REFINING MECHANISTIC ESTIMATES

In Section 4, we presented our mechanistic ranges for the different comparator groups. This was based on a preferred set of results, triangulating using the full distribution of recent empirical estimates. Ofcom may choose to adopt these base estimates as a transparent methodology for setting beta. An approach that prioritises transparency and clarity for stakeholders would be consistent with the approach applied in European contexts, informed by the non-binding annual estimates of the cost of capital produced by the Body of European Regulators for Electronic Communications (BEREC). More importantly, it is consistent with the UKRN's guidance for estimating beta.

However, a mechanistic approach may have implications for the cost of capital that are not reflective of the balance of risk and return for the regulated entities, due to shock events, differing choices around summarising a large body of evidence, M&A activity by comparator peers within the sample, general parameter uncertainty, and others. This section sets out additional evidence that we consider to be useful if Ofcom chooses to apply more regulatory judgement in its approach. The application of judgement means that the precise estimation of a range is more judgement-based and discretionary, while remaining grounded in a holistic review of the best available quantitative evidence on telecoms betas.

We discuss each of the broader cross-cutting pieces of evidence in Appendix E that inform our assessment for each comparator group, with the relevant section highlighted below.

| Evidence source (section) | Reason for inclusion |
|---|---|
| Empirical betas for other comparator sub-groups (E.1) | To contextualise our headline asset beta ranges for the four core comparator groups above, it is useful to consider asset beta estimates for a broader set of comparator groups. For example, we consider that UK and European energy (and water) networks are particularly relevant for UK and European telecoms respectively. This is because European energy networks are assessed as having low risk, with limited demand risk and RAB models reducing asset stranding risk. Where telecoms asset betas are lower than these energy networks, it would indicate a need to check the robustness of both of the data points.<br>We also look at US telecoms networks – to the extent that the significantly declining telecoms betas observed in Section 4 are due to legitimate decreases in risk, we would expect to see many of the same trends come through in those empirical beta estimates.<br>We assess betas of UK Power Generators. BT Group's asset beta estimate in WFTMR 2021 and in prior Ofcom determinations has been close to betas estimated for power generator companies, so this is a wider cross-check.<br>European satellite providers are our final comparator group. This is a less direct cross-check, but given that telecoms betas for some companies are less than European utility networks, we consider further assessment of a broader pool of comparators to be useful. |
| Distribution of empirical evidence (E.2 and E.3) | At WFTMR 2021, Ofcom stated the following principles around its approach to estimating WACC:<br>• Efficient price and investment signals<br>• Stability<br>• Consistency |

| Evidence source (section) | Reason for inclusion |
|---|---|
| | The mechanistic estimates produced in Section 4 point to lower results than at WFTMR 2021. We look at how the beta has evolved and the extent to which Ofcom has taken a more 'data-driven' approach versus looking to smooth volatility that is inherent in beta estimation.<br>We also present the full distribution of European telecoms asset betas and its implications for the selection of a range. |
| Regulatory decisions from the UK and other jurisdictions (E.2 and E.4) | Ofcom is not the only regulator of telecoms services. Whilst regulatory decisions from other jurisdictions are not binding on Ofcom in any way, we consider it useful to see how other regulatory bodies have assessed beta. Where competition for capital exists both in a given sector across countries and across sectors, it is also a useful exercise to benchmark returns. |
| Changes in telecom company equity valuations / gearing (E.5) | Our mechanistic estimates include a focus on the asset beta. This requires de-levering equity betas. Higher levels of gearing lead to lower asset betas,and we have observed this for multiple comparator groups. We consider whether changes in equity valuations have the potential to distort asset beta estimates. |
| M&A activity (E.6) | M&A activity has the potential to bias beta estimates. In our experience, the direction and magnitude of this bias is difficult to predict and depends on the timing of the transaction with the market, as well as the relative motion of stock and market returns on-the-day.<br>We have identified a set of "significant" M&A transactions involving our sample companies since 2014, and find that these transactions are not material to our results, or that removing companies featuring these transactions has only a small effect on our mechanistic ranges. |
| Statistical tests and standard errors (E.7) | Ofcom has requested that we verify the OLS assumptions underpinning our beta estimates through appropriate statistical testing. We find consistent evidence for heteroskedastic errors, and so present and draw inference only from heteroskedasticity-robust standard errors. We find consistent evidence for autocorrelation only in 2- and 5-year ICT company betas. To assess the materiality of this autocorrelation, we cross-check our heteroskedasticity-robust standard errors with (Newey-West) HAC standard errors and generalised least squares. |
| Debt assumption, capitalised leases and hybrid bonds (E.8) | It is important to check that specific methodological choices and assumptions are not leading to bias in the evidence base.<br>To help ensure that our summary of the available evidence on beta is wide-ranging and robust, we consider the impact on our mechanistic ranges of using net debt, rather than gross debt, to calculate gearing, and the impact of excluding leases capitalised under IFRS 16. |

## 5.2. PROPOSED RANGES

In this section we present our final estimates of asset beta for each comparator group. We refer to these as our proposed ranges. These build on the mechanistic ranges set out in Section 4.

### 5.2.1. BT Group

Our mechanistic asset beta range for BT Group is 0.42-0.48.

In making a recommendation of a proposed range, we considered the following points in our assessment:

- We have cross-checked this range against the interquartile range of 1-year and 5-year asset betas. Table 5.1 below shows that the interquartile range of 1-year asset betas for BT Group is slightly wider than for 2-year betas, while the endpoints of the range based on 5-year betas are slightly higher.

*Table 5.1: BT Group asset beta ranges for different estimation windows*[7]

| | 1-year | 2-year | 5-year |
|---|---|---|---|
| UQ | 0.49 | 0.48 | 0.52 |
| LQ | 0.40 | 0.42 | 0.44 |

*Source: CEPA analysis of Bloomberg Data*

- The BT Group beta sits above UK utilities and largely below median in the range of UK power generators, which is plausible given the relative systematic risk exposures of the two comparator groups.
- BEREC decisions for European telecoms comparators would support a decline in the asset beta over time, especially since 2019/20, though their results are lower than Ofcom's prior decisions on BT Group's asset beta.
- BT Group's equity valuation has fallen (with increasing gearing) over time, which could potentially reduce the asset beta mechanistically. Some of the increase in gearing is due to BT's acquisition of EE, which closed on 29 January 2016, and the implementation of IFRS 16 in 2019.
- We note that longer-term trailing averages and estimation windows (presented in Table 4.1 above) can yield higher asset betas than our proposed range, though only one data point (out of the fifteen considered) is at the 0.62 level used by Ofcom for BT Group at WFTMR 2021.
- BT's M&A activity (the BT-EE merger) is unlikely to have distorted the empirical asset beta estimates in a meaningful way during our sample period, though we note that the merger caused a spike in market capitalisation ahead of acquisition.
- We have based our preferred estimate on gross debt gearing for consistency with Ofcom's prior positions, but consider that use of net debt gearing would be a suitable approach if cash is available to pay down debt. Use of net debt gearing gives asset beta estimates that are ~0.05 higher than our mechanistic evidence.
- Our results do not appear to suffer from robustness issues around statistical tests. The longer estimation windows have lower standard errors than the shorter windows, and the associated asset betas are generally higher. Our mechanistic range is based on 2-year betas, but the top of the range is consistent with evidence from 5-year betas.

There is also evidence specific to BT Group that we discuss in greater detail in Appendix E. This includes the following pieces of evidence:

- BT's equity beta exhibits greater stability than its asset beta and raw equity beta estimates are typically 0.90-1.00. Ofcom may choose to be guided by a combination of asset beta and gearing that helps deliver an equity beta consistent with empirical evidence on equity beta. Our asset beta range is broadly consistent with this, with the upper bound asset beta close to a unitary equity beta at around 55% notional gearing.
- We have examined rolling betas for BT Group, and do not consider that there are any shock events that are leading to systematic bias in our estimated ranges.

## Proposed range

We consider whether we need to adapt our mechanistic asset range of 0.42-0.48.

[7] 1-year beta ranges are based on a post-Brexit start date of 24 June 2017, 2-year beta are based on 24 June 2018, and 5-year beta ranges are based on 24 June 2021.

- **We do not adjust our lower bound of 0.42.** There is limited justification from the evidence above to support a reduction in the lower end of our range. We would need to place significant weight on shorter term estimates with higher parameter uncertainty to do so (for example, on 1-year betas).
- **We adjust our upper bound to 0.50** (from 0.48). We consider that the upper end of the base estimates is broadly appropriate and captures most of the relevant information, but consider that rounding the upper bound to 1 decimal place is appropriate, given the particular points noted above.
    - This includes relevance of the stable equity beta, net debt cross-checks, and setting more stable investment signals and higher statistical robustness by adopting a longer term perspective to beta estimates.
    - We note that an upper bound of 0.50 is consistent with the midpoint of the upper-bounds of 2-year and 5-year asset beta ranges (0.48 and 0.52, see Table 5.1 above).

Our proposed asset beta range is therefore **0.42 to 0.50** for BT Group.

### 5.2.2. UK Utilities

Our mechanistic asset beta range for the UK utilities is 0.29-0.34.

In relation to the cross-cutting evidence, we consider that the following points are relevant – all of which we support our broad mechanistic range:

- We have cross-checked this range against the interquartile range of 1-year and 5-year asset betas. Table 5.1 below shows that the interquartile range of 1-year asset betas for UK Utilities is slightly wider than for 2-year betas, while the range based on 5-year betas is slightly narrower.

  *Table 5.2: UK utilities asset beta ranges for different estimation windows*[8]

| | 1-year | 2-year | 5-year |
|---|---|---|---|
| UQ | 0.37 | 0.34 | 0.32 |
| LQ | 0.27 | 0.29 | 0.29 |

  *Source: CEPA analysis of Bloomberg Data*

- For this comparator group, we have also considered a cross-check based on the full time sample of beta observations. For UK utilities comparators we consider this appropriate due to the high stability of their beta estimates. Table 5.3 shows that the implied range is similar to the 1-year beta range estimated on the restricted time sample, and is slightly wider than our preferred mechanistic range.

  *Table 5.3: Interquartile range of 2-year daily estimates for UK utilities (1 October 2011 - 30 September 2024)*

| | LQ | Median | UQ |
|---|---|---|---|
| **Equity Beta** | 0.50 | 0.58 | 0.65 |
| **2-year Gearing** | 49% | 51% | 54% |
| **Asset Beta** | 0.28 | 0.31 | 0.37 |

  *Source: CEPA analysis of Bloomberg Data*

- The UK utilities range is positioned in a way that aligns closely with our expectations for these companies' exposure to systematic risk, relative to the other comparator groups.

[8] 1-year beta ranges are based on a post-Brexit start date of 24 June 2017, 2-year beta are based on 24 June 2018, and 5-year beta ranges are based on 24 June 2021.

- The width of the range reflects that these companies are well-established network utilities with broadly similar operations (with some other challenges to interpretation, including National Grid's US-based operations and Pennon's changes in composition over time.
- Our mechanistic range is consistent with Brattle's assessment (for Ofcom) of the UK utilities asset beta at WFTMR 2021. This is consistent with our experience that these companies' betas are relatively stable over time.
- We consider that the mechanistic asset beta range is suitably balanced when taking a holistic view of the available evidence.
- Net debt gearing gives asset beta estimates that are 0.01-0.02 higher than our mechanistic range.
- Our results do not appear to suffer from robustness issues around statistical tests. The longer estimation windows have lower standard errors than the shorter windows, and the associated asset betas are generally higher. This could point to selecting a point estimate from higher in the range.

There is also evidence specific to the UK utilities comparator group that we discuss in greater detail in Appendix E. This includes the following pieces of evidence:

- We have examined rolling betas for UK Utilities, and do not consider that there are any shock events that are leading to systematic bias in our estimated ranges.
- Both National Grid and Pennon Group have been involved with significant[9] announced M&A transactions during the time sample. Removing these two companies from the mechanistic ranges would slightly reduce our asset beta estimates, by 0.01-0.03. We continue to consider that National Grid and Pennon should not be excluded in this context, though care is required for interpretation of results.

### Proposed range

We propose to slightly increase the mechanistic range to 0.30-0.35 (from 0.29-0.34). This acknowledges that alternative methodological choices around gearing and the adoption of a longer-term view of the evidence on highly-stable UK utilities betas point to higher figures, but also reflects that figures above 0.35 are likely to place excessive weight on utility networks with other non-regulated or international operations, such as Pennon and National Grid.

Our proposed asset beta range is therefore **0.30 to 0.35** for UK Utilities.

## 5.2.3. European Telecoms

Our base mechanistic range of asset betas for the EU telecoms comparator group was 0.30-0.52.

In relation to the cross-cutting evidence, we consider that the following points are relevant – most of which are supportive of our mechanistic range:

- We have cross-checked this range against the interquartile range of 1-year and 5-year asset betas. Table 5.1 below shows that the interquartile range of 1-year asset betas for EU telecoms is slightly wider than for 2-year betas, while the range based on 5-year betas is slightly narrower.

*Table 5.4: EU telecoms asset beta ranges for different estimation windows*[10]

| | 1-year | 2-year | 5-year |
|---|---|---|---|
| UQ | 0.52 | 0.52 | 0.51 |
| LQ | 0.28 | 0.30 | 0.34 |

[9] By this we mean that the announced deal value exceeded 30% of market cap for at least one company in our sample

[10] 1-year beta ranges are based on a post-Brexit start date of 24 June 2017, 2-year beta are based on 24 June 2018, and 5-year beta ranges are based on 24 June 2021.

*Source: CEPA analysis of Bloomberg Data*

- The mechanistic asset beta range for European Telecoms covers the full asset beta range assessed for BT Group.
- Based on our assessment of the relative systematic risk profiles of our comparator groups, we would expect that European telecoms companies overall should have similar exposure to systematic risk as BT Group, which we would expect to be reflected in company betas.
- Likewise, from a qualitative perspective, we would expect European telecoms asset betas to be at least as high risk as European energy networks (which we estimate in Appendix E as 0.31-0.47). We note that many of the European energy networks considered are not pure play regulated networks.
- We estimate a range for US telecoms of 0.32-0.54 in Appendix E. While there are likely to be material differences in risk exposure, this does not imply a significant directional movement for our European telecoms range.
- Our base mechanistic range is lower than those presented by previous telecoms market review consultancy reports on EU Telecoms betas e.g. at WFTMR 2021, though the top end of the mechanistic range is fairly close to those estimates.
- Likewise, BEREC's[11] recent estimates typically point to values consistent with this range. We note that BEREC's estimates are based on 5-year weekly betas and therefore place weight only on longer-term evidence on stock and market returns.
- The fall in share prices for some EU telecoms operators over the last ten years might be reflective of their regulatory environment, in which companies have been asked to deliver large network investments to meet government targets.
- Our mechanistic range is broad, but the observations outside of the upper quartile point to significantly higher estimates. There are materially lower estimates below our lower bound, highlighting the variation in estimates for European telecoms.
- We consider M&A activity by companies within our sample. The removal of companies with significant M&A activity during our sample points to small (at most 0.02) increases in our estimated range.
- Our statistical test results for heteroskedasticity and autocorrelation do not indicate issues with robustness in our estimates. There is periodic evidence for the presence of heteroskedastic standard errors, so we present and draw inference only from heteroskedasticity-robust standard errors.
- Use of net debt gearing gives estimates that are 0.01-0.03 higher than our mechanistic range, on an unlevered basis. The removal of capitalised leases has a similar impact.

There is also evidence specific to European telecoms that we discuss in the following Appendix E. This includes the following points:

- Equity betas and asset betas for European Telecoms comparators display a similar sustained downward trend over the past decade.
- We have examined rolling betas for our sample of European telecoms comparators, and do not consider that there are any shock events that are leading to systematic bias in our estimated ranges.

[11] BEREC (2024) "Report on WACC parameter calculations according to the European Commission's WACC Notice on 6th November 2019", Table 6, Available here.

- Our sample selection process closely mirrors those considered in previous reports commissioned by Ofcom, and results in a final sample similar to BEREC's. We note that rolling forward BEREC's and Brattle's EU telecoms samples results in slightly lower ranges than our preferred sample.

### Proposed range

We consider that our mechanistic asset beta range for European telecoms is largely appropriate. We have rounded down the upper bound to 0.50 from 0.52.

We have opted for a relatively broad range to highlight the uncertainty that exists with the data. The rounding of the upper bound aligns the range with the upper bound of the BT Group range, highlights the steady reduction in EU telecoms asset betas over time, and reflects the availability of alternative samples with lower estimates and the overall level of uncertainty for this comparator group.

Our final proposed asset beta range for European telecoms is **0.30 – 0.50**.

## 5.2.4. UK Telecoms

Our mechanistic asset beta range for UK Telecoms – namely Vodafone – is 0.29 to 0.51.

In relation to the cross-cutting evidence, we consider that the following points are relevant.

- We have cross-checked this range against the interquartile range of 1-year and 5-year asset betas. Table 5.1 below shows that the interquartile range of 1-year asset betas for Vodafone is slightly wider than for 2-year betas, while the range based on 5-year betas is noticeably narrower, especially at the upper bound.

  *Table 5.5: Vodafone asset beta ranges for different estimation windows*[12]

| | 1-year | 2-year | 5-year |
|---|---|---|---|
| UQ | 0.53 | 0.51 | 0.44 |
| LQ | 0.27 | 0.29 | 0.34 |

  *Source: CEPA analysis of Bloomberg Data*

- The majority of Vodafone's operations are in Europe, and whilst their UK listing leads to inclusion as UK Telecoms here, we consider that there are clear similarities with European telecoms.
- The Vodafone range is positioned in a way that aligns closely with our expectations for the relative systematic risk exposure of our comparator groups.
- Our mechanistic range lies below Ofcom's assessment of Vodafone's beta at WFTMR 2021. This is consistent with the sustained decline we have observed in asset betas for BT Group and European telecoms comparators.
- We have considered the distribution of empirical beta estimates for Vodafone. We note that longer-term trailing averages and estimation windows yield higher betas, and are not as high as set out by Brattle at WFTMR 2021.
- The impact of Vodafone's M&A activity (relating to the sale of Vodafone Italy to Swisscom) does not appear to have materially distorted our empirical beta estimates.
- Use of net debt gearing gives estimates that are 0.03 – 0.10 higher.
- Our results do not appear to suffer from robustness issues around statistical tests. The longer estimation windows have lower standard errors than the shorter windows, and the associated asset betas are generally higher. This could point to selecting a point estimate from higher in the range.

[12] 1-year beta ranges are based on a post-Brexit start date of 24 June 2017, 2-year beta are based on 24 June 2018, and 5-year beta ranges are based on 24 June 2021.

There is also evidence specific to Vodafone that we discuss in greater detail in Appendix E. This includes the following pieces of evidence:

- We have examined rolling betas for Vodafone, and do not consider that there are any shock events that are leading to systematic bias in our estimated ranges.
- Given the de-listing of TalkTalk, we consider that Vodafone remains the best available cross-check to BT Group's beta estimates. However, given that just under 19% of its annual turnover was UK-based in FY 2024 and that Vodafone does not provide wholesale access to its fixed network in any country, Vodafone is not a perfect comparator.

### Proposed range

We consider that adopting the same asset beta range as European telecoms, namely **0.30 to 0.50** is suitable for Vodafone. We do not consider that the evidence conclusively points to different estimates and involves a symmetric 0.01 rounding adjustment to both lower and upper bounds.

## 5.2.5. ICT companies

Our base mechanistic range of asset betas for the ICT comparator group was 0.65-0.93.

In relation to the cross-cutting evidence, we consider that the following points are relevant:

- We have cross-checked this range against the interquartile range of 1-year and 5-year asset betas. Table 5.1 below shows that the interquartile range of 1-year asset betas for ICT companies is slightly wider than for 2-year betas, while the range based on 5-year betas is slightly narrower at the upper bound.

  *Table 5.6: Vodafone asset beta ranges for different estimation windows*[13]

| | 1-year | 2-year | 5-year |
|---|---|---|---|
| UQ | 0.96 | 0.93 | 0.89 |
| LQ | 0.63 | 0.65 | 0.65 |

  *Source: CEPA analysis of Bloomberg Data*

- The range of betas for ICT comparators is substantially higher than that of other comparator groups, only slightly overlapping the very top end of the range for UK power generators. This is consistent with our understanding of the risk profiles of these companies and the results of our qualitative risk assessment.
- Furthermore, this range is consistent with the estimate of Brattle at WFTMR 2021 (as well as a roll-forward of the same sample with updated beta estimates – see Appendix C for further details).
- We have considered M&A activity by companies within our sample. The removal of all ICT companies displaying M&A activity leads to only small increases in the range of between 0.00 - 0.02.
- Our ICT sample displays consistent evidence for the presence of autocorrelation in 2- and 5-year betas. It is not clear that estimated heteroskedasticity-robust standard errors display any systematic bias and are broadly consistent with standard errors estimated on other comparator groups. We consider it reasonable to conclude that ICT standard errors tighten as the estimation window lengths (thereby reducing parameter uncertainty for 5-year betas). A cross-check based on HAC standard errors does not materially alter the base estimates, though GLS does point to a range that is overall tighter by 0.02.
- Use of net debt gearing gives estimates that are 0.05-0.06 higher than our mechanistic range, on an unlevered basis.

[13] 1-year beta ranges are based on a post-Brexit start date of 24 June 2017, 2-year beta are based on 24 June 2018, and 5-year beta ranges are based on 24 June 2021.

There is also evidence specific to ICT companies that we discuss in Appendix E. This includes the following points:

- We have examined rolling betas for our sample of ICT comparators, and do not consider that there are any shock events that are leading to systematic bias in our estimated ranges.
- Unlike the approach to sample selection taken by Brattle at WFTMR, we have opted to consider a wider array of Europe-based ICT firms, and preferred to exclude US-based firms that might operate under very different regulatory and business conditions, while retaining focus on businesses whose operations closely resemble those of BT's ICT business. However, our estimated results are consistent with prior approaches, and we are confident that sample selection is not driving material bias in the mechanistic range.

## Implications for the proposed range

There is a very wide range for ICT companies in our assessed asset beta. We do not propose any adjustments to our mechanistic range and consider that such an approach is consistent with how ICT companies are used by Ofcom in their assessment.

We use an asset beta range for ICT companies of **0.65 to 0.93**.

# 6. CONCLUSIONS

This section summarises the key conclusions of this report.

We set out asset betas for different comparator groups. Our recommendations are shown in Table 6.1, which presents the initial mechanistic base range estimates and our final proposed range.

*Table 6.1: CEPA recommended asset betas for TAR 2026*

| Comparator group | Mechanistic Base Range | Final Proposed Range |
|---|---|---|
| **BT Group** | 0.42-0.48 | 0.42-0.50 |
| **European telecoms** | 0.30-0.52 | 0.30-0.50 |
| **Vodafone** | 0.29-0.51 | 0.30-0.50 |
| **UK Utilities** | 0.29-0.34 | 0.30-0.35 |
| **ICT** | 0.65-0.93 | 0.65-0.93 |

# Appendix A PROJECT SCOPE

This advice will be used to inform our approach to estimating asset betas, similar to that used in the WFTMR 2021 statement.

We are not envisaging a significant change to the disaggregation approach proposed in the WFTMR 2021 statement but we require updated beta estimates of BT and relevant comparator groups to inform our estimates of BT Group beta and its constituent parts.

The required advice and analysis is as follows:

- Review the asset beta estimates included in our WFTMR 2021 statement and supporting report by Brattle.
- In the event that you consider the sample of comparator groups used by Brattle for UK utilities, UK telecoms and European telecoms should be modified, please outline the reasoning in your report. We continue to think the systematic risk of ICT activities is expected to be higher than telecoms and therefore should be considered separately. In the event you disagree with previous comparators Brattle has used for ICT, please also explain why in your report.
- Provide your views on the appropriate sampling period(s), time horizon(s) and market index(es). We would expect to discuss your views on these issues before agreeing the approach to estimating the required betas.
- Provide estimates of BT Group's equity beta using the agreed sampling periods, time horizons and market indices.
- Provide estimates of BT Group's gearing and asset beta, prepared using comparable time frames to the equity beta estimates.
- From your analysis, suggest an appropriate range for BT Group's asset beta.
- Provide estimates of the equity betas, asset betas, and gearing of publicly traded UK utility companies, suitable UK and European telecommunications comparator companies, and ICT companies. We would expect your approach to calculation of asset betas to factor in an appropriate debt beta, taking account of Ofcom's past reasoning and the 2023 UKRN cost of capital guidance.
- In equity beta and asset beta analysis, include confidence intervals and consider diagnostic tests to check underlying assumptions (e.g. heteroscedasticity and impact on standard errors).
- Perform such analysis as you consider necessary to explain how the estimated equity betas have moved over time (e.g. M&A activity, COVID-19, etc) and to what extent, if any, this affects interpretation of the beta estimates.
- Provide your views on if and how gearing estimates should take account of leases given changes to accounting rules under IFRS16 and explain any assumptions or adjustments made to gearing estimates to account for this.
- Compare your proposed approach for beta estimation to the UKRN's 2023 cost of capital guidance.
- We are likely to ask you to present and discuss your approach and, at a later point, your draft findings with Ofcom at a meeting at Ofcom's Riverside House offices or by a virtual meeting.
- We require a publishable report on the above analysis which, on current plans, would accompany the main TAR consultation in January 2025. This report should then be updated ahead of the TAR statement in early 2026. If separate advice were required – e.g. on specific areas of analysis – please prepare such notes or reports in the expectation that they may also be published.

# Appendix B LONGLIST SELECTION FOR THE CORE COMPARATOR GROUPS

This appendix summarises our approach to selecting a broad longlist of comparators for each of the four groups we have been asked to consider:

- UK telecoms companies
- UK network utilities
- European telecoms companies
- ICT companies.

To derive a shortlist of suitable comparators, we screen companies on the longlist for liquidity – these liquidity tests are presented in Appendix D.

## B.1. UK TELECOMS

In its consultancy report for WFTMR 2021, Brattle maintained the UK telecoms sample used by NERA for the 2019 BCMR[14], consisting of BT Group itself, Vodafone Group PLC, and TalkTalk Telecom Group Ltd.

We consider that both companies can be useful comparators to differing extents, though neither is a perfect comparator for BT Group.

Most critically, TalkTalk was delisted on 15 March 2021, following its takeover by Tosca IOM Ltd. CEPA's house approach to estimating beta emphasises a holistic view, including an assessment of how betas have evolved over time[15]. We therefore consider that TalkTalk could be a useful cross-check on the UK telecoms beta prior to its de-listing, but acknowledge that it is unlikely to be informative on a forward-looking basis.

Vodafone, likewise, has challenges to interpretation as a comparator:

- The majority of Vodafone's operations are in Europe despite its UK listing, and we observe clear similarities with European telecoms companies.
- Likewise, just under 19% of its annual turnover in FY 2024 was UK-based.
- Vodafone is more high-geared than BT – at 76%, its 2-year average gearing is currently 10 percentage points higher than BT's.
- Vodafone also does not provide wholesale access to its fixed network in any country.

In spite of these issues, we consider that Vodafone is the closest available comparator to BT Group itself. For purposes of deriving a mechanistic range with which to draw inference on beta for non-BT UK telecoms companies, we therefore place primary weight on Vodafone.

## B.2. UK UTILITIES

As with UK telecoms, Brattle maintained the UK utilities sample applied by NERA for the 2019 BCMR, consisting of National Grid PLC, Pennon Group PLC, Severn Trent PLC, and United Utilities PLC. This is consistent with the UKRN's guidance. We consider that this sample continues to be appropriate, and that there is considerable value in maintaining a consistent approach to this aspect of the methodology.

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[14] Brattle (2021), "Cost of Capital: Beta and Gearing for WFTMR 2021"

[15] In contrast to an approach that focuses exclusively on current spot estimates of beta, which are prone to volatility.

Nevertheless, these comparators are not uniform and several have specific challenges to interpretation:

- National Grid includes significant US operations – in FY 2024 its US regulated business accounted for 50.6% of group turnover - as well as its 'National Grid Ventures' business unit containing a portfolio of commercial businesses operating in more competitive markets.
- The composition of Pennon Group has changed over time, though it now comprises primarily pure play water networks.

In spite of these challenges, we consider that these companies are suitable for inclusion in the evidence base, and conduct a sensitivity excluding them to ensure that our results are not being driven materially by the choice of comparators.

## B.3. EUROPEAN TELECOM OPERATORS

Brattle updated the sample of European Telecoms firms, using the Bloomberg Intelligence classifications for "EU telecom carriers[16]" for an initial sample.

Bloomberg Intelligence lists 28 "EU telecoms operators" in the BIEUITVP, BIEUCTCP, and BIEUETVP indices, including BT Group and Vodafone Group.

Thus we proceed with a longlist consisting of the following 26 European telecoms companies:

| European Telecoms Longlist |
|---|
| Deutsche Telekom AG |
| Elisa Oyj |
| Hellenic Telecommunications Organization SA |
| Koninklijke KPN NV |
| NOS SGPS SA |
| Orange Belgium SA |
| Orange Polska SA |
| Orange SA |
| Proximus SADP |
| Swisscom AG |
| Tele2 AB Class B |
| Telecom Italia SpA |
| Telefonica Deutschland Holding AG |
| Telekom Austria AG |
| Freenet AG |
| 1&1 AG |
| Tele Columbus AG |
| Euskaltel SA |
| Turk Telekomunikasyon AS |
| Turkcell Iletisim Hizmetleri AS |
| Mobile TeleSystems PJSC |
| Rostelecom PJSC |
| Telefonica SA |
| Telenor ASA |
| Telia Co AB |

[16] Specifically, they appear to have collated the BIEUITVP, BIEUCTCP, and BIEUETVP indices for their initial list.

These comparators are then screened for liquidity and domestic revenues to qualify for inclusion on our shortlist of comparators.

## B.4. ICT COMPANIES

We note that the ICT companies selected should be tied to the activities conducted by BT Group where possible, as opposed to any ICT companies.

For WFTMR 2021, Brattle updated the sample of ICT comparators as follows:

1. Identify companies based in Europe, the US and Canada with over $1 billion in annual turnover and with at least 50% of turnover from ICT services.
2. Exclude companies relying heavily on a single client or focusing mainly on consulting services.
3. Include only companies that operate in at least two of the three segments in which BT's ICT business operates.

In contrast to Brattle, we would prefer to exclude North American companies from the comparator set. To estimate a beta for BT's ICT business, it is important to restrict the comparator set to companies facing a similar profile of risk. The legal, financial, and business environments in the UK and Europe are more similar to each other than to North America. Because UK and EU markets are relatively more closely aligned, a focus on European comparators may yield a more robust beta estimate for BT's ICT business than an estimate based on North American comparators.

Furthermore, BT Group's beta estimate is disaggregated as a weighted average of three components, including the ICT business. We therefore prefer to keep reference indices for our comparator groups as consistent with one another as possible; North American equity markets may be driven by different sets of structural factors from UK/EU markets, which may give rise to distortions when decomposing the BT Group beta.

To review the ICT comparator universe, we have conducted an equity screening based on the Bloomberg Industry Classification Standard (BICS). Our preferred longlist consists of Western European software and technology services firms with an annual turnover of at least $1bn. This yields a broad UK/EU ICT services sample of 53 firms.

For brevity, we do not present this longlist, noting that over half of the list is excluded by our liquidity screening process, described in Appendix C.

# Appendix C SAMPLE SELECTION: SHORTLIST

## C.1. LIQUIDITY TESTING

Daily beta estimates may be subject to bias if the firm's shares do not trade liquidly. If the market for a specific equity asset is illiquid, new information may be reflected in the asset's prices more slowly than in the market index, resulting in a downward bias in estimated betas.

One solution to this problem is to estimate beta on lower-frequency time-series data, such as weekly or monthly average stock returns. This introduces additional problems, such as the so-called 'reference day bias[17]' and reduced statistical robustness due to fewer observations.

Our preferred approach, however, is to verify that the underlying shares trade liquidly enough that daily betas are unlikely to be subject to bias from low levels of liquidity.

To that end, we conduct three liquidity screening tests, which are broadly in line with those applied by Brattle at WFTMR 2021, We require that, over an estimation sample consisting of business-daily observations between 1 October 2009 and 30 September 2024:

- No more than 5% of sample dates have bid-ask spreads exceeding 2%.
- No more than 0.5% of sample dates have negative bid-ask spreads.
- No more than 5% of sample dates have low traded value (which we define as fewer than 50,000 units of local currency).

We furthermore require that comparators have an investment-grade credit rating. This is because firms that with ratings below investment grade can be very sensitive to news regarding the firm's credit quality, which may not be consistent with BT Group's investment-grade credit rating. Where information on a company's credit rating is not available, we apply a cross-check that the Bloomberg 1-year real-world default probability for the firm is not greater than 1%.

The following sections present the list of companies passing these screening tests for our core comparator groups.

## C.2. UK TELECOMS COMPANIES

*Table C.1: Liquidity Screening Test Results for UK Telecoms*

| Company | Days with high bid-ask spreads (%) | Days with negative bid-ask spreads (%) | Days with low traded value (%) | S&P Credit Rating |
|---|---|---|---|---|
| BT Group | 0.00 | 0.00 | 0.00 | BBB |
| Vodafone Group PLC | 0.00 | 0.03 | 0.00 | BBB |
| TalkTalk Telecom Group PLC | 0.18 | 0.00 | 0.00 | D |

*Source: CEPA analysis of Bloomberg data*

[17] This refers to variance in betas of the same frequency and estimation window due to differing choices about the 'reference day' on which the week or month should start (e.g., 2-year Monday-weekly betas may differ from 2-year Tuesday-weekly betas and so forth).

## C.3. UK Utilities Companies

*Table C.2: Liquidity Screening Test Results for UK Utilities*

| Company | Days with high bid-ask spreads (%) | Days with negative bid-ask spreads (%) | Days with low traded value (%) | S&P Credit Rating |
|---|---|---|---|---|
| National Grid PLC | 0.00 | 0.03 | 0.00 | BBB+ |
| Severn Trent PLC | 0.00 | 0.00 | 0.00 | BBB |
| Pennon Group PLC | 0.00 | 0.00 | 0.00 | Investment-grade[18] |
| United Utilities PLC | 0.00 | 0.00 | 0.00 | BBB- |

*Source: CEPA analysis of Bloomberg data*

## C.4. EU Telecoms Companies

*Table C.3: Liquidity Screening Test Results for European Telecoms*

| Company | Days with high bid-ask spreads (%) | Days with negative bid-ask spreads (%) | Days with low traded value (%) | S&P Credit Rating |
|---|---|---|---|---|
| Deutsche Telekom AG | 0.00 | 0.00 | 0.00 | BBB+ |
| Elisa Oyj | 0.03 | 0.00 | 0.00 | BBB+ |
| Helennic Telecommunications Organisation SA | 0.08 | 0.08 | 0.00 | BBB+ |
| Koninklijke KPN NV | 0.00 | 0.03 | 0.00 | BBB |
| NOS SGPS | 0.13 | 0.00 | 0.00 | BBB- |
| Orange SA | 0.00 | 0.18 | 0.00 | BBB+ |
| Proximus SADP | 0.03 | 0.03 | 0.00 | BBB+ |
| Tele2 AB | 0.05 | 0.00 | 0.00 | BBB |
| Telefonica Deutschland Holding AG | 1.91 | 0.00 | 0.63 | BBB |
| Freenet AG | 0.00 | 0.00 | 0.00 | |
| 1&1 AG | 0.00 | 0.00 | 0.00 | |
| Euskaltel SA | 0.25 | 0.00 | 0.06 | |
| Telefonica SA | 0.48 | 0.19 | 0.00 | BBB- |
| Telenor ASA | 0.00 | 0.00 | 0.00 | A- |
| Telia Co AB | 0.00 | 0.03 | 0.00 | BBB+ |
| United Internet AG | 0.00 | 0.00 | 0.00 | |

*Source: CEPA analysis of Bloomberg data*

Our final shortlist for the EU telecoms comparator group consists of the companies in the above table, with the exception of Euskaltel SA, which was acquired. This leaves a total of fifteen companies.

[18] Pennon Group (2024) Half-year Results 2024/25, Available here.

**Alternative Samples**

BEREC recently published asset beta estimates for a sample of European telecoms comparators. BEREC's report on WACC parameter calculations aims to assist National Regulatory Authorities around the EU by publishing a consistent set of transparent parameter calculations for the cost of capital. Their selected sample is broadly consistent with ours, with some differences. We do not include Digi Communications NV or Telecom Italia SpA (low credit rating), but do include a number of other suitable comparators, including Hellenic Telecommunications Organization SA, Telefonica Deutschland Holding AG, Freenet AG, 1&1 AG, and United Internet AG.

Estimates based on BEREC's sample (based on the same methodology) point to estimates broadly consistent with our mechanistic range, though the range is slightly lower at 0.26-0.42. We have also considered rolling forward Brattle's sample from WFTMR 2021. This gives a similar range of 0.27-0.45.

**Screening for Domestic Revenue**

In keeping with the approach applied by Brattle at WFTMR 2021, we have also considered the share of revenue earned within the EU for the EU telecoms comparators. Overall, we are satisfied that our comparators are sufficiently EU-focused, though we note that Deutsche Telekom in particular has pivoted towards US-based, rather than EU-based, operations and turnover over the last decade. However, it remains in common use as a European telecoms comparator in recent beta studies covering the EU telecoms market, including BEREC's. We therefore continue to include it as a comparator for BT.

## C.5. ICT Companies

*Table C.4: Liquidity Screening Test Results for ICT companies*

| Company | Days with high bid-ask spreads (%) | Days with negative bid-ask spreads (%) | Days with low traded value (%) | S&P Credit Rating |
|---|---|---|---|---|
| Serco Group PLC | 0.00 | 0.00 | 0.00 | |
| Link Mobility Group Holding AG | 0.90 | 0.00 | 0.00 | |
| Truecaller AB | 0.13 | 0.00 | 0.00 | |
| Sopra Steria Group | 0.42 | 0.03 | 2.64 | |
| Sage Group PLC | 0.00 | 0.00 | 0.00 | BBB+ |
| ATEA ASA | 0.22 | 0.08 | 0.00 | BBB+ |
| Computacenter PLC | 0.45 | 0.00 | 0.00 | |
| Raysearch Laboratories AB | 4.52 | 0.00 | 0.30 | |
| Sinch AB | 3.52 | 0.00 | 0.00 | |
| Dassault Systemes SA | 0.00 | 0.16 | 0.00 | A |
| KNOW IT AB | 1.99 | 0.00 | 0.19 | |
| Ionos Group SE | 0.23 | 0.00 | 0.00 | |
| Netcompany Group A/S | 0.06 | 0.00 | 0.00 | |
| SAP SE | 0.03 | 0.03 | 0.27 | A+ |
| NNIT A/S | 0.71 | 0.00 | 0.00 | |
| Teleperformance SE | 0.00 | 0.00 | 0.00 | BBB |
| Capgemini SE | 0.00 | 0.08 | 0.00 | BBB+ |
| TietoEVRY Oyj | 0.19 | 0.00 | 0.00 | |

| Company | Days with high bid-ask spreads (%) | Days with negative bid-ask spreads (%) | Days with low traded value (%) | S&P Credit Rating |
|---|---|---|---|---|
| Global Dominion Access SA | 1.39 | 0.05 | 0.93 | |

*Source: CEPA analysis of Bloomberg data*

Our final shortlist of companies include the companies in the table above, with the exception of Ionos Group SE, which we exclude for its very short history of stock returns. This leaves us with a final shortlist of 18 ICT comparators.

**Alternative Samples**

To verify that our choice of sample is not driving systematic bias in our estimates, we have produced our mechanistic ranges across a roll-forward of the ICT sample applied by Brattle at WFTMR 2021. This gives a range of 0.65-0.99, which is broadly consistent with our mechanistic range.

## C.6. OTHER COMPARATOR SAMPLES

This subsection presents the companies included as other comparator groups.

*Table C.5: Composition of alternative comparator groups*

| UK Power Generation | US Telecoms | EU Satellite Operators | EU Energy Networks |
|---|---|---|---|
| • E.ON SE<br>• SSE PLC<br>• TotalEnergies SE<br>• Centrica PLC<br>• EDF<br>• Good Energy Group<br>• Orsted AS<br>• Shell PLC<br>• Iberdrola SA<br>• Drax Group<br>• ContourGlobal Power Holdings SA | • Lumen Technologies Inc<br>• Frontier Communications Parent Inc<br>• T-Mobile US Inc<br>• AT&T Inc<br>• Verizon Communications Inc<br>• Cogent Communications Holdings Inc<br>• Rogers Communications Inc<br>• TELUS Corp<br>• BCE Inc | • NOS SGPS SA<br>• Vivendi SE<br>• Cyfrowy Polsat SA<br>• SES SA<br>• Modern Times Group MTG AB<br>• Eutelsat Communications SACA<br>• Tele Columbus AG<br>• MultiChoice Group<br>• Euskaltel SA | • A2A SpA<br>• Enel SpA<br>• Hera SpA<br>• Terna - Rete Elettrica Nazionale<br>• Snam SpA<br>• Naturgy Energy Group SA<br>• Redeia Corp SA<br>• EDP SA<br>• REN - Redes Energeticas Nacionais SGPS SA<br>• Electricite de France SA<br>• Engie SA<br>• Veolia Environnement SA<br>• RWE AG<br>• E.ON SE<br>• Enagas SA<br>• Elia Group SA/NV |

| UK Power Generation | US Telecoms | EU Satellite Operators | EU Energy Networks |
|---|---|---|---|
| | | | • Italgas SpA<br>• Fluxys Belgium SA |

# Appendix D INDIVIDUAL COMPANY BETA ESTIMATES

In this Appendix, we provide a broader range of beta estimates for individual companies across our comparator groups.

## D.1. UK UTILITIES

### 1-year estimates

*Table D.1: UK utilities 1-year estimates, company-level breakdown*

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | National Grid PLC | 0.62 | 0.61 | 0.58 | 0.56 | 0.60 |
| | Pennon Group PLC | 1.09 | 1.05 | 0.86 | 0.62 | 0.63 |
| | Severn Trent PLC | 0.66 | 0.68 | 0.63 | 0.56 | 0.61 |
| | United Utilities PLC | 0.66 | 0.70 | 0.65 | 0.58 | 0.62 |
| 1-year Gross Debt Gearing | National Grid PLC | 53% | 54% | 54% | 52% | 49% |
| | Pennon Group PLC | 67% | 63% | 60% | 52% | 51% |
| | Severn Trent PLC | 51% | 52% | 51% | 51% | 51% |
| | United Utilities PLC | 57% | 56% | 55% | 56% | 55% |
| Asset Beta | National Grid PLC | 0.33 | 0.32 | 0.31 | 0.31 | 0.35 |
| | Pennon Group PLC | 0.41 | 0.43 | 0.38 | 0.32 | 0.34 |
| | Severn Trent PLC | 0.36 | 0.37 | 0.35 | 0.31 | 0.34 |
| | United Utilities PLC | 0.32 | 0.35 | 0.34 | 0.30 | 0.32 |

*Source: CEPA analysis of Bloomberg data*

### 2-year estimates

*Table D.2: UK utilities 2-year estimates, company-level breakdown*

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | National Grid PLC | 0.58 | 0.58 | 0.53 | 0.58 | 0.62 |
| | Pennon Group PLC | 1.00 | 0.81 | 0.65 | 0.57 | 0.61 |

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Severn Trent PLC | 0.67 | 0.62 | 0.55 | 0.55 | 0.61 |
| | United Utilities PLC | 0.71 | 0.64 | 0.57 | 0.57 | 0.63 |
| 2-year Gross Debt Gearing | National Grid PLC | 54% | 54% | 54% | 51% | 48% |
| | Pennon Group PLC | 63% | 60% | 56% | 51% | 50% |
| | Severn Trent PLC | 52% | 51% | 50% | 52% | 51% |
| | United Utilities PLC | 56% | 55% | 55% | 57% | 55% |
| Asset Beta | National Grid PLC | 0.31 | 0.31 | 0.29 | 0.32 | 0.36 |
| | Pennon Group PLC | 0.41 | 0.37 | 0.32 | 0.31 | 0.34 |
| | Severn Trent PLC | 0.36 | 0.34 | 0.31 | 0.30 | 0.34 |
| | United Utilities PLC | 0.35 | 0.33 | 0.30 | 0.29 | 0.32 |

*Source: CEPA analysis of Bloomberg data*

## 5-year estimates

*Table D.3: UK utilities 5-year estimates, company-level breakdown*

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | National Grid PLC | 0.61 | 0.60 | 0.60 | 0.61 | 0.60 |
| | Pennon Group PLC | 0.58 | 0.56 | 0.54 | 0.55 | 0.59 |
| | Severn Trent PLC | 0.56 | 0.55 | 0.55 | 0.57 | 0.60 |
| | United Utilities PLC | 0.58 | 0.58 | 0.57 | 0.59 | 0.61 |
| 5-year Gross Debt Gearing | National Grid PLC | 52% | 52% | 52% | 49% | 48% |
| | Pennon Group PLC | 52% | 51% | 50% | 50% | 49% |
| | Severn Trent PLC | 51% | 51% | 52% | 52% | 51% |
| | United Utilities PLC | 56% | 56% | 56% | 57% | 55% |
| Asset Beta | National Grid PLC | 0.33 | 0.33 | 0.33 | 0.35 | 0.35 |

| | UK Utilities Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Pennon Group PLC | 0.31 | 0.31 | 0.30 | 0.32 | 0.34 |
| | Severn Trent PLC | 0.31 | 0.31 | 0.30 | 0.31 | 0.33 |
| | United Utilities PLC | 0.30 | 0.29 | 0.29 | 0.30 | 0.31 |

*Source: CEPA analysis of Bloomberg data*

## D.2. European Telecoms

### 1-year estimates

*Table D.4: European Telecoms 1-year estimates, company-level breakdown*

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Deutsche Telekom AG | 0.30 | 0.34 | 0.43 | 0.66 | 0.81 |
| | Elisa Oyj | 0.33 | 0.39 | 0.32 | 0.36 | 0.52 |
| | Freenet AG | 0.45 | 0.52 | 0.63 | 0.76 | 0.85 |
| | Helennic Telecommunications Organisation SA | 0.59 | 0.38 | 0.45 | 0.53 | 0.70 |
| | Koninklijke KPN NV | 0.07 | 0.10 | 0.15 | 0.35 | 0.59 |
| | NOS SGPS | 0.35 | 0.34 | 0.36 | 0.49 | 0.65 |
| | Telefonica Deutschland Holding AG | 0.09 | 0.52 | 0.47 | 0.50 | 0.61 |
| | Orange SA | -0.02 | 0.09 | 0.12 | 0.38 | 0.67 |
| | Proximus SADP | 0.52 | 0.69 | 0.69 | 0.58 | 0.63 |
| | Telefonica | 0.37 | 0.48 | 0.42 | 0.67 | 0.89 |
| | Telenor ASA | 0.03 | 0.14 | 0.22 | 0.34 | 0.49 |
| | Tele2 AB | 0.32 | 0.36 | 0.39 | 0.50 | 0.69 |
| | Telia Co AB | 0.19 | 0.32 | 0.32 | 0.48 | 0.61 |
| | United Internet AG | 1.25 | 0.80 | 0.88 | 0.89 | 0.98 |
| | 1&1 AG | 0.88 | 0.59 | 0.66 | 0.83 | 0.96 |
| 1-year Gross Debt Gearing | Deutsche Telekom AG | 56% | 58% | 60% | 60% | 53% |
| | Elisa Oyj | 17% | 16% | 15% | 15% | 16% |
| | Freenet AG | 21% | 23% | 25% | 35% | 31% |
| | Helennic Telecommunications Organisation SA | 16% | 17% | 17% | 20% | 26% |
| | Koninklijke KPN NV | 35% | 34% | 35% | 37% | 40% |
| | NOS SGPS | 49% | 47% | 46% | 43% | 36% |
| | Telefonica Deutschland Holding AG | 42% | 41% | 40% | 40% | 28% |

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Orange SA | 61% | 61% | 62% | 60% | 54% |
| | Proximus SADP | 63% | 59% | 52% | 39% | 30% |
| | Telefonica | 67% | 68% | 68% | 68% | 62% |
| | Telenor ASA | 37% | 39% | 42% | 40% | 32% |
| | Tele2 AB | 32% | 34% | 32% | 29% | 25% |
| | Telia Co AB | 48% | 51% | 46% | 43% | 38% |
| | United Internet AG | 41% | 41% | 37% | 28% | 22% |
| | 1&1 AG | 27% | 29% | 28% | 22% | 13% |
| Asset Beta | Deutsche Telekom AG | 0.17 | 0.18 | 0.21 | 0.30 | 0.43 |
| | Elisa Oyj | 0.29 | 0.34 | 0.29 | 0.32 | 0.45 |
| | Freenet AG | 0.38 | 0.42 | 0.49 | 0.50 | 0.61 |
| | Helennic Telecommunications Organisation SA | 0.51 | 0.33 | 0.38 | 0.44 | 0.53 |
| | Koninklijke KPN NV | 0.07 | 0.09 | 0.12 | 0.24 | 0.37 |
| | NOS SGPS | 0.21 | 0.22 | 0.23 | 0.31 | 0.46 |
| | Telefonica Deutschland Holding AG | 0.09 | 0.33 | 0.31 | 0.33 | 0.47 |
| | Orange SA | 0.04 | 0.08 | 0.09 | 0.20 | 0.37 |
| | Proximus SADP | 0.24 | 0.33 | 0.37 | 0.37 | 0.47 |
| | Telefonica | 0.17 | 0.20 | 0.18 | 0.26 | 0.40 |
| | Telenor ASA | 0.05 | 0.11 | 0.15 | 0.24 | 0.37 |
| | Tele2 AB | 0.24 | 0.26 | 0.29 | 0.38 | 0.54 |
| | Telia Co AB | 0.13 | 0.20 | 0.21 | 0.31 | 0.41 |
| | United Internet AG | 0.77 | 0.50 | 0.59 | 0.66 | 0.79 |
| | 1&1 AG | 0.67 | 0.44 | 0.49 | 0.67 | 0.86 |

*Source: CEPA analysis of Bloomberg data*

## 2-year estimates

*Table D.5: European Telecoms 2-year estimates, company-level breakdown*

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Deutsche Telekom AG | 0.34 | 0.47 | 0.57 | 0.72 | 0.86 |
| | Elisa Oyj | 0.32 | 0.30 | 0.29 | 0.37 | 0.54 |
| | Freenet AG | 0.54 | 0.68 | 0.71 | 0.85 | 0.89 |
| | Helennic Telecommunications Organisation SA | 0.46 | 0.48 | 0.51 | 0.59 | 0.74 |
| | Koninklijke KPN NV | 0.14 | 0.17 | 0.20 | 0.43 | 0.64 |
| | NOS SGPS | 0.38 | 0.37 | 0.39 | 0.53 | 0.68 |

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Telefonica Deutschland Holding AG | 0.39 | 0.44 | 0.42 | 0.51 | 0.61 |
| | Orange SA | 0.11 | 0.12 | 0.15 | 0.45 | 0.74 |
| | Proximus SADP | 0.80 | 0.69 | 0.59 | 0.56 | 0.63 |
| | Telefonica | 0.44 | 0.39 | 0.38 | 0.72 | 0.93 |
| | Telenor ASA | 0.19 | 0.25 | 0.28 | 0.39 | 0.52 |
| | Tele2 AB | 0.39 | 0.40 | 0.40 | 0.55 | 0.70 |
| | Telia Co AB | 0.31 | 0.33 | 0.33 | 0.53 | 0.64 |
| | United Internet AG | 1.02 | 0.93 | 0.89 | 0.91 | 0.98 |
| | 1&1 AG | 0.76 | 0.69 | 0.68 | 0.90 | 0.99 |
| 2-year Gross Debt Gearing | Deutsche Telekom AG | 58% | 60% | 61% | 60% | 53% |
| | Elisa Oyj | 16% | 15% | 15% | 15% | 17% |
| | Freenet AG | 23% | 25% | 27% | 37% | 31% |
| | Helennic Telecommunications Organisation SA | 17% | 17% | 17% | 21% | 27% |
| | Koninklijke KPN NV | 34% | 35% | 35% | 38% | 42% |
| | NOS SGPS | 47% | 46% | 45% | 41% | 35% |
| | Telefonica Deutschland Holding AG | 41% | 40% | 40% | 38% | 27% |
| | Orange SA | 62% | 62% | 62% | 58% | 54% |
| | Proximus SADP | 59% | 52% | 46% | 35% | 28% |
| | Telefonica | 68% | 68% | 68% | 68% | 61% |
| | Telenor ASA | 40% | 42% | 42% | 39% | 31% |
| | Tele2 AB | 33% | 32% | 30% | 28% | 24% |
| | Telia Co AB | 48% | 46% | 43% | 41% | 37% |
| | United Internet AG | 41% | 37% | 32% | 26% | 20% |
| | 1&1 AG | 29% | 28% | 26% | 19% | 12% |
| Asset Beta | Deutsche Telekom AG | 0.19 | 0.23 | 0.27 | 0.33 | 0.46 |
| | Elisa Oyj | 0.28 | 0.26 | 0.26 | 0.33 | 0.46 |
| | Freenet AG | 0.43 | 0.53 | 0.54 | 0.55 | 0.64 |
| | Helennic Telecommunications Organisation SA | 0.40 | 0.41 | 0.43 | 0.48 | 0.55 |
| | Koninklijke KPN NV | 0.12 | 0.13 | 0.15 | 0.29 | 0.40 |
| | NOS SGPS | 0.24 | 0.23 | 0.25 | 0.35 | 0.48 |
| | Telefonica Deutschland Holding AG | 0.26 | 0.29 | 0.28 | 0.35 | 0.48 |
| | Orange SA | 0.09 | 0.09 | 0.10 | 0.24 | 0.40 |
| | Proximus SADP | 0.37 | 0.37 | 0.35 | 0.38 | 0.47 |
| | Telefonica | 0.19 | 0.18 | 0.17 | 0.29 | 0.42 |

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Telenor ASA | 0.14 | 0.18 | 0.19 | 0.27 | 0.39 |
| | Tele2 AB | 0.29 | 0.30 | 0.30 | 0.42 | 0.55 |
| | Telia Co AB | 0.20 | 0.21 | 0.22 | 0.34 | 0.44 |
| | United Internet AG | 0.63 | 0.61 | 0.62 | 0.70 | 0.80 |
| | 1&1 AG | 0.56 | 0.52 | 0.52 | 0.76 | 0.90 |

*Source: CEPA analysis of Bloomberg data*

## 5-year estimates

*Table D.6: European Telecoms 5-year estimates, company-level breakdown*

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Deutsche Telekom AG | 0.74 | 0.75 | 0.76 | 0.83 | 0.91 |
| | Elisa Oyj | 0.37 | 0.38 | 0.38 | 0.47 | 0.58 |
| | Freenet AG | 0.83 | 0.85 | 0.88 | 0.91 | 0.87 |
| | Helennic Telecommunications Organisation SA | 0.61 | 0.60 | 0.61 | 0.68 | 0.83 |
| | Koninklijke KPN NV | 0.45 | 0.45 | 0.48 | 0.61 | 0.69 |
| | NOS SGPS | 0.53 | 0.54 | 0.55 | 0.63 | 0.75 |
| | Telefonica Deutschland Holding AG | 0.50 | 0.53 | 0.53 | 0.59 | 0.62 |
| | Orange SA | 0.46 | 0.48 | 0.50 | 0.66 | 0.88 |
| | Proximus SADP | 0.55 | 0.56 | 0.55 | 0.59 | 0.61 |
| | Telefonica | 0.74 | 0.77 | 0.78 | 0.95 | 1.05 |
| | Telenor ASA | 0.38 | 0.39 | 0.41 | 0.49 | 0.58 |
| | Tele2 AB | 0.52 | 0.54 | 0.56 | 0.67 | 0.72 |
| | Telia Co AB | 0.53 | 0.55 | 0.56 | 0.65 | 0.71 |
| | United Internet AG | 0.87 | 0.87 | 0.89 | 0.93 | 0.96 |
| | 1&1 AG | 0.88 | 0.89 | 0.92 | 0.99 | 1.02 |
| 5-year Gross Debt Gearing | Deutsche Telekom AG | 61% | 61% | 60% | 55% | 52% |
| | Elisa Oyj | 15% | 15% | 15% | 15% | 18% |
| | Freenet AG | 33% | 36% | 38% | 38% | 31% |
| | Helennic Telecommunications Organisation SA | 19% | 20% | 21% | 25% | 34% |
| | Koninklijke KPN NV | 37% | 37% | 38% | 40% | 44% |
| | NOS SGPS | 45% | 43% | 41% | 36% | 35% |
| | Telefonica Deutschland Holding AG | 41% | 40% | 38% | 30% | 26% |
| | Orange SA | 61% | 60% | 58% | 54% | 53% |

| | European Telecoms Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Proximus SADP | 41% | 37% | 34% | 28% | 24% |
| | Telefonica | 69% | 68% | 67% | 63% | 58% |
| | Telenor ASA | 41% | 40% | 38% | 34% | 28% |
| | Tele2 AB | 29% | 29% | 28% | 26% | 23% |
| | Telia Co AB | 43% | 42% | 41% | 39% | 35% |
| | United Internet AG | 29% | 27% | 25% | 21% | 17% |
| | 1&1 AG | 24% | 21% | 18% | 11% | 10% |
| Asset Beta | Deutsche Telekom AG | 0.34 | 0.34 | 0.35 | 0.41 | 0.48 |
| | Elisa Oyj | 0.33 | 0.33 | 0.34 | 0.41 | 0.49 |
| | Freenet AG | 0.58 | 0.57 | 0.57 | 0.60 | 0.62 |
| | Helennic Telecommunications Organisation SA | 0.51 | 0.49 | 0.50 | 0.53 | 0.55 |
| | Koninklijke KPN NV | 0.31 | 0.31 | 0.32 | 0.39 | 0.42 |
| | NOS SGPS | 0.33 | 0.34 | 0.36 | 0.44 | 0.52 |
| | Telefonica Deutschland Holding AG | 0.33 | 0.35 | 0.35 | 0.44 | 0.49 |
| | Orange SA | 0.23 | 0.24 | 0.25 | 0.35 | 0.46 |
| | Proximus SADP | 0.36 | 0.38 | 0.39 | 0.45 | 0.48 |
| | Telefonica | 0.28 | 0.29 | 0.31 | 0.40 | 0.49 |
| | Telenor ASA | 0.25 | 0.27 | 0.28 | 0.35 | 0.44 |
| | Tele2 AB | 0.39 | 0.40 | 0.43 | 0.52 | 0.58 |
| | Telia Co AB | 0.33 | 0.35 | 0.36 | 0.43 | 0.49 |
| | United Internet AG | 0.64 | 0.65 | 0.69 | 0.75 | 0.81 |
| | 1&1 AG | 0.69 | 0.72 | 0.78 | 0.89 | 0.93 |

*Source: CEPA analysis of Bloomberg data*

## D.3. ICT Comparators

### 1-year estimates

*Table D.7: ICT company 1-year estimates, company-level breakdown*

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Atea ASA | 0.52 | 0.63 | 0.66 | 0.65 | 0.58 |
| | Capgemini SE | 1.03 | 1.16 | 1.27 | 1.24 | 1.21 |
| | Computacenter PLC | 0.99 | 1.09 | 1.12 | 0.93 | 0.85 |
| | Global Dominion Access SA | 0.97 | 0.73 | 0.73 | 0.80 | 0.75 |
| | Dassault Systemes SA | 1.01 | 1.06 | 1.16 | 0.99 | 0.92 |
| | KNOW IT AB | 1.15 | 1.14 | 1.02 | 0.97 | 0.83 |
| | Link Mobility Group Holding ASA | 1.19 | 1.23 | 1.29 | 1.36 | 1.36 |

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Netcompany Group A/S | 1.19 | 1.20 | 1.34 | 1.09 | 1.08 |
| | NNIT A/S | 0.72 | 1.04 | 0.86 | 0.84 | 0.74 |
| | RaySearch Laboratories AB | 0.80 | 1.00 | 1.00 | 0.91 | 0.80 |
| | SAP SE | 0.83 | 0.77 | 0.79 | 0.89 | 0.88 |
| | Sage Group PLC | 0.72 | 0.63 | 0.68 | 0.67 | 0.80 |
| | Sinch AB | 2.04 | 2.17 | 2.01 | 1.47 | 1.18 |
| | Sopra Steria Group | 1.73 | 1.50 | 1.42 | 1.31 | 1.17 |
| | Serco Group PLC | 1.09 | 0.94 | 0.85 | 0.85 | 0.85 |
| | Teleperformance SE | 1.35 | 1.13 | 0.94 | 0.91 | 0.86 |
| | TietoEVRY Oyj | 1.41 | 1.13 | 1.01 | 0.88 | 0.86 |
| | Truecaller AB | 1.25 | 1.74 | 1.52 | - | - |
| 1-year Gross Debt Gearing | Atea ASA | 14% | 14% | 15% | 14% | 14% |
| | Capgemini SE | 17% | 19% | 20% | 22% | 20% |
| | Computacenter PLC | 4% | 5% | 5% | 7% | 4% |
| | Global Dominion Access SA | 45% | 42% | 37% | 27% | 22% |
| | Dassault Systemes SA | 6% | 6% | 6% | 7% | 5% |
| | KNOW IT AB | 21% | 22% | 19% | 12% | 12% |
| | Link Mobility Group Holding ASA | 43% | 50% | 53% | 46% | 46% |
| | Netcompany Group A/S | 16% | 15% | 14% | 9% | 9% |
| | NNIT A/S | 4% | 8% | 16% | 17% | 11% |
| | RaySearch Laboratories AB | 11% | 15% | 18% | 11% | 6% |
| | SAP SE | 5% | 7% | 9% | 10% | 9% |
| | Sage Group PLC | 10% | 11% | 12% | 11% | 11% |
| | Sinch AB | 29% | 31% | 29% | 14% | 13% |
| | Sopra Steria Group | 28% | 24% | 23% | 25% | 25% |
| | Serco Group PLC | 28% | 29% | 29% | 28% | 27% |
| | Teleperformance SE | 41% | 32% | 25% | 20% | 18% |
| | TietoEVRY Oyj | 33% | 28% | 26% | 25% | 17% |
| | Truecaller AB | 1% | 1% | 1% | - | - |
| Asset Beta | Atea ASA | 0.46 | 0.56 | 0.57 | 0.57 | 0.51 |
| | Capgemini SE | 0.86 | 0.95 | 1.03 | 0.99 | 0.99 |
| | Computacenter PLC | 0.95 | 1.04 | 1.07 | 0.87 | 0.81 |
| | Global Dominion Access SA | 0.57 | 0.45 | 0.49 | 0.61 | 0.60 |

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Dassault Systemes SA | 0.96 | 1.00 | 1.09 | 0.93 | 0.87 |
| | KNOW IT AB | 0.93 | 0.90 | 0.84 | - | - |
| | Link Mobility Group Holding ASA | 0.71 | 0.65 | 0.65 | 0.78 | 0.78 |
| | Netcompany Group A/S | 1.01 | 1.03 | 1.17 | 0.99 | 0.98 |
| | NNIT A/S | 0.70 | 0.96 | 0.75 | 0.72 | 0.66 |
| | RaySearch Laboratories AB | 0.72 | 0.86 | 0.83 | 0.81 | 0.75 |
| | SAP SE | 0.80 | 0.73 | 0.73 | 0.81 | 0.81 |
| | Sage Group PLC | 0.65 | 0.56 | 0.61 | 0.61 | 0.72 |
| | Sinch AB | 1.48 | 1.51 | 1.44 | 1.21 | 0.99 |
| | Sopra Steria Group | 1.27 | 1.15 | 1.10 | 1.00 | 0.90 |
| | Serco Group PLC | 0.81 | 0.69 | 0.63 | 0.63 | 0.65 |
| | Teleperformance SE | 0.82 | 0.78 | 0.71 | 0.73 | 0.72 |
| | TietoEVRY Oyj | 0.97 | 0.83 | 0.76 | 0.67 | 0.72 |
| | Truecaller AB | 1.24 | 1.72 | 1.51 | - | - |

*Source: CEPA analysis of Bloomberg data*

## 2-year estimates

*Table D.8: ICT company 2-year estimates, company-level breakdown*

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Atea ASA | 0.59 | 0.67 | 0.67 | 0.64 | 0.56 |
| | Capgemini SE | 1.25 | 1.30 | 1.30 | 1.26 | 1.20 |
| | Computacenter PLC | 1.14 | 1.13 | 1.07 | 0.95 | 0.84 |
| | Global Dominion Access SA | 0.77 | 0.73 | 0.75 | 0.81 | 0.78 |
| | Dassault Systemes SA | 1.20 | 1.20 | 1.14 | 1.00 | 0.90 |
| | KNOW IT AB | 1.05 | 0.97 | 0.94 | 0.94 | 0.77 |
| | Link Mobility Group Holding ASA | 1.06 | 1.32 | 1.39 | 1.39 | 1.39 |
| | Netcompany Group A/S | 1.28 | 1.40 | 1.40 | 1.09 | 1.09 |
| | NNIT A/S | 0.84 | 0.78 | 0.73 | 0.78 | 0.72 |
| | RaySearch Laboratories AB | 0.79 | 1.00 | 0.99 | 0.94 | 0.78 |
| | SAP SE | 0.86 | 0.80 | 0.80 | 0.90 | 0.87 |
| | Sage Group PLC | 0.70 | 0.70 | 0.68 | 0.70 | 0.80 |
| | Sinch AB | 1.98 | 1.94 | 1.86 | 1.31 | 1.13 |
| | Sopra Steria Group | 1.50 | 1.39 | 1.31 | 1.27 | 1.08 |

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Serco Group PLC | 0.93 | 0.83 | 0.82 | 0.84 | 0.86 |
| | Teleperformance SE | 0.88 | 0.86 | 0.82 | 0.91 | 0.86 |
| | TietoEVRY Oyj | 1.13 | 0.96 | 0.91 | 0.84 | 0.82 |
| | Truecaller AB | 1.34 | 1.42 | - | - | - |
| 2-year Gross Debt Gearing | Atea ASA | 14% | 15% | 14% | 14% | 13% |
| | Capgemini SE | 19% | 20% | 20% | 22% | 19% |
| | Computacenter PLC | 5% | 5% | 6% | 7% | 4% |
| | Global Dominion Access SA | 42% | 37% | 32% | 24% | 21% |
| | Dassault Systemes SA | 6% | 6% | 6% | 7% | 5% |
| | KNOW IT AB | 21% | 19% | 15% | 10% | 12% |
| | Link Mobility Group Holding ASA | 50% | 52% | 47% | 47% | 47% |
| | Netcompany Group A/S | 15% | 13% | 10% | 7% | 7% |
| | NNIT A/S | 9% | 16% | 18% | 17% | 12% |
| | RaySearch Laboratories AB | 14% | 17% | 16% | 9% | 5% |
| | SAP SE | 7% | 9% | 10% | 10% | 9% |
| | Sage Group PLC | 11% | 12% | 12% | 11% | 10% |
| | Sinch AB | 30% | 29% | 20% | 11% | 11% |
| | Sopra Steria Group | 25% | 23% | 23% | 25% | 25% |
| | Serco Group PLC | 29% | 29% | 30% | 28% | 27% |
| | Teleperformance SE | 31% | 24% | 20% | 19% | 16% |
| | TietoEVRY Oyj | 28% | 26% | 25% | 24% | 17% |
| | Truecaller AB | 1% | 1% | - | - | - |
| Asset Beta | Atea ASA | 0.52 | 0.58 | 0.58 | 0.56 | 0.49 |
| | Capgemini SE | 1.03 | 1.06 | 1.05 | 1.00 | 0.98 |
| | Computacenter PLC | 1.09 | 1.07 | 1.01 | 0.89 | 0.81 |
| | Global Dominion Access SA | 0.48 | 0.49 | 0.54 | 0.64 | 0.63 |
| | Dassault Systemes SA | 1.13 | 1.13 | 1.07 | 0.94 | 0.85 |
| | KNOW IT AB | 0.84 | 0.81 | 0.80 | 0.85 | 0.70 |
| | Link Mobility Group Holding ASA | 0.57 | 0.66 | 0.78 | 0.78 | 0.78 |
| | Netcompany Group A/S | 1.10 | 1.22 | 1.26 | 1.01 | 1.01 |
| | NNIT A/S | 0.77 | 0.67 | 0.61 | 0.66 | 0.63 |

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | RaySearch Laboratories AB | 0.69 | 0.84 | 0.84 | 0.85 | 0.74 |
| | SAP SE | 0.81 | 0.74 | 0.73 | 0.82 | 0.80 |
| | Sage Group PLC | 0.63 | 0.62 | 0.60 | 0.63 | 0.73 |
| | Sinch AB | 1.41 | 1.40 | 1.49 | 1.14 | 0.99 |
| | Sopra Steria Group | 1.14 | 1.08 | 1.02 | 0.98 | 0.84 |
| | Serco Group PLC | 0.69 | 0.61 | 0.60 | 0.63 | 0.65 |
| | Teleperformance SE | 0.63 | 0.68 | 0.67 | 0.75 | 0.73 |
| | TietoEVRY Oyj | 0.83 | 0.73 | 0.70 | 0.65 | 0.70 |
| | Truecaller AB | 1.33 | 1.41 | - | - | - |

*Source: CEPA analysis of Bloomberg data*

## 5-year estimates

*Table D.9: ICT 5-year estimates, company-level breakdown*

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| Equity Beta | Atea ASA | 0.62 | 0.63 | 0.63 | 0.60 | 0.56 |
| | Capgemini SE | 1.21 | 1.23 | 1.24 | 1.21 | 1.20 |
| | Computacenter PLC | 0.94 | 0.93 | 0.92 | 0.87 | 0.78 |
| | Global Dominion Access SA | 0.82 | 0.81 | 0.82 | 0.82 | 0.82 |
| | Dassault Systemes SA | 0.93 | 0.95 | 0.96 | 0.92 | 0.82 |
| | KNOW IT AB | 0.94 | 0.94 | 0.94 | 0.87 | 0.72 |
| | Netcompany Group A/S | 1.02 | 1.02 | 1.01 | 1.01 | 1.01 |
| | NNIT A/S | 0.74 | 0.78 | 0.78 | 0.76 | 0.76 |
| | RaySearch Laboratories AB | 0.91 | 0.93 | 0.93 | 0.87 | 0.74 |
| | SAP SE | 0.89 | 0.90 | 0.91 | 0.91 | 0.84 |
| | Sage Group PLC | 0.66 | 0.66 | 0.68 | 0.74 | 0.80 |
| | Sinch AB | 1.31 | 1.28 | 1.22 | 1.04 | 1.04 |
| | Sopra Steria Group | 1.23 | 1.24 | 1.24 | 1.20 | 0.91 |
| | Serco Group PLC | 0.87 | 0.85 | 0.84 | 0.88 | 0.85 |
| | Teleperformance SE | 0.92 | 0.92 | 0.92 | 0.91 | 0.89 |
| | TietoEVRY Oyj | 0.84 | 0.82 | 0.81 | 0.80 | 0.80 |
| 5-year Gross Debt Gearing | Atea ASA | 14% | 14% | 14% | 13% | 13% |
| | Capgemini SE | 21% | 22% | 22% | 21% | 19% |
| | Computacenter PLC | 6% | 7% | 7% | 6% | 4% |
| | Global Dominion Access SA | 31% | 27% | 24% | 21% | 21% |

| | ICT Company | Spot | 1-year avg. | 2-year avg. | 5-year avg. | 10-year avg. |
|---|---|---|---|---|---|---|
| | Dassault Systemes SA | 7% | 7% | 7% | 6% | 5% |
| | KNOW IT AB | 14% | 13% | 11% | 9% | 13% |
| | Netcompany Group A/S | 8% | 7% | 7% | 7% | 7% |
| | NNIT A/S | 16% | 17% | 17% | 13% | 13% |
| | RaySearch Laboratories AB | 11% | 10% | 9% | 5% | 3% |
| | SAP SE | 9% | 10% | 10% | 9% | 9% |
| | Sage Group PLC | 11% | 11% | 11% | 11% | 10% |
| | Sinch AB | 12% | 11% | 10% | 7% | 7% |
| | Sopra Steria Group | 25% | 25% | 25% | 24% | 25% |
| | Serco Group PLC | 29% | 29% | 28% | 26% | 26% |
| | Teleperformance SE | 21% | 19% | 18% | 18% | 15% |
| | TietoEVRY Oyj | 27% | 26% | 25% | 20% | 15% |
| Asset Beta | Atea ASA | 0.54 | 0.55 | 0.56 | 0.53 | 0.50 |
| | Capgemini SE | 0.97 | 0.98 | 0.99 | 0.97 | 0.98 |
| | Computacenter PLC | 0.88 | 0.87 | 0.86 | 0.82 | 0.75 |
| | Global Dominion Access SA | 0.59 | 0.61 | 0.64 | 0.66 | 0.66 |
| | Dassault Systemes SA | 0.87 | 0.89 | 0.90 | 0.87 | 0.78 |
| | KNOW IT AB | 0.82 | 0.83 | 0.84 | 0.80 | 0.64 |
| | Netcompany Group A/S | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| | NNIT A/S | 0.63 | 0.66 | 0.66 | 0.67 | 0.67 |
| | RaySearch Laboratories AB | 0.82 | 0.84 | 0.85 | 0.83 | 0.72 |
| | SAP SE | 0.82 | 0.82 | 0.83 | 0.83 | 0.78 |
| | Sage Group PLC | 0.59 | 0.60 | 0.61 | 0.67 | 0.73 |
| | Sinch AB | 1.16 | 1.14 | 1.11 | 0.97 | 0.97 |
| | Sopra Steria Group | 0.94 | 0.95 | 0.96 | 0.92 | 0.71 |
| | Serco Group PLC | 0.64 | 0.63 | 0.63 | 0.67 | 0.65 |
| | Teleperformance SE | 0.74 | 0.76 | 0.77 | 0.76 | 0.77 |
| | TietoEVRY Oyj | 0.64 | 0.63 | 0.63 | 0.65 | 0.69 |

*Source: CEPA analysis of Bloomberg data*

# Appendix E EVIDENCE FOR ADJUSTING MECHANISTIC RANGES

In Section 5 of our report, we consider whether our mechanistic ranges are suitable to be adopted without adjustment, or whether the weight of evidence supports alternative estimates.

We discuss the following pieces of evidence in this Appendix that we utilise in Section 5:

- Betas of other comparator groups;
- Distribution of empirical evidence on asset and equity betas;
- Regulatory determinations;
- Telecom company equity valuations;
- M&A activity;
- Statistical tests and standard errors; and
- Debt assumptions, capitalised leases and hybrid bonds.

We discuss each of these in more detail in the text below.

## E.1. BETAS FOR OTHER COMPARATOR GROUP EVIDENCE

To contextualise our mechanistic estimates, we have also produced estimates for several additional comparator groups that we consider to potentially be informative in assessing betas of our core comparators.

These additional comparator groups include UK and EU energy networks, US-based telecoms companies, and European satellite operators. Please refer to Appendix C for a complete list of the companies considered in each of these groups.

These interquartile ranges are derived consistently with the methodology for the core comparator groups. To be clear, we adopt the following procedure:

- We collect the 2-year daily asset beta estimates (one per business day, for each company in the comparator group) from 24 June 2018 to 30 September 2024 (between the date on which the Brexit referendum fell out of the estimation window for the 2-year daily beta and our cutoff date)
- We summarise these daily asset beta observations by computing their interquartile range (i.e. the range between the 25$^{th}$-percentile and 75$^{th}$-percentile observations).

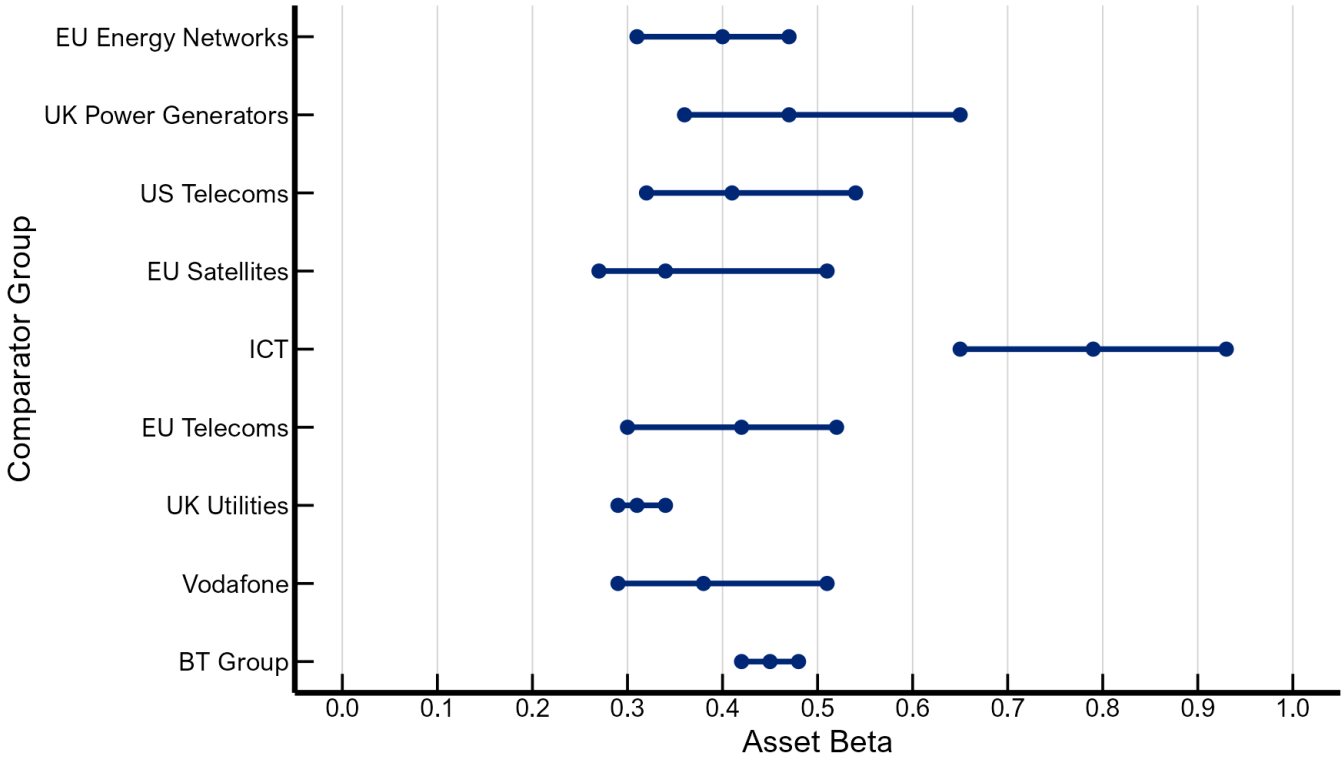
*Table E.1: 2-year Asset beta ranges for additional comparator groups.*

| 2-year Asset Beta Interquartile Range | UK Power Generators | EU Energy Networks | US Telecoms Companies | EU Satellite operators |
|---|---|---|---|---|
| Number of firms | 11 | 18 | 9 | 9 |
| UQ | 0.65 | 0.47 | 0.54 | 0.51 |
| Median | 0.47 | 0.40 | 0.41 | 0.34 |
| LQ | 0.36 | 0.31 | 0.32 | 0.27 |

*Source: CEPA analysis of Bloomberg Data*

Figure E.1 below presents the asset beta ranges for these additional comparator groups, in comparison with the four main comparator groups for BT outlined in Chapter 4.

*Figure E.1: Asset Beta ranges for additional comparator groups*



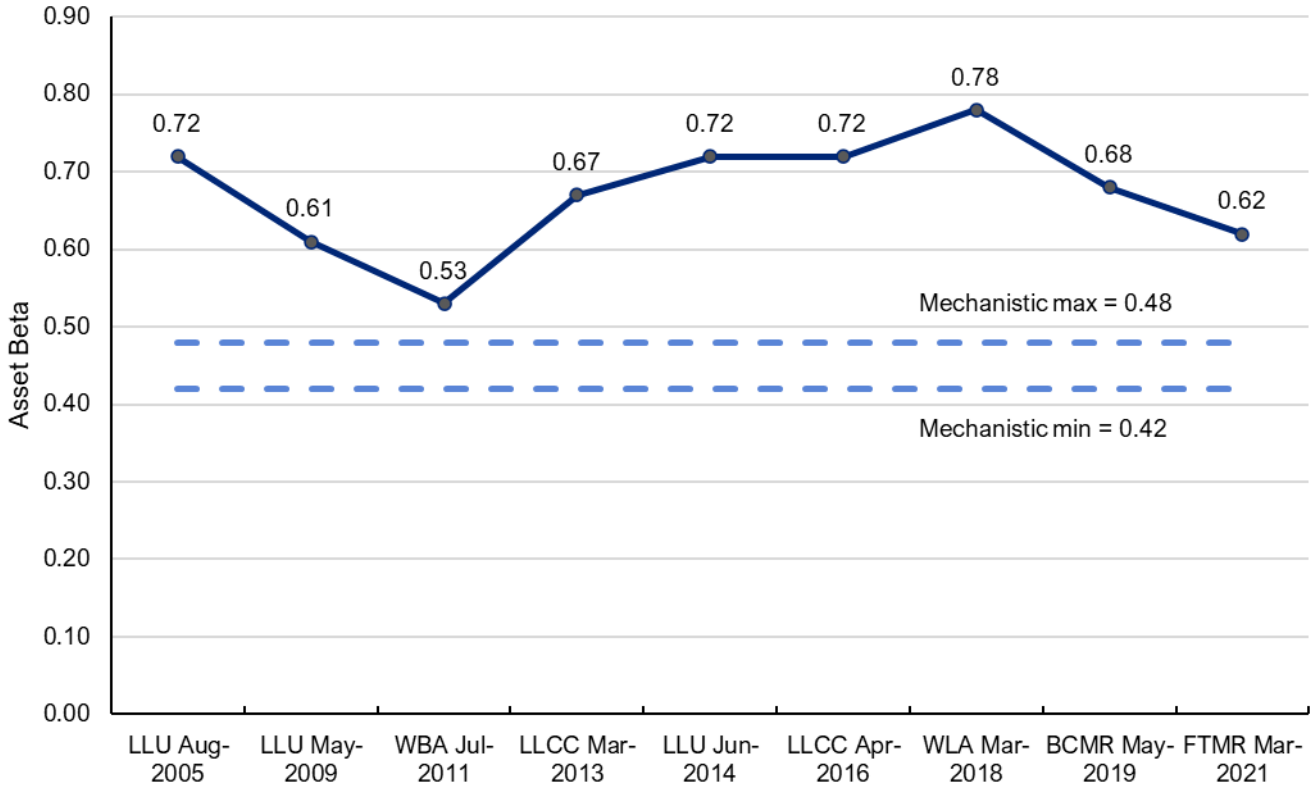

*Source: CEPA analysis of Bloomberg Data*

We refer to these broader comparator group results in Section 5 of the report.

## E.2. Distribution of Empirical Evidence – BT Group

We present Ofcom's previous decisions on BT Group's asset beta in Eigure E.2, alongside the mechanistic range for BT Group presented above. This shows that estimates below 0.60 for BT Group have been rare over the sample period shown.

*Figure E.2: Ofcom decisions on BT Group asset beta*




*Source: Ofcom, CEPA Analysis*

We note that Ofcom has adopted an approach to estimating the asset beta that places material weight on prevailing market evidence, with a 5yr beta to support greater stability than a shorter estimation window (e.g. 2yrs).

This reflects the principles applied by Ofcom to estimating the cost of capital:

- Efficient price and investment signals – the allowed return is an important input in setting cost-based regulated charges (particularly in capital intensive industries). Regulated charges should provide the regulated firm with the opportunity to finance efficient investment and provide access seekers with efficient 'build-vs-buy' price signals.
- Stability – financing telecoms infrastructure and services involves making long-term investments where demand may be uncertain and wholesale prices are limited by ex-ante regulation. It is important for investors to be able to commit risky capital in the knowledge that our approach to price regulation provides an expectation, but not the guarantee of recovery of efficient costs, including the cost of finance.
- Consistency – ensuring that there is consistency in regulatory decisions, both between parameters in a given decision and, as far as reasonably possible, with other regulatory decisions.
- Transparency – Ofcom aim to clearly explain their approach to stakeholders.

There will always be a significant degree of judgement required to draw conclusions from that market evidence. How the regulator chooses to smooth volatility, weight pieces of evidence that trade off stability and relevance to differing extents, and summarise a broad evidence base can be informed by broader considerations of stability and consistency in the regulatory regime, broader market trends, and relative risk analysis.

We consider overall that our mechanistic base ranges are a balanced summary of the range of evidence on beta, but acknowledge that this can point to asset betas that fall significantly below any previous regulatory determinations for BT and that Ofcom may wish to apply discretion to best meet their duties.

## Equity Beta Decomposition

Ofcom has requested that we analyse the evolution of BT's equity beta with a "beta decomposition exercise," in keeping with previous consultancy reports commissioned by Ofcom.

As the point estimate in an OLS regression of stock returns on market returns, the equity beta for BT $(\beta_{BT})$ can be expressed as the ratio of the covariance between stock and market returns (in the numerator), and the variance of the returns of the market index (in the denominator).

This expression can be straightforwardly rewritten as the product of the correlation coefficient between stock and market returns $(\rho_{BT,M})$ and a ratio that characterises the relative volatility of stock and market returns (the ratio between the standard deviations of stock returns $(\sigma_{BT})$ and market returns $(\sigma_M)$):

$$\beta_{BT} = \rho_{BT,M} \times \frac{\sigma_{BT}}{\sigma_M}$$

This decomposition for the 2-year BT Group equity beta is presented in Figure E.3 below.

*Figure E.3: Decomposition of 2-year BT Group equity betas*


*Source: CEPA Analysis of Bloomberg Data*

This analysis helps to contextualise fluctuations in equity beta estimates.

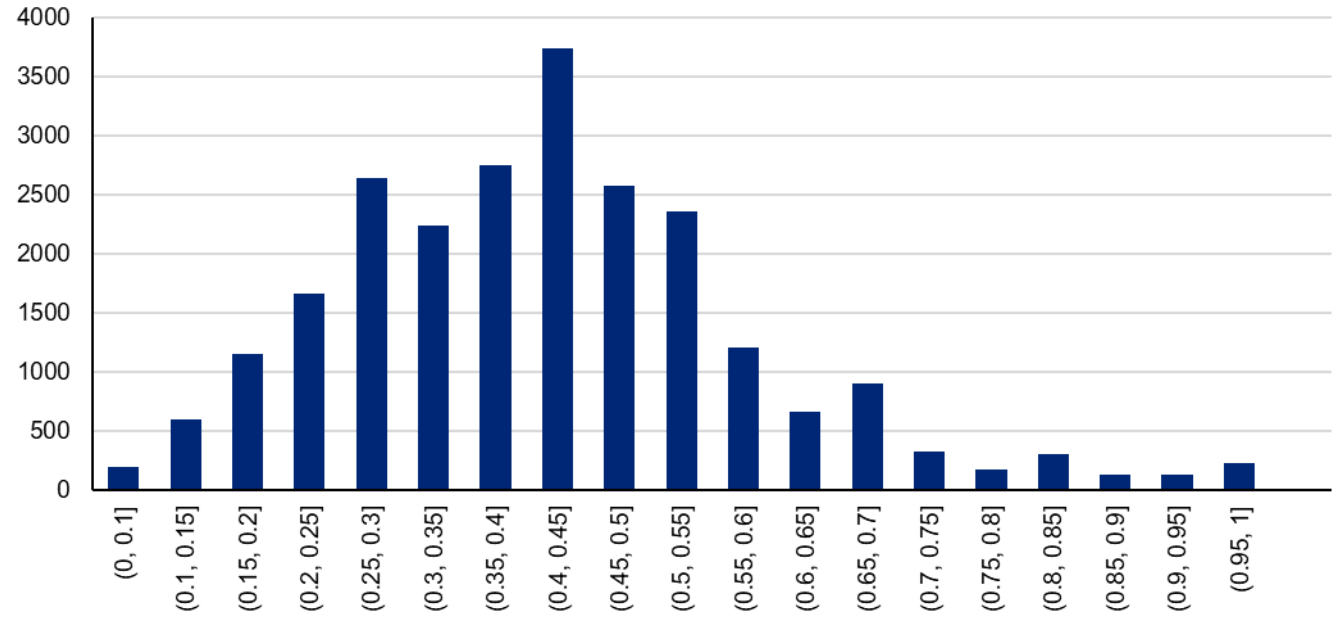
## E.3. Distribution of Empirical Estimates – European telecoms

We consider that the interquartile range of daily beta estimates is a balanced summary for the distribution of asset betas for a comparator group. In particular, it provides a robust central estimate that describes how the evidence on beta is distributed. However, alternative approaches to summarising the evidence on beta could point to higher or lower estimates than the empirical quartiles.

Our approach captures multiple sources of variation, including how asset beta estimates change across time, and across companies facing differing risk profiles and operational environments.

We observe significant cross-company variation in the asset beta distribution. This cross-company variation explains the long upper tails we observe in the beta distribution for European telecoms companies. We present in Figure E.4 below a histogram of our 2-year asset beta estimates for European telecoms comparators for the period from 26 June 2018 – 30 September 2024.

*Figure E.4: Histogram of European telecoms asset betas*




*Source: CEPA analysis of Bloomberg data*

This long upper tail means the interquartile range of this distribution is likely to be a more balanced and statistically robust measure of central tendency than an average. The interquartile range also more easily facilitates the construction of a range of empirically plausible asset beta estimates.

## E.4. REGULATORY DECISIONS FROM OTHER JURISDICTIONS

Whilst regulatory decisions from other jurisdictions have little direct relevance for Ofcom, we consider that approaches applied by telecoms regulators internationally can be valuable as a cross-check. This includes both the estimates of beta and the justification for adopting those estimates.

We find that the approaches applied by the Body of European Regulators for Electronic Communications (BEREC) and ComReg broadly support declining telecoms betas and our proposed ranges for European telecoms.

BEREC provides annual non-binding estimates of the cost of capital, in light of the European Commission's 2019 notice on an appropriate methodology. Their approach reports the spot value of five-year weekly betas for different comparators.

The results have fallen over time, but the weekly beta calculations are higher than daily equivalents (even when applying a higher debt beta of 0.10 for consistency with BEREC's methodology).

*Table E.2: Comparison of results for BEREC's sample group*

| **Comparator ticker** (Net Debt Gearing, 0.1 asset beta, Stoxx TMI) | **CEPA 2024 5yr weekly** | **BEREC 2024 5yr weekly** | **CEPA 2024 5yr spot daily** |
|---|---|---|---|
| DTE GY Equity | 0.38 | 0.36 | 0.35 |
| DIGI RO Equity | 0.39 | 0.21 | 0.32 |
| ELISA FH Equity | 0.43 | 0.43 | 0.33 |

| Comparator ticker (Net Debt Gearing, 0.1 asset beta, Stoxx TMI) | CEPA 2024 5yr weekly | BEREC 2024 5yr weekly | CEPA 2024 5yr spot daily |
|---|---|---|---|
| KPN NA Equity | 0.39 | 0.38 | 0.33 |
| NOS PL Equity | 0.40 | 0.41 | 0.34 |
| ORA FP Equity | 0.32 | 0.31 | 0.25 |
| PROX BB Equity | 0.42 | 0.39 | 0.38 |
| TEL2B SS Equity | 0.39 | 0.42 | 0.40 |
| TIT IM Equity | 0.30 | 0.31 | 0.27 |
| TEF SM Equity | 0.38 | 0.41 | 0.31 |
| TKA AV Equity | 0.45 | 0.48 | 0.32 |
| TEL NO Equity | 0.23 | 0.23 | 0.27 |
| TELIA SS Equity | 0.33 | 0.36 | 0.35 |
| VOD LN Equity | 0.38 | 0.39 | 0.30 |
| **Median** | **0.37** | **0.36** | **0.32** |

*Source: Bloomberg*

BEREC's weekly results would indicate a current median estimate of 0.36, slightly higher than the daily equivalent estimate. We consider that daily beta estimates remain preferable to weekly estimates for sufficiently liquid stocks. As discussed in the UKRN cost of capital guidance[19], weekly and monthly estimates are subject to the so-called 'reference day bias' under which betas of the same frequency and estimation window can vary widely due to the reference day used to define the start of the week or month[20]. Additional analytical work is required to correct this, and results effectively in a lower-frequency time series of beta estimates, which can make it more difficult to identify and interpret the effects of shock events.

It is further valuable to check how these estimates have changed over time. The BEREC reports are produced annually. These demonstrate a significant fall in the asset beta since 2020, driven by a fall in the equity beta and increase in gearing.

*Table E.3: Evolution of BEREC estimates – arithmetic mean estimates*

| | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|
| Asset beta | 0.53 | 0.47 | 0.41 | 0.38 | 0.36 |
| Equity beta | 0.79 | 0.75 | 0.67 | 0.64 | 0.64 |
| Gearing | 37.0% | 39.2% | 42.4% | 45.4% | 46.7% |

*Source: BEREC (2024)*

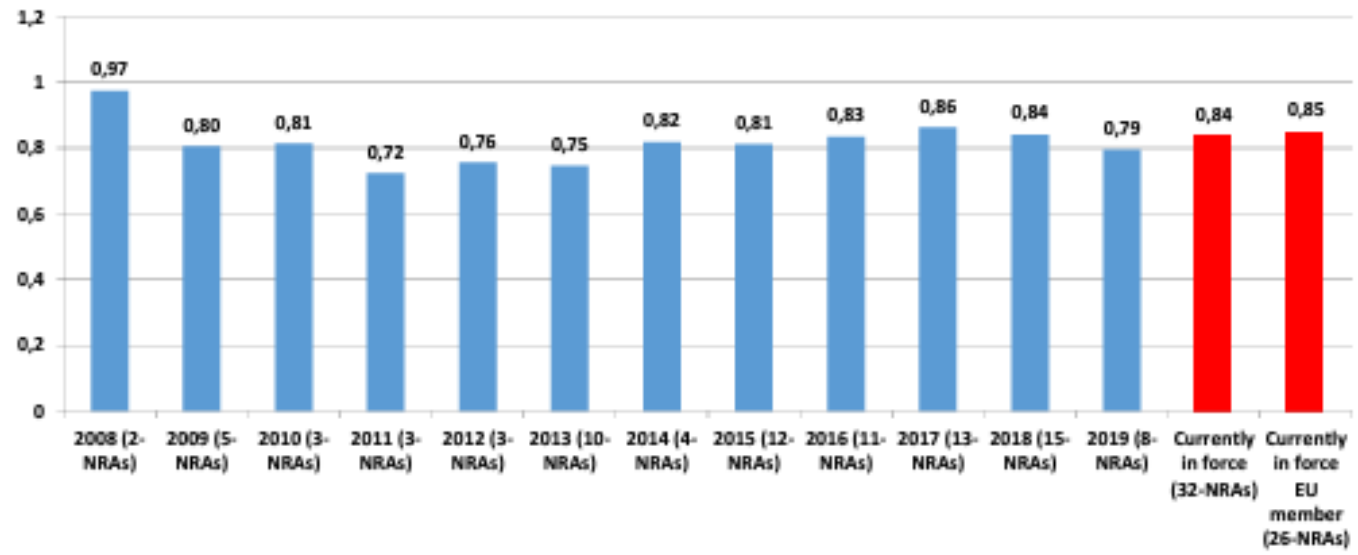
BEREC did not provide its own estimates prior to 2019, but surveyed historical telecoms equity beta estimates applied by National Regulatory Authorities (NRAs). These country-level NRAs estimate a notional beta based on their own methodology, including differing estimation windows and peer groups. Figure E.5 below shows the average equity betas applied by European NRAs in a given year[21].

[19] UK Regulators Network (2023), UKRN guidance for regulators on the methodology for setting the cost of capital, pp. 23, available here.

[20] Our approach uses averages across all reference days to smooth this volatility.

[21] BEREC (2019), "2019 Regulatory Accounting Report," pp. 35, partially available here.

*Figure E.5: Equity beta estimates applied by NRAs*




*Source: BEREC (2019)*

Overall, this analysis shows that, in the period 2008-2019, equity betas estimated for European telecoms peer groups have been relatively stable, within a band of 0.72 – 0.86. BEREC's own post-2019 estimates, however, point to a consistently declining equity beta which is now as low as 0.64. This is consistent with the upper bound of our range of equity betas for European Telecoms

The subsequent post-COVID trend in declining betas has also been observed in the Irish context, with ComReg having commissioned updates to the estimates of the WACC for the Irish mobile, fixed-line and broadcasting sectors annually since 2020[22].

*Table E.4: Evolution of Irish fixed-line and mobile asset beta estimates*

| | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|
| Fixed-line | 0.48 | 0.48 | 0.43 | 0.38 | 0.36 |
| Mobile | 0.50 | 0.50 | 0.44 | 0.39 | 0.37 |

*Source: Europe Economics (2024)*

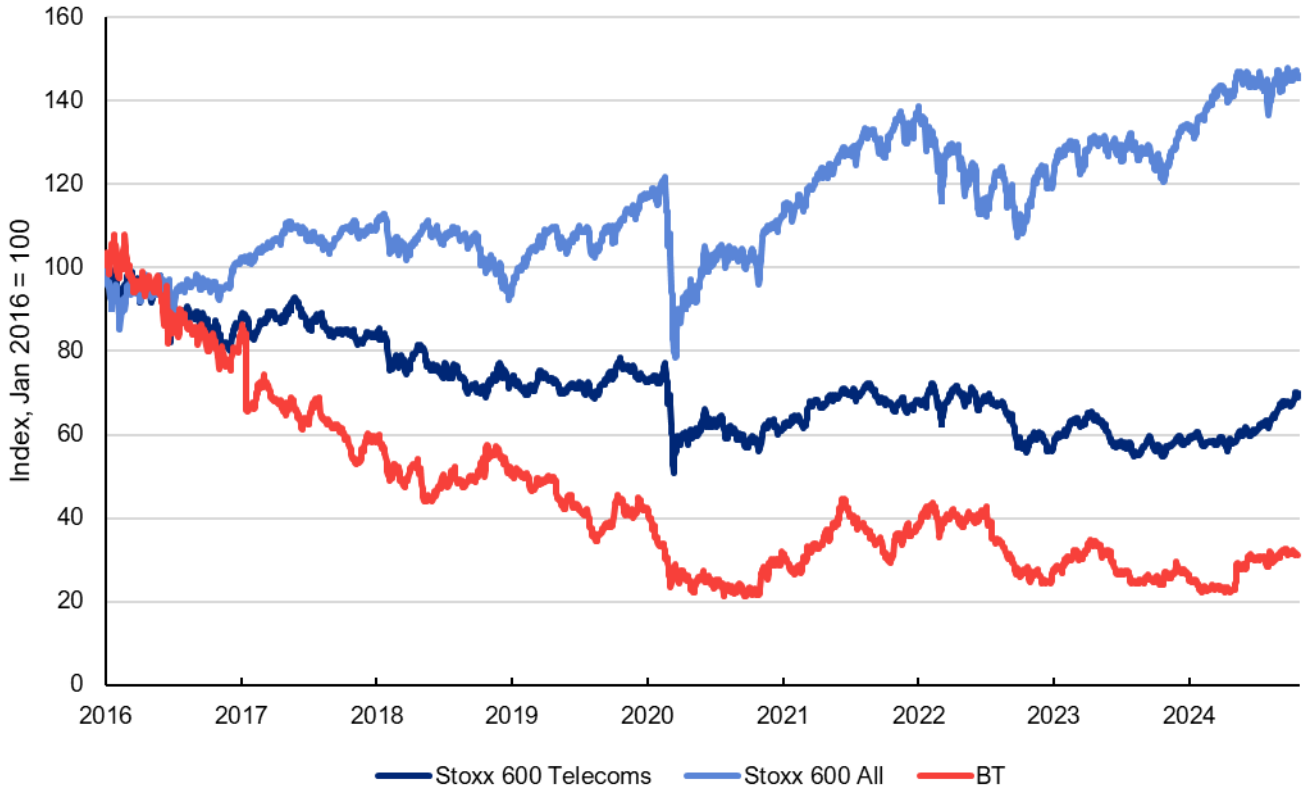
The unlevered betas for both fixed-line and mobile in Ireland have decreased steadily since 2021. The approach taken by Europe Economics in their report treats declining betas as signal rather than noise.

## E.5. TELECOM COMPANY EQUITY VALUATIONS / GEARING

One of the drivers of the higher levels of gearing set out in the BEREC analysis has been the fall in share prices for European telecoms operators. This is shown in Figure E.6, where the Stoxx 600 index has increased by over 40% since 2016, whilst equity valuations for the European telecoms operators, measured by the Stoxx 600 Telecoms index, have fallen by over 30%.

[22] Europe Economics (2024), "WACC update for the Irish mobile, fixed-line, and broadcasting sectors", Available here

*Figure E.6: Comparative valuations – telecoms versus broader index*




*Source: Bloomberg*

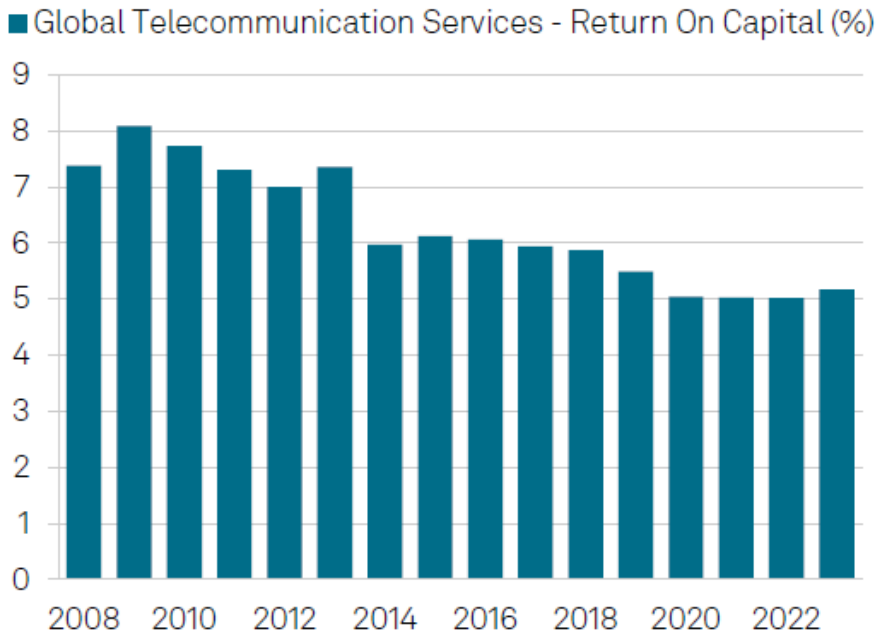
Furthermore, BT itself has underperformed both indices over this period, supporting a downward trend in its covariance coefficient with the market since 2016 (as shown in Figure E.3 above).

One of the drivers of this is likely to be the difference in trends between the wider stock market and telecoms companies specifically. Some of the slower growth observed in the EU telecoms sector in recent years may be in part due to regulatory decisions driving allowed returns on investment in fixed broadband below the cost of capital.

Figure E.7 below shows that globally the return on capital employed for investment in telecoms has declined materially, from over 8% in 2009 to just over 5% from 2019-2023[23].

[23] S&P Global (2024) "Industry Credit Outlook 2024," pp. 33.

*Figure E.7: Return on Capital Employed – Global Telecoms companies*

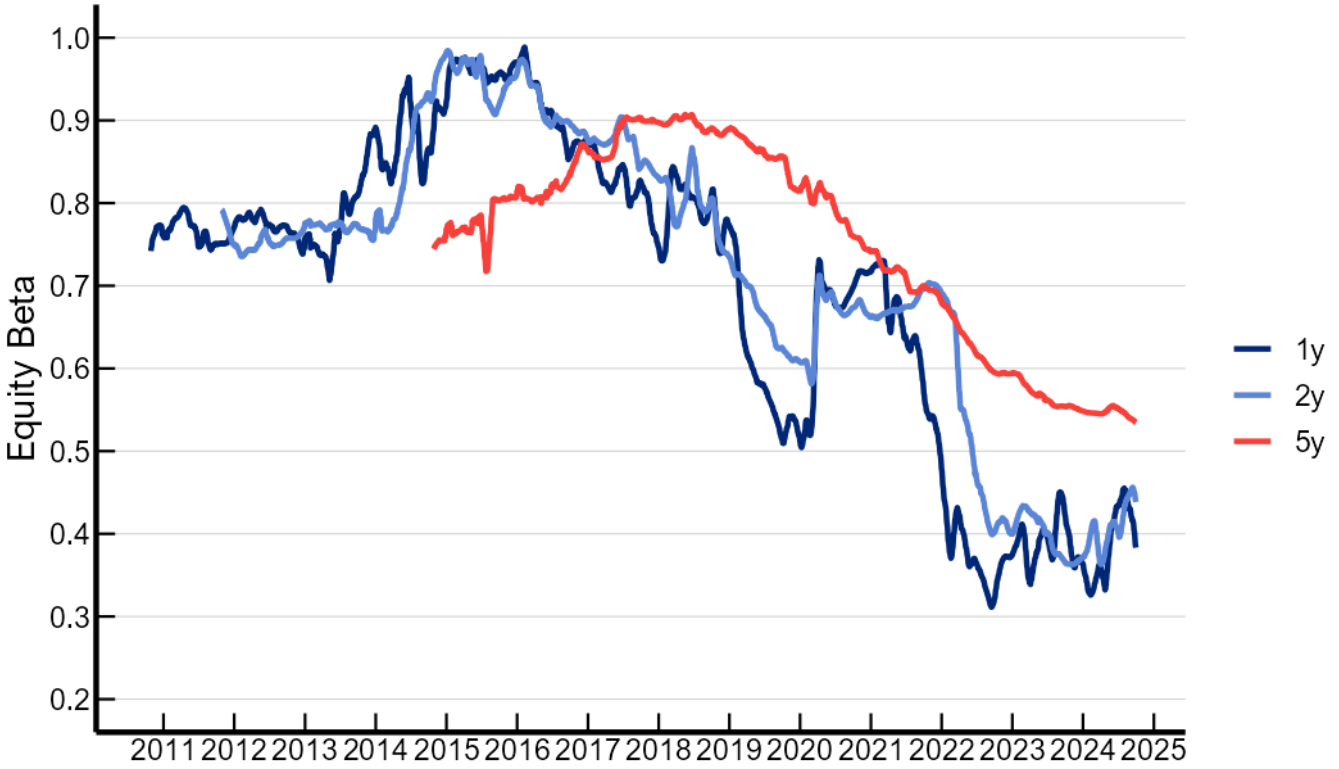



*Source: S&P Global*

A period of lower expected profitability is likely reflected in investor expectations, driving relatively low growth in telecoms company valuations in a period where the overall market was generally growing. This suggests lower overall correlation with the market, which is reflected in declining beta estimates.

The onset of the COVID-19 pandemic is likely to have disrupted this trend of declining betas, as telecoms company valuations and the broader market were both subject to the same negative shock. Indeed, this view is supported by the median 1- and 2-year European telecoms rolling equity beta, presented in Figure E.8 below.

*Figure E.8: Evolution in European telecoms daily raw equity beta for the median company (20-day smoothed)*




*Source: CEPA analysis of Bloomberg data.*

If this trend of declining telecoms valuations is not seen as likely to persist going forwards (due to expectations for more relaxed future price regulation in European fixed-line telecoms[24], for example), then the last several years could be viewed as a 'market correction' in the valuations of telecoms companies, and there could be an argument that this is less representative of forward-looking systematic risk exposure.

This could suggest placing weight on longer-term beta estimates. We consider this in finalising our beta estimates for the other comparator groups.

## E.6. M&A Activity

We have collected information from Bloomberg about M&A transaction announcements where our sample companies were involved as a seller, acquirer, or target since 2014[25]. We have isolated those announcements where the announced value exceeded 30% of the average market cap of any associated sample companies over the preceding 30 days. Table E.5 below presents the number of these announcements for our sample companies.

*Table E.5: Significant M&A transactions for sample companies*

| Company | Number of Transactions | Comparator Group |
|---|---|---|
| LINK Mobility Group Holding ASA | 4 | ICT |
| Orange SA | 2 | EU Telecoms |
| Deutsche Telekom AG | 2 | EU Telecoms |

[24] Goldman Sachs (2024), "European telecom companies poised for growth amid deregulation," Available here.

[25] We consider only transactions after 2014 as this is the earliest date that could affect the mechanistic ranges we present.

| Company | Number of Transactions | Comparator Group |
|---|---|---|
| Vodafone Group PLC | 2 | Vodafone |
| Telefonica SA | 2 | EU Telecoms |
| Pennon Group PLC | 2 | UK Utilities |
| Koninklijke KPN NV | 1 | EU Telecoms |
| Telia Co AB | 1 | EU Telecoms |
| TalkTalk Telecom Group Ltd | 1 | UK Telecoms |
| United Internet AG | 1 | EU Telecoms |
| National Grid PLC | 1 | UK Utilities |
| BT Group PLC | 1 | UK Telecoms |
| TietoEVRY Oyj | 1 | ICT |
| KNOW IT AB | 1 | ICT |
| Sinch AB | 1 | ICT |
| NNIT A/S | 1 | ICT |

*Source: CEPA Analysis of Bloomberg data.*

We have identified only one such transaction involving BT Group, which is BT's acquisition of EE from Orange SA and Deutsche Telekom AG, announced on 15 December 2014. We see no evidence that this transaction has materially impacted BT's asset beta measurements around this date.

Vodafone has been involved in two such M&A announcements recently, relating to its sale of Vodafone Italy to Swisscom. We do not consider that these M&A announcements are systematically biasing our more recent estimates of Vodafone's beta.

For UK Utilities, European Telecoms, and ICT comparators, we have considered the impact of removing the relevant companies listed in Table E.5 from the calculation of our mechanistic ranges. These impacts, expressed in asset beta terms, are presented in Table E.6.

*Table E.6: Asset beta impact of removing companies with significant M&A announcements*

| | UK Utilities | European Telecoms | ICT |
|---|---|---|---|
| UQ | -0.03 | 0.02 | 0.02 |
| Median | -0.01 | 0.01 | 0.01 |
| LQ | -0.01 | 0.01 | 0.00 |

*Source: CEPA Analysis of Bloomberg data.*

For all three larger comparator groups, the removal of these companies has a small impact, no greater in magnitude than 0.03. For UK Utilities, the removal of Pennon and National Grid reduces estimated asset betas, while for EU telecoms and ICT companies the removal of companies with M&A activity increases estimates.

We stress that this exercise is a rough cross-check to our central estimates. A full accounting of M&A activity within our sample companies' asset beta estimates would be demanding, and this analysis serves to show that even the most conservative approach to correcting for M&A activity (i.e. removing companies wholly from the comparator group) has at most small impacts on our central estimates.

Overall, we do not consider the effect of M&A activity to be material for our sample companies.

## E.7. Statistical Tests and Standard Errors

Ofcom has requested that we produce standard errors for our equity beta estimates, as well as perform appropriate statistical testing to verify the robustness of those standard errors.

To test for heteroskedasticity within the regression residuals, we apply the Breusch-Pagan test for heteroskedasticity, which performs a regression on squares of the residuals to determine if there is a trend. Generally speaking, we observe consistent evidence for the presence of heteroskedasticity in all of our comparator

groups over the time sample. While this does not bias our regression point estimates, it renders simple standard errors unsuitable for statistical inference.

To correct for this, we apply and draw inference only from heteroskedasticity-robust standard errors.

To test for autocorrelation within the regression residuals, we apply the Breusch-Godfrey test for autocorrelation. For BT Group, Vodafone, UK utilities and European telecoms comparators, we do not find conclusive evidence for the presence of autocorrelation except in limited periods for specific estimation windows (for example, statistical testing suggests that 1-, 2-, and 5-year betas for UK utilities comparators reflect some autocorrelation in the months following the COVID-19 pandemic). We do not, however, observe any consistent biasing effect on robust standard errors during these periods, and do not consider the effect of any autocorrelation to be material for these comparator groups.

For ICT comparators, there is more consistent evidence for the presence of autocorrelation throughout the time sample, especially in 2-year and 5-year equity beta estimates. We note that estimated standard errors for ICT companies are not out of line with those of the other comparator groups, though they are more likely to be wider.

We present below the corresponding interquartile ranges of robust standard errors for the different comparator groups. These are derived similarly to our headline estimates, as the interquartile range of robust standard error estimates since 24 June 2018.

*Table E.7: Heteroskedasticity-robust standard errors for 2-year equity betas by comparator group*

| Comparator Group | BT Group | Vodafone | UK Utilities | European Telecoms | ICT |
|---|---|---|---|---|---|
| UQ | 0.10 | 0.09 | 0.09 | 0.09 | 0.12 |
| Median | 0.10 | 0.08 | 0.08 | 0.07 | 0.09 |
| LQ | 0.09 | 0.07 | 0.07 | 0.06 | 0.08 |

*Source: CEPA Analysis of Bloomberg data.*

We have not drawn inference from the absolute level of these standard errors, and instead only draw inference from their relative width – in part, this reflects uncertainty about the applicability of standard errors estimated for equity betas to statistical inference on asset betas, given that gearing ratios are likely to be correlated with stock returns. In the case of ICT comparators, this also reflects the possibility that these estimates may reflect bias from the presence of autocorrelation. We note, however, that overall these standard errors are consistent with our experience of normal levels of volatility in beta estimates for GB regulated firms.

While we do not draw inference on the absolute level of the standard errors, we do draw inference from their relative width.. Standard errors are tighter for longer estimation windows, likely due to the larger regression sample. At the same time, they have overall been trending up over the time sample, particularly in recent years. Table E.8 below presents a sample of robust standard errors for BT Group's equity betas, showing that, on average, statistical uncertainty has been rising in all three of our equity beta estimates in recent years.

*Table E.8: BT Group robust standard errors for different estimation windows and averaging periods.*

| Estimation window | Spot | 1-year | 2-year | 5-year | 10-year |
|---|---|---|---|---|---|
| 1yr | 0.15 | 0.16 | 0.15 | 0.14 | 0.13 |
| 2yr | 0.12 | 0.11 | 0.10 | 0.10 | 0.09 |
| 5yr | 0.07 | 0.07 | 0.07 | 0.07 | 0.06 |

*Source: CEPA Analysis of Bloomberg data.*

The fact that longer-term evidence generally features lower standard errors could point to adopting a higher number in the asset beta range – lower standard errors for equity betas estimated over longer estimation windows implies these betas feature lower parameter uncertainty and greater statistical robustness.

**Addressing autocorrelation**

We have considered two cross-checks to address the possible presence of autocorrelation in our ICT sample:

- Applying heteroskedasticity and autocorrelation-robust (HAC) standard errors (e.g. using a Newey-West adjustment to the heteroskedasticity-robust standard errors.
- Estimating the model with generalised least squares (GLS), which explicitly controls for modelled autocorrelation.

We find that neither approach materially alters the picture for the ICT standard errors: Table E.9 below compares the range of robust standard errors presented above with equivalent interquartile ranges for HAC and GLS standard errors:

*Table E.9: Comparison of 2-year standard errors for ICT comparators*

| Methodology | Heteroskedasticity-robust SEs | HAC SEs | GLS SEs |
|---|---|---|---|
| UQ | 0.12 | 0.12 | 0.10 |
| Median | 0.09 | 0.09 | 0.08 |
| LQ | 0.08 | 0.07 | 0.06 |

*Source: CEPA Analysis of Bloomberg data.*

We note that GLS standard errors are tighter for the ICT comparators. However, more generally, we do not consider that GLS is necessarily superior to OLS in finite samples for two reasons:

- GLS requires large amounts of data to estimate beta consistently and efficiently.
- GLS requires an assumption about the autocorrelation structure of the data, which could differ between individual equity shares. This introduces greater risk of model mis-specification.

Finally, we note that ICT asset betas estimated with GLS do not differ from those estimated with OLS at two decimal places.

## E.8. DEBT ASSUMPTION, CAPITALISED LEASES AND HYBRID BONDS

It is important to check that specific methodological choices and assumptions are not leading to bias in the evidence base.

Estimation of asset betas requires unlevering the estimated equity betas with an assumption on the firms' gearing. Our preferred asset beta estimates are unlevered with a gearing ratio computed with a firm's gross debt (reflecting an assumption that cash balances aren't available to pay down existing debt obligations). The use of net debt (which would assume that cash balances are available to repay existing debt obligations) will naturally lead to higher asset beta estimates, as net debt is typically lower than gross debt.

Our mechanistic asset beta ranges reflect gross debt, for consistency with Ofcom's position that cash balances are generally unavailable to repay existing debt obligations.

However, we consider it is important to cross-check that specific methodological choices aren't biasing the results. For this, we present asset betas unlevered with net debt.

*Table E.10: 2-year asset beta ranges under net-debt gearing*

| Comparator Group | BT Group | Vodafone | UK Utilities | European Telecoms | ICT |
|---|---|---|---|---|---|
| UQ | 0.53 | 0.61 | 0.36 | 0.55 | 0.99 |
| Median | 0.50 | 0.44 | 0.32 | 0.44 | 0.85 |

| Comparator Group | BT Group | Vodafone | UK Utilities | European Telecoms | ICT |
|---|---|---|---|---|---|
| LQ | 0.47 | 0.32 | 0.30 | 0.31 | 0.70 |

*Source: CEPA Analysis of Bloomberg data.*

As expected, the use of net debt, rather than gross debt, for unlevering betas, tends to increase asset beta by between 0.01 - 0.10. Despite this, we continue to consider that Ofcom's preferred approach based on gross debt is appropriate.

We also acknowledge that relatively recent changes to accounting rules under IFRS 16 have required companies to capitalise their operating leases, causing a one-off increase in debt and therefore gearing for most companies. We have considered the impact of excluding short- and long-term leases from gross debt, as a further cross-check on our methodology. These results are presented in Table E.11 below, which shows that the impact on the beta increases our estimated ranges by 0.00-0.06.

*Table E.11: 2-year asset beta ranges under gross-debt gearing, excluding operating leases.*

| Comparator Group | BT Group | Vodafone | UK Utilities | European Telecoms | ICT |
|---|---|---|---|---|---|
| UQ | 0.51 | 0.51 | 0.35 | 0.54 | 0.95 |
| Median | 0.49 | 0.40 | 0.31 | 0.44 | 0.81 |
| LQ | 0.48 | 0.32 | 0.29 | 0.33 | 0.69 |

*Source: CEPA Analysis of Bloomberg data.*

We consider that, the switch in assumptions for IFRS 16 is not likely to have a significant impact on our mechanistic ranges. Furthermore, the impact of IFRS 16 is baked into investor expectations for firms' capital structures, and Ofcom considers that there is some rationale for including capitalised leases in gearing.

More recent trends can therefore be considered representative of investors' forward-looking expectations for firms' capital structures, and no adjustment for capitalised leases under IFRS 16 is required.

**Hybrid bonds**

We understand that BT has £2.5bn of hybrid bonds on its balance sheet. The effect is smaller than the removal of capitalised leases. Removing BT's capitalised leases increases the estimated asset beta range by 0.03 – 0.06, whilst removing BT's hybrid bonds is likely to increase its asset beta estimates by about 0.015 – 0.03. This is likely an over-estimate as hybrid bond issuance has only taken place more recently. In addition, we note that this analysis is illustrative only, and does not drive our decision on BT Group's asset beta ranges.

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