Stuck, Jana; Kulenkampff, Gabriele; Eltges, Fabian

Working Paper

Implementation of the WACC Notice and challenges in determining the VHCN risk premium

WIK Working Paper, No. 11

Provided in Cooperation with:
WIK Wissenschaftliches Institut für Infrastruktur und Kommunikationsdienste GmbH, Bad Honnef

Suggested Citation: Stuck, Jana; Kulenkampff, Gabriele; Eltges, Fabian (2025) : Implementation of the WACC Notice and challenges in determining the VHCN risk premium, WIK Working Paper, No. 11, WIK Wissenschaftliches Institut für Infrastruktur und Kommunikationsdienste, Bad Honnef

This Version is available at:
https://hdl.handle.net/10419/334524

WIK

Working Paper

No. 11

Implementation of the WACC Notice and challenges in determining the VHCN risk premium

Autoren:

Jana Stuck
Dr. Gabriele Kulenkampff
Fabian Eltges

Bad Honnef, December 2025

WIK
Wissenschaftliches Institut
für Infrastruktur und
Kommunikationsdienste

IMPRINT

WIK WORKING PAPERS

The working papers published in the series constitute work in progress circulated to stimulate discussion and critical comments. Views expressed represent exclusively the authors' own opinions and do not necessarily reflect those of the editor.

WIK Wissenschaftliches Institut für
Infrastruktur und Kommunikationsdienste GmbH
Rhöndorfer Str. 68
53604 Bad Honnef, Germany
E-Mail: info@wik.org

www.wik.org

Person authorised to sign on behalf of the organisation

Board of Directors	Dr Cara Schwarz-Schilling (Chairwoman of the Management Board, Director)
	Alex Kalevi Dieke (Chief Financial Officer)
Authorized representatives	Prof. Dr Bernd Sörries
	Dr Christian Wernick
	Dr Lukas Wiewiorra
Chairperson of the Supervisory Board	Dr Thomas Solbach
Registered at	Amtsgericht Siegburg, HRB 7225
Tax No.	222/5751/0722
VAT-ID	DE 123 383 795

Date: January 2025

Abstract

In 2019, the European Commission published the WACC Notice that sets out a methodology for estimating the weighted average costs of capital (WACC) used by national regulatory authorities in the cost regulation of the telecommunication sector. The Notice is explicitly limited to legacy infrastructure and does not address Very High Capacity Networks. The Commission's Recommendation on the regulatory promotion of gigabit connectivity advises that NRAs may apply a VHCN risk premium in addition to the applicable WACC, but provides less methodological guidance for its calculation.

This paper provides an overview of current regulatory practices for determining the WACC for both legacy networks and VHCNs in Europe. It examines the implementation of the WACC Notice across Member States, assessing its impact and identifying notable deviations from the prescribed methodology. It further examines Member States' approaches to determining a risk premium for VHCN investments. The analysis draws on an extensive literature review and interviews with five national regulatory authorities.

Findings indicate that the WACC Notice has largely standardised the methodology for calculating the regulated WACC for legacy infrastructure, although differences remain in the frequency of WACC updates. Overall, WACC values across Member States have declined since the Notice's introduction. Several NRAs adjusted their methodology for calculating the risk-free interest rate between 2022 and 2024, placing greater weight on more recent data in order to reflect macroeconomic developments. By 2025, most NRAs returned to the methodology of the WACC Notice, as the 5-year average better reflects prevailing interest rates.

In contrast, only a few Member States calculate a VHCN risk premium, and no standardised methodology exists. This results in substantial differences in VHCN risk premiums both in absolute terms and relative to legacy WACC. Additional risks for VHCN investments vary by national market conditions and primarily arise from the lack of established infrastructure compared to legacy networks. These risks are expected to diminish over time.

Keywords: Weighted Average Cost of Capital (WACC), risk premium, WACC Notice, Gigabit Recommendation

JEL Classification: G31, L51

Contents

List of Tables

List of Figures

1 Background and focus of the study

1.1 Background

If owners of fixed telecommunications networks are subject to access regulation, the national regulatory authority (NRA) typically regulate the wholesale price. The cost of capital are an important parameter in cost regulation. According to Article 74 of the EECC, NRAs *"shall allow undertakings a reasonable rate of return on adequate capital employed, taking into account any risks specific to a particular new investment network project"* where they consider price control obligations to be appropriate.[1] To determine this reasonable rate of return NRAs typically use the weighted average costs of capital (WACC). The WACC is defined as the opportunity cost of an investment rather than of a different investment with equal risk. The European Commission (2019)[2] explains that NRAs typically define a maximum price cap equal to the sum of the annualised capital costs (depreciation) on which the WACC is allowed as a reasonable rate of return, plus the operating costs (Opex) of the services:

$$Maximum\ Price\ Cap = \frac{Depreciation\ \times WACC + Opex}{Volumes}$$

The above formula shows how the WACC, as set by the regulators, directly affects wholesale prices. This, in turn, impacts prices for consumers and the investment decisions of operators. Therefore, defining the WACC is an important part of regulation. Regulators have to define the WACC in advance of a regulatory period. As there is uncertainty about future conditions on the capital market, assumptions and models should be used to determine the WACC.

The European Commission published in 2019 the WACC Notice[3] that sets out a methodology for estimating the WACC which is used by the Commission to review draft measures notified by NRAs. The WACC Notice aim is to harmonize the WACC calculation of European NRAs and thereby ensure a consistent regulatory practice. The methodology is based on the Capital Asset Pricing Model (CAPM)[4] that estimates the WACC based on historical data of the economy and historical financial data of regulated telecom operators. The CAPM was already the most common methodology to estimate the WACC among European NRAs before the WACC Notice was introduced.[5]

The cost of capital reflect the risk of an investment, thus the riskier the projects the higher the costs of capital. European regulations distinguish between investments in telecommunications infrastructure in so-called legacy infrastructure and Very High Capacity Networks (VHCN)[6]. According to Article 2 of the EECC, Very High Capacity Networks are defined as electronic communications networks that either consist entirely of optical fibre elements up to the distribution point at the serving location, or are capable of delivering comparable performance in terms of downlink and uplink bandwidth, resilience, error-

---

1 European Parliament and the Council of the European Union (2018): Directive 2018/1972 establishing the European Electronic Communications Code, Article 74 (1).
2 European Commission (2019b): Commission staff Working Document Accompanying the document Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commissions' review of national notifications in the EU electronic communications sector, p.2.
3 European Commission (2019a): Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector.
4 The CAPM that was introduced in the 1960s.
5 The Brattle Group (2016): Review of approaches to estimate a reasonable rate of return for investments in telecoms network in regulatory proceedings and options for EU harmonization – A study prepared for the European Commission DG Communications Networks, Content & Technology, p.15.
6 Or NGA networks.

related parameters, and latency (including its variations)[7]. The WACC Notice is explicitly limited to legacy infrastructure and does not address Very High Capacity Networks[8]. In contrast to legacy infrastructure, new VHCN projects may be exposed to additional risk factors. These are addressed by the Commission's recommendation on the regulatory promotion of gigabit connectivity, hereafter Gigabit Recommendation. The Gigabit Recommendation specifies five additional risk factors for VHCN projects[9]:

i. Demand (retail and wholesale),
ii. Costs of deployment, civil-engineering works and managerial execution,
iii. Technological progress,
iv. Market dynamic and changing competitive situation,
v. Macroeconomic.

The European Commission explains that NRAs should consider applying a risk premium for access prices on new VHCN projects in addition to the applicable WACC that reflect these additional risk factors.[10] The Gigabit Recommendation provides less detail on the methodology for calculating a VHCN risk premium than the WACC Notice does on the WACC for legacy infrastructure. The Commission recommends the use of detailed financial models or quantitative estimation techniques to calculate a risk premium. If it is not possible to adequately quantify the additional risk, NRAs can also determine the risk premium based on a benchmark of best practices in comparable Member States.[11] The Commission emphasises that the reasonable rate of return should strike a balance between providing sufficient incentives for operators to invest in VHCN projects and ensuring that the rate is not excessive, thereby promoting allocative efficiency, sustainable competition and maximum consumer benefits.[12] When applying a risk premium in addition to the legacy WACC, the legacy WACC also influences investment incentives in fibre.

1.2 Objectives of the study

The study aims to provide an overview of the current regulatory practice of determining the weighted average cost of capital (WACC) in relation to both legacy networks and very high-capacity networks in Europe. It examines the implementation of the WACC Notice across Member States, assessing its impact as well as notable deviations from the prescribed methodology, including their underlying rationale and effects.

Furthermore, the study reviews Member States' approaches towards the determination of a risk premium associated with the deployment of VHCN.

1.3 Methodology

The study relies on an extensive literature review, encompassing BEREC reports, published EU notifications from national regulatory authorities (NRAs) concerning WACC and related comments from the European Commission, national regulatory decisions, scientific literature, and expert opinions.

---

7 European Commission (2018): Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code.
8 European Commission (2019a), No. 6.
9 See European Commission (2024a): Commission Recommendation of 6.2.2024 on the regulatory promotion of gigabit connectivity, No 68.
10 Ibid., No 67, p. 31.
11 Ibid, No 74, 75, p. 32.
12 Ibid., p. 14f.

The desk research was further complemented by interviews with NRAs, which provided input for detailed case studies in section 2.4 and 3.2.

Section 2 provides an overview of the regulated WACC for legacy infrastructure. It begins with an introduction to the regulatory framework, and the methodology used to calculate the WACC, providing an overview of its parameters. It then considers the impact of macroeconomic factors. Next, it analyses the implementation of the WACC Notice in the Member States, including several case studies. Finally, it analyses the level of the impact of the Notice on the WACC and its developments and trends.

Section 3 focuses on the risk premium for VHCN. It begins with the theoretical background to the risk premium before considering several modelling approaches, including case studies of different Member States. It concludes with an analysis of the level of the VHCN WACC in Europe and trends.

Section 4 concludes and gives an outlook on future prospects.

2 The WACC Notice by the European Commission

In November 2019, the European Commission published its "Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector" (the WACC Notice). The aim of the WACC Notice is to harmonize WACC calculations across Member States and thereby prevent investment distortions. To this end, it specifies the data sources to be used and sets out a detailed methodology for estimating WACC parameters. BEREC agreed to calculate the parameter values and publish them annually to support the work of national regulatory authorities (NRAs).

The scope of the WACC Notice is explicitly limited to legacy infrastructure and does not apply on VHCN, which are addressed separately in the Gigabit Recommendation (see section 3). The methodology is built on four regulatory principles:

- Consistency,
- Regulatory predictability,
- Promotion of efficient investment,
- Transparency.

Although the WACC Notice is formally non-binding, the European Commission emphasizes that it serves as a reference point when reviewing draft measures notified by NRAs under Article 32 of the European Electronic Communications Code (EECC).[13] [14] Thus, while non-binding, the WACC Notice exerts significant influence and substantial deviations from its methodology can trigger a "serious doubts" procedure and potentially lead to Commission intervention.

---

13 European Commission (2019a), No 1.

14 Under Article 32, when a NRA intends to adopt a regulatory measure concerning market definition, significant market power (SMP), or remedies (including WACC-based price controls), it must notify the Commission, BEREC, and other NRAs. These entities may provide comments within one month. If the Commission has serious doubts that a proposed measure could create barriers to the internal market or conflict with EU law, adoption of the measure is suspended for up to two additional months. During this period, BEREC issues an opinion on the Commission's reservations, indicating whether the draft measure should be maintained, amended, or withdrawn. Within the same timeframe, the Commission may recommend, require amendment or withdrawal of the measure, or lift its reservations.

2.1 The Methodology of the WACC Notice

The methodology outlined in the WACC Notice is based on the Capital Asset Pricing Model (CAPM), which is a widely used financial model for calculating the WACC. It establishes a relationship between the return on an investment and its risk. The CAPM takes into account the capital structure of a company and consists of the costs of equity and the costs of debt:

$$WACC = g \times \underbrace{(RFR + Debt\ Premium)}_{Cost\ of\ debt} + (1 - g) \times \underbrace{(RFR + \beta \times ERP)}_{Cost\ of\ equity}$$

The parameters can be grouped into generic economic parameters and enterprise specific ones.

Generic economic parameters:

- Risk-free rate (RFR): The return an investor would earn from an investment with zero default risk.
- Equity risk premium (ERP): The additional return expected by investors for taking on the higher risk associated with equity investments, over and above the risk-free rate.

Enterprise specific parameters:

- Beta: Beta measures the systematic investment risk[15] of a company. A higher beta indicates greater sensitivity to market movements.[16] The asset beta represents the weighted average of equity and debt beta, based on the gearing ratio. Specifically, the equity beta reflects the correlation between the returns of a company's equity and those of a market index. Debt beta is usually small because debt values tend to be less volatile than equity.
- Debt Premium: The difference between the interest rate a company pays on its debt and the risk-free rate, compensating lenders for the risk of default.
- Gearing ratio (g): The proportion of a company's capital structure that is financed by debt, showing the extent to which the firm relies on borrowing.

These parameters are again subject of calculations and derivations. The WACC Notice specifies several factors for the deviation of multiple parameters:

- A length of the averaging period of five years as a balance between predictability and efficiency.
- The arithmetic average as averaging method because it has opposed to geometric average or median the highest transparency.
- The frequency of sampling is suggested to be weekly as opposed to daily or monthly to guarantee sufficient observations for a robust estimation.

---

15 From a financial perspective, risk can be divided into two categories: systematic and unsystematic. Systematic risks are non-diversifiable market risks that are beyond the control of a single company and are caused by external factors. Unsystematic risks are unique to a company and can be reduced through diversification of investments.

16 $\beta = 0$ means the stock is uncorrelated with the market return; $0 < \beta < 1$ means the stock is positively correlated with the market return but with smaller volatility; $\beta = 1$ means the stock has a perfect correlation with the market return and $\beta > 1$ means the stock has a positive correlation with the market return with a higher volatility.

The WACC Notice stipulates that the **risk-free rate** is estimated using the arithmetic average of a 5-year time-window of a yield on a 10-year domestic government bond for each Member State.[17] BEREC calculates the risk-free rate accordingly each year for each Member State, using a five-year averaging period based on monthly data retrieved from Eurostat.[18] A key methodological difference between the NRA's methodologies for estimating the risk-free rate before the application of the WACC Notice and after is the choice of the averaging time window. Before the WACC Notice, the time windows applied by NRAs varied considerably: around one-third used a window of one year or less; 27% used two to three years; 30% used five years; and 10% used ten years.[19] In contrast, by 2024, only 19% of NRAs used a window of one year or less, 7% used two to three years, and 59% applied the five-year window specified in the WACC Notice.[20] However, the RFR, and particularly the time window, is a controversial parameter among stakeholders and NRAs due to the sharp increase in interest rates since July 2022, following a period of low interest rates. Six of the 18 NRAs that adopted the WACC Notice have deviated from the risk-free rate estimated by BEREC. This is discussed in more detail in section 2.4.

Like the risk-free rate, the **equity risk premium** reflects general macroeconomic conditions. In contrast to the national RFR, the WACC Notice specifies an EU-wide ERP to reflect the increasingly integrated financial market of the EU.[21] BEREC has estimated a notional European ERP, which is a weighted average of the national ERP using historical data. The estimation period for the national ERP is from 1900 to 2024, depending on data availability.[22] The EU-wide ERP is calculated using the 5-year average market capitalisation as the weight for equity and the 5-year average GDP as the weight for bonds. A secondary weighting is employed to consider the duration of the time period over which data is available. This ensures that data from all EU member states, irrespective of varying available time lengths, can be integrated without the risk of over- or underestimation of available data series of differing lengths.[23]

To estimate enterprise-specific parameters (beta, gearing and debt premium) NRAs typically benchmark various telecommunication operators' (peer group) data. Thus, the definition of the peer group is the first step. The WACC Notice sets five selection criteria for determining the peer group:

- *"Are listed on stock exchange and have liquidity traded shares;*
- *Own and invest in electronic communications infrastructure;*
- *have their main operations located in the Union;*
- *have an investment grade credit rating; and*
- *are not, or have not been recently, involved in any substantial mergers and acquisitions."* (European Commission (2019): WACC Notice, No. 44)

---

17 European Commission (2019a).

18 BEREC (2024a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

19 BEREC (2019b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

20 BEREC (2024b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

21 European Commission (2019a), No. 38.

22 DMS publishes historical time series for 12 EU member states and Norway dating back to 1900. For Greece, DMS publishes historical time series for equity returns from 1954 and for bond returns from 1993. For the 12 EU Member States and Iceland for which DMS data is unavailable, BEREC uses Bloomberg data starting from 2001 and ending in 2024. See BEREC (2025a): BEREC Report on WACC parameter calculations according to the European Com-mission's WACC Notice of 6th November 2019., p. 56.

23 BEREC (2025a) p. 56f.

The equity **beta** (or unlevered beta) in the CAPM model reflects the systematic risk of a company relative to the average company in the market. It is estimated using a regression analysis to determine the correlation between the company's share returns and those of a market index (usually using an OLS estimator). The WACC Notice specifies the use of a European market index that represents a significant proportion of market capitalisation in the EU, such as the STOXX Europe TMI.[24] In order to compare the betas of several companies within a peer group, it is necessary to remove the impact of debt on equity by unlevering it. A company's asset beta reflects its systematic risk, free of the financial risk associated with the financial leverage ratio. The asset beta (β_A) of a company can be derived from the equity beta (β_E), debt beta (β_D) and the gearing ratio (g):[25]

$$\beta_A = g \times \beta_D + (1 - g) \times \beta_E,$$

To reduce complexity and improve transparency the WACC Notice prescribes a single value for debt beta value of 0.1. This is an intermediate value within the typical range of 0–0.2.[26] For the estimation of the regulated WACC, the asset beta of the peer group is converted back into equity beta using the derived gearing ratio.

The WACC notice outlines the appropriate approach for calculating the **gearing ratio** using a company's book value of net debt, including the value of financial leases[27] for five year annual data. BEREC calculates the equity component weekly from the number of outstanding shares times the last price value of share in the relevant trading day.[28]

The **debt premium** can be estimated as the spread between the domestic risk-free rate and the yield of long-term corporate bonds with a similar maturity (10 years).[29]

Furthermore, taxes and inflation affect the WACC. Interest on debt is tax-deductible for companies. The post-tax WACC takes this tax shield on debt into account:

$$WACC_{Post-Tax} = (1 - \tau) \times g \times \textit{Return on debt} + (1 - g) \times \textit{Return on Equity,}$$

where τ is the tax rate. The post-tax WACC reflects the actual average costs of capital after tax effects have been taken into account and is relevant for company valuations or investment decisions. Regulators typically consider the pre-tax WACC in order to determine tax-independent revenue caps. The pre-tax WACC is calculated indirectly by dividing the post-tax WACC by (1-τ) or directly as:

$$WACC_{Pre-Tax} = g \times \textit{Return on debt} + \frac{1}{1 - \tau} \times (1 - g) \times \textit{Return on Equity.}$$

---

24 European Commission (2019), No. 45.
25 Ibid No. 48.
26 Ibid, No. 49.
27 Ibid, No. 54.
28 BEREC (2025a), p. 39.
29 Ibid, No. 56.

2.2 Trends in WACC Parameters in the EU and their impact on the WACC

Table 1 presents the average WACC parameters in the EU from 2020 to 2024, as reported by BEREC.

Table 1: Average WACC Parameters in the EU Member States

Parameter	Nominal RFR	ERP	Equity beta	Gearing ratio	Cost of debt	Tax
2020 N=24	2.24%	5.77%	0.85	37.84%	3.55%	21.57%
2021 N=25	1.76%	5.81%	0.81	36.33%	3.00%	21.68%
2022 N=23	1.38%	5.70%	0.78	37.24%	2.49%	22.04%
2023 N=23	1.48%	5.82%	0.74	38.67%	2.58%	21.66%
2024 N=23	1.87%	5.96%	0.71	39.90%	3.04%	21.55%
2025 N=23	2.02%	5.99%	0.69	40.57%	3.14%	21.61%

Source: BEREC (2025): Report Regulatory Accounting in Practice 2025 Chapter 5-WACC.

The average risk-free rate (RFR) declined from 2.24% in 2020 to 1.38% in 2022, reflecting the prolonged period of low interest rates up to July 2022. Since the RFR is calculated as a five-year average, the sharp rise in interest rates between July 2022 and October 2023 is only reflected with a lag, leading to a modest rise in the average RFR from 2022 to 2023 and a greater rise from 2023 to 2024.[30].

The equity risk premium varies only slightly between 5.70% and 5.99% indicating a stable understanding of market risks. The equity beta decreases steadily from 0.85 in 2020 to 0.69 in 2025. According to BEREC (2025), this decline followed a temporary peak in 2020 linked to pandemic-related volatility for most operators.[31] An equity beta below 1 indicates that the peer group of incumbent operators carries lower systematic risk than the market as a whole, implying less volatility.

The average level of gearing increased from 37.84% in 2020 to 40.57% in 2025.[32] The level of gearing can rise because of an increase in debt or because a decline in the value of equity. BEREC (2025) explains that since 2018 the average debt has increased by about 32.05% and simultaneously market capitalization has decreased.[33] For the interpretation of the costs of debt it is important to revise that the cost of debt are equal to the risk-free rate plus a debt premium. As noted by BEREC (2024b), it appears that the development of the costs of debt is mainly driven by the development of the RFR.[34]

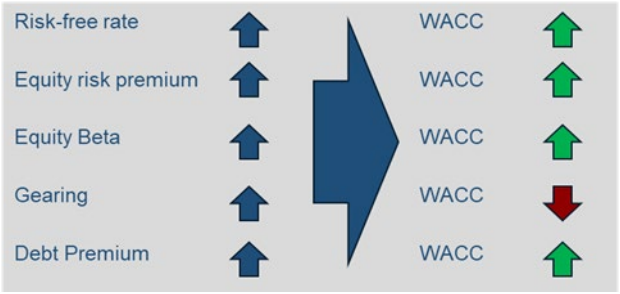
Figure 1 illustrates the direction the impact of changes in WACC parameters on the level of the WACC. The risk-free rate, the equity risk premium, equity beta and the debt premium are positively correlated

---

30 However, this is also influenced by the deviation of some MS from the methodology of the WACC Notice (discussed in section 2.3).
31 BEREC (2025a), p.41.
32 A higher level of gearing usually increases the risk of both the debt and the equity.
33 BEREC (2025a), p.43f.
34 BEREC (2024b), p.43.

with the total WACC. However, the WACC decreases as the debt ratio increases, because the cost of equity is generally higher than the cost of debt.

Figure 1: Direction of the effect of a change in WACC parameters on WACC



Source: WIK.

To quantify these effects, a sensitivity analysis was conducted using the European arithmetic average for 2024. We varied each parameter from -20% to +20%, while keeping the others constant. As the equity beta and the equity risk premium have the same coefficient, the two overlap.

Figure 2: Sensitivity Analysis: Impact of parameter variations on the WACC value based on the European arithmetic average WACC parameters for 2024

	Impact on value of total WACC								
Parameter variations	-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%
RFR	5.45%	5.56%	5.67%	5.78%	5.89%	6.00%	6.11%	6.21%	6.32%
ERP	5.24%	5.40%	5.56%	5.73%	5.89%	6.05%	6.21%	6.37%	6.54%
Equity beta	5.24%	5.40%	5.56%	5.73%	5.89%	6.05%	6.21%	6.37%	6.54%
Gearing	6.27%	6.17%	6.08%	5.98%	5.89%	5.79%	5.70%	5.60%	5.51%
Debt Premium	5.79%	5.82%	5.84%	5.86%	5.89%	5.91%	5.93%	5.96%	5.98%
Tax	5.64%	5.70%	5.76%	5.82%	5.89%	5.95%	6.02%	6.09%	6.16%

Source: WIK calculation based on BEREC (2024b).

Each row represents one WACC input parameter, and each column shows the resulting WACC level for a given percentage change of this input parameter. The colour scale highlights lower WACC values in red and higher values in green. For example, a 20% decrease of the equity risk premium (ERP) lowers the WACC from 5.89% to 5.24%, while a 20% increase raises it to 6.54%. The risk-free rate also has a significant effect, with higher values driving the WACC upward. In contrast, changes in the debt premium have a more limited impact. By contrast, the gearing ratio has an inverse effect. Increasing gearing by 20% reduces the WACC from 5.89% to 5.51%, because the cost of equity are higher than the costs of debt, whereas a 20% decrease in gearing raises the WACC to 6.27%. However, it is important to note that the magnitude of these effects is influenced by the baseline values: for instance, the ERP is substantially higher than the debt premium, making a 20% change in ERP larger in absolute terms than the same change in the debt premium.

2.3 Impact of macroeconomic factors

2.3.1 Inflation

Investors consider real returns when taking their investment decisions. The WACC Notice describes that there are two ways in which regulators can take inflation into account. The first one is to compensate for inflation by annual indexation of the company's assets on which a real return is allowed and the

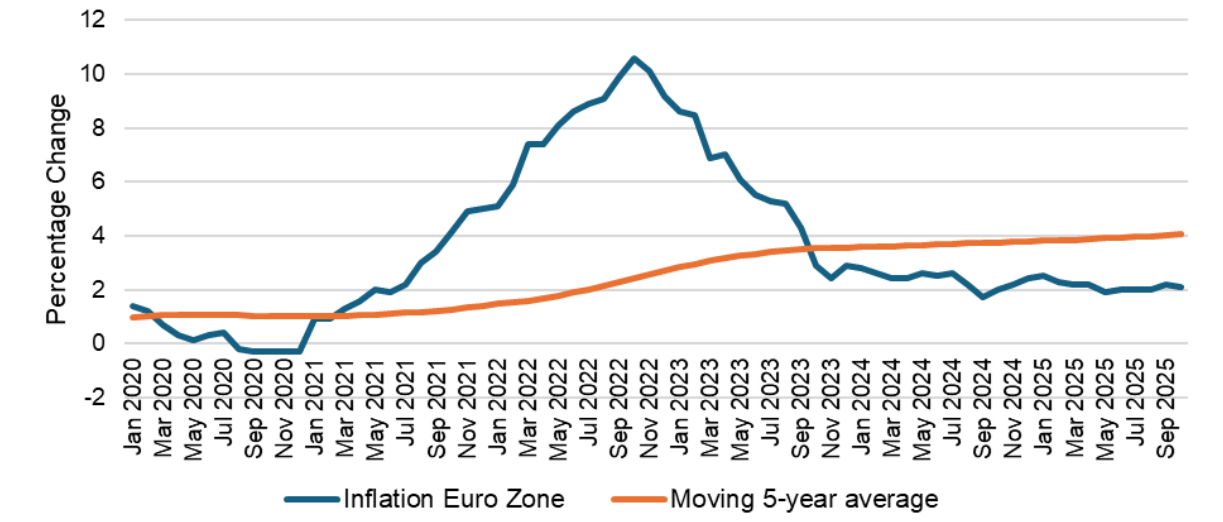
second is that inflation expectations are included in the regulated return by using a nominal WACC without any adjustment to the company's capital asset base.[35] For the conversion of the nominal WACC to real WACC the WACC Notice specifies the Fisher equation:

$$WACC_{Real} = \frac{(1+WACC_{Nominal})}{(1+\pi)} - 1,$$

where π is the inflation. The Notice recommends the use a 10-year inflation forecast and a Eurozone-wide inflation estimate for Eurozone Member States and a national inflation estimate for non-Eurozone Member State. As 10-year estimates are in practice rarely available, it allows for the use of shorter term estimates like the 5-year inflation forecast by ECB.[36]

The following figure shows year-on-year inflation in the Euro area from January 2020 to December 2024, compared to a 5-year average. Inflation remained low through 2020 and early 2021, then surged sharply, peaking above 10% in late 2022. Since then, it has declined steadily, remaining relatively stable at around 2–3% through 2024. The 5-year average inflation rate was 3.8%.

Figure 3: Inflation rate in the Euro area, 2020-2024



Source: European Central Bank (2025): HICP-Overall index, Euro area (changing composition), Monthly, https://www.ecb.europa.eu/stats/macroeconomic_and_sectoral/hicp/more/html/data.de.html, [last call 17.09.2025].

In comparison, the 5-year inflation forecast of the ECB of 2020 was significantly lower at 1.7%(as shown in the following table). However, external shocks such as geopolitical events and energy prices caused the much higher inflation than anticipated, though recent trends show a return toward the forecasted range.

---

35 European Commission (2019a), No 61.
36 European Commission (2019a), No 62.

Table 2: 5-year inflation forecast

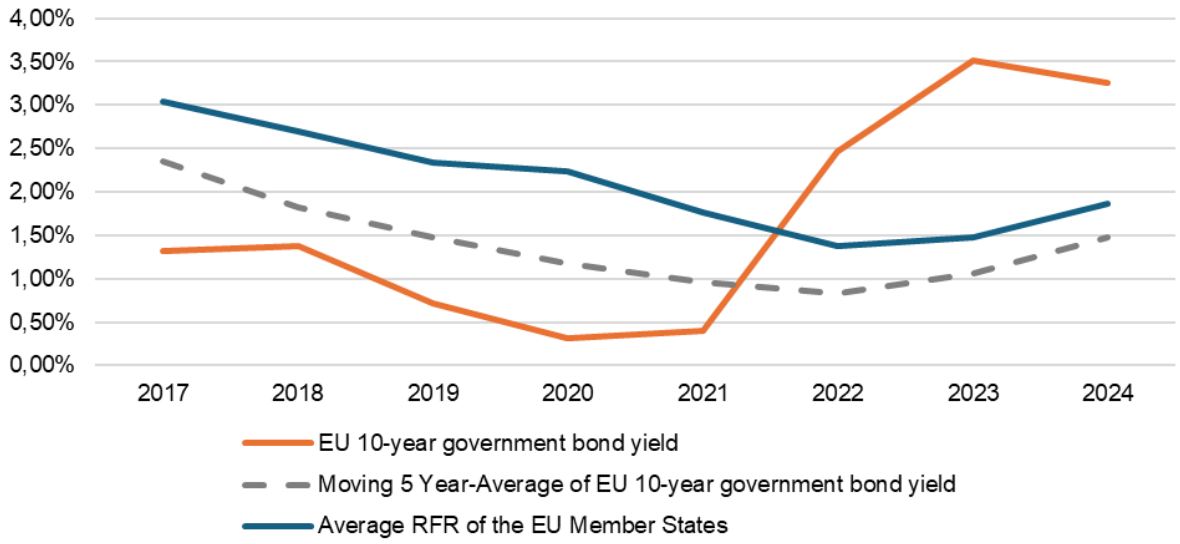
	2020	2021	2022	2023	2024	2025
5-year inflation forecast of the ECB as reported by BEREC	1.7%	1.7%	2.1%	2.1%	2.0%	2.0%

Source: BEREC Reports on WACC parameter calculations according to the European Commission's WACC Notice of the 7th November 2019 of the years 2020-2025.

2.3.2 Interest Rates

Since the introduction of the WACC Notice, there has been a significant rise in interest rates and inflation that leaded to increasing government bond yields (see orange line of the Figure 4). As described in section 2.1, when estimating the risk-free interest rate the WACC Notice specifies the use of the past 5-year average yields on 10-year government bonds. The historical basis means that the effect of an increase in interest rates is reflected in the regulated WACC with a delay. The length of the lag depends on the averaging period used. The WACC Notice proposes this five-year averaging period as a balance between predictability and efficiency.

Figure 4: Average Risk-free rate of EU Member States according to BEREC reports vs. 10-year government bond yield EU Member States (average of monthly data)



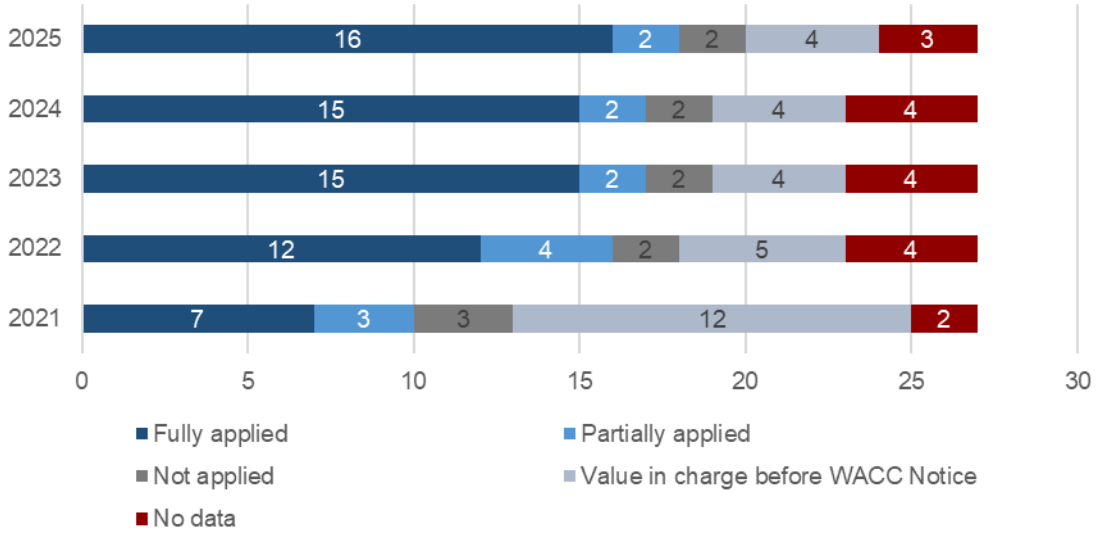
Source: EU 10-year government bond yield: Eurostat (2025): EMU convergence criterion series – monthly data, Online data code: irt_lt_mcby_m (yearly average of monthly data). Risk-free rate EU MS: BEREC (2024b).* BEREC collects data on the WACC set in the Member States each year on 1 April. The average stated accordingly includes the applicable WACC parameters on this date.

Since 2021, government bond yields have increased due to rising inflation and interest rates, peaking in 2023. However, the average risk-free rate of EU Member States does not reflect this, as it is in most Member States and according to the WACC Notice methodology based on a five-year average. Consequently, despite the changing economic environment, the average risk-free rate continued to fall until 2022, only increasing slightly in 2023. This shows that, while the historical average is a reliable indicator in stable economic environments, it exhibits countercyclical behaviour in volatile contexts.

2.4 Implementation of the WACC Notice in the Member States

The following figure shows how the EU regulators applied the WACC Notice between 2021 and 2025, categorised into five groups: Fully applied[37], Partially applied[38], Not applied, Value in charge before WACC Notice, and No data according to the BEREC Reports on Regulatory Accounting in Practice. Overall, the figure shows a clear trend toward a consistent application of the WACC Notice, with fewer NRAs relying on values in charge before the Notice or not apply the Notice.

Figure 5: Application of the WACC Notice in the Member States, 2021-2025



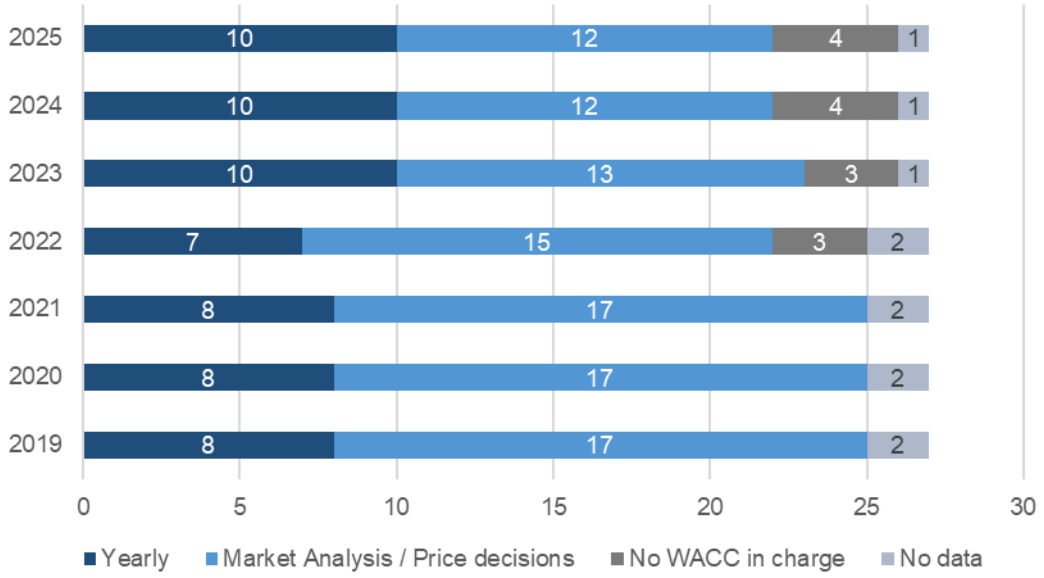
Source: WIK based on BEREC (2025b), p.12f, BEREC (2024b), p.11f; BEREC (2023b), p.11; BEREC (2022b), p. 10; BEREC (2021b), p. 9.

In the WACC Notice, the European Commission reported that NRAs reviewed the WACC at intervals ranging from more than once a year to once every four to five years. According to the Commission, this variation in review frequency is one factor that explained differences in WACC values across the Member States. The Commission recommends the update of the national WACC value at least once a year.[39] Figure 6 illustrates the frequency of WACC updates in the Member States from 2019 to 2025. While 10 NRAs update the WACC on an annual basis, the majority (12) estimate the WACC in line with their market analysis or when pricing decisions have been taken.

---

37 A Member State is counted as "fully applied" if the NRA calculates a minimum of four out of five parameters.
38 A Member State that is counted as "partially applied" does not apply the methodology of the WACC Notice for more than one or two parameters.
39 European Commission (2019b), No. 68-70.

Figure 6 Frequency of WACC Updates in the Member States (EU27), 2019-2025



Source: WIK based on BEREC Reports on Regulatory Accounting 2019-2025.

For example, in 2024, the WACC values from 2018 in Finland and from 2019 in Belgium and Malta were still in force. This can lead to significant differences in WACC values despite a standardised methodology, particularly in times of macroeconomic changes.

Table 18 in the Appendix summarises the deviations from the European Commission's WACC Notice based on WACC Notifications by Member States between 2019 and 2024. Most of these deviations relate to the estimation of the risk-free rate, where regulators (e.g., in Germany, Spain, Italy, France and Slovenia) apply weighted averages of long- and short-term government bond yields instead of the prescribed five-year averaging. While the European Commission acknowledges that some deviations are justified by national macroeconomic conditions or transitional provisions, it constantly stresses the need for regulatory consistency across the EU and urges gradual or full alignment with the Notice. Other deviations include Poland's handling of the equity beta (2024) and gearing ratio (2023), Finland's partial parameter update (2024), and Malta's averaging of WACC scenario values (2019). While the Commission generally acknowledges limited flexibility, it emphasises the need for methodological coherence amongst the NRAs. The following case studies will provide a more detailed examination of the calculation and implementation of the WACC in five Member States.

2.4.1 Case Study: Spain

Key Facts:

The Spanish regulator CNMC updates the WACC every year. The following table summarizes key information about the WACC for legacy infrastructure in Spain.

Table 3: Case Study Spain: Legacy WACC

Key Facts: WACC						
Year	2020	2021	2022	2023	2024	2025*
Nominal pre-tax WACC	6.36%	4.82%	5.20%	5.55%	5.33%	5.41%
Application	Direct application in the annual decision verifying the incumbent operator's (Telefónica's) accounting and in the procedures for updating wholesale offer prices.					
Implementation of the WACC Notice						
Year of implementation	2020					
Is the WACC Notice methodology currently applied?	Yes					
Parameter(s) of adjustment	2020	2021	2022	2023	2024	2025*
	RFR (QE)	/	RFR	RFR	RFR	/

* Not the final value. Presented in the draft measure to notify the European Commission. Source: Written interview with CNMC and regulatory decisions.

Methodology:

There are several differences between the methodology set out in the WACC Notice the approach previously applied by the CNMC. To estimate the risk-free rate, the CNMC used the average yield of daily prices of 10-year government bonds of the preceding six months. In addition, it added a one-percentage-adjustment to reflect the effects of the ECB's Quantitative Easing programme on financial markets.[40] Before the WACC Notice, the CNMC calculated the equity risk premium for the Spanish market rather than using an EU-wide risk premium. o determine this parameter, it considered the three methods most commonly used by NRAs in the electronic communications sector and in other regulated sectors:

- Historical stock returns
- Surveys of investors, CEOs of large companies, and academic specialists
- The Dividend Growth Model (DGM) or other dividend valuation methods[41]

Prior to the WACC Notice, the CNMC also calculated a market-based beta and gearing ratio, as well as an operator-specific cost of debt.

---

40 CNMC (2020): WACC/DTSA/011/20/ Nueva Metodologìa WACC, p. 14f [translated with DeepL].
41 Ibid, p. 16f.

In its 2020 WACC calculation, the CNMC relied on the methodology of the WACC Notice and on the parameters published in the BEREC report except for the risk free rate. The only deviation was the continued application of the one-percentage-point QE adjustment to the risk-free rate. The CNMC argued that prevailing economic conditions justified retaining this upward adjustment and referred to the transition period foreseen in the Notice for cases where applying the new methodology would result in significant changes to the WACC. The CNMC planned to apply the adjustment only for the 2020 calculation and to discontinue it thereafter.[42]

In 2021, the CNMC WACC calculation was fully based on the methodology outlined in the WACC Notice and the parameters published in the BEREC report.[43]

In 2022, the CNMC applied the parameters published in the BEREC report, with the exception of the risk-free rate. Instead of using the five-year average recommended in the WACC Notice, the CNMC calculated the risk-free rate as arithmetic average of:

- of the 5-year (April 2017 – March 2022),
- and the 6-month (April 2022 – September 2022).

The CNMC argued that this adjustment was necessary to capture current macroeconomic conditions, which it considered insufficiently reflected in the latest BEREC WACC parameters report. Using the five-year averaging period for Spanish long-term government bonds, as set out in the WACC Notice, would have resulted in a risk-free rate of 0.84%. By contrast, the arithmetic-average approach produced a value of 1.57%. If the Notice had been fully followed, the nominal pre-tax WACC would have been 4.34%, whereas the arithmetic-average approach led to a WACC of 5.20%.[44]

In 2023 and 2024, the CNMC observed that the risk-free rate reported by BEREC remained misaligned with the prevailing yields on government bonds. For this reason, the CNMC decided to maintain the adjustment. However, it gradually increased the weight assigned to BEREC's historical data with the aim of returning to the unweighted five-year average once the historical series better reflected recent market conditions.[45] The risk-free rate was therefore calculated as a weighted average of the five-year and six-month data as follows:

---

42 European Commission (2021c): Case ES/2021/2309: Cost of capital for regulated services in Spain Article 32(3) of Directive (EU) 2018/1972: No comments, available at: https://circabc.europa.eu/sd/a/5f0d2ba0-43c1-48a0-9704-c4d331e41824/ES-2021-2309%20Adopted_EN.pdf [last call: 08.12.2025].

43 European Commission (2021d): Case ES/2021/2340: Weighted Average Cost of Capital (WACC) in Spain

44 European Commission (2022): Case ES/2022/2419: Weighted Average Cost of Capital (WACC) in Spain.

45 European Commission (2024f): Case ES/2024/2487: Weighted Average Cost of Capital (WACC) in Spain and European Commission (2024g): Case ES/2024/2544: Weighted average cost of capital in Spain.

Table 4: Comparison of the risk-free rate according to the WACC Notice with the risk-free rate resulting from the adjustments that have been made, both of values were estimated by CNMC

	2022	2023	2024	2025
Risk-free rate according to BEREC	0.84%	1.09%	1.51%	2.05%
Weight on the 5-year-average	50%	67%	75%	100%
Weight on the 6-months-average	50%	33%	25%	0%
Risk-free rate	1.57%	1.89%	1.93%	2.05%

Source: CNMC (2025): WACC/DTSA/003/25, CNMC (2024a): WACC/DTSA/009/23, CNMC (2024b): WACC/DTSA/002/24, CNMC (2023): WACC/DTSA/008/22.

In its draft measure for notification to the European Commission in 2025, the CNMC plans to fully return to the WACC Notice methodology for calculating the risk-free rate, as the five-year average now covers a longer period characterised by higher interest rates.[46]

2.4.2 Case Study: Germany

Key Facts:

The German regulator BNetzA updates the WACC annually after the deadline for the annual cost release (1st July). The following table summarizes key information about the WACC for legacy infrastructure in Germany.

Table 5: Case Study Germany: Legacy WACC

Key Facts: WACC in Germany						
Year	2020	2021	2022	2023	2024	2025
Nominal pre-tax WACC	/	4.82%	4.02%	5.06%	4.81%	4,88%
Real pre-tax WACC	3.64%	3.12%	2.16%	2.96%	2.81%	2,88%
Application	Local loop, leased lines[47]	Local loop, leased lines[48]	Local loop, leased lines[49]	Colocation services, leased lines[50]	Colocation services[51]	Colocation services[52]
Implementation of the WACC Notice						
Year of implementation	2021					
Is the WACC Notice methodology currently applied?	Yes					

Source: WIK based on an interview with BNetzA.

---

46 CNMC (2025): WACC/DTSA/003/25, [translated with DeepL].
47 BK3c-20/113, BK2a-20/019, BK2a-20/020, BK2a-20/021, BK2a-21/001, BK2a-21/002.
48 BK3c-21/004, BK2a-21/006, BK2a-21/007, BK2a-21/008.
49 BK3c-22/004, BK2a-22/005.
50 BK3a-23/005, BK2a-23/005.
51 BK3a-24/012.
52 BK3a-25/009.

Methodology:

Prior to the publication of the WACC Notice, BNetzA had already applied the CAPM to estimate the WACC. Compared to the methodology set out in the WACC Notice, there are two main differences. First, BNetzA applied exponential smoothing with WACC values from previous years in order to ensure stability. A smoothing factor of 0.3 was used, meaning that 30% of the newly estimated WACC was combined with 70% of the previously smoothed value.[53] This approach was discontinued in 2021, as it was neither foreseen in the WACC Notice nor applied by other NRAs.[54]

Second, BNetzA used a 10-year averaging period for the risk-free rate and inflation, rather than the 5-year period specified in the WACC Notice. To avoid a sharp decline in WACC due to both the low interest rate environment and the removal of exponential smoothing, BNetzA introduced a gradual transition. While a 5-year averaging period would have reduced the WACC by 34%, a 10-year average limited the reduction to 11%. Accordingly, in 2021 BNetzA decided to apply a 10-year averaging period, while committing to converge towards the WACC Notice methodology by 2024.[55] In 2022, it implemented a hybrid approach: two-thirds based on a 10-year period and one-third on a 5-year period. In 2023, however, BNetzA adjusted this path to account for changing macroeconomic conditions, particularly the sharp increase in interest rates. Following the example of the Spanish regulator, BNetzA combined the 5-year average of long-term German government bond yields with a shorter 4-month average to capture recent interest rate increases.[56] In 2024, BNetzA again adjusted its approach by reducing the weight of short-term rates. It applied a weighted average in which two-thirds of the weight was assigned to the 5-year period and one-third to the average yield observed over the most recent three-month period (April–June 2024). BNetzA justified this approach by pointing to the significant gap between the 5-year average and the actual yield in June 2024, which in its view did not adequately reflect current macroeconomic conditions.[57]

---

53 See Bundesnetzagentur (2020): BK3c-20/013 Konsultationsentwurf wegen Genehmigung von Entgelten für den Zugang zur Teilnehmeranschlussleitung, p. 69.

54 See European Commission (2021b): Case DE/2021/2339: Wholesale local access provided at a fixed location in Germany- amendments of prices, p. 2.

55 Ibid.

56 See European Commission (2023a): Case DE/2023/2457: Market for wholesale local access provided at a fixed location - Ancillary collocation services and the weighted average cost of capital.

57 See European Commission (2024b): Case DE/2024/2530: Market for wholesale local access provided at a fixed location- Ancillary collocation services and the weighted average cost of capital.

Table 6: Comparison of the WACC according to the WACC Notice with the WACC resulting from the adjustments that have been made, both of values were estimated by BNetzA.

	2021	2022	2023	2024
Nominal pre-tax WACC following the Notice	3.96%	3.61%	3.70%	4.04%
Nominal pre-tax WACC including the adjustments to the WACC Notice	4.82%	4.02%	5.06%	4.81%
Parameter of adjustment	RFR	RFR	RFR	RFR
Driver of the adjustment	Gradual transition to avoid a sharp decline	Gradual transition to avoid a sharp decline	Changing macroeconomic conditions	Changing macroeconomic conditions

Sources: BNetzA (2024): BK3-24-0012, p.46; BNetzA (2023): BK3-23-005, p.47; BNetzA (2022): BK3-22-004, p.85; BNetzA (2021): BK2-21-0004, p.43.

In 2025, the BNetzA observed that the difference between the five-year average and the actual yield had decreased, and that the level of the risk-free rate had continued to stabilise. As a result, the risk-free rate calculated in under the WACC Notice was in line both with the current level of the risk-free rate and with the adjusted risk-free rate used by the BNetzA in previous decisions. For this reason, the BNetzA has followed the WACC Notice completely in calculating the risk-free interest rate in 2025.[58]

Stakeholder Feedback:

In 2024, the European Commission has emphasized in its comment that the objective of the Notice is twofold: to harmonize the internal market by promoting consistent regulatory approaches across the EU, and to provide long-term predictability of regulatory decisions for the market participants. They have urged BNetzA to calculate its WACC in full alignment with the guidelines from the WACC Notice. As in the CNMC case the European Commission recognized the need to reflect macroeconomic conditions.[59] In 2025, this was implemented by BNetzA. The Commission did not comment on the WACC in 2025.[60]

Deutsche Telekom, as the incumbent operator, has consistently raised objections to the WACC Notice in regulatory proceedings, stressing its non-binding nature. In 2020, Deutsche Telekom criticized the methodological inconsistency of combining a national risk-free rate with an EU-wide market risk premium, arguing that the national risk-free rate was irrelevant for investors active in EU-wide capital markets. They pointed out that investors compare returns on equity across countries and are not tied to a specific national market.[61] By contrast, other operators called in 2020 for the immediate application of the WACC Notice methodology without a transition period.[62]

These positions have largely remained unchanged in subsequent years. In 2023, Deutsche Telekom welcomed the fact that the BNetzA had taken macroeconomic conditions into account but continued to

---

58 See BNetzA (2025): BK3a-25/009, p.40f.
59 European Commission (2024b).
60 European Commission (2025): Case DE/2025/2603: Wholesale local access provided at a fixed location in Germany - Ancillary collocation services and calculation of the weighted average cost of capital.
61 See Bundesnetzagentur (2020): BK3c-20/013 Konsultationsentwurf wegen Genehmigung von Entgelten für den Zugang zur Teilnehmeranschlussleitung, p. 26f.
62 Ibid., p. 29f.

oppose the application of the WACC Notice methodology, claiming that it resulted in a too low WACC.[63] Other operators, however, supported strict adherence to the Notice and opposed deviations, arguing that Deutsche Telekom had benefited from historically low interest rates in earlier years. In their view, also in a period of rising rates, the increase should only be passed on to wholesale customers with a time lag.[64]

2.4.3 Case Study: Czech Republic

Key Facts:

CTU has not set sector-specific WACC or real WACC values over the last five years. The WACC for legacy infrastructure is updated annually on a fixed cycle based on regular BEREC reports (the new WACC comes into effect on 1 January next year).

Table 7: Case Study Czech Republic: Legacy WACC

Key Facts: WACC					
Year	2021	2022	2023	2024	2025
Nominal pre-tax WACC	7,25%	4,84%	5,01%	5,72%	5,98%
Application	• Price control measure imposed on the SMP operator on the relevant market 1 (Wholesale local access provided at a fixed location) – only for maximum prices for collocation services and ERT test. • Commitments from 4G and 5G frequencies auctions to provide wholesale mobile access.				
Implementation of the WACC Notice					
Year of implementation	2021				
Is the WACC Notice methodology currently applied?	Yes				

Source: WIK based on a written interview with CTU.

Methodology:

CTU has fully implemented the WACC Notice without deviating from it in the recent years.

Stakeholder Feedback:

Operators stated during the public consultation in 2021[65] and 2022[66] that a reduction in the WACC could negatively affect investment in telecommunications infrastructure, the sector's attractiveness, and the general motivation to invest. They noted that a low WACC increases uncertainty for long-term

---

63 See BNetzA (2023): Beschluss in dem Verwaltungsverfahren wegen Genehmigung von Entgelten für den Zugang zu baulichen Anlagen, BK3c-23/079, p. 6.
64 Ibid., p. 9.
65 CTU (2021): opatření obecné povahy č. OOP/4/10.2021-10 [translated with DeepL].
66 CTU (2022): opatření obecné povahy č. OOP/4/10.2022-20 [translated with DeepL].

investment decisions by market participants. In 2021, ČAEK also highlighted that the peer group used in the WACC calculation consisted solely of companies from economically advanced EU countries, excluding those from Eastern and Central Europe. Consequently, they argued, the selected peer group did not reflect the investment profile of the Czech market, and the resulting WACC did not adequately account for local market conditions. CTU clarified that the composition of the peer group was determined by BEREC in accordance with point 67 of the WACC Notice, and that companies from Eastern and Central Europe were not represented in the peer group because none met the criteria outlined in the Notice at that time.[67] In 2022, BEREC included a company from Eastern Europe in the peer group. O2 argued that Eastern Europe is significantly undervalued due to lower public listing of companies on the stock exchange, meaning that the regulated WACC did not reflect the market environment.[68] Since the update in 2023, CTU has not received any further comments.

2.4.4 Case Study: France

Key Facts:

The French regulator Arcep updates the WACC regularly. The WACC for the years 2024-2025 was set in their 2023 decision. The latest WACC decision was adopted on October 28th setting the WACC for 2026 onwards. The following table summarizes key information about the WACC for legacy infrastructure in France.

67 CTU (2021).
68 CTU (2022).

Table 8: Case Study France: Legacy WACC

Key Facts: WACC							
Year	2020	2021	2022	2023	2024	2025	2026
Nominal pre-tax WACC	7.6%	4.8%	4.8%	4.8%	5.5%	5.5%	5.0%
Application	The legacy WACC set out by Arcep is applied to all of Orange's offers based on the use of its fixed network and is subject to an obligation to apply cost-oriented pricing and/or cost accounting, for instance: • For unbundled access to the copper local loop (in areas where competitive conditions are not sufficiently developed) and for the cost accounting obligations, • For central access ("bitstream") at a fixed location delivered at an infranational level and the cost accounting obligations; • For local loop civil engineering access services and the cost accounting obligations; • For high-quality activated access services over copper networks excluding DSL, as well as high-quality access services over copper using DSL technology for access in copper "zone 3"[69]; • The obligation to not apply excessive pricing and the obligation to ensure the tariff replicability of its retail offers for high-quality access services over dedicated fiber optic lines (BLOD) in "zone 2"[70]; • The obligation to not apply predatory pricing for high-quality access services on FttH networks owned or operated by Orange.						
Implementation of the WACC Notice							
Year of implementation	2021 (first effective year)						
Is the WACC Notice methodology currently applied?	Yes						

Source: WIK based on a written interview with Arcep and published regulatory decisions.

Methodology:

In 2020, Arcep decided to fully apply the methodology outlined in the WACC Notice for calculating the nominal WACC for 2021. In its regulatory decision[71], Arcep noted that the methodology of the WACC Notice did not represent a fundamental deviation from its previous practice, as it had already been using a CAPM model based on historical averages. However, several differences between prior Arcep practice and WACC notice had been: The WACC Notice suggests a five-year historical average for estimating parameters, whereas Arcep had previously used a ten-year average for both the risk-free rate and the

---

69 With the exception of access connected to subscriber connection nodes whose service are-as are located in an area commercially closed by Orange for 12 months and for which the technical closure has been announced and is scheduled within less than 2 years (see Article 35 of Decision n°2023-2803). Copper Zone 3 is a set of subscriber connection node service areas as defined in Article 1 of Decision n°2023-2803.

70 Fiber Zone 2 is a set of municipalities defined in Article 1 of Decision n°2023-2803.

71 Arcep (2020): Décision n° 2020-1163 de de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 22 octobre2020 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes et mobiles régulées à compter de l'année 2021, https://www.arcep.fr/uploads/tx_gsavis/20-1163.pdf, (last call: 27.11.2025), [translated with DeepL].

debt premium. Furthermore, while the WACC Notice provides for the regular updating of all parameters, Arcep had kept some parameters, such as the market risk premium, constant in earlier years. Furthermore, Arcep determined the nominal WACC level while calculating the real WACC each year on the basis of this defined nominal WACC and the annual inflation forecast provided in the draft finance law.

In 2023, given the prevailing macroeconomic context and the need for the WACC to reflect current market conditions, Arcep considered it appropriate to calculate the risk-free rate as an arithmetic average of observed yields on 5-year government bonds and yields observed over a more recent period, rather than applying the five-year average defined in the WACC Notice.[72] Specifically:

- The average yield of French government bonds for the five-year average from April 2018 to March 2023: 0.59%
- The average yield of French government bonds for the five-month average from April to August 2023: 2.98%

As in 2020, Arcep followed the WACC Notice methodology for calculating all other parameters. Arcep also adjusted the calculation of the real WACC by using the ECB's 5-year inflation forecast in order to provide greater stability in the face of significant yearly inflation fluctuations. This approach was supported by the majority of stakeholders in the public consultation[73].

In its most recent regulatory decision of 28 October 2025,[74] Arcep fully aligned its calculation with the Commission's guidelines and updated parameter values in line with the most recent BEREC WACC parameters report. In particular, Arcep considered that the prevailing macroeconomic conditions no longer justified adapting the methodology for calculating the risk-free rate used in 2023.

Stakeholder Feedback:

In 2023, the European Commission noted in its commentary on the calculation of the risk-free rate that NRAs should generally follow the WACC Notice to ensure consistency across the internal market, while acknowledging that justified alternative approaches aligned with the Code and national macroeconomic conditions may also be acceptable.[75] Stakeholder feedback during the public consultation was mixed. Several operators were in favor of maintaining the WACC Notice method for calculating the risk-free rate, whereas others supported taking the prevailing macroeconomic context into account.[76] In 2025, in the public consultation, all stakeholders except Orange supported a return to the approach recommended in the WACC Notice; Orange favored a more gradual transition.[77]

---

72 Arcep (2023): Décision n° 2023-2318 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 24 octobre 2023 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées à compter de l'année 2024, https://www.arcep.fr/uploads/tx_gsavis/23-2318.pdf (last call: 27.11.2025), [translated with DeepL].

73 Arcep (2023).

74 Arcep (2025): Décision n° 2025-2047 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 28 octobre 2025 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées à compter de l'année 2026, https://www.arcep.fr/uploads/tx_gsavis/25-2047.pdf (last call: 27.11.2025),), [translated with DeepL].

75 European Commission (2023b): Case FR/2023/2455; Cost of capital for regulated services in France.

76 Arcep (2023).

77 Arcep (2025).

2.4.5 Case Study: Italy

Key Facts:

Agcom updates the WACC with every market review and more generally in case of price setting decision that modifies ex ante the price control obligation (i.e. update of BU-LRIC model) and that need an Art. 32 notification procedure. The following table summarizes key information about the WACC for legacy infrastructure in Italy.

Table 9: Case Study Italy: Legacy WACC

Key Facts: WACC					
Year	2015-2019	2019-2021	2022-2023	2024-2028	
Nominal pre-tax WACC	8.77%	8.64%	7.4%	7.49%	
Application	Fixed markets 1 and 2				
Implementation of the WACC Notice					
Year of implementation	2022				
Is the WACC Notice methodology currently applied?	Yes				
Parameter(s) of adjustment	2020	2021	2022	2023	2024
	/	/	RFR	RFR	RFR

Source: WIK based on a written interview with Agcom and published regulatory decisions.

Methodology:

Prior to the WACC Notice Agcom estimated the WACC using similar methodologies to derive the CAPM-parameters. In the estimations done in 2015 and 2019, the RFR was based on the arithmetic mean of the nominal national bond yield with 10 years residual maturity, over five years' time windows, in line with the Notice and the ERP was based on DMS historical data for Italy[78].

In its estimation for 2022 and 2023, Agcom calculated the WACC in line with the WACC Notice, but adjusted the risk-free rate to reflect drastic changes in macroeconomic conditions.[79] The ECB's five-year inflation forecast estimated average inflation in Italy at 2.1%. This is approximately one percentage point above the average inflation rate, as represented by the arithmetic mean of nominal yields in Italy between 2017 and 2022. This rate is used to estimate the RFR by BEREC, following the WACC Notice. For this reason, in the public consultation Agcom proposed using the 'Spanish model' to estimate the RFR. This is an amendment to the RFR used by the CNMC in 2022, they used an average of the RFR from a 5-year time horizon and a more recent period. Following a request from the European Commission for Agcom to provide a substantial justification for the methodology used to estimate the RFR.[80] Agcom examined a partial amendment to the notified approach to better reflect national specifics. In this

---

78 Agcom (2019a): Annesso 2 del Documento V – delibera n. 348/19/CONS, p.17, [translated with DeepL].
79 Agcom (2023): Allegato C alla delibera N. 132/23/CONS, Stima del WACC di TIM per l'anno 2023, [translated with DeepL].
80 See Table 2-2.

final approach, Agcom estimated a real RFR based on a five-year time horizon, to which it added a forward-looking inflation rate estimate of 2% to determine a nominal RFR. The following table provides an overview of Agcom's calculations following the three approaches.

Table 10: Comparison of different approaches to estimate the risk-free rate and the WACC by Agcom

Italian WACC Estimation 2022-2023	Approach by BEREC (5-year average 1.4.2017-31.3.2022)	Approach of CNMC (Combined 5-year average and more recentd data)	Approach by Agcom (Estimated real RFR 5-year average added by forward looking inflation)
Nominal Risk-free Rate	1.7%	2.65%	2.56%
Nominal WACC	6.28%	7.56%	7.4%

Source: Agcom (2023): Allegato C alla delibera N. 132/23/CONS, Stima del WACC di TIM per l'anno 2023, p. 10.

Furthermore, Agcom excluded Telnor, Digi and Telenet from the Berec peer group, because they were not relevant for Italy. Telenet is a cable operator, a technology not present in the Italian market. Digi is a small operator that work mainly in countries with low regulatory pressure and more competitive markets that differs significantly from Italy where strong regulatory risk is present and Telnor is an operator that works in Nordic countries that experience a different macroeconomic condition from the demand side and the peer group already had three operators (Elisa, Telia, Tele2) that work in the same geographical region, so those markets are already fully represented in the corresponding peer group selected.[81]

For its WACC determination in 2024, AGcom has retained the methodology used to calculate the RFR and select the peer group.[82]

Stakeholder Feedback:

The OAO asked to be fully compliant with the Notice for the RFR taking directly the values of BEREC calculation. The SMP operator and the other main infrastructure operator (Open fiber) asked to increase the WACC, in general, deviating also from the Notice. The SMP operator asked specifically that the new cost of debt would be fully represented in the WACC, while the Berec calculation didn't represent the new cost of debt.[83]

All the operators agree on the peer group selection considered by Agcom.

2.4.6 Summary

Table 9 summarises the risk-free rate adjustments detailed in the case studies. As described in the case study, the adjustment made by the German regulator in 2022 was part of a transition path towards the methodology of the WACC Notice, and was not caused by the macroeconomic conditions as were the

---

81 Written interview with Agcom.
82 See Agcom (2024a): Annesso 1 del Documento VI della deliber n. 114/24/CONS, Modello di costo BU-LRIC per la calutazone dei prezzi dei serviui di accesso alla rete in rame e alle rete NGA di Telecom Italia, , [translated with DeepL].
83 See Agcom (2024b), Allegato A decision 114/24/CONS, [translated with DeepL], p. 115.

other adjustments. For this reason, this adjustment is shown in grey in the following tables. The periods specified refer to the respective periods in the past that were used to estimate the risk-free interest rate. In general, it is evident that regulatory authorities implemented similar adjustments to the calculation of the risk-free interest rate during the period spanning from 2022 to 2024. However, for the WACC determinations in 2025, most regulators have reverted to the methodology set out in the WACC Notice.

Table 11: Overview of the adjustments of the risk-free rate

<table>
<tr><th>Year</th><th>CNMC (Spain)</th><th>Arcep (France)</th><th>Agcom (Italy)</th><th>BNetzA (Germany)</th></tr>
<tr><td>2022</td><td>Arithmetic Average:
• 5-years
• 6-months</td><td rowspan="2">/</td><td rowspan="2">Estimated real RFR-5-year-average added by a forward looking inflation (2%)</td><td>Weighted Average:
• 33% 5-years
• 66% 10-years</td></tr>
<tr><td>2023</td><td>Weighted Average:
• 66% 5-years
• 33% 6-months</td><td>Arithmetic Average:
• 5-years
• 4-months</td></tr>
<tr><td>2024</td><td>Weighted Average:
• 75% 5-years
• 25 % 6-months</td><td rowspan="2">Arithmetic Average:
• 5-years
• 5-months</td><td rowspan="3">Determination 2024-2028: Estimated real RFR-5-year-average added by a forward looking inflation (2%)</td><td>Weighted Average:
• 66% 5-years
• 33% 3-months</td></tr>
<tr><td>2025</td><td>Return to WACC Notice</td><td>Return to WACC Notice</td></tr>
<tr><td>2026</td><td>/</td><td>Return to WACC Notice</td><td>/</td></tr>
</table>

Source: Summary of Regulatory decisions.

Table 10 summarises the impact that adjustments to the risk-free rate had on the WACC value in Spain, France, Italy and Germany. The values are quoted from the regulators' regularly published decisions and EU notifications, where available. These adjustments significantly impacted the WACC, raising its value from 20% (e.g. Spain in 2022 or Germany in 2024) to 37% (e.g. France in 2024 or Germany in 2023).

Table 12: Impact of the adjusted risk-free rate on the WACC

Year	**CNMC** (Spain)		**Arcep** (France)		**Agcom** (Italy)		**BNetzA** (Germany)	
	WACC Notice	Adjusted WACC	WACC Notice	Adjusted WACC	WACC Notice	Adjusted WACC	WACC Notice	Adjusted WACC
2022	4.34%	5.20%	4.8%		6.28%	7.4%	3.61%	4.02%
2023	n. A.	5.55%					3.70%	5.06%
2024	n. A.	5.34%	4.0%	5.5%	n. A.	7.49%	4.04%	4.81%
2025	5.41%						4.88%	
2026	/		5.0%		/	/	/	

Source: Spain: EU-Notification Case ES/2022/2419, France: EU-Notification Case FR/2023/2455, Italy: Agcom (2023): Allegato C alla delibera N. 132/23/CONS, Annesso 1 del Documento VI della delibera n. 114/24/CONS, Germany: BK3-24-0012, BK3-23-005, BK3-22-004, BK2-21-0004

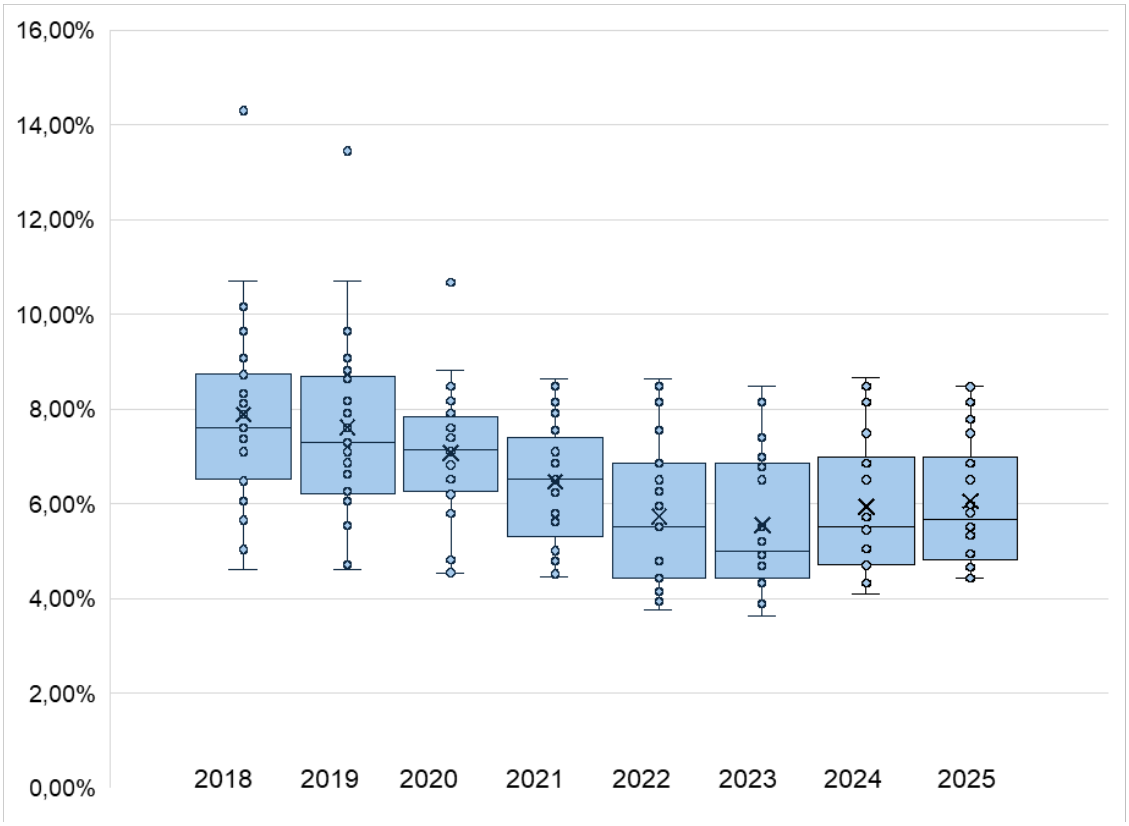
In its comments, the European Commission has always emphasised the importance of regulatory consistency in the internal market (see Table 18). They acknowledged that the methodology could be adjusted if justified by macroeconomic conditions (e.g. ES22, FR23, DE23), but in some cases they required more detailed justification from the NRA (e.g. IT23). In particular, in 2024, they encouraged or urged a complete return to the WACC methodology (e.g. ES24, DE24). The regulators complied with this in their WACC determinations for 2025.

2.5 Impact of the Notice on the level of WACC

This chapter examines the impact of the WACC Notice on WACC levels across EU Member States. Figure 7 shows boxplots of the applicable WACC in the Member States, including the average, median and quartiles, for the years 2018 to 2025. Over this period, the EU average of the regulated WACC in force in the Member States decreased from 7.89%[84] in 2018 to 6.05% in 2025, reaching a low of 5.56% in 2023. After the introduction of the WACC Notice, the standard deviation decreased from around 2% in 2018 to 1.33% in 2025.

84 This refers to the WACC values published by BEREC in the 'Regulatory Accounting in Practice Report' for each year. The reporting date is 1 April each year. In the figure, we have calculated the average of the published WACCs for the EU27. Consequently, slight differences are observed up to 2019 compared to the EU MS averages calculated by BEREC, which include the UK.

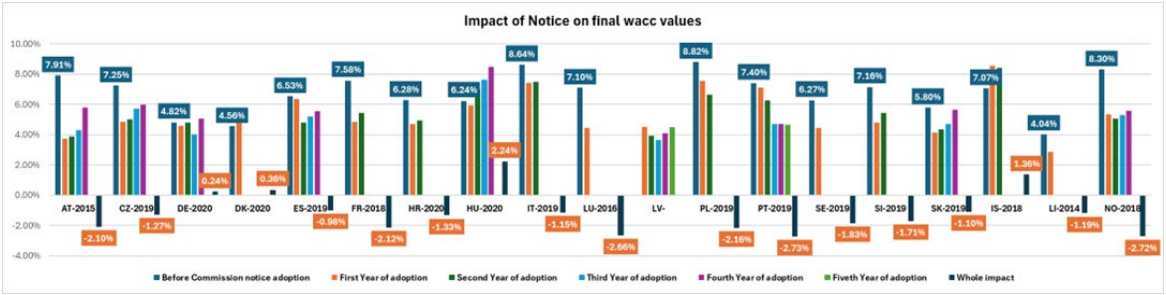
Figure 7: Nominal pre-tax WACC in force in EU27, 2018-2025



Source: WIK based on data retrieved from BEREC reports on Regulatory Accounting 2018-2025. (Cut-off Date: 1. April of each year).

In particular, the average WACC has fallen significantly during the period when most regulators introduced the WACC Notice methodology (2019–2022, see section 2.4). Figure 8 illustrates the WACC values before and after NRAs adopted the WACC Notice between 2021 and 2025. The figure shows that WACC has fallen significantly in most countries in recent years.

Figure 8 WACC values and year of the adoption of the WACC Notice, 2021-2025



Source: BEREC (2025b).

BEREC (2025b) attributes the decline in WACC primarily to three factors:

- The systematic risk of the telecom sector decreased, leading to lower beta values,
- low interest rates prior to 2022, affecting the risk-free rate,
- and the stable equity risk premium evaluated based on long-term historical values.[85]

Furthermore, several Member States applied WACC values that had been estimated between 2015 and 2017 prior to the application of the WACC Notice. Given the decline in interest rates until 2022 (see section 2.3.2), WACC values would likely have declined even if a consistent methodology had been used. This includes the two Member States with the largest relative decline in WACC:

- Austria's WACC had been in force since 2015. It more than halved after the application of the WACC Notice, falling from 7.91% in 2021 to 3.86% in 2022.
- In Luxembourg, the WACC had been in force since 2016, and its application reduced the WACC from 7.1% in 2021 to 4.44% in 2022.

These cases suggests that part of the strong decline in WACC following the implementation of the WACC Notice might be due to non-regulatory factors.

However, relatively small changes in the methodology can have a substantial impact on the WACC. For example, prior to the WACC Notice the averaging windows used by NRAs to calculate the risk-free rate varied considerably, ranging from spot rates to historical averages up to ten years.[86] As illustrated by the Germany case study (see section 2.4.2), reducing the historical time window from 10 to 5 years, given the prevailing macroeconomic conditions, significantly reduced the risk-free interest rate and, consequently, the WACC. For this reason, the German regulator (BNetzA) introduced a gradual transition towards the methodology of the WACC Notice. This example demonstrates that significant reductions in WACC may arise form methodological changes, depending on the approach previously applied.

There are Member States where the WACC Notice had a substantial impact on the value even though the WACC had been updated regularly. In these cases, the decline is more likely to be caused by methodological changes rather than by delayed re-estimation:

- In the Czech Republic, the WACC declined around a third, from 7.25% in 2021 to 4.84% in 2022. The previous WACC had been in force since 2019.
- In Slovenia, the application of the WACC Notice led to a similar decrease of around a third from 2021 to 2022. The previous WACC had been in force since 2019.

Overall, the data clearly indicates that the WACC values of the Member States have fallen since the introduction of the WACC Notice, with a corresponding reduction in dispersion. In several Member States, the application of the WACC Notice has led to a significant reduction in WACC. However, these reductions cannot be attributed solely to methodological changes introduced by the Notice. Broader macroeconomic developments also caused a decline in WACC during this period. In some cases, the observed reductions likely reflect the combined effect of methodological harmonization and the recalibration of WACC values that had not been updated regularly.

---

85 BEREC (2025b), p. 19f.
86 BEREC (2019b).

2.6 Interim conclusions

he WACC Notice has largely harmonized the methodology used by NRAs to calculate the WACC. However, differences remain, particularly with regard to the frequency of WACC updates. Due to recent macroeconomic developments, the WACC Notice methodology temporarily resulted in a significant divergence between the calculated risk-free rate and prevailing market interest rates. In response, several NRAs adjusted their approach to calculating the risk-free rate between 2022 and 2024 by placing greater weight on more recent data to better reflect macroeconomic conditions. In 2025, most NRAs returned to the WACC Notice methodology, as the five-year average once again better captured current interest rate levels.

The European Commission has emphasized that deviations in national approaches can lead to inconsistencies in WACC values across the EU internal market. For example, Germany set a nominal WACC of 5.06% for 2023/24, compared with 4.70% in Portugal in 2023 and 4.71% in Slovakia in 2024.[87] Estimating the WACC requires balancing several regulatory objectives. The WACC Notice lists consistency, regulatory predictability, the promotion of efficient investment, and transparency. However, these objectives can sometimes conflict with each other. For instance, during periods of significant macroeconomic change, consistency and regulatory predictability may conflict with the goal of promoting efficient investment. When determining the WACC, NRAs balance these objectives, and the Commission has acknowledged that, in certain cases, deviations from the methodology set out in the WACC Notice may be justified by macroeconomic conditions.

87 BEREC (2024b).

3 Regulated WACC for VHCN: The Risk Premium Approach

3.1 Theoretical background

The Gigabit Recommendation addresses the regulated cost of capital applicable for price obligations for VHCN wholesale access products. It argues that regulators should set the WACC at a level that provides adequate investment incentives for operators while avoiding excessive returns, thereby supporting allocative efficiency, competition, and consumer welfare.[88] To this end, NRAs should consider adding a risk premium to the applicable legacy WACC to reflect additional, quantifiable risk factors specific to VHCN investments. The Recommendation identifies five categories of risk that make VHCN projects inherently riskier than investments in legacy infrastructure and that NRAs should take into account:[89]

- Uncertainty relating to retail and wholesale demand,
- Uncertainty relating to the costs of deployment, civil-engineering works and managerial execution,
- Uncertainty relating to technological progress,
- Uncertainty relating to market dynamics and the changing competitive situation, such as the degree of infrastructure-based competition,
- Macroeconomic uncertainty.

These considerations reflect the distinction between project-specific costs of capital and company-wide capital costs estimated under the WACC Notice methodology. According to Brealey et. al (2011), many projects can be treated as the average risk of the company's other assets and for those projects the company's WACC is the adequate discount rate and for other projects the company's cost of capital are a good starting point.[90] In the CAPM framework, a firm's beta capture its systematic risk As the WACC Notice methodology estimates beta using financial data from a peer group of European telecom operators investing in telecom infrastructure, the resulting beta for the legacy WACC implicitly reflects both legacy and VHCN risks in proportion to their weight in operators' portfolios. If a suitable peer group of pure VHCN operators existed[91], NRAs could estimate a VHCN-specific beta directly. However, several NRAs argued that there is no suitable peer group available.[92]

The Gigabit Recommendation does not prescribe a methodology for calculating the VHCN risk premium in the same level of detail as the WACC Notice provides for the legacy WACC. It states that the premium may be derived using detailed financial models or quantitative techniques that decompose the systematic risk of different assets.[93] Where NRAs cannot appropriately quantify the additional risk, they may

---

88 European Commission (2024a), p.14f.
89 Ibid, p. 31.
90 Allen, F., Brealey, R. A., & Myers, S. C. (2011). Principles of corporate finance Global Edition. New York: McGraw-Hill/Irwin, p. 243.
91 A suitable peer group needs to meet certain criteria. For example, the criteria set out in the WACC Notice are that the companies *"Are listed on stock exchange and have liquidity traded shares; Own and invest in electronic communications infrastructure; have their main operations located in the Union; have an investment grade credit rating; and are not, or have not been recently, involved in any substantial mergers and acquisitions."* (European Commission (2019a), No. 44)
92 See for example The Brattle Group (2020): The WACC for KPN and VodafoneZiggo, p.7f.
93 European Commission (2024a), No 74.

rely on benchmarks based on best practices from comparable Member States, ensuring that these benchmarks reflect similar circumstances and have been applied in similar regulatory contexts.[94]

3.2 Approaches applied by European regulators

3.2.1 Financial models

Czech Republic

The Czech regulator CTU has calculated a VHCN risk premium based on a financial model since 2013 that applies to commitments from 4G and 5G frequencies auctions/renewals as well as state aid schemes for VHCN deployment.

Table 13: Czech Republic: VHCN Risk Premium

Key Facts: VHCN Risk Premium					
Year	2021	2022	2023	2024	2025
Nominal pre-tax WACC (VHCN)	8.66%	5.78%	5.98%	8.70%	8.39%
Risk Coefficient (ratio NGA to legacy)	119.375	119.375	119.375	123.438	123.438
Market Risk Coefficient	/	/	/	1.33%	0.82%
Frequency of Updates	The risk premium was introduced in 2013 and recalculated in 2018 and 2023.				
Application	• Commitments from 4G and 5G frequencies auctions/renewals ○ to provide national roaming (not used) ○ to cover selected rural areas and transportation corridors • State aid schemes operated by the Ministry of Industry and Trade (for VHCN deployment)				
Modelling Approach	Financial Model				

Source: WIK based on a written interview with CTU

The VHCN risk premium represents a risk difference between the NGA and legacy networks. CTU used a special model of complex box method for cost of equity estimation published by Prof. Mařík to estimate the risk premium. This method segments the total risk into partial risks which are then assessed separately. The partial risks associated with NGA networks are assessed not in relative terms to the risks of legacy networks, that is, whether the risk is the same, higher, or lower than for legacy networks. A consistent risk factor is defined as 100%, a higher risk factor exceeds 100%, and a lower risk factor is

94 Ibid, No. 75.

below 100%. The following scale was used in the risk assessment to evaluate the partial risk factors and advantages:[95]

- negligible risk: 100%,
- low risk: 110% (or 90%),
- significant risk: 125% (or 75%),
- extreme risk: 150% (or 50%).

Table 14: Partial risk factors of VHCN investments and their assessment by CTU in 2023

Partial Risk Factor	**Assessment in 2023**
Dynamics of the sector, innovation, and continuity of services	The risk assessment considers that while VHCN and other broadband access technologies are continuously innovating toward multi-hundred-megabit capacities, NGA/VHCN remains relatively new and limited in coverage, with established xDSL and WiFi technologies still dominant, and ongoing innovations in other technologies (e.g., 60 GHz and 26 GHz wireless) significantly reduce the predictability of long-term NGA/VHCN investment returns, leading GTA[96] to classify this risk as extreme with a 150% impact coefficient, unchanged since 2018.
Dependence on the economic cycle	GTA considers VHCN services highly sensitive to economic cycles, as post-COVID downturns reduce demand and revenues, with most new FTTH/B connections remaining unused in favor of xDSL/WiFi services, leading to a significant risk rating with a 125% impact coefficient, unchanged since 2018.
Size, capacity of the market, and opportunities for expansion	GTA considers VHCN networks to face significant risk from market size, capacity, and expansion potential, as their current coverage is limited to saturated, high-demand areas, future growth is uncertain due to low profitability and competing technologies, leading to a substantial risk rating with a 125% impact coefficient.
Intensity of competition	GTA assesses the competitive intensity risk for VHCN networks as extreme, since these networks consistently face strong competition from multiple substitute technologies (including 5G, WiFi, xDSL, and fixed wireless), leading to downward pressure on prices, margins, and market share, and resulting in a 150% impact coefficient.
Barriers to market entry	GTA considers market-entry-barrier risk significant because low-cost local WiFi networks, and increasingly 5G and FWA solutions with low fixed costs—remain widespread and competitive against capital-intensive FTTH/B networks, leading to a 125% impact coefficient, unchanged since 2018.
Position towards customers and suppliers	GTA considers the buyer–supplier position risk negligible for both NGA/VHCN and other networks and assigns it a coefficient of 100%, unchanged since 2018.
Competitiveness of the service	GTA finds that VHCN networks gain a meaningful competitive advantage from higher capacity and the ability to offer related services like IPTV, reducing risk and yielding a 75% coefficient.

95 CTU (2023): opatření obecné povahy č. OOP/4/11.2023-7, [translated with DeepL].
96 In June 2023, the consulting firm Grant Thornton Advisory (GTA) conducted a reassessment of the individual risks.

Partial Risk Factor	Assessment in 2023
Prices	GTA views price risk for VHCN as extreme due to high investment costs, lower expected returns, stronger price sensitivity, and competitive pressure from cheaper wireless technologies, resulting in a 150% coefficient.
Regulatory risk	GTA assesses regulatory risk for NGA/VHCN as slightly negative—higher than for other technologies but mitigated by ongoing subsidies—assigning it a coefficient of 110%, the same as in 2018.
Financial risks	GTA rates financial risk for NGA/VHCN as low, noting only minimal risk reduction from subsidies due to their limited scope and burdensome obligations, and applies a 90% coefficient, unchanged since 2018.

Source: WIK based on CTU (2023).

Furthermore, the partial risk factors were assessed according their significance and a weighted average of these percentage values was calculated. This average represents the relative risk of NGA networks compared to legacy technologies. The following table shows the evaluated partial risk factors, the respective risk coefficient and weights for 2018 and 2023.

Table 15: Evaluation of the risks associated with VHCN investment in the Czech Republic in 2023.

Partial Risk	Update 2023	Coefficient		Weight	Weighted Coefficient	
		2018	2023		2018	2023
Dynamics of the sector, innovation, and continuity of services	No	150	150	12.5	18.750	18.750
Dependence on the economic cycle	No	125	125	6.25	7.813	7.813
Size, capacity of the market, and opportunities for expansion	Yes	110	125	6.25	6.875	7.813
Intensity of competition	Yes	125	150	12.5	15.625	18.750
Barriers to market entry	No	125	125	12.5	15.625	15.625
Position towards customers and suppliers	No	100	100	6.25	6.250	6.250
Competitiveness of the service	No	75	75	6.25	4.688	4.688
Prices	No	150	150	12.5	18.750	18.750
Regulatory risk	No	110	110	12.5	13.750	13.750
Financial risks	No	90	90	12.5	11.250	11.250
Total				**100**	**119.375**	**123.438**

Source: CTU (2023).

Based on this assessment, CTU calculated a risk premium for VHCN networks of 123,438% in 2023. To determine the WACC for VHCN networks, CTU multiplied the overall risk coefficient by the legacy WACC, which is calculated in accordance with the WACC Notice.

In 2023, CTU argued that several macroeconomic factors (i.e. Covid-19, war in Ukraine, energy shock, high inflation) created a growing gap between the risk-free rate embedded in the WACC Notice methodology (i.e. average monthly yields of 10-year Czech bonds for the period of 5 years) and prevailing interest rates. To reflect the current macroeconomic situation CTU added a market risk coefficient to the WACC for NGA/VHCN.

$$Market\ Risk\ Coefficient = WACC_{MRC} - WACC_{Notice}$$

Here, $WACC_{Notice}$ is the legacy WACC calculated under the WACC Notice methodology, while $WACC_{MRC}$ is a modified WACC that uses a risk-free rate equal to the average of (a) the five-year average monthly yields of 10-year Czech bonds and (b) the one-year average monthly yields of the same bonds. CTU specified that this market risk coefficient was only applied when the one-year and five-year averages of 10-year bond yields differ by more than 10%, and it did not apply the adjustment when the short-term average is lower than the long-term average. In 2023, the one-year average yield on 10-year bonds was approximately 35% lower than the five-year average. CTU therefore added a market risk coefficient to the VHCN WACC for 2024:

$$Market\ Risk\ Coefficient = 0.0705 - 0.0572 = 1.33\%$$

This value was added to the legacy WACC before applying the VHCN risk coefficient of 119.375%.[97] In 2025, CTU applied a market risk coefficient of 0.82% (0.068 − 0.0598), reflecting a roughly 30% lower one-year average yield relative to the five-year average.[98]

Italy

The Italian regulator Agcom has calculated a VHCN risk premium based on a financial model since 2015 that is relevant in all decisions related to approval of Reference Offer in access market, as well as any dispute resolution that needs to address pricing issue for VHCN network.

---

97 CTU (2023).
98 CTU (2024): opatření obecné povahy č. OOP/4/10.2024-6 [translated with DeepL].

Key Facts: VHCN Risk Premium in Italy					
Year	2015	2019	2022	2023	2024-2028
FTTH Risk Premium	3.2%	3.2%	2.50%	1.92%	Glide path to a risk premium equal to 0% by the end of 2028.
FTTC Risk Premium	1.2%	0%	0%	0%	0%
Frequency of Updates	With every pricing decision (as for the legacy WACC)				
Application	The risk premium is relevant in all decisions related to approval of Reference Offer in access market, as well as any dispute resolution that needs to address pricing issue for VHCN network.				
Modelling Approach	Financial Model				

Source: Written interview with Agcom

Methodology:

In 2015, Agcom developed a financial model based on real options theory to quantify the additional risk premium for investments in next-generation access (NGA) networks, specifically FTTH and FTTC. The model recognizes that such infrastructure projects are irreversible, involve high uncertainty, and can be delayed, making them comparable to financial call options. A financial option gives the buyer the right (not the obligation) to buy (in case of a call option) or to sell (in case of put option) an underlying financial asset at a specific price or a specific date. Agcom identified two distinct option-related risk components:

- A **"**wait-and-see" option, compensating investors for giving up the possibility to delay investment until uncertainty resolves;
- A "flexibility" option, reflecting regulatory asymmetry—since incumbents must provide wholesale access to competitors, who can enter only when profitable, transferring part of the risk to the incumbent.

Agcom used the Cox–Ross–Rubinstein (1979) binomial option pricing model, a discrete-time version of Black–Scholes, combined with the Market Asset Disclaimer (MAD) approach, which allows valuation when the underlying asset is not traded on financial capital markets.

To simulate the evolution of the project's value, Agcom identified three key variables that determine the riskiness of a FTTH investment: the take-up rate, average revenue per user (ARPU), and capital expenditure (CAPEX). Each variable was modelled using triangular probability distributions, and a Monte Carlo simulation were performed to generate a distribution of possible investment payoffs and estimate the volatility of returns. This volatility was then used as an input for the binomial model to quantify the option premium. Agcom estimated the premium for the "wait-and-see" option at 2.8% (in real pre-tax terms), noting that this represents an upper bound since early investment may also grant incumbents first-mover advantage. The "flexibility" premium was calculate based on additional factors, such as long-term contracts and advance payment of access fees, that can reduce the risk of investment for the incumbent. The total risk premium for investment in FTTH was then derived by combining these two effects non-additively.

For FTTC, Agcom in 2015 estimated the risk premium as a proportion of the FTTH premium, reflecting its lower investment risk and partial reliance on existing copper infrastructure. Because FTTC is essentially an upgrade rather than a full rebuild, its uncertainty mainly stems from a demand risk, that is, consumers' willingness to pay for faster broadband compared to DSL services. Because of the data availability, Agcom compared European broadband prices and regulatory benchmarks to infer relative risk levels, concluding that the FTTC premium should equal 38% of the FTTH premium.

In 2019, Agcom confirmed the FTTH risk premium but refined its composition by limiting the "flexibility" component to a maximum of 50% to encourage long-term risk-sharing agreements and wholesale access contracts. Following stakeholder feedback, Agcom removed the risk premium for FTTC, acknowledging its comparatively lower investment risk.[99]

For 2022 and 2023, Agcom recognized that the "wait-and-see" option was no longer relevant in areas already covered by the SMP operator's fiber network. Consequently, Agcom estimated the risk premium as a weighted average between:

- 3.2%, corresponding to the full risk premium previously calculated under the real options model for non-covered areas (where uncertainty and irreversibility still apply); and
- 0%, for areas already covered by the SMP operator's FTTH network (where the option to defer investment no longer exists).

The weights were based on the geographical coverage of the SMP operator's fiber network[100].

In 2024, Agcom confirmed that FTTH coverage is expected to be largely completed by 2028, implying that the risk premium for the "wait-and-see" option will phase out. [101] The Authority therefore adopted a glide path, reducing the FTTH risk premium to 0% by 2028, as shown below:

Table 16: Risk premium for FTTH determined by Agcom in 2024 for 2024 to 2028

Year	2024	2025	2026	2027	2028
Risk Premium for FTTH	1.36%	1.21%	0.91%	0.51%	0%

Source: Agcom (2024b), p.163.

In its new draft market analysis (205/25/CONS), Agcom proposes overcoming cost-oriented pricing, meaning that no specific risk premium will be calculated in future.

---

99 Agcom (2019b): Annesso 6 del Documento V – deliber n.348/19/CONS. Il calcolo del Risk Premium per gli investment in reti NGA, FTTH e FTTC, https://www.agcom.it/provvedimenti/delibera-348-19-cons (last call 20.10.2025), [translated with DeepL].

100 Written interview with Agcom conducted by WIK in Q3/4 2025.

101 See Agcom (2024a): Annesso 1 del Documento VI della delibera n. 114/24/CONS Modello di costo BU-LRIC per la valutazione dei prezzi dei servizi di accesso alla rete in rame e alla rete NGA di Telecom Italia.

3.2.2 Market survey

Germany

The German regulator BNetzA estimated a VHCN risk premium in 2023 that applies to civil engineering assets (i.e., access to ducts to deploy fibre).

Table 17: Case Study Germany: VHCN Risk Premium

Key Facts: VHCN Risk Premium in Germany					
Year	2020	2021	2022	2023	2024
VHCN Risk Premium	/	/	/	2.48%	2.48%
Frequency of Updates	It is not explicitly specified, but it is defined in such a way that it applies over a longer period of time.				
Application	Civil Engineering Access (BK3c-23/079, BK3c-25/005)				
Modelling Approach	Market Data				

Source: WIK based on an interview with BNetzA

Methodology:

To estimate the VHCN risk premium BNetzA conducted a market survey between the 17 August and 9 October 2023.[102] The survey collected information on the returns on equity applied by operators to fibre deployment projects, as well as the average interest rates on debt capital for fibre deployment projects (including funded projects). According to BNetzA, the responses cover companies representing more than 90% of the market volume in the xDSL/FTTX and HFC sector in Germany.

BNetzA distinguished between equity and debt to reflect the different expected returns of a comprehensive fibre rollout. They argue that while expected returns on equity are primarily driven by sector-specific risks, expected returns on debt also reflect general macroeconomic and financial market conditions.

The responses to the survey (reported return on equity and return on debt) were weighted for the analysis according to the operators' reported external revenues. The methodology proceeded in several steps:

1. A weighted average was calculated for the 13 major operators.
2. For the other operators, revenue data was not consistently available. Accordingly, a weighted average was calculated for those that provided revenue data, and an unweighted average was calculated for those without such. These two results were then averaged on an unweighted basis.
3. Finally, the weighted average of the 13 major operators and the aggregated result for the other operators was calculated.

---

102 See Bundesnetzagentur (2023b).

Table 18: Comparison of Returns for Equity and Debt: VHCN Returns from the Market Survey and Legacy Returns Estimated by BNetzA

	Equity	Debt
VHCN Return (Results from the market survey)	10.15%	4.95%
Legacy Return (Estimated by the BNetzA)	7.63%	2.52%

Source: Bundesnetzagentur (2023b): Beschluss BK3c-23/079 - Genehmigung von Entgelten für den Zugang zu baulichen Anlagen.

To derive the VHCN risk premium, BNetzA subtracted the legacy WACC values from these average returns derived from the survey. The premium was then calculated by applying the gearing ratio of the legacy WACC:

$$\text{VHCN Risk Premium} = (10.15\% - 7.63\%) \times 49{,}74\% + (4.95\% - 2.52\%) \times 50.26\% = 2.48\%.$$

As a result, the VHCN risk premium amounts to 2.48% in addition to the annually determined WACC for legacy infrastructure.

BNetzA reports that an important advantage of a market survey is its high level of transparency and comprehensibility for the entire market and operators expanding their networks. They considered alternative methods, for example the estimation of a special VHCN beta. However, according to BNetzA there are transparency problems. Based on stock market data only one beta can be determined for a listed operator that provides both copper and fibre products.

Stakeholder Feedback:

Instead of applying the risk premium approach set out in the Gigabit Recommendation, Deutsche Telekom has proposed an alternative methodology for calculating a distinct VHCN WACC that is independent of the legacy WACC. To this end, it presented an expert opinion that defines a VHCN peer group consisting of European and US cable network operators. According to this expert opinion, this group is most comparable to pure VHCN operators in terms of network technology. The expert opinion estimated a market-standard return in the range of 7.55% to 13.77%, which is significantly higher than the VHCN WACC calculated by BNetzA.[103]

Other operators disagreed with Deutsche Telekom's approach, arguing that US cable operators are not an appropriate peer group. They argue that regulated European telecommunications companies that migrate from copper to fibre provide a more suitable benchmark.[104] BNetzA also rejected Deutsche Telekom's proposal, pointing out that US operators are not comparable to European operators subject to regulatory oversight, partly due to differences in accounting standards.[105]

Operators also diverged in their views on the appropriate level of the risk premium. 1&1 supported abolishing the VHCN surcharge entirely, whereas Deutsche Glasfaser argued in favour of a higher surcharge to help meet the fibre rollout targets for 2030 and to align with the return expectations of international investors.[106]

---

103 See Bundesnetzagentur (2023b), p. 27.
104 Ibid p. 23.
105 Interview with BNetzA conducted by WIK in context of this study.
106 Ibid, p.23.

3.2.3 Benchmarking

The Gigabit Recommendation explicitly states that when NRAs cannot reliable quantify the additional risk for VHCN, they may rely on benchmarks based on best practices from comparable Member States. According to BEREC (2025), three Member States estimated a VHCN risk premium based on such a benchmark.

AKOS (Slovenia) has determined the VHCN risk premium using benchmark values from other Member States. In 2021, AKOS applied the median risk premium of ten countries (Belgium, Croatia, Czech Republic, Denmark, Finland, Italy, Luxembourg, Netherlands, Poland, UK).[107] In 2024, AKOS updated the risk premium using the median of values from seven Member States (Belgium, Croatia, Czech Republic, Italia, Denmark, Finland and Poland).[108]

UKE (Poland) calculated its 2021 risk premium as the arithmetic average of five EU Member States (Belgium, Croatia, Czech Republic, Denmark and Italy)[109] and updated this value in 2023 using more recent data.[110]

HAKOM (Croatia) determined the risk premium for FTTH/ FTTB/ FTTDP networks in 2023 and 2024 using a benchmark of seven Member States (Belgium, Czech Republic, Italy, Denmark, Finland, Poland, and Slovenia).[111]

While the Gigabit Recommendation explicitly states that NRAs should ensure that the data inputs to such a benchmark represents similar circumstances,[112] most Member States used an average of all risk premiums available including those from other benchmarks.

3.2.4 Other approaches

In 2019, BIPT (Belgium) estimated a VHCN risk premium. They increased the beta and the cost of debt and worsened the credit rating based on qualitative arguments as shown in the following table.

---

107 European Commission (2021e): Case SI/2021/2326: Determination of the Weighted Average Cost of Capital (WACC) for regulated products and services in Slovenia.

108 European Commission (2024d): Case SI/2024/2488: Weighted Average Cost of Capital (WACC) in Slovenia.

109 European Commission (2021f): Case PL/2021/2314: Determination of the Weighted Average Cost of Capital (WACC) for regulated products and services related to market 3a and 3b (2014) in Poland.

110 European Commission (2024e): Case PL/2023/2441: Market for wholesale local access provided at a fixed location and wholesale central access provided at a fixed location for massmarket products – Re-examination of the Weighted Average Cost of Capital (WACC).

111 European Commission (2023c): Case HR/2023/2459: Weighted Average Cost of Capital in Croatia. European Commission (2024c): Case HR/2024/2539: Weighted Average Cost of Capital in Croatia.

112 European Commission (2024a), No 75.

General parameters	2019		2020	
Corporate tax rate t	29,6%		25,0%	
Risk-free rate of interest Rf	0,8%		0,8%	
Market premium ERP*	6,7%		6,7%	
Specific Parameters	**Copper**	**FttH**	**Cable**	**Mobile**
Gearing g = D/(D+E)	46,0%	46,0%	46,0%	32,0%
Credit Score NC	BBB+	BBB-	BBB-	BB+
Debt premium d	1,4%	2,0%	2,0%	2,3%
Economic Beta βa	0,71	0,90	0,73	0,81
Equivalent Harris-Pringle βa (HP)	0,63	0,80	0,66	0,75
Debt Beta βd	0,14	0,19	0,19	0,20
Equity Beta βe	1,06	1,33	1,06	1,01
Cost of capital				
Cost of debt Cd	2,3%	2,8%	2,8%	3,1%
Cost of equity Ce	8,0%	9,8%	7,9%	7,6%
Nominal WACC 2019 before taxes	**7,12%**	**8,77%**	**7,39%**	**8,35%**
WACC 2020+	**6,86%**	**8,45%**	**7,12%**	**7,98%**

Source: European Commission (2019c): Commission Decision concerning Case BE/2019/2185: Cost of capital for wholesale fixed and mobile call termination, wholesale local access provided at a fixed location, wholesale central access at a fixed location for mass-market products and wholesale high-quality access provided at a fixed location in Belgium.

3.3 VHCN WACC Level and Trends

The following table provides an overview of the VHCN risk premium and the legacy WACC level, as well as the methodology used to determine the risk premium in EU member states, according to BEREC. There is no clear trend in the VHCN risk premium between Member States. The VHCN risk premium in the Czech Republic has risen significantly since 2024, primarily due to the market risk coefficient (an adjustment to the legacy WACC). Conversely, the Italian regulator has significantly reduced the VHCN risk premium since 2021, on the basis that the additional risk of VHCN investments decreases with deployment levels.

Table 19: Overview of VHCN risk premiums imposed by EU NRAs

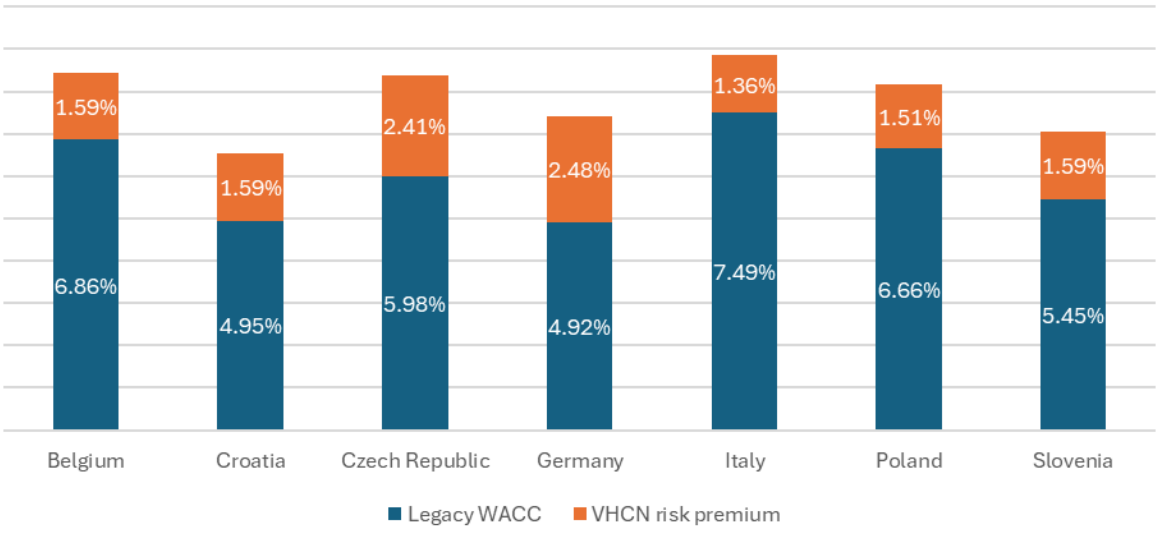
	Year	Nominal WACC on legacy infrastructure	Nominal VHCN risk premium	Methodology VHCN risk premium
Belgium	Since 2019	6.86%	1.59%	Other approach
Czech Republic	2021	7.25%	1.41%	Financial model
	2022	4.84%	0.94%	
	2023	5.01%	0.97%	
	2024	5.72%	2.98%	
	2025	5.98%	2.41%	
Croatia	2021	6.28%	1.97%	Benchmarking
	2022	4.71%	1.55%	
	2025	4.95%	1.59%	
Denmark*	2020	4.56%	2.00%	Other approach
Germany	2025	4.92%	2.48%	Market Survey
Italy	2021	8.64%	3.20%	Financial model
	2022**	7.40%	2.50%	
	2023	7.40%	1.92%	
	2024	7.49%	1.36%	
	2025	7.49%	1.36%	
Luxembourg	2021	7.10%	2.50%	Benchmarking + consideration of national market
	2022	4.44%	2.50%	
Poland	2021	7.56%	2.05%	Benchmarking
	2022	6.78%	2.05%	
	2023	6.78%	1.51%	
	2024	6.66%	1.51%	
	2025	6.66%	1.51%	
Slovenia	2021	4.44%	2.50%	Benchmarking
	2022	4.44%	1.50%	
	2023	5.45%	1.50%	
	2024	5.45%	1.59%	
	2025	5.45%	1.59%	

The table depicts the nominal legacy WACC and VHCN Premium that is reported in the BEREC report in the respective year. * not added nationally as a certain area around the capital has high deployment of fibre. **The BEREC report (2022) still contained the latent values for Italy, as it was adopted after the survey's cut-off date (April 1). We adjusted these values to reflect the correct time series.

Sources: BEREC Reports on Regulatory Accounting 2021-2025.

Figure 9 illustrates the nominal legacy WACC and VHCN risk premium that NRAs applied in 2025. The figure shows significant variations in the absolute level of the VHCN risk premium between the NRAs (1.36% in Italy to 2.48% in Germany), as well as in the relative level compared to the legacy WACC (18% of the legacy WACC in Italy to 50% in Germany).

Figure 9: Legacy WACC and VHCN Risk Premium in Force, 2025.



Source: BEREC (2025b).

3.4 Interim conclusions

Overall, only a limited number of NRAs calculate a VHCN risk premium, and there is no standardised method for calculating such a premium. As a result, considerable differences exist between Member States' VHCN risk premiums, both in absolute terms and relative to the legacy WACC. However, it should be noted that VHCN risk premiums are not necessarily comparable between countries. The additional risk of VHCN investments depends heavily on the national market, i.e. deployment level of VHCN, competition, take-up of VHCN. For this reason, the Gigabit Recommendation emphasises that the additional risks of VHCN projects were likely to differ between different levels of coverage in different geographic areas and that, therefore the NRA should assess the risk with a sufficient level of detail, where possible.[113]

Furthermore, the Brattle Group (2016) noted that additional risk can be also reflected in the modelling of project cash flows. They argued that the WACC should capture only systematic risk, while non-systematic risk should be addressed through cost modelling. For example, multiple demand scenarios could be modelled to account for demand uncertainty.[114] This further complicates cross-country comparisons of VHCN risk premiums, as reliable comparisons also require consideration of the assumptions used in cost modelling, particularly with regard to demand.

113 European Commission (2024a), No. 69.
114 The Brattle Group (2016).

4 Conclusions and future prospect

The WACC Notice has widely standardised the methodology used by national regulatory authorities to calculate the regulated WACC for legacy infrastructure. However, relevant differences remain in the frequency with which WACC calculations are updated. Overall, the data clearly indicates that the WACC values of the Member States have fallen since the introduction of the WACC Notice, with a corresponding reduction in dispersion but to which extent this decrease has resulted from methodological changes is inconclusive. However, it is clear that some methodological changes, such as using a 5-year historical period instead of a 10-year period to estimate the risk-free interest rate during the low interest rate phase, have led to lower estimates. For this reason, Bundesnetzagentur, for example, has decided on a transition path.

Due to macroeconomic factors, the methodology of the WACC Notice has led to a large deviation between risk-free interest rates and current interest rates in the short term: Several NRAs have adjusted the methodology for calculating the risk-free interest rate from 2022 to 2024 and placed greater emphasis on more recent data in order to reflect macroeconomic effects. The WACC Notice explicitly aims to harmonise methodology, as the European Commission argued that methodological inconsistencies can distort investment incentives within the EU's internal market.[115] The European Commission has emphasized that deviations of individual NRAs can be a challenge for the consistency of WACC values in the EU internal market. For example, the BNetzA has set a nominal WACC of 5.06% for 2023/24, while the WACC in Portugal has been set at 4.70% for 2023 and in Slovakia at 4.71% for 2024.[116] In 2025, most NRAs returned to the methodology of the WACC Notice, as the 5-year average better reflects current interest rates. Estimating the WACC requires balancing several regulatory objectives (i.e. consistency, regulatory predictability, the promotion of efficient investment, and transparency). However, these objectives can conflict with each other. When determining the WACC, NRAs balance these objectives, and the Commission has acknowledged that, in certain cases, deviations from the methodology set out in the WACC Notice may be justified by macroeconomic conditions.

With regard to the VHCN risk premium, there is no standardised methodology for calculating a VHCN risk premium. In general, there are large differences between the VHCN risk premiums of the Member States, both in absolute terms and relative to the legacy WACC. Many NRAs use benchmarking due to methodological challenges. They use the median or arithmetic mean of all published risk premiums from EU Member States including other benchmarks.

Different interpretations of regulatory objectives in the WACC Notice and the Gigabit Recommendation can lead to inconsistencies between the legacy WACC and the VHCN risk premium: While the WACC Notice recommends annual recalculation of the legacy WACC, the Gigabit Recommendation recommends setting a stable risk premium per project for a at least 5-years to ensure that investors are adequately compensated for the risk they take. However, this refers to a specific investment project. The recommendation says that if a risk premium must be set for a new project, either the risk premium from an old project can be used, or a new risk premium can be created just for the new project.[117]

The additional risks for VHCN arise in particular from the lack of established infrastructure compared to legacy networks. These risks are expected to decline in the long term. For this reason, in 2024 the Italian regulator has decided on a transition path in which the VHCN risk premium should be reduced to zero

---

115 European Commission (2019a), No 4.
116 BEREC (2024b).
117 European Commission (2024a), No 73.

by 2028.[118] The Spanish regulator has also stated that no VHCN risk premium was calculated for Telefónica, since its fibre business is its only remaining business in Spain.

Furthermore, the WACC estimate according to the CAPM could cover the capital costs of VHCN investments in the long term, given the increasing proportion of VHCN business within the peer group.

---

118 See section 3.2.1. However, in its new draft market analysis (205/25/CONS), Agcom proposes overcoming cost-oriented pricing, meaning that no specific risk premium will be calculated in future.

References

Allen, F., Brealey, R. A., & Myers, S. C. (2011). Principles of corporate finance Global Edition. New York: McGraw-Hill/Irwin.

Agcom (2024a): Annesso 1 del Documento VI della deliber n. 114/24/CONS, Modello di costo BU-LRIC per la calutazone dei prezzi dei serviui di accesso alla rete in rame e alle rete NGA di Telecom Italia, [translated with DeepL].

Agcom (2024b), Allegato A decision 114/24/CONS, , [translated with DeepL].

Agcom (2023): Allegato C alla delibera N. 132/23/CONS, Stima del WACC di TIM per l'anno 2023, [translated with DeepL].

Agcom (2019a): Annesso 2 del Documento V – delibera n. 348/19/CONS [translated with DeepL].

Agcom (2019b): Annesso 6 del Documento V – deliber n.348/19/CONS. Il calcolo del Risk Premium per gli investment in reti NGA, FTTH e FTTC, https://www.agcom.it/provvedimenti/delibera-348-19-cons (last call 20.10.2025), [translated with DeepL].

Arcep (2025): Décision n° 2025-2047 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 28 octobre 2025 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées à compter de l'année 2026, https://www.arcep.fr/uploads/tx_gsavis/25-2047.pdf (last call: 27.11.2025),), [translated with DeepL].

Arcep (2023): Décision n° 2023-2318 de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 24 octobre 2023 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées à compter de l'année 2024, https://www.arcep.fr/uploads/tx_gsavis/23-2318.pdf (last call: 27.11.2025), [translated with DeepL].

Arcep (2020): Décision n° 2020-1163 de de l'Autorité de régulation des communications électroniques, des postes et de la distribution de la presse en date du 22 octobre2020 fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes et mobiles régulées à compter de l'année 2021, https://www.arcep.fr/uploads/tx_gsavis/20-1163.pdf, (last call: 27.11.2025), [translated with DeepL].

BEREC (2025a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2025b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2024a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2024b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2023a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2023b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2022a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2022b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2021a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2021b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2020a): BEREC Report on WACC parameter calculations according to the European Commission's WACC Notice of 6th November 2019.

BEREC (2020b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

BEREC (2019b): BEREC Report Regulatory Accounting in Practice – Chapter 5 The Weighted Average Costs of Capital.

Bundesnetzagentur (2025): Beschluss BK3a-25/009 - Genehmigung von Entgelten für Kollokationsstrom, Entwärmung und weiter Kollokationsleistungen.

Bundesnetzagentur (2024): Beschluss BK3-24-0012 - Genehmigung von Entgelten für Kollokationsstrom, Raumlufttechnik und Mieten.

Bundesnetzagentur (2023a): Beschluss BK3-23-005 – Genehmigung von Entgelten für Kollokationsstrom, Raumlufttechnik und manuelle Stromzählerablesung.

Bundesnetzagentur (2023b): Beschluss BK3c-23/079 - Genehmigung von Entgelten für den Zugang zu baulichen Anlagen.

Bundesnetzagentur (2022): Beschluss BK3-22-004 - Genehmigung von Entgelten für den Zugang zur Teilnehmeranschlussleitung.

Bundesnetzagentur (2021): Beschluss BK2-21-0004 – Genehmigung von Überlassungsentgelten für den lokal virtuell entbündelten Zugang zur Teilnehmeranschlussleitung (KVz-AP).

Bundesnetzagentur (2020): Konsultationsentwurf BK3c-20/013 - Genehmigung von Entgelten für den Zugang zur Teilnehmeranschlussleitung.

CNMC (2025): WACC/DTSA/003/25, [translated with DeepL].

CNMC (2024a): WACC/DTSA/009/23, [translated with DeepL].

CNMC (2024b): WACC/DTSA/002/24, [translated with DeepL].

CNMC (2023): WACC/DTSA/008/22, [translated with DeepL].

CNMC (2020): WACC/DTSA/011/20/ Nueva Metodologìa WACC [translated with DeepL].

CTU (2024): opatření obecné povahy č. OOP/4/10.2024-6 [translated with DeepL].

CTU (2023): opatření obecné povahy č. OOP/4/11.2023-7 [translated with DeepL].

CTU (2022): opatření obecné povahy č. OOP/4/10.2022-20 [translated with DeepL].

CTU (2021): opatření obecné povahy č. OOP/4/10.2021-10 [translated with DeepL].

European Central Bank (2025): HICP - Overall index, Euro area (changing composition), Monthly, https://www.ecb.europa.eu/stats/macroeconomic_and_sectoral/hicp/more/html/data.de.html, [last call 17.09.2025].

European Commission (2025): Case DE/2025/2603: Wholesale local access provided at a fixed location in Germany - Ancillary collocation services and calculation of the weighted average cost of capital.

European Commission (2024a): Commission Recommendation of 6.2.2024 on the regulatory promotion of gigabit connectivity.

European Commission (2024b): Case DE/2024/2530: Market for wholesale local access provided at a fixed location- Ancillary collocation services and the weighted average cost of capital.

European Commission (2024c): Case HR/2024/2539: Weighted Average Cost of Capital in Croatia.

European Commission (2024d): Case SI/2024/2488: Weighted Average Cost of Capital (WACC) in Slovenia.

European Commission (2024e): Case PL/2023/2441: Market for wholesale local access provided at a fixed location and wholesale central access provided at a fixed location for massmarket products – Re-examination of the Weighted Average Cost of Capital (WACC).

European Commission (2024f): Case ES/2024/2487: Weighted Average Cost of Capital (WACC) in Spain.

European Commission (2023a): Case DE/2023/2457: Market for wholesale local access provided at a fixed location - Ancillary collocation services and the weighted average cost of capital.

European Commission (2023b): Case FR/2023/2455; Cost of capital for regulated services in France.

European Commission (2023c): Case HR/2023/2459: Weighted Average Cost of Capital in Croatia.

European Commission (2022): Case ES/2022/2419: Weighted Average Cost of Capital (WACC) in Spain.

European Commission (2021b): Case DE/2021/2339: Wholesale local access provided at a fixed location in Germany- amendments of prices.

European Commission (2021c): Case ES/2021/2309: Cost of capital for regulated services in Spain Article 32(3) of Directive (EU) 2018/1972: No comments, available at: https://circabc.europa.eu/sd/a/5f0d2ba0-43c1-48a0-9704-c4d331e41824/ES-2021-2309%20Adopted_EN.pdf [last call: 08.12.2025].

European Commission (2021d): Case ES/2021/2340: Weighted Average Cost of Capital (WACC) in Spain

European Commission (2021e): Case SI/2021/2326: Determination of the Weighted Average Cost of Capital (WACC) for regulated products and services in Slovenia.

European Commission (2021f): Case PL/2021/2314: Determination of the Weighted Average Cost of Capital (WACC) for regulated products and services related to market 3a and 3b (2014) in Poland.

European Commission (2019a): Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commission's review of national notifications in the EU electronic communications sector.

European Commission (2019b): Commission staff Working Document Accompanying the document Commission Notice on the calculation of the cost of capital for legacy infrastructure in the context of the Commissions' review of national notifications in the EU electronic communications sector.

European Commission (2019c): Commission Decision concerning Case BE/2019/2185: Cost of capital for wholesale fixed and mobile call termination, wholesale local access provided at a fixed location, wholesale central access at a fixed location for mass-market products and wholesale high-quality access provided at a fixed location in Belgium.

European Commission (2018): Directive (EU) 2018/1972 of the European Parliament and of the Council of 11 December 2018 establishing the European Electronic Communications Code.

European Parliament and the Council of the European Union (2018): Directive 2018/1972 establishing the European Electronic Communications Code, Article 74 (1).

Eurostat (2025): EMU convergence criterion series – monthly data, Online data code: irt_lt_mcby_m (yearly average of monthly data).

The Brattle Group (2020): The WACC for KPN and VodafoneZiggo.

The Brattle Group (2016): Review of approaches to estimate a reasonable rate of return for investments in telecoms network in regulatory proceedings and options for EU harmonization – A study prepared for the European Commission DG Communications Networks, Content & Technology.

Appendix

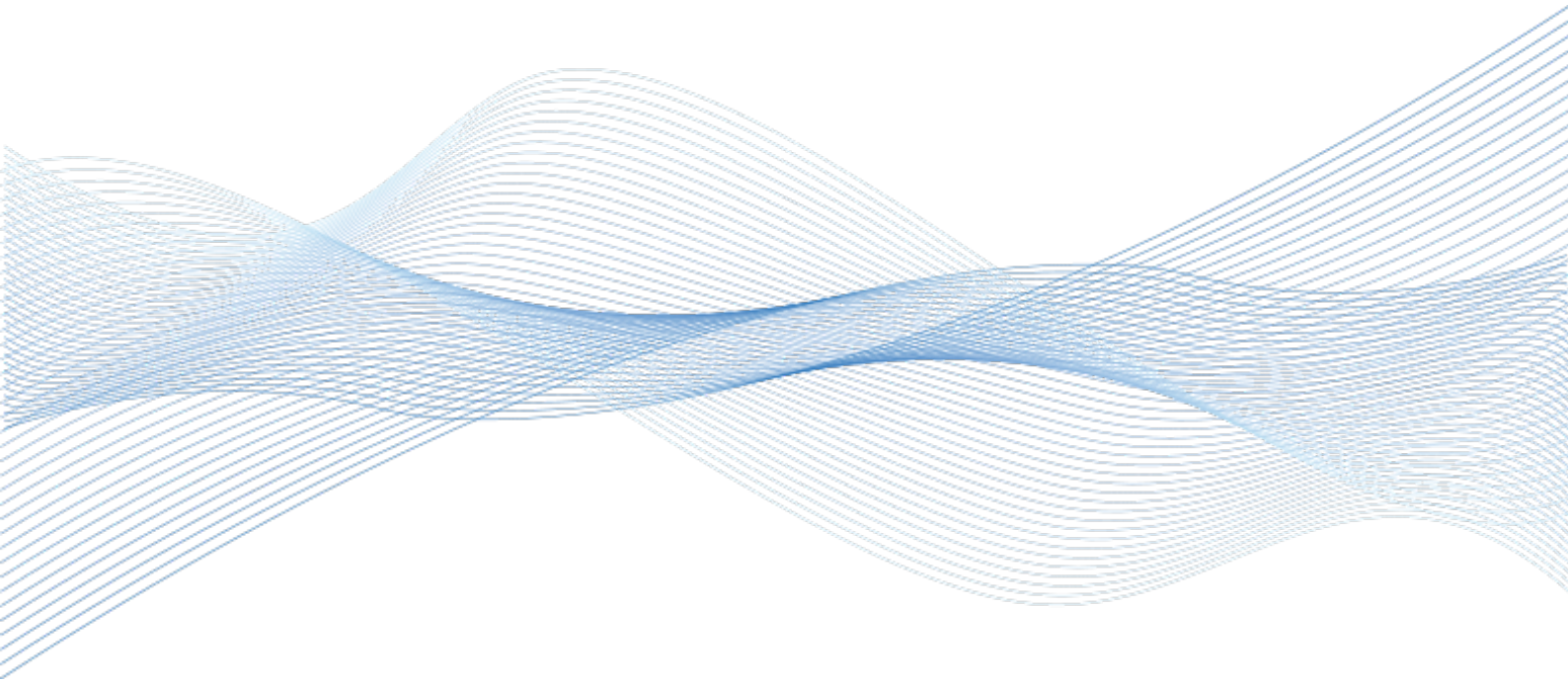
Table 20: Deviations from the WACC Notice by Member States

Member State	Year	Deviation	EC Comment
Germany	2024	**Risk-free rate:** The BNetzA applies a weighted average of long-term German government bond yields, using 2/3 weight for a five-year period and 1/3 for a recent three-month period, to better reflect the recent rise and stabilization of interest rates.	The Commission urges BNetzA to calculate its WACC in full alignment with the guidelines from the WACC Notice
	2023	**Risk-free rate:** The BNetzA uses the average of long-term German government bond yields over a five-year period (1 April 2018 to 31 March 2023) and long-term German government bond yields over a four-month period (1 April to 30 June 2023).	The Commission reiterates that NRAs should follow the Notice to promote regulatory consistency in the internal market, but may adopt justified alternative approaches if aligned with the Code's objectives and national macroeconomic conditions.
	2022	**Risk-free rate:** BNetzA still has not fully aligned its WACC methodology with regard to the estimation of the risk-free rate where it uses a mix of 10-year and 5-year averages. BNetzA will gradually align with the Notice on the estimation of the risk-free rate.	No comments.
	2021	**Risk-free rate:** BNetzA takes the average yield of German long-term government bonds over the last ten years because of the 34% decrease in WACC a 5-year average would imply. To reconcile with WACC Notice, BNetzA commits to a gradual transition toward full compliance by 2024.	The Commission urges BNetzA to adopt a methodology for the risk-free rate aligned with German economic conditions that keeps the WACC below certain other Member States. It also encourages earlier implementation of the WACC Notice methodology, if economic conditions permit.
Spain	2024	**Risk-free rate:** CNMC applies weighted average of Spanish government bond yields over both a 5-year and a recent 6-month period (1 April to 30 September 2024) to reflect current economic conditions. The respective weights are ¾ and ¼.	EC notes that the deviation is smaller than in previous calculations but emphasizes the importance of regulatory consistency across the EU and encourages CNMC to fully implement the WACC Notice methodology in the future.

Member State	Year	Deviation	EC Comment
	2023	**Risk-free rate:** CNMC calculates the RFR using a weighted average, where 2/3 of the weight is given to the average yield of long-term Spanish government bonds over a five-year period from April 2018 to March 2023, and 1/3 of the weight to the average yield of the same bonds over a more recent five-month period from April 2023 to September 2023.	While the Commission stresses that national regulators should follow the Notice to ensure consistent regulation across the internal market, it also acknowledges that justified alternative approaches aligned with the Code's objectives and national conditions may be acceptable. Overall, the Commission welcomes the CNMC's steps toward closer compliance with the Notice's methodology.
	2022	**Risk-free rate:** CNMC relies on a weighted average of the 5-year (April 2017 – March 2022) averaging and the 6-month (April 2022 – September 2022) averaging, rather than the five-year average advocated in the Notice. If the Notice had been fully followed, the nominal pre-tax WACC would be 4.34%. The nominal pre-tax WACC for legacy infrastructure is set at 5.20%.	The Commission affirms that while NRAs must consider the WACC Notice and promote regulatory consistency, they may adopt alternative approaches aligned with the Code and macroeconomic conditions if properly justified.
	2021	**Risk-free rate**: CNMC has temporarily added a 1 percentage point adjustment to the risk-free rate due to quantitative easing. This adjustment is justified by current economic conditions and is permitted under the Notice's transitional provisions but will not be applied in future WACC calculations.	No comments.
Finland	2024	TRAFICOM only updated the risk-free rate, leaving all other parameters unchanged.	The Commission requests TRAFICOM to set a fully updated WACC value as soon as possible in order to best reflect market conditions.
Poland	2024	**Equity beta:** UKE did not apply the two-step method of unlevering the equity beta and relies solely on the average equity beta of the peer group.	The Commission emphasises the importance of this step for methodological consistency across EU regulators. It therefore invites UKE to apply the full transformation in future calculations to fully align with the WACC Notice.
	2023	**Gearing ratio:** UKE diverged from the WACC Notice by transforming the gearing value of 42.42%—which should directly represent the share of debt—into a lower value of 29.79%.	The Commission urges UKE to align with the standard methodology by using the original gearing values for calculating copper WACC, ensuring consistency across EU regulators.

Member State	Year	Deviation	EC Comment
Slovenia	2024	**Risk-free rate:** AKOS proposed to calculate the risk-free rate as the arithmetic average of: • average yield of long-term Slovenian government bonds (6) over 5 years (from 1 April 2018 to 31 March 2023); and • average yield of the same bonds over 6 months (from 1 April 2023 to 31 September 2023)	The Commission would like to recall that NRAs to apply the methodology outlined in its Notice to ensure consistent regulation and support the internal market. However, it acknowledges that NRAs may use a different approach if it is well-justified, aligned with the objectives of the European Code, and reflects national economic conditions. The Commission therefore encourages AKOS to fully apply the Notice's methodology in its future WACC assessments.
Italy	2024	**Risk-free rate:** Agcom calculated the value of the WACC at 7.49% for the period 2024-2028. Agcom calculated this value based on a risk-free rate of 2.71%. This value is derived from the real yield (i.e. inflation adjusted yield) of long-term government bonds and swaps plus expected inflation (2%).	The Commission noted that current economic forecasts do not clearly justify such a deviation. Further, in an instable macroeconomic environment setting the WACC on annual basis could help NRAs to react to rapid changes impacting the value of the WACC. The Commission recalled its previous comments and invited Agcom to review its approach and emphasised that harmonization of the WACC methodology
	2023	**Risk-free rate:** Agcom proposed to use a weighted average that includes both the 5-year rate and a more recent 8-month rate of 3.60%.	The Commission urges Agcom to provide a solid rationale for its decision, particularly given the legacy network's significant role in the Italian market.
France	2023	**Risk-free rate:** ARCEP calculates the arithmetic average of the average yield of long-term French government bonds over 5 years (from 1 April 2018 to 31 March 2023) and average yield of the same bonds over 5 months (from 1 April 2023 to 31 August 2023).	The Commission emphasizes that NRAs should follow the Notice to ensure regulatory consistency across the internal market but acknowledges that justified alternative approaches aligned with the Code and national macroeconomic conditions may also be acceptable.
Malta	2019	MCA estimates the WACC based on the CAPM Model. It estimates low and high values for most parameters and calculates a WACC for each scenario. The proposed final WACC value is the arithmetic average of the WACC values of the corresponding scenarios.	Although using averages for determining the WACC parameters is a standard approach, averaging WACC values is not an approach taken by other NRAs or in line with the WACC Notice. The Commission encourages MCA to follow the methodology outlined in the WACC Notice for future revisions.

Source: WIK based on EC Decisions on WACC Notifications.



WIK Wissenschaftliches Institut für
Infrastruktur und Kommunikationsdienste GmbH
Rhöndorfer Str. 68
53604 Bad Honnef, Germany
www.wik.org

ISSN 2750-5448 (Online)