



# COST OF EQUITY INDEXATION USING RFR

## A REPORT FOR ENA

13 MARCH 2019

# Structure of this report

1. Summary of Ofgem's proposals from its December 2018 sector consultation and recommendation

*In sections 2 to 4, we consider key design aspects of RfR indexation:*

2. Appropriate tenor of RfR index
3. Inflation adjustment to derive a CPIH real RfR
4. Averaging period

*In final sections, we consider :*

5. Impact on RIIO-2 allowances, credit metrics, and network charges
6. Overall merits of ex ante vs cost of equity/RfR indexation

# In RIIO-2, Ofgem proposes to index the cost of equity allowance to changes in the risk-free rate (RfR)

## Ofgem proposes to index the cost of equity to the risk-free rate only

- In SEC CON, Ofgem identifies indexation of RfR as cost of equity indexation mechanism, as follows:

$$\Delta kE = \Delta RfR * (1-\beta)$$

where RfR is a risk-free rate index in real CPIH terms

- Ofgem identifies the following practical challenges:
  - Deriving a CPIH real risk-free rate, given the lack of CPIH or CPI-linked gov't bond information
  - Choosing the appropriate tenor for RfR
  - Estimating expected CPIH-RPI wedge
  - Choosing appropriate averaging period and cut-off to measure the risk-free rate (i.e. one-year vs one-month average, 31 March vs 31 October cut-off date)

## Ofgem's proposal for setting RfR indexation

- Ofgem identifies two approaches for estimating a real RfR measure in CPIH terms:
  - add expected RPI-CPI wedge to RPI-linked gilts
  - subtract expected CPIH inflation from nominal gilt yields
- Ofgem proposes to rely on the former option using the following steps:
  - 20-year real zero coupon gilt rate published by Bank of England
  - Plus forecast difference between RPI and CPI from OBR
  - Assuming that RPI-CPIH wedge is equal to RPI-CPI wedge
- Ofgem also proposes to calculate the October month average of the RfR index to set the risk-free rate ahead of each financial year

# Conclusions: We recommend use of 20 yr nominal gilt deflated using CPI forecast, based on 12 mth average prior to charging year. Provides for more stable and objective measure of RfR

## We propose long-term (eg 20 yr) nominal gilts, as more stable and objective measure, and common practice

- In practice, investors use long run gilts, e.g.
  - Survey of investor practice supports use of 10-30 yrs
  - DMS, to calculate RfR, draws on government bonds with a mean maturity of twenty years
- Stability criterion supports use of long-term *nominal* gilts:
  - Longer term nominal gilt yields less volatile than short term gilts
  - Also, RfR measured over a 12-months averaging period rather than Ofgem's 1 month provides more stable measure
- Objectivity criterion supports nominal gilts
  - For LT real gilts, excess demand/ "structural imbalance" from obligations on pension funds depresses yields
    - LT real gilts do not provide objective measure of RfR
- UK and European regulatory precedent have principally used 10Y-20Y nominal
- In terms of levels:
  - In recent history, longer term gilt yields have been higher than shorter term gilt rates since financial crisis, and term spreads are greater for nominal relative to real gilts

## We consider HMT, OBR or BoE CPI target to derive real RfR

- Real CPIH can be derived from nominal gilts drawing on CPI forecast:
  - We have identified three potential forecasts: a) HMT Consensus 5Y; ii) OBR 5Y forecast; iii) BoE CPI target. HMT has advantage of drawing on market wide survey; BoE CPI target provides longer-term forecast
  - Forecast error could be trued-up along with other aspects of price control (e.g. inflation is trued-up)
- Use of nominal gilt less CPI forecast consistent with Ofgem's proposed methodology to calculate cost of debt, based on nominal iBoxx deflated using OBR's CPI forecast

## RfR indexation could negatively affect ratios

- Ofgem needs to ensure sufficient head-room in financial ratios in setting control to protect companies against financeability problems, where RfR declines
  - Decline in RfR reduces cost of equity, and notional AICR
  - Assuming Ofgem's proposed cost of equity, and assuming notional gearing, notional debt costs, and 25 per cent ILD, we have calculated that AICR falls by ca 0.10 if RfR declines by 150bps
- Case for indexation needs to be made: does increased credit risk outweigh RfR forecast error?

2 | Appropriate tenor of RfR index

# There are different theoretical approaches to determining tenor of CAPM components: investor holding period or asset lives. In practice, investors use 10 to 30 year gilts

## Under CAPM framework, the tenor of RfR could be set consistent with the investor holding period

- Evidence on average investor holding period tends to support short tenors:
  - Roberge et al (2016) find that the average holding period in the NYSE was 8.3 months as of December 2016
  - CFA Institute UK that suggests that the average holding period is between 1-2 years
  - Helm and Tindall (2009) found that most utilities are held by private equity or infrastructure funds, where the former have an average holding period of 4-5 years and the latter tend to be even more long-term.
- UKRN 2018 report suggests estimating the different components of the CAPM (and WACC) “using a methodology that is consistent with the chosen horizon”, and assume 10 years

## UK energy networks have typical asset lives of around 20 years, which implies a 20-year investment horizon

- Typical remaining (regulatory) asset life is 22.5 years, based on the 45-year RAV depreciation
- This suggests that UK 20Y gilt yields should be used to match the 20-year investment horizon of energy networks

## Financial practitioners use 10-30 year tenors

- Survey evidence shows that majority of corporations and financial analysts use yields of long-term government bonds 10 to 30 years
- DMS calculates the Equity Risk Premium (ERP) drawing on government bonds with a mean maturity of twenty years, as well as short-term Treasury bills

Sources: Roberge M., Flaherty J., Almeida R., Boyd A. (July 2017), *Lengthening the Investment Time Horizon*, p.2

Kay Review of UK Equity Markets and Long-Term Decision Making, Interim Report, Feb 2012; CFA UK response to the Kay Review of UK Equity Markets and Long-Term Decision Making – Call for Evidence.

Helm and Tindall (November 2009), *The evolution of infrastructure and utility ownership and implications*, Oxford Review of Economic Policy, Vol 25, p. 411–434;

Wright, Burns, Mason, and Pickford (2018), *Estimating the cost of capital for implementation of price controls by UK Regulators*, An update of Mason, Miles and Wright (2003), p.7.

Sources: Ofgem (December 2018), *RIIO-2 Sector Specific Methodology Annex: Finance*, p.18

Bruner, et al. (2015), *Best practices in estimating the cost of capital: An update*  
DMS (February 2018), *Credit Suisse Global Investment Returns Yearbook 2018*, p. 210.

# Longer term gilt yields higher than shorter term yields since financial crisis. Nominal gilts term spreads have been greater than real gilts

## Long-term gilt yields higher since 2008, with term spread greater for nominal gilt than real gilt

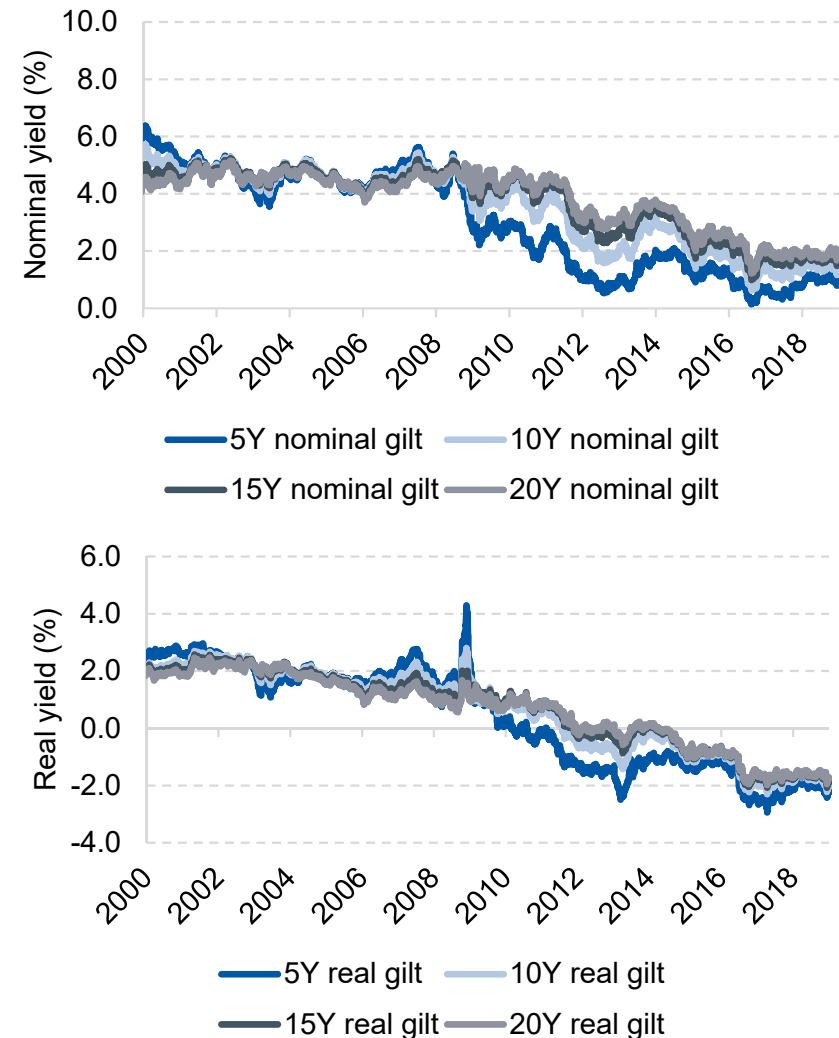
- UK nominal gilts with longer maturity have higher yields since around 2008 financial crisis, reflecting an upward sloping nominal yield curve
- The term spread of UK real gilts have been lower relative to nominal gilt, and the difference reflects the term structure of breakeven inflation
- Over RIIO-1 to date (2014-2018), average 20Y nominal gilt yields are ca 60 bps higher than 10Y nominal gilt yields, and ca 20 bps higher than 15Y nominal gilt yields

## UK Gilt term spread over RIIO-1 to date (2014-2018)

	20Y - 5Y	20Y - 10Y	20Y - 15Y
Nominal Gilts	1.25%	0.62%	0.23%
Real Gilts	0.57%	0.18%	0.05%

Source: NERA analysis

## UK nominal and real gilt yields with different maturities



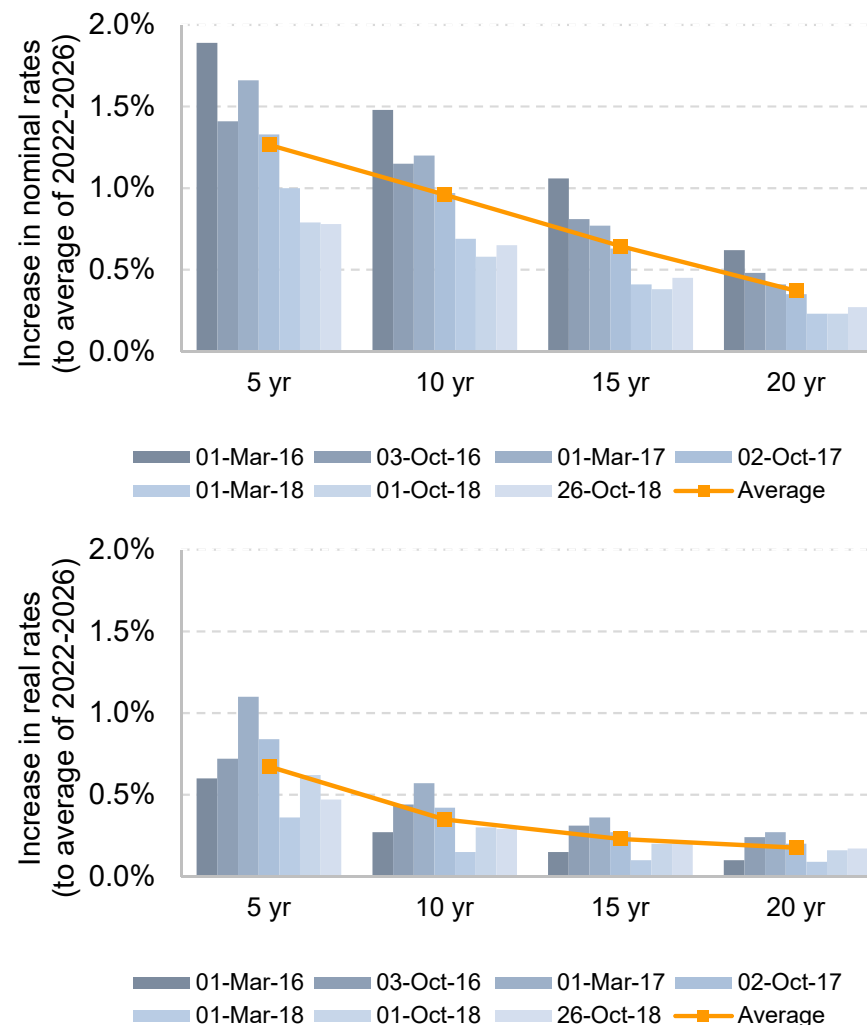
Source: Bank of England Yield Curves

# Longer-term gilts have higher (less negative) yields, but short-term gilts expected to increase to a greater degree, reflecting expected near term increase in yields

## The implied increase in RfR depends on choice of nominal/real and tenor

- Charts show Ofgem's estimated increases in risk-free rates based on 2016-2018 data
- Implied increase in RfR based on *nominal gilts* are on average higher than *real gilts* by 45 bps
  - i.e. nominal yield curves were steeper than real yield curves over the period 2016-2018
- Implied increase in RfR based on *shorter term gilts* are on average higher than based on *longer term gilts* (e.g. implied increase 20 bps higher for 10Y than 20Y real gilts, and 60 bps for nominal gilts)
  - i.e. shorter end of yield curves are steeper than longer end of yield curves

## Implied increase in nominal and real gilt yields with different maturities



Source: Ofgem (December 2018), RIIO-2 Sector Specific Methodology Annex: Finance, Table 5.



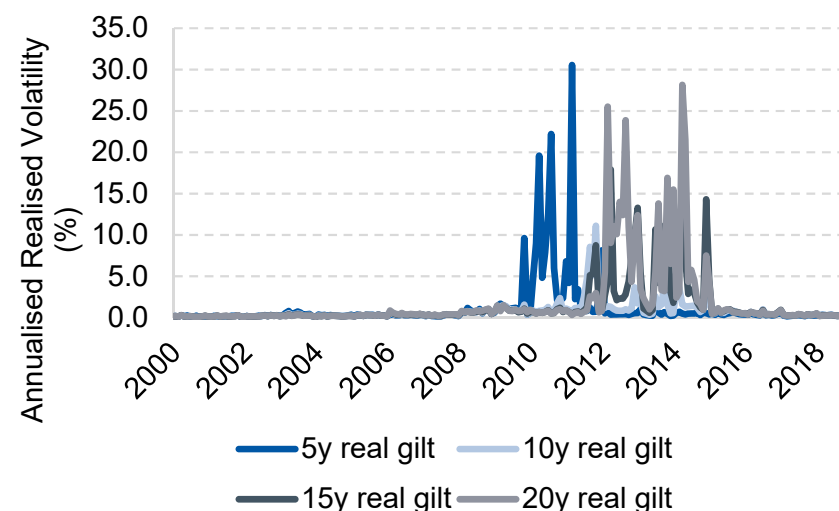
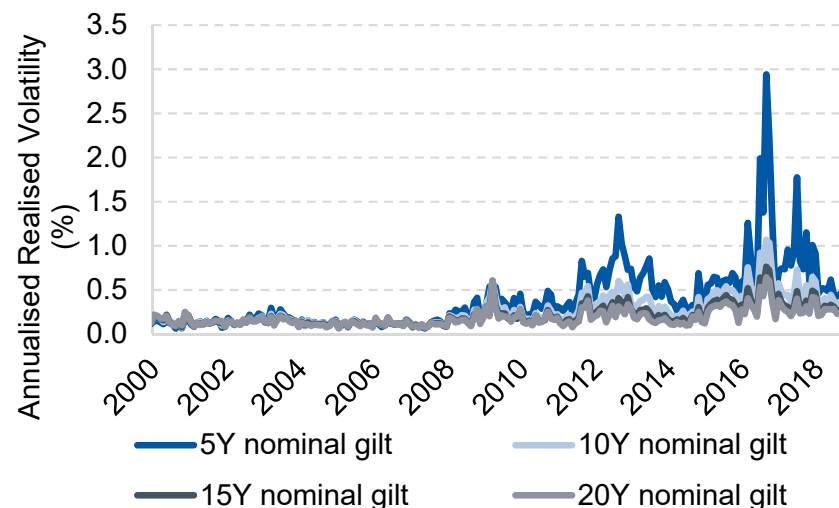
# Longer term *nominal* gilt yields provide more stable and objective measure of RfR. Real gilts affected by supply-demand imbalance which depresses yields

## 20Y nominal gilt yields have been more stable than other maturities

- 20Y nominal gilt yields have been more stable than yields of shorter-term maturities
  - volatility has increased for all maturities compared to long-term average

## 20Y real gilt yields have been as volatile as the shorter term real gilt yields

- Real gilt yields showed greater volatility over period 2010-15, but volatility has since declined
  - At longer end, excess demand or “structural imbalance” from pension funds; *“yields are likely to remain depressed relative to economic fundamentals for the foreseeable future”*
- Conclusion: 20Y real gilt less suitable measure given greater volatility, and less objective measure of RfR given excess demand



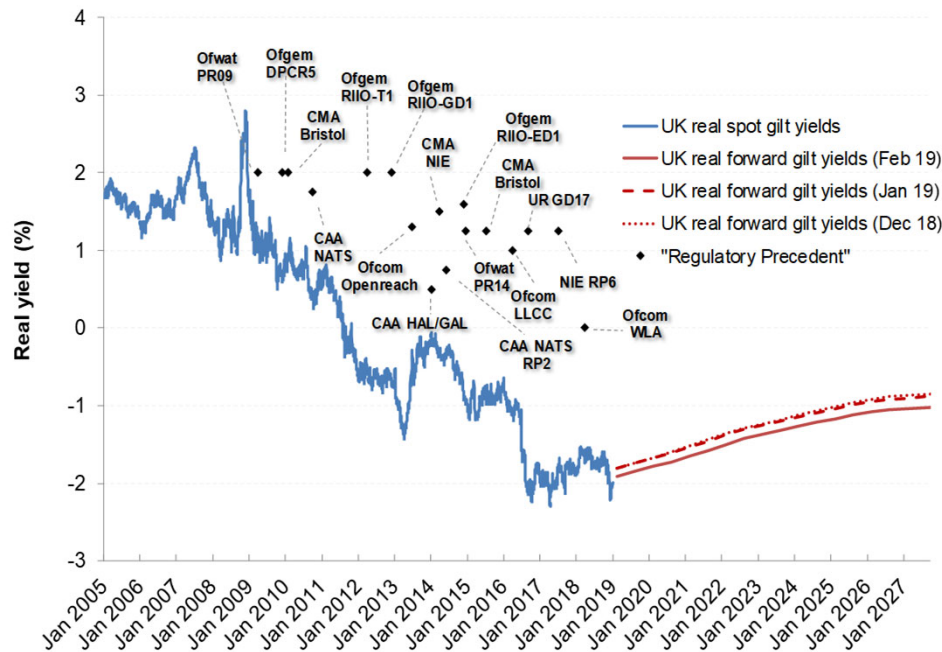
Source: See appendix A.

Note: Realised yield volatility is calculated as the standard deviation of daily log return of gilt yields, annualised using the square root of number of trading days

Historically, UK regulators have set RfR in cost of equity based on long run averages/ precedent, e.g. ca 1.5-2%. In recent price controls, Ofwat/CAA draw on 10/20 yr nominal and real to determine RfR

In most cases, UK regulators have not drawn on UK gilt evidence directly in setting RfR for cost of equity

Ofwat (PR19) proposes nominal 10/20 gilts; CAA used 10/15 yr nominal and real



- In two recent cases, UK regulators have drawn on spot market gilts:
  - Ofwat PR19:** average of the nominal yields of 10-year and 20-year gilts as of March 2017, deflated assuming 3.0 per cent RPI, or 2.0 per cent CPIH, + uplift of 50-60 bps based on forward rates
  - CAA's Q6:** based on current yields of 10- and 15-year index-linked gilts (lower bound) and current nominal yields of 10- and 15-year gilts deflated using a 2.8 per cent RPI inflation assumption (upper bound)
    - CAA calculates an uplift to spot estimates of around 70 bps based on forward rates of government bond yields

Sources: Ofwat (December 2017) *Delivering Water 2020: Our methodology for the 2019 price review* Appendix 12: *Aligning risk and return*, p.67; CAA (October 2013), *Estimating the cost of capital: a technical appendix to the CAA's Final Proposal for economic regulation of Heathrow and Gatwick after April 2014*

# European regulators have used 10-year nominal gilts for indexation, and floors to ensure stability of RfR index

## European energy regulators have used 10Y nominal yields to set ex ante RfR in determining cost of equity

Precedent	Year	Sector	Tenor	ILD/nominal
Switzerland	2017	ET	10-year	Nominal
Finland	2016	ET	10-year	Nominal
Italy	2015	ET	10-year	Nominal
Belgium	2015	ET	10-year	Nominal

- European regulators may have used 10-year nominal because of lack of liquidity in sovereign debt markets for longer yields

Sources: For Switzerland, see: [https://www.admin.ch/ch/d/gg/pc/documents/2248/Gutachten\\_%20IFBC\\_120725.pdf](https://www.admin.ch/ch/d/gg/pc/documents/2248/Gutachten_%20IFBC_120725.pdf) (in German only), p. 40.; for Finland, see: EMVI (2015): Regulation methods decision [https://www.energiavirasto.fi/documents/101091/0/Appendix\\_2\\_Regulation+methods+draft\\_DSO\\_2016-2023.pdf/3fb120b9-97ba-4226-a7a8-6f0b3cb39f15](https://www.energiavirasto.fi/documents/101091/0/Appendix_2_Regulation+methods+draft_DSO_2016-2023.pdf/3fb120b9-97ba-4226-a7a8-6f0b3cb39f15); for Belgium, see: CREG (2014): ARRETE (Z)141218-CDC-1110/7 fixant la "méthodologie tarifaire pour le réseau de transport de gaz naturel, l'installation de stockage de gaz naturel et l'installation de GNL" (available in French only); for Italy, see ARERA (December 2011), Deliberazione 29 dicembre 2011 - ARG/elt 199/11 – Disposizioni dell'Autorità per l'energia elettrica e il gas per l'erogazione dei servizi di trasmissione, distribuzione e misura dell'energia elettrica per il periodo di regolazione 2012-2015 e disposizioni in materia di condizioni economiche per l'erogazione del servizio di connessione.

## European RfR indexation mechanisms include “safety mechanisms” to ensure RfR does not decline below defined floor

- **Switzerland:** the BFE sets nominal RfR as average monthly return on 10Y Swiss gov't bonds for the preceding calendar year, but *subject to a lower bound of 2.5 per cent in nominal terms*
- **Italy:** the AEEGSI sets real risk-free rate based on 1-y average of 10Y gov't bond yield, *subject to a lower bound of 0.5 per cent in real terms*
- **Finland:** the EMVI sets the RfR annually based on the greater of i) 6-month average of 10Y Finnish gov't bonds in the preceding year, and ii) *10-y average yield on 10Y Finnish gov't bonds in previous ten years*
- **Belgium:** the CREG calculates the nominal RfR annually as average of the daily 10Y Belgian gov't bond yields. *If nominal yield becomes less or equal to zero, then the network operators can re-negotiate*

## Overall, our review supports use of longer term (eg 20 year) nominal gilt for indexation of RfR

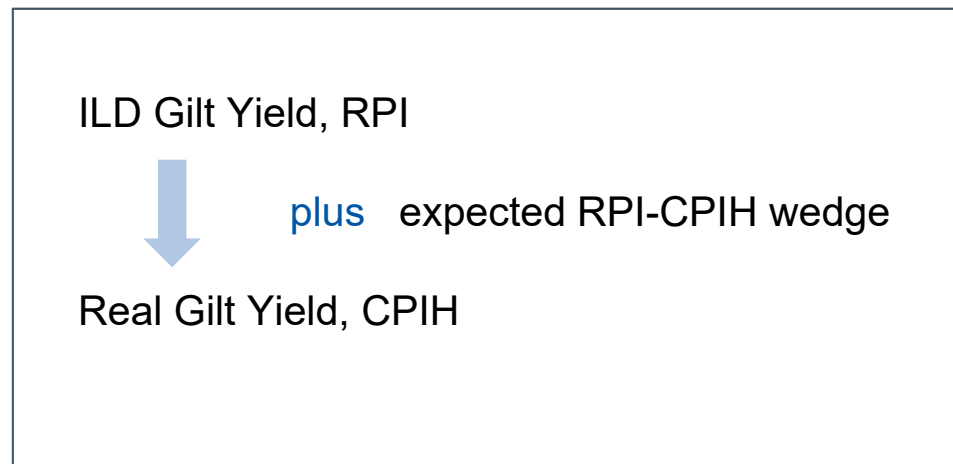
- Financial practitioners use long run gilts
  - Survey of investor practice supports use of 10-30 year gilts
- Stability criterion supports use of long-term nominal gilts:
  - Longer term nominal gilt yields less volatile than short term gilts
- Objectivity criterion supports use of nominal gilts
  - Excess demand from pension funds suppresses real yields
  - Real gilts do not provide objective measure of RfR
- UK and European regulators have principally used 10Y-20Y nominal
- In terms of levels:
  - Longer term gilt yields have been higher than shorter term gilt rates since financial crisis, and term spreads are greater for nominal relative to real gilts

3 | Inflation adjustment to derive a CPIH  
real RfR

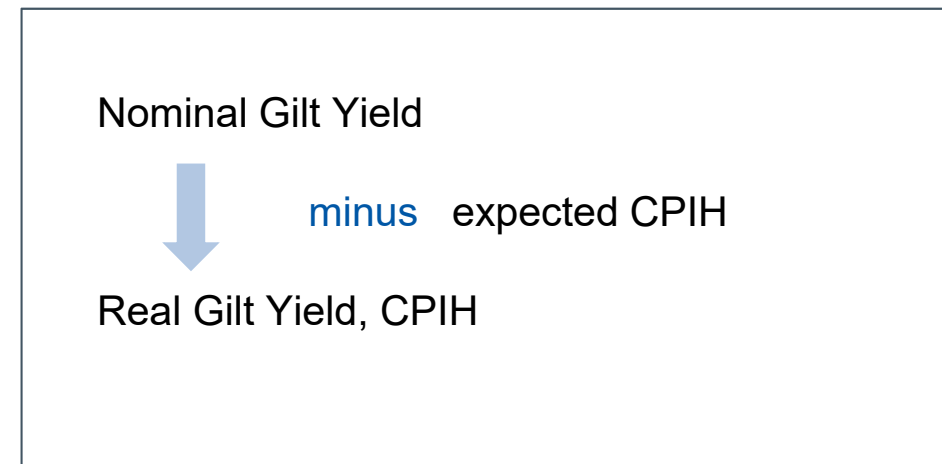
# We consider optimal approach to derive a real CPIH RfR from available inflation measures

- Ofgem outlines following methods to derive real CPIH RfR

## Ofgem's proposed method for RIIO-2



## Alternative method

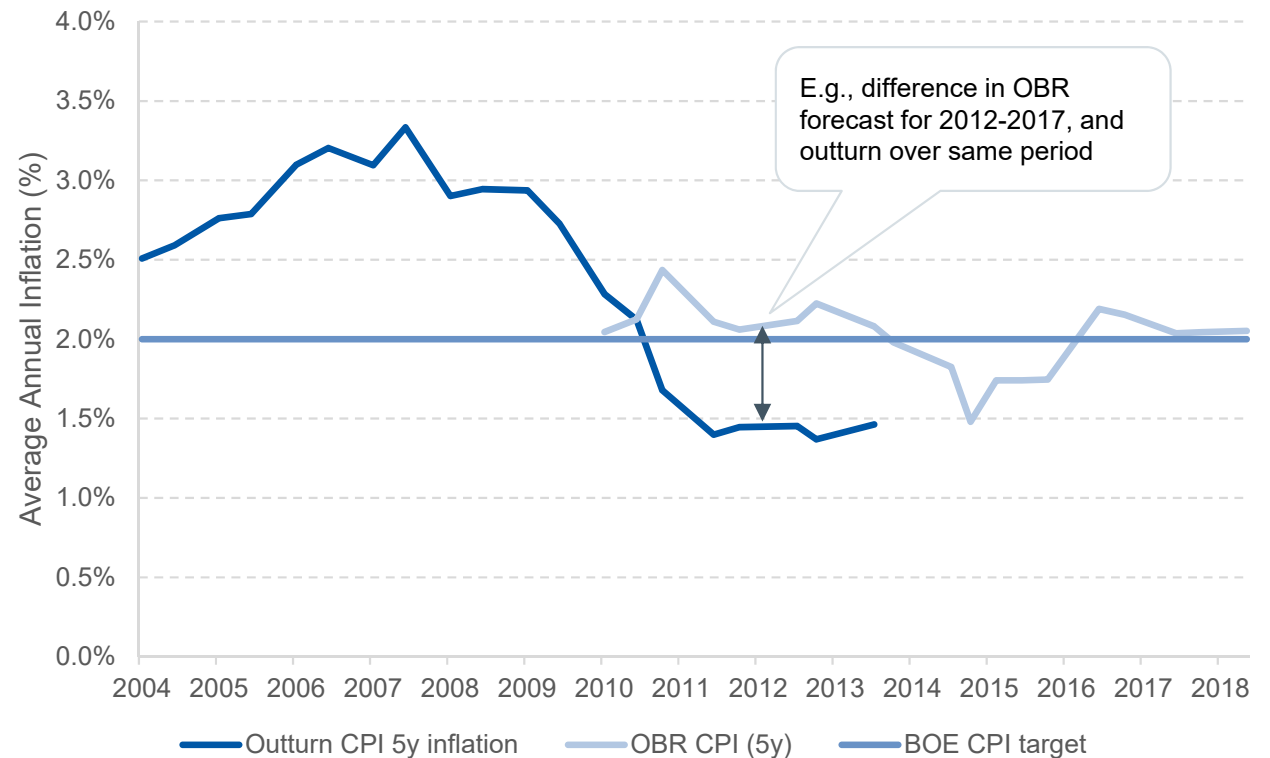


- Ofgem's proposed method effectively incorporates 20-year "breakeven" inflation measure, which is difference between the yields of 20-year nominal gilt and inflation-linked/ real gilt
  - 20Y breakeven inflation measure may be a poor measure of inflation, particularly at long end given concerns about excess demand from pension funds for real gilts, as per previous slides
- Use of nominal yield provides greater stability and objectivity, which implies deduction of expected CPI (i.e. the "alternative approach") to derive real CPIH gilt
  - We consider potential CPI forecasts to use in our preferred method (Ofgem's "alternative method")

# OBR's forecasted CPI has been above outturn inflation for short period available (since 2010)

- We compare OBR's 5-year CPI forecast against outturn CPI for corresponding period
- OBR forecasts only available from December 2010
- OBR's 5 yr forecast inflation has been above the outturn inflation since 2010
- Figure also shows that outturn inflation (5 yr average) has been above BoE target over period to 2010, but below post-2010

**OBR's 5-year forecast CPI inflation vs outturn**



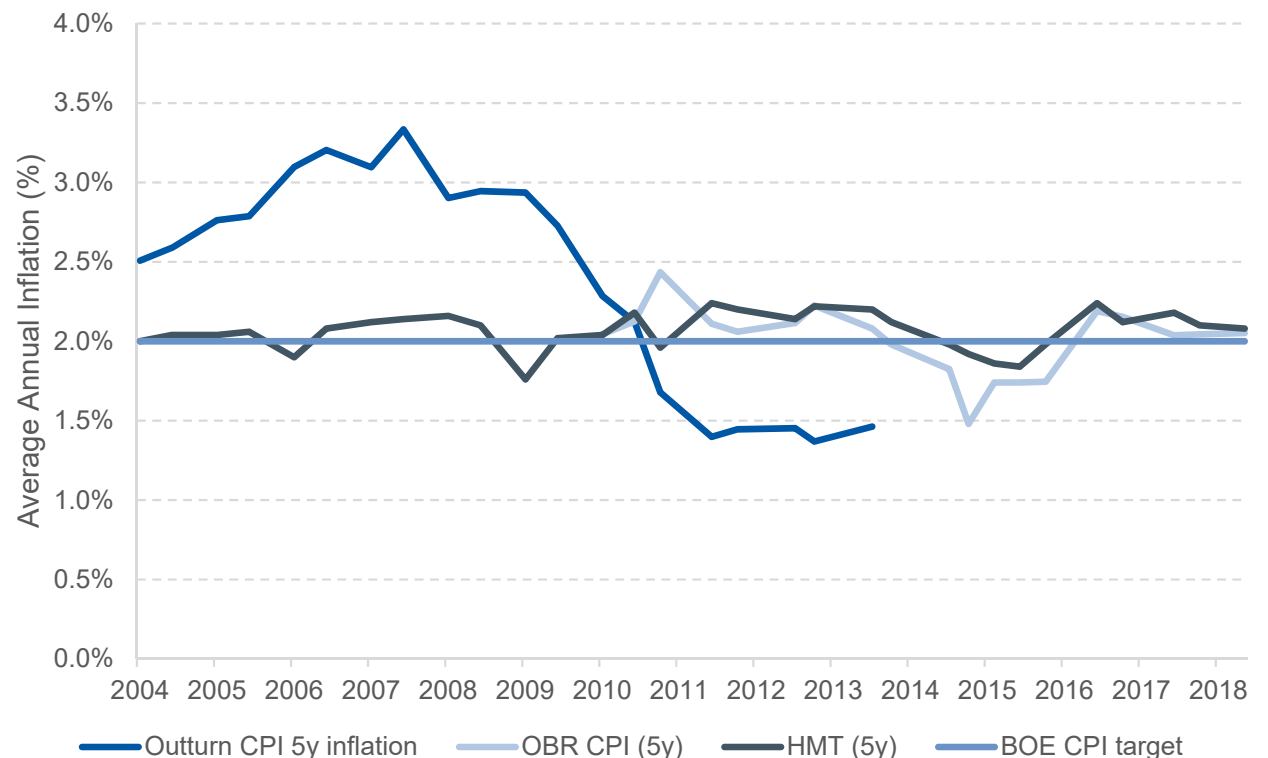
Source: NERA analysis based on Bank of England and OBR data

Notes: Outturn inflation measures 5 year average for comparison with OBR, and therefore extends only to end 2013 (which shows inflation for period 2013-18)

# Either HMT or OBR could provide objective 5-year forecast; HMT has advantage of being consensus as opposed to single forecast. BoE inflation target of 2 per cent provides longer term view

- We compare HMT Consensus 5-year forecasts with OBR forecast and outturn CPI
- HMT based on c. 20 forecasts, inc. investment banks and macro research companies
  - HMT published quarterly; OBR published bi-annually
- HMT forecast understated outturn CPI pre-2010, and overstates post-2010
- HMT and OBR forecasts similar
- BoE CPI target provides long-term view of CPI
- Alternative (or complementary approach) is to true-up CPI forecast for outturn, e.g. along the lines of true-up for RPI inflation at RIIIO-1
  - Likewise, assumed nominal yield could also be trued-up for outturn

**HMT Consensus 5-year forecast vs OBR 5-year and outturn CPI**



Source: NERA analysis based on Bank of England; OBR data; and HMT Consensus Forecasts

Notes: Outturn inflation measures 5 year average for comparison with OBR, and therefore extends only to end 2013 (which shows inflation for period 2013-18)



## 4 | Averaging Period

# Ofgem identifies a one-month average of returns as optimal estimation period as captures most recent market evidence

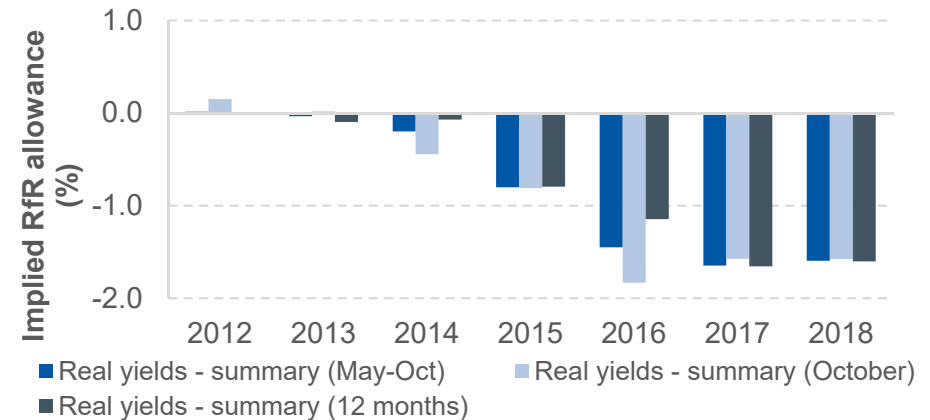
## 1-month averaging period may not reflect interest rate over price control

- The use of a 1-month averaging period ignores the interest rates variations over the year. As a result, the risk-free rate allowance over RIIO-2 would be representative of only 5 months (out of a 5-year regulatory period)
  - Difference between 1 month and 12 month average could be material
    - Eg RfR allowance for 2016 based on October average (Ofgem) 70 bps lower than if calculated on 12-month averaging period

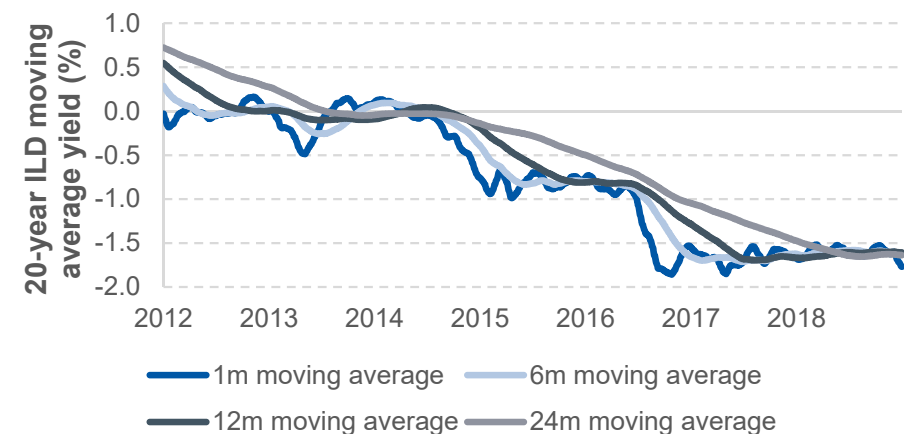
## 12-months average provides more stable estimates

- Use of 12-months average provides more stable estimates (see bottom right-hand side figure)
- European regulatory precedents support the use of an averaging period of at least 6 months

## Differences in averaging period (12mth vs 1 mth) can have material impact on RfR estimate



## Longer (eg 12 mth) averages provide more stable estimates of the RfR



**We propose RfR measured over a 12-months averaging period, as more stable measure**

5 | Impact on RIIO-2 allowances,  
financeability and volatility in charges

# In expectations, RIIO-2 proposed cost of equity allowance would be around 17 bps higher using nominal gilts less OBR CPI than under Ofgem's approach

## Comparison of NERA vs Ofgem indexation mechanisms

- We have compared the implied cost of equity allowance under our preferred methodology (using nominal yields deflated by 2 per cent CPI assumption) and under Ofgem's proposal (RPI-linked gilt yields, plus an assumed RPI-CPI wedge of 1 per cent)
  - Analysis shows ca. 17 bps higher allowance over period in expectations based on today's market values
  - Order of magnitude and direction uncertain, e.g. our proposed approach could provide a lower cost of equity allowance

## Impact of proposed risk-free rate indexation mechanisms on RIIO-2 cost of capital allowance

End year	2022	2023	2024	2025	2026	Average
Gearing (%)	60%	60%	60%	60%	60%	60%
Risk-free Rate (NERA approach)	-0.07%	-0.02%	0.04%	0.09%	0.14%	0.04%
Risk-free Rate (Ofgem's approach)	-0.60%	-0.57%	-0.53%	-0.50%	-0.47%	-0.53%
Equity Beta	0.70	0.70	0.70	0.70	0.70	0.70
TMR (Real, CPI)	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Cost of Equity (Nera approach)	4.53%	4.54%	4.56%	4.58%	4.59%	4.56%
Cost of Equity (Ofgem's approach)	4.37%	4.38%	4.39%	4.40%	4.41%	4.39%
<b>Δ NERA - Ofgem</b>	<b>0.16%</b>	<b>0.16%</b>	<b>0.17%</b>	<b>0.17%</b>	<b>0.18%</b>	<b>0.17%</b>

Source: NERA analysis based on Bank of England and OBR data.

Notes: Risk-free rate under both "NERA approach" and "Ofgem's approach" are based on the spot rates as of 26 October 2018 presented in Ofgem's SECCON Finance Annex (Table 4), adjusted annually for the implied increase in rates presented in Table 5 of SECCON. Table 5 shows expected increase in rates between 26 October 2018 and 30 September 2023 (midpoint of RIIO-2); we have linearly interpolated these numbers to calculate a constant annual increase in rates from 26 October 2018 to the end of RIIO-2.

Risk-free rate under "NERA approach" is based on the spot rate and the implied annual increase for the 20-year nominal gilt, deflated using 2 per cent CPI assumption.

Risk-free rate under "Ofgem approach" is based on the spot rate and the implied annual increase for the 20-year real gilt, plus an assumed RPI-CPI wedge of 1 per cent.

# Ofgem needs to ensure sufficient head-room in financial ratios in setting control to protect companies against financeability problems, where RfR declines

## Companies' credit ratings could fall a notch from decline in RfR

- We calculate indicative AICR (key Moody's metric) based on Ofgem's proposed cost of equity, and assuming notional gearing, notional debt costs, and 25 per cent ILD
- Decline in RfR reduces cost of equity and notional AICR. We calculate notional AICR declines by ca:
  - 0.07 if 100 bps reduction in RfR
  - 0.10 if 150 bps
  - 0.20 if 300 bps (e g potentially full notch)

	Sub-factor weight	Aaa	Aa	A	Baa	Ba
Factor 4: Leverage and Coverage (40%)						
Adjusted Interest Coverage Ratio: <sup>8</sup> (FFO + Interest Expense - Non-Cash Accretion <sup>9</sup> - Capital Charges) / (Interest Expense - Non-Cash Accretion)	10%	≥ 5.5x	3.5 - 5.5x	2 - 3.5x	1.4 - 2x	1.1 - 1.4x
OR		OR	OR	OR	OR	OR
FFO Interest Coverage: (FFO + Interest Expense) / Interest Expense		≥ 7.5x	5.5 - 7.5x	4 - 5.5x	2.8 - 4x	1.8 - 2.8x
Net Debt / RAB OR Net Debt / Fixed Assets <sup>10</sup>	12.5%	< 30%	30 - 45%	45 - 60%	60 - 75%	75 - 90%
FFO / Net Debt <sup>11</sup>	12.5%	≥ 35%	26 - 35%	18 - 26%	11 - 18%	5 - 11%
RCF / Net Debt <sup>10</sup>	5%	≥ 30%	21 - 30%	14 - 21%	7 - 14%	1 - 7%
Factor 5: Structural Considerations and Sources of Rating Uplift From Creditor Protection						
Number of Notches Provided by Debt Structural Features (0-3 notches)						

## The bills impact of a change in RfR relatively modest: 100bps increase in RfR increases bills by up to 1 per cent

- We have calculated the impact of a risk-free rate increase on allowed returns, and therefore network charges
- Keeping fixed the share of allowed revenues not linked to WACC, we measure the sensitivity of allowed return to the risk-free rate scenario (which impacts the return element of allowed returns, calculated as WACC\*RAB)
- The impact of RfR changes on network charges is relatively modest
  - a 100bps increase in RfR, increases network charges by around 0.6 per cent for GDNs/DNOs, and 1 per cent for TOs
  - Difference between sectors reflects variation in cost structure

## 6 | Relative merits of ex-ante RfR vs indexation

# Is RfR indexation superior to setting ex-ante RfR (including uplift)? Ofgem has identified potential costs to consumers, but has not considered increased credit risk

- Ofgem should consider four questions for deciding equity indexation vs ex-ante allowance:
  1. *Is the cost of equity largely outside of management control?*
    - Since the cost of equity is a function of general market parameters, namely total market return and risk-free rate, and the regulatory regime, which is determined by Ofgem, the management has little ability to affect its cost of equity
  2. *Does the cost of equity form a material proportion of the company's total costs?*
    - Our analysis shows that the equity return element comprises ca 10-15 per cent of bills
  3. *Can cost of equity indexation be applied in an objective manner?*
    - We have set out objective approach to determining RfR indexation, based on nominal yield less HMT/OBR forecast
  4. *Does the forecast error in setting ex-ante RfR outweigh increase in risk/credit metrics from use of indexation?*
- Answer to last question less clear:
  - Ofgem has stated that cost of forecast error could be around £240 m p.a. where RfR is 200 bps higher than expected
    - Forward curves may not predict outturn yields well, but no evidence of systematic bias, and therefore *expected* cost to consumer is zero
    - Indeed, ex-ante approach (RfR + uplift) provides same expected RfR as indexation (see next slide)
  - Indexation increases risk around credit metrics within control period. For example, 200 bps decline in RfR could result in half-to-one notch downgrade on AICR, 20 bps on cost of debt (or ca £120 m based on Ofgem's assumed RAB of £93bn), and yet far greater potential cost for companies facing financial distress/ sub-IG
- UK regulators have set ex-ante RfR including up-lift for expected increase in gilt yields (where RfR in CAPM based on short-run market evidence)

Source: Sources: Ofgem (December 2018), RIIO-2 Sector Specific Methodology Annex: Finance, p.21, Table 6.

In expectations/theory, RIIO-GD2 cost of capital allowance should be same whether RfR is fixed ex-ante (assuming market based uplift), or indexed over time. But as seen, indexation imposes risk on credit metrics

#### Comparison of indexation vs ex ante mechanisms

- We have compared the results of indexation vs ex-ante + uplift, *based on Ofgem's proposed methodology*
- RfR allowance under the ex ante methodology is calculated as the average forecasted yield over the regulatory period
- Indexation also based on expected changes to gilt yields as per forward curve
  - Both approaches yield same return in expectations
  - Revenues delayed under indexation
  - Increase in credit metric risk given uncertainty in outturn RfR

#### Impact of proposed risk-free rate indexation mechanism on RIIO-2 cost of capital allowance

	2022	2023	2024	2025	2026	Average
Gearing (%)	65%	65%	65%	65%	65%	65%
Risk-free Rate (ex ante)	-0.51%	-0.51%	-0.51%	-0.51%	-0.51%	-0.51%
Risk-free Rate (indexation)	-0.60%	-0.57%	-0.53%	-0.50%	-0.47%	-0.53%
Equity Beta	0.70	0.70	0.70	0.70	0.70	0.70
TMR	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Cost of Debt	1.93%	1.76%	1.67%	1.62%	1.57%	1.71%
Cost of Equity (ex ante)	4.40%	4.40%	4.40%	4.40%	4.40%	4.40%
Cost of Equity (with indexation)	4.37%	4.38%	4.39%	4.40%	4.41%	4.39%
<b>Δ Indexation - ex ante</b>	<b>0.03%</b>	<b>0.02%</b>	<b>0.01%</b>	<b>0.00%</b>	<b>-0.01%</b>	<b>0.01%</b>
Vanilla WACC (ex ante)	2.79%	2.68%	2.62%	2.59%	2.56%	2.65%
WACC (with indexation)	2.78%	2.68%	2.62%	2.59%	2.56%	2.65%
<b>Δ with RIIO-1 methodology</b>	<b>0.01%</b>	<b>0.01%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0.00%</b>

Source: NERA analysis

Notes: Risk-free rate under the "ex ante" methodology is calculated as the sum of the spot yield of 20-year index-linked gilt, adjusted for the expected increase with respect to the midpoint of RIIO-2, as presented in Table 4 and 5 of Ofgem's SECCON. Risk-free rate under the "indexation" methodology is based on the spot rate and the implied annual increase for the 20-year real gilt.



Appendix

Long-term real gilt yields provide less  
objective measure of RfR

# Appendix: Real gilt yields provide less objective measure of RfR than nominal gilts

## Market participants and UK regulators recognise long-term real gilts may not provide objective RfR measure

- “UK private sector defined benefit schemes already own an estimated 80% of the long-dated index-linked gilt market and **potential demand is almost five times the size of the market. Supply is expected to remain high, and is likely to increase the market by around a third over the next five years, but this will not come close to matching demand. Pension funds waiting for index-linked gilt yields to rise to “attractive” levels are fighting a losing battle. The imbalance is structural and yields are likely to remain depressed relative to economic fundamentals for the foreseeable future.**”
  - Source: Schroders (June 2016), *Pension funds and index-linked gilts – A supply/demand mis-match made in hell*
- CMA has drawn previous conclusions at airport reviews, e.g.
- “The main challenge that we faced when using this [real gilt] data was the segmentation in the gilt market caused by **regulatory and accounting rules which encourage pension funds to purchase long-maturity government debt. A number of observers believe that strong demand from this one specific type of investor has pushed down the yields of long-dated ILGs (as shown in Figure 2) to the point where the returns that were on offer were attractive only to other pension funds. This is said to make the long-dated ILG yields an unreliable indicator of the risk-free rate for a typical equity investor and, in particular, for the marginal shareholder whose cost of capital we were trying to measure when estimating the rate of return that Stansted needs to earn.**”
  - Source: CMA (November 2008) *Stansted Airport Ltd Q5 price control review, Appendix L – Cost of Capital, para 51*

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