NERA
ECONOMIC CONSULTING

REVIEW OF OFGEM'S DD ADDITIONAL COSTS OF BORROWING, AND DEFLATING NOMINAL IBOXX

2 SEPTEMBER 2020

Insight in Economics™

Contents

Summary: We respond to Ofgem's estimation of Additional Costs of Borrowing (including halo), as well as its approach to deflating nominal iBoxx

- **Section 1:** Consider the evidence for halo effect drawing on: i) a comparison of companies' bonds with the Utilities iBoxx index; and, ii) using a duration adjusted measure of spread to address Ofgem's concerns with our earlier analysis
  - *Making these changes, we find support for a negative halo or new issue premium (NIP) of 9 bps, consistent with our earlier studies examining network bond spreads with respect to the iBoxx A/BBB index*
- **Section 2:** Provide further evidence on additional costs associated with issuing index-linked debt
  - *We find evidence from recent CPI issues that support indexation costs of 15 bps*
- ***Section 3:*** Review Ofgem's use of RFPR and group cash data and we update our cost-of-carry estimates
  - *We find that Ofgem's use of RFPR and Group cash holdings unreliable. We update our approach to estimate cash holding cost of 11-23 bps*
- ***Section 4:*** Conclusions on additional costs of borrowing
  - *We summarise additional costs of borrowing: 47- 59 bps compared to Ofgem's DD of 17 bps*
- **Section 5:** Consider the different measures for deflating nominal iBoxx
  - *We find that breakeven inflation based on gilts unreliable. Alternatives are to use OBR forecast or a measure of outturn inflation to derive a real cost of debt allowance from nominal iBoxx*

Conclusions: We estimate Additional Cost of Borrowing of 53 bps, with a range of 47 to 59 bps, compared to Ofgem's DD of 17 bps

	Ofgem	NERA (September 2019)	NERA (August 2020)	Comment
Transaction Costs	6 bps	7 bps	7 bps	Ofgem draws on company data but excludes apparent outlier NERAs analysis includes all companies within sample
Liquidity/RCF cost	3 - 5.5 bps	4.5 bps	4.5 bps	Both Ofgem and NERA draw on companies' assumptions on RCF size and cost
Cost of carry	1.5 – 11 bps	16 – 45 bps	11 – 23 bps	Ofgem assumptions on cash at OpCo and Group unreliable NERA approach assumes 12-24 mth pre-financing, half met by RCF
New Issue Premium (NIP)	0	13 bps	9 bps	Ofgem's analysis does not draw on precise measures of spread and therefore estimate of halo/NIP is unreliable NERAs spreads calculation duration matched and support range 4 -14bps
CPI indexation costs	0	12 bps	15 bps	Ofgem assumes that companies do not require compensation for basis risk NERA's analysis based on recent cost of CPI issuance and CPI swaps
Total	**17 bps**	**53-82 bps (68bps)**	**47 – 59 (53bps)**	Ofgem: mid-point of its range

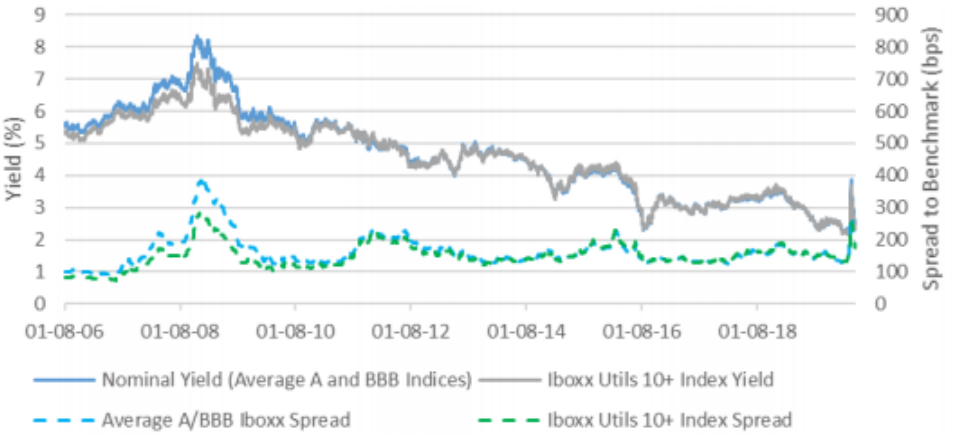
Sources:
Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, p. 14
NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA, p. 18

1 Updated evidence on the halo effect and new issue premium

In its Draft Determination, Ofgem estimated halo effect based on a comparison of relative credit spreads. Ofgem estimated outperformance of 11 bps and 4 bps for iBoxx A/BBB and iBoxx Utilities respectively

- In its SSMD and DD, Ofgem estimated the halo effect as the difference between the relevant iBoxx benchmark indices' spread and companies' bond spreads, i.e.:
  - *Halo effect = iBoxx index spread – company's bond spread*
- At SSMD, Ofgem concluded that the halo effect was 7bps when using iBoxx A/BBB and when controlling for rating at issue, i.e. comparing network BBB rated bond spreads to the iBoxx BBB index spread.[1] Updating for DD, Ofgem found a halo effect of 11 bps[2]
- At DD, Ofgem also compared company spreads relative to iBoxx Utilities, and identified a halo of only 4 bps
  - Ofgem noted that network bond spreads compared to iBoxx Utilities are lower at times of financial distress (relative to iBoxx A/BBB). It concluded that this is not surprising as regulated networks (which have a greater weighting in iBoxx Utilities) may be better insulated from shocks than wider market
- Ofgem concludes that iBoxx Utilities provides a closer match to expected network debt costs, and proposed to use this as the benchmark index with no adjustment (i.e. no reduction for a supposed halo effect)

At DD, Ofgem estimated a halo effect of 11 and 4 bps for iBoxx A/BBB and iBoxx Utilities respectively



Source: Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, p. 15

Sources:
1. Ofgem (24th May 2019) RIIO-2 Sector Specific Methodology Decision – Finance, p.20, para 2.72.
2. Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, p. 14

In our previous report, we derived a "negative halo" or new issue premium (NIP) of 13bps using a more robust measure of credit spread based on BoE yield curve. Ofgem has raised concerns with our own approach at DD

- In our previous report for ENA[1], we noted Ofgem's spreads do not control for tenor precisely. The spread for the iBoxx index and company bond is calculated relative to a specific benchmark gilt
  - there may not be a benchmark gilt that exactly matches the tenor of the bond issue
  - notably, there tend to be fewer long-dated benchmark gilts available to match the long tenor of the iBoxx bonds and companies' bonds
- As a result, Ofgem's supposed halo also reflects the tenor mismatch between the network bonds/iBoxx index and the relevant benchmark gilt
- We calculated credit spreads that match more precisely the tenor of the iBoxx/ company bond by drawing on the Bank of England nominal yield curve
  - Yield curve fits a smoothed function over observed benchmark gilt yields, allows us to match tenor precisely, and provides a more reliable measure of spread
- At SSMD, we estimated a negative "halo effect" of -13bps (compared to Ofgem's 7bps).[1] The negative halo is explained by networks facing a new issue premium (NIP), i.e.
  - company's yield at issue in the primary higher than secondary traded yields, as represented by the iBoxx index. NIP required to incentivise participation in primary market
- In its DD, Ofgem has retained the approach it employed at SSMD. Ofgem disagrees with our proposed calculation of spread claiming:[2]
  - BoE nominal spot curve is a zero coupon curve whereas the bonds issues by companies are not zero coupon, and therefore there is a duration mismatch in our calculation of the relative spread
  - The convention in the market is to price a corporate bond over the nearest benchmark gilt, not over the exact tenor of an interpolated curve

Sources: 1 NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA;
2. Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, p. 179

We have re-calculated spreads based on duration matching. We find a negative halo of between 4 and 14 bps (i.e. average 9 bps) depending on iBoxx benchmark

- To respond to Ofgem, we have modified our spread calculation to duration match, where duration is the weighted average of the times that cash-flows are received (see next slide for more detailed explanation)
- We calculate the duration of the network bond and iBoxx index, and for each identify the relevant BoE zero coupon bond to calculate our relative spread
- We calculate a negative halo of -4 bps based iBoxx A/BBB spread less company bond spread, and -14 bps when we use iBoxx Utilities.
  - By contrast, Ofgem calculates a positive halo of +11 and +4 respectively.
  - However, as we set out, Ofgem's approach does not control for tenor correctly, and therefore is not a reliable measure of network bonds' performance
  - As with Ofgem, we find that companies perform less well against the iBoxx Utilities index, although our analysis supports a NIP of 14 bps (whereas Ofgem propose no NIP)
- Our sample includes all outstanding energy network bonds, including those of short tenor as we account for tenor precisely through duration matching. We exclude the most recent five bonds issued during COVID-19 crisis given high levels of market volatility

We find negative halo of between 4 and 14 bps using iBoxx A/BBB and iBoxx Utilities spreads respectively

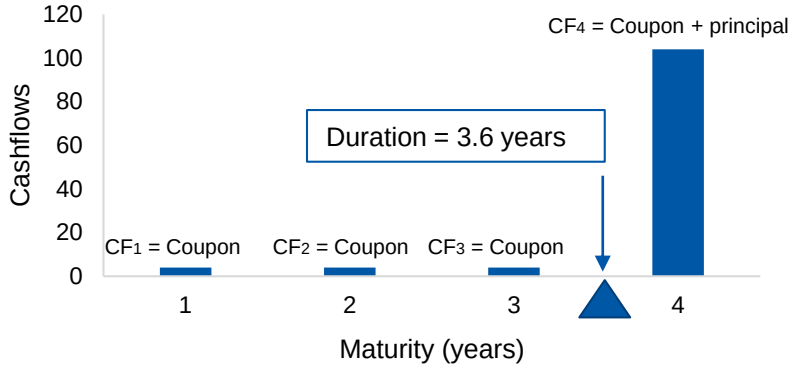
	Halo effect (bps)	
Index	**Ofgem**	**NERA[1]**
iBoxx A/BBB	+11	-4 (-2)
iBoxx Utilities	+4	-14 (-10)

Notes: 1. Estimates in parentheses include five bonds issued during COVID-19 period (post- March 2020). However, given market volatility and the substantive variation in spreads relative to benchmark spread, we consider it reasonable to exclude these recent issues.

Our approach to measuring spreads is consistent with other empirical studies examining NIP

An explanation of duration matching

- The duration of a bond is a measure of the number of years it takes to recoup the cost of the bond
- It is the weighted average of the time until the bond cash-flows (coupon and principal) are received. To calculate spreads, we use the standard Macaulay duration as follows:
  - $Macaulay\ Duration = \sum_{t=0}^{n} \frac{PV(CF_t) \times t}{Bond\ Price}$
- For example, a bond with 2 year tenor and an annual coupon of 20%, will have a duration of 1.78 years



- Zero coupon bonds have a duration equal to their tenor, as the investor must wait to maturity to receive the value of the bond. The larger the intervening coupons, the shorter the duration relative to the tenor

Our estimate of NIP and approach consistent with empirical studies

- NIP arises from the need for corporate bond issuers to offer a yield premium to incentivise participation in the market for new bonds (Adams and Smith (2019))
- Our average NIP estimate of 9bps is in line with recent studies:
  - Maitra and Salt (2018) estimates an average NIP of 14bps for European corporate bond since 2009
  - Rischen and Theissen (2018) estimates the NIP to be 10bps, measured as the under-pricing in the primary issues of European corporate bonds
- Ofgem has stated that its approach follows the "convention in the market to price a corporate bond over the nearest benchmark gilt". However:
  - An efficient market would adjust bond prices to reflect any mis-match in tenor of the bond to the benchmark gilt, and effectively match to the interpolated yield curve
  - empirical studies that seek to measure NIP (or halo) do not use Ofgem's simple "market convention" – studies use variety of approaches including our approach to duration matching[1,2,3]

Source: 1. Maitra and Salt (May 2018) New issuance premium in European corporate bonds, Lombard Odier Asset Management; 2. Rischen and Theissen (2018), Underpricing in the euro area corporate bond market: New evidence from post-crisis regulation and quantitative easing, CFR Working Paper, No. 18-03, University of Cologne, Centre for Financial Research; 3. Adams and Smith (2019), "Fixed Income Analysis", John Wiley & Sons, p. 839, Leake (2003), Credit spreads on sterling corporate bonds and the term structure of UK interest rates,

Conclusion: We find evidence of a NIP of between 4 and 14 bps (average 9bps) consistent with other empirical studies

- In our earlier report for ENA, comparing the relative spreads of network bonds to iBoxx A/BBB index, we found a negative halo of 13 bps – consistent with the existence of a NIP for primary issuances relative to benchmark secondary yields[1]
- In its DD, Ofgem criticised our approach stating that there is duration mismatch in comparing network coupon paying bonds with BoE zero coupon yield curve (although the same problem applies equally to Ofgem's approach). Matching for duration, we calculate a negative halo or an NIP of between 4 and 14 bps when spread is measured using iBoxx A/BBB and iBoxx Utilities respectively
- As we have set out in previous studies for ENA[1], a negative halo is not surprising: it reflects the cost of incentivising investors in the primary market relative to the secondary traded market yields. Indeed, our estimate of NIP is in line with other recent studies of the costs of issuing corporate bonds
  - The implication is that Ofgem should include an NIP of 9 bps (mid-point estimate) in its additional cost of borrowing

Sources:
1. NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA; 2.

2 Inflation linked debt costs

Ofgem fails to recognise CPI switching costs in its additional costs of borrowing, and yet assumes 30 per cent CPI-ILD in financeability assessment

Ofgem rejects evidence on CPI indexation associated costs

- In our earlier report for ENA, we estimated 12bps premium to issue CPI ILD and to mitigate basis risk of existing RPI ILD, based on a swap cost of 50 bps (range 15bp to 80bp) and 25% of ILD[1]
- In its DD, Ofgem argues:[2]
  - impact of the inflation wedge means if liability remains in RPI (rather than swapped to CPIH), this improves cash flow metrics in near term
  - premium for CPI swaps compared to RPI swaps is limited to 'low single digit basis points', which, when applied to 25% of the portfolio, may indicate 1-2bps
  - CPI indexation associated costs should not be remunerated in the cost of debt allowance, as not required for notional company

Ofgem assumes CPIH ILD at 30% without corresponding cost allowance

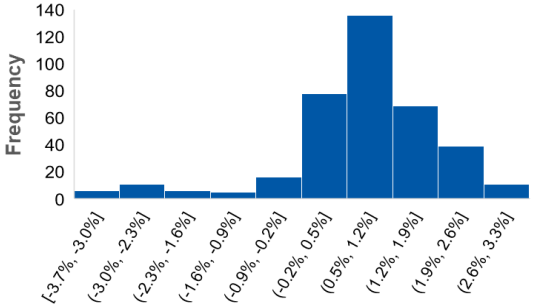
- In the DD, Ofgem assumes 30% of the networks' debt CPIH linked, an increase from SSMD working assumption of 25%[3]
  - based on BP submissions, which indicate that 37% of externally raised GD&T company debt (pre-derivatives) is inflation linked as at FYE 2019
  - closer to the assumption of 33% used by Ofwat

Sources:

1. *NERA range: i) 80 bps based on evidence from the RPI ILD market which shows illiquidity premium increased to around 80bps during the financial crisis (when market liquidity declined),indicative of a premium for an illiquid CPI(H) ILD market; ii) 15 bps based on evidence of the relatively higher bid-ask spreads for CPI products. Source: NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA, section 3*
2. *Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, Annex 2, pp, 183-184*
3. *Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, Annex 2, p. 99*

Ofgem ignores basis risk in asserting companies do not need to be compensated for switch. Increase in wedge leads to materially weaker metrics

- The existing framework for indexing the RAV with outturn RPI provides a natural hedge for companies financed with RPI I/L debt, where both allowed return and actual cost of debt grow with outturn RPI inflation, leaving equity returns unchanged. Under CPI indexation, this natural link will be broken
  - Even if investors are compensated for expected difference between RPI and CPI inflation ex-ante, ex-post variation in the outturn RPI-CPI wedge exposes companies to additional risks
- To take an example:
  - Assume CPI = 2% and RPI inflation 2.8%, and real allowed return (CPI deflated) set to reflect 80bps wedge
  - In actuality, CPI = 2 % but RPI increases to 3.8%, i.e. *outturn wedge* is 180bps
    - Historical distribution of RPI-CPI wedge shows 180bps wedge lies comfortably within distribution
  - Allowed revenues provide compensation for RPI ILD of 2.8%, lower than outturn RPI ILD accretion of 3.8%
- The additional cost of RPI ILD from higher outturn RPI – CPI wedge unfunded



Source: ONS data of outturn RPI and CPI 1989-2020

- We illustrate impact of basis risk on Moody's AICR:
  - AICR is calculated as (*FFO + Cash Interest - Regulatory Depreciation)* / *Cash Interest.* This can be re-written as *Real Allowed Rate of Return* / *Cash Cost of Debt.*
  - Assuming RPI-CPI wedge increases by 100bps above Ofgem ex-ante allowance increases ILD portion of "cash" cost of debt by the same amount, reducing AICR by around 0.1 (equivalent to half a notch)

A 100bps increase in RPI-CPI wedge reduces AICR by 0.1 (equivalent to half a notch downgrade)

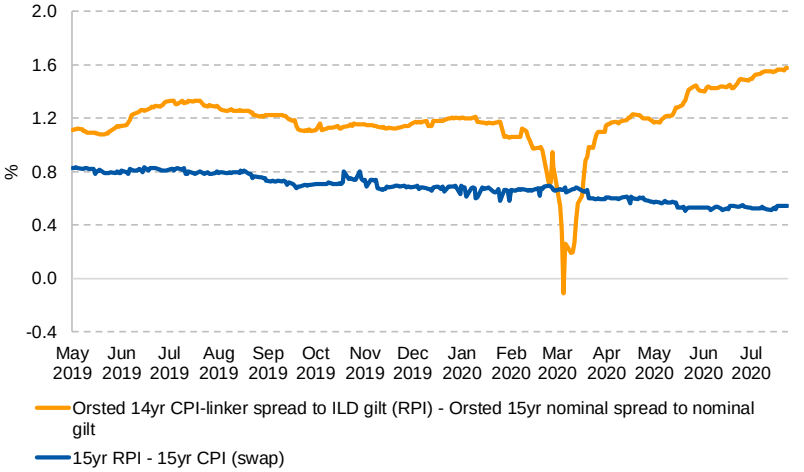
		Ex-ante RPI-CPI wedge	+100bps increase in RPI-CPI wedge
Real allowed rate of return (CPIH)	*a*	2.63%	2.63%
Notional gearing	*b*	60%	60%
Proportion of ILD	*c*	30%	30%
Cost of ILD (CPIH)	*d*	1.74%	**2.74%**
Nominal cost of debt	*e*	3.80%	3.80%
AICR= *a / [b*(c*d+(1-c)*e)]*		**1.37**	**1.26**

Note: Calculated based on Ofgem DD AROR for GD2 assuming Moody's recognises only CPI accretion for ILD in cash interest calc. Ofgem reports higher AICR values in the DD of 1.4-1.5 for GD2 (Table 34 Finance annex)

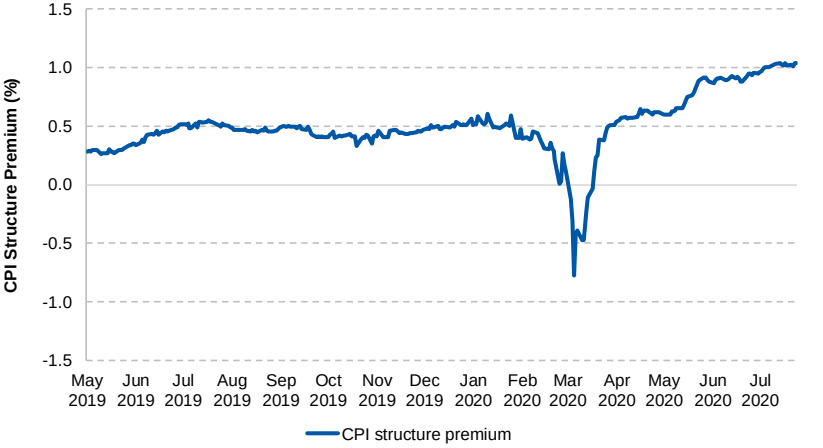
We have reviewed updated market evidence on CPI premium costs, which supports premium of between 30 and 100 bps, and supportive of our original estimate of 50 bps

- Oersted, a renewable energy company (formerly Dong), issued two bonds in May 2019:
  - A nominal bond with yield:
    - nominal UK Treasury benchmark + 128bps
  - A CPI-linked bond yield (but priced to RPI ILG):
    - ILG (RPI) + 238 bps, which is the real cost of debt relative to CPI
- Since these two bonds are almost identical in maturity (term risk) and issuer (credit risk), the spread between the nominal yield and real yield must reflect: a) expected CPI inflation plus any b) "CPI premium". That is:
  - *nominal UKT + 128 bps + CPI-premium = real ILG (RPI) + 238 bps + CPI*
- *Rewrite real ILG(RPI) as nominal UKT – RPI, and rearrange, we have:*
  - *[RPI – CPI] + CPI-premium = 110 bps [at issuance]*
- Drawing on RPI-CPI 15 year swaps, RPI-CPI wedge was ca 80 bps at issuance, implying a premium of 30 bps
- Our analysis of the bonds over time shows that the spread has widened, and RPI-CPI wedge has fallen, providing an implied CPI premium of ca 100 bps by July 2020

- The spread between CPI linker and nominal bond ca 110 bps at issuance – explained by RPI-CPI wedge and CPI



- with RPI-CPI wedge 80 bps at issuance, implies CPI premium ca 30 bps but has increased to ca 100

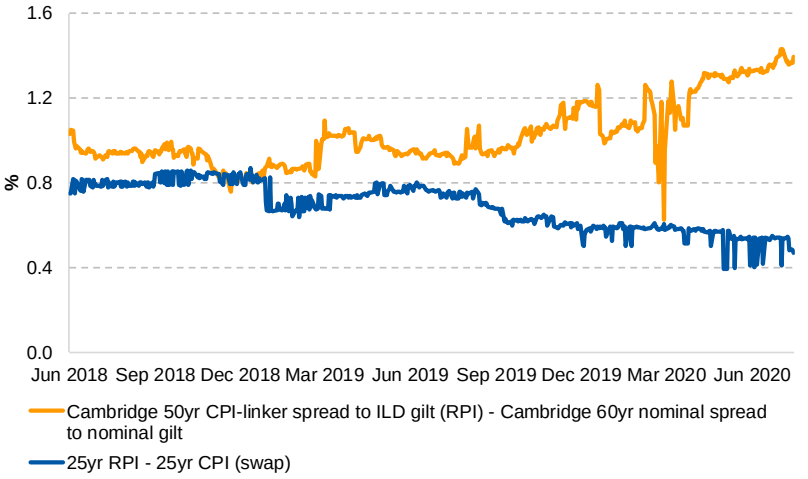


As with Oersted, evidence from Cambridge University bonds support CPI premium of ca 30-90 bps

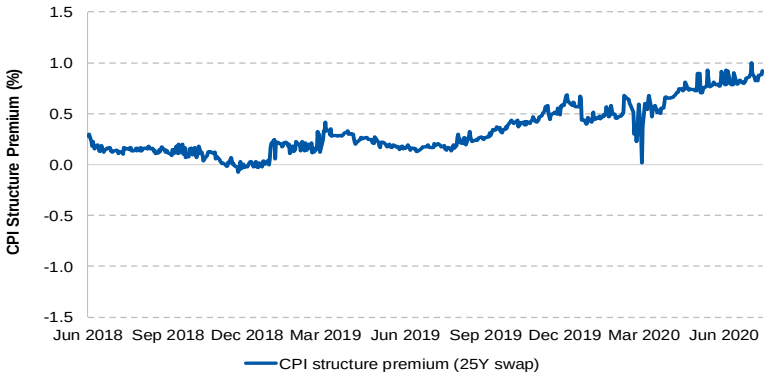
- In its DD, Ofgem states that A-rated issuers such as Cambridge University pay less or no premium vs BBB issuers such as Oersted.[1] By contrast, we find Cambridge University bonds support a CPI premium at issuance of 26 bps, which has increased to ca 90 bps recently
- Cambridge University issued two instruments in 2018: i) a 60 year nominal bond; ii) a 50 year CPI-linked amortising bond.
- As with Oersted, we are able to derive a CPI premium from these two bonds, as the difference in spreads must equal RPI-CPI wedge plus CPI premium, i.e.[1,2]
- Based on spreads to gilts, we derive:
  - [RPI – CPI] + CPI premium = 101bps.
- Drawing on RPI-CPI 25 year swaps[3], RPI-CPI wedge at issuance was ca 75bps, which implies CPI premium of 26bps at issuance.[2] By July 2020, this premium increased to around 90bps

Notes:
1. Spreads calculated as follows: a) Nominal bond yield at issue = 2.334%, and UKT benchmark =1.536%, implying 80 bps spread, using UKT with maturity 2071 (closest to the maturity of the nominal bond of 2078); b) real CPI yield at issue = 0.196%, and UKT RPI yield = -1.613%, implies 181 bps spread, using UKTI with maturity 2068 (closest to the maturity of the CPI-linked bond of 2068)
2. Theoretically, there would also be a term premium given the different maturities, but given the long dated nature of the bonds, we assume term premium is zero;
3. We rely on 25y swaps as opposed to 50y swaps due to concerns over the data not showing any variation in 50y CPI swaps as of the issue date. Had we used 50y swaps, the yield at issuance would be close to 90bps

- The spread between CPI linker and nominal bond ca 101 bps at issuance – explained by RPI-CPI wedge and CPI



- with RPI-CPI wedge of 75 bps at issuance, implied CPI premium of ca 26 bps but increased to ca 90bps



Conclusions: updated market evidence supports CPI premium of ca 50 bps. Given notional ILD of 30%, supports additional cost of 15 bps on notional debt

- In our earlier report for ENA[1], we derived estimates for the CPI indexation costs based on higher bid-ask spreads for CPI swaps relative to RPI, and historical periods of illiquidity in RPI ILD, as proxy for illiquidity in nascent CPI ILD
  - Provided overall range of 15 to 80 bps, and mid-point of 50 bps
  - implied additional cost of around 12bps on notional debt (25% ILD *50bps)
- We have updated our estimates based on comparison of nominal and CPI ILD issued by Oersted and Cambridge University:
  - Oersted: 30 bps at issuance increasing to 100 bps
  - CU: 26 bps at issuance increasing to 90 bps
  - These bonds broadly support our initial assessment of 50 bps issuance costs, i.e. taking approximate mid-points between cost at issuance and today's implied premium
- We also understand from discussion with Banks that swapping a nominal debt liability to CPI ILD costs ca 40 to 60 bps, depending on the level of collateral posted by the Bank
  - Assuming 50 bps CPI premium, and Ofgem's CPI ILD assumption of 30%, supports a CPI premium of 15 bps

Sources:

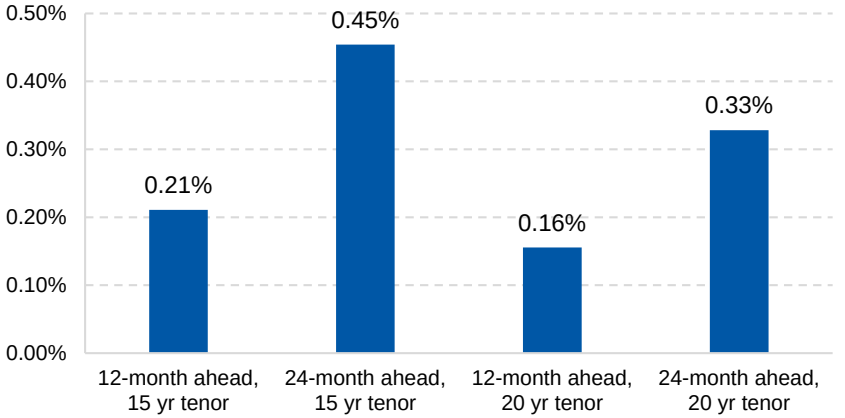
1. *NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA, p. 18*

4 Cost of carry

Ofgem estimate cost of carry of 1.5-11 bps (6 bps) compared to our earlier estimate of 16-45 bps

- Cost-of-carry is defined as the requirement to issue debt ahead of maturity to meet sufficiency of resources requirement, rating agency and debt covenant requirements etc.
- In our earlier report for ENA[1], we calculated cost-of-carry range from 16 to 45bps, assuming:
  - pre-financing period between 12 to 24 months in line with licence requirement and rating criteria
  - debt tenor to be between 15 and 20 years (refinancing 1/15 or 1/20 of debt each year)
  - Net carry cost of iBoxx A/BBB less Libor on cash-deposits, based on 5-year average interest rate differentials

Cost-of-carry of 16-45bps based on 12 to 24 months pre-financing and 15-20 year debt tenor



- Ofgem argue that:
  - licence requirements to have sufficient liquidity to meet obligations over the following 12 months does not translate into a requirement to hold cash for 12 months ahead of upcoming maturities
  - assuming 12-24 months' cash is held and revolving credit facilities sized at 10% of debt double counts costs
  - cost of carry should be less than difference between LIBOR and the cost of debt
- Ofgem estimates cost of carry to be 1.5-11bps based on a range of 0.6-4.1% cash on balance sheet (RFPR data), and a differential between iBoxx and 3-month deposit rates

Sources:

1. NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA, section 2

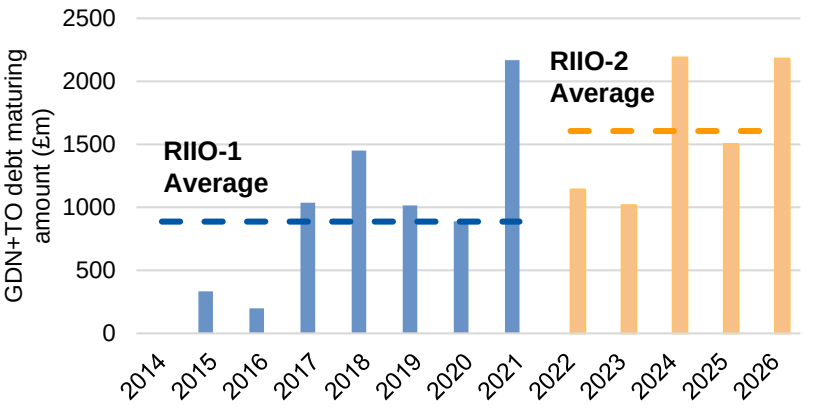
Ofgem's analysis of cash holdings at OpCo and Group level is not reliable

Ofgem's cash holdings calculation at OpCo and Group level is unreliable. OpCo cash data shows cash requirement of 6-8%

- Ofgem examined network RFPR/BPDT and group accounts for actual cash holdings. Evidence suggests a range of:
  - 0.6% RAV cash-holdings based on median of network/OpCo data
  - 4.1% based on mean of cash held on balance sheet, with 75% weighting on OpCo and 25% weighting on group
- Ofgem's analysis does not reflect divergent approaches taken by companies to location of Treasury functions:
  - For some networks, Treasury functions undertaken entirely at Group, and Group means different things: e.g. ultimate parent or mid-co
  - For others, all Treasury functions are conducted at the OpCo level
  - Ofgem's approach is unreliable,
    - median 0.6% at OpCo understates cash requirement as some networks do not operate Treasury at this level
    - Otherwise, Ofgem's weights – 0.75*Opco + 0.25*Group – incorrect and unclear whether Ofgem has considered midCo or parent
- Furthermore, RFPR cash data only provides end-year snapshot where the cash positions are managed down, whereas within year average far higher

Companies have higher cash requirement in RIIO-2 than in RIIO-1, due to higher amount of debt maturing and greater use of uncertainty mechanisms

- Level of debt maturing at RIIO-2 likely to be double RIIO-1:
  - Ofgem's mid-point 2.5% RAV RIIO-1 cash-requirement (i.e. mid-point 0.6-4.1%) should be ca 5%, or at least 12 bps
  - Indeed, for two companies that operate Treasury at OpCo level and therefore RFPR data more reliable, RIIO-2 cash requirement ca 6-8% of RAV
    - consistent with our notional analysis of cost of carry (see next slide)
- In RIIO-2, greater use of uncertainty mechanisms also increases need for operational cash



NERA analysis of companies RFPR data

If we accept RCF is partially used to meet pre-financing requirement, then implied cost of carry lies in range of 11 to 23 bps

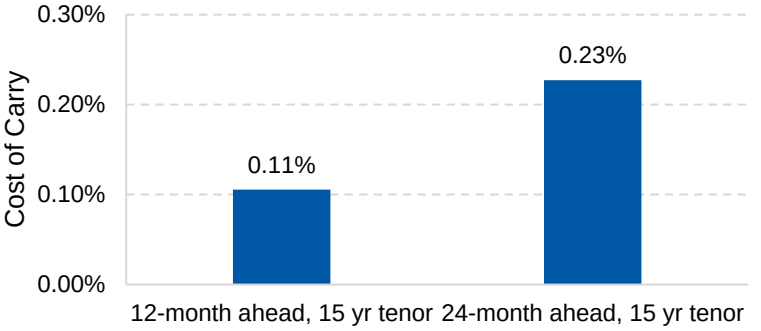
We do not include RCF draw-down costs to avoid double count with cost of carry

- In DD, Ofgem argues that assuming 12-24 months' cash is held and RCF at 10% of debt book double counts and overestimates cost of carry[1]
  - But in our earlier report, our 4.5 bps liquidity cost assumed no draw-down of RCF to avoid double-count with cost of carry
- Also, Ofgem wrongly states "*one should not include the utilisation fee in the liquidity cost, because this is when the debt is drawn down and is covered by the cost of debt allowance in any event*"[2]
  - companies will draw down facilities to meet operational cash-flow requirements and incur utilisation and interest fee
    - As shown in our earlier report, liquidity cost/RCF cost = 9bps if facility half-drawn
  - Draw-down RCF meets operational needs – it is not remunerated through RAV*WACC
- By excluding RCF draw down costs, our estimate of liquidity and cost-of-carry avoids double-count

Note: 1.2. Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, Annex 2, pp, 181

We further assume half pre-financing requirement met by RCF

- RCF could in part meet pre-financing needs, but also required to meet working capital requirement and pre-funding investment
- We assume 50% of RCF can meet pre-financing needs, implying cost-of-carry of 11 to 23 bps:
  - pre-financing period 12 to 24 months and debt tenor of 15 years, based on average tenor
  - Net carry cost of iBoxx less overnight LIBOR on cash-deposits.
    - Companies confirmed that reasonable assumption as focus is on providing liquidity rather than investing



Note: We assume that carry costs are amortised over the tenor of the bond as opposed to expensed as cash cost within period, as per Ofgem/ regulators' approaches to other costs.

5 Conclusions: Additional Cost of Borrowing

Conclusions: We estimate Additional Cost of Borrowing of 53 bps, with a range of 47 to 59 bps, compared to Ofgem's DD of 17 bps

	Ofgem	NERA (September 2019)	NERA (August 2020)	Comment
Transaction Costs	6 bps	7 bps	7 bps	Ofgem draws on company data but excludes apparent outlier NERAs analysis includes all companies within sample
Liquidity/RCF cost	3 - 5.5 bps	4.5 bps	4.5 bps	Both Ofgem and NERA draw on companies' assumptions on RCF size and cost
Cost of carry	1.5 – 11 bps	16 – 45 bps	11 – 23 bps	Ofgem assumptions on cash at OpCo and Group unreliable NERA approach assumes 12-24 mth pre-financing, half met by RCF
New Issue Premium (NIP)	0	13 bps	9 bps	Ofgem's analysis does not draw on precise measures of spread and therefore estimate of halo/NIP is unreliable NERAs spreads calculation duration matched and support range 4 -14bps
CPI indexation costs		12 bps	15 bps	Ofgem assumes that companies do not require compensation for basis risk NERA's analysis based on recent cost of CPI issuance and CPI swaps
Total	**17 bps**	**53-82 bps (68bps)**	**47 – 59 (53bps)**	Ofgem: mid-point of its range

Sources:
Ofgem (July 2020) Consultation – RIIO-2 Draft Determination – Finance Annex, p. 14
NERA (September 2019) Halo effect and additional costs of borrowing at RIIO-2, A report for ENA, p. 18

5 Deflating Nominal iBoxx Index

At DD, Ofgem has proposed to deflate nominal "all-in" yields to CPIH real allowances, using the 5-year OBR forecast for CPI

- At RIIO-2, Ofgem needs to draw on a forecast of CPI(H) to derive a real cost of debt allowance from nominal iBoxx index values
- In its SSMC/SSMD, Ofgem identified two broad methods to derive a real cost of debt allowance in CPI terms from a nominal iBoxx index:[1]
  - i) Retain RIIO-1 breakeven approach but include an expected RPI-CPIH wedge when deflating the nominal iBoxx yields
  - ii) Use an expected value for CPIH directly, e.g. Office for Budget Responsibility's (OBR's) longest-term CPI forecast as a proxy or Bank of England inflation target of 2 per cent
- In its DD, Ofgem notes that none of the respondents supported i), and all of the all respondents preferred simplicity of deflating nominal iBoxx in one step (option ii), using a single measure of inflation[2]
- On ii), Ofgem notes that the BoE target is not an inflation forecast (but rather a target), and therefore proposes to use 5-year OBR forecast for CPI. It also states that if OBR publishes CPIH forecasts, it proposes to switch to CPIH forecasts
- We evaluate the options that Ofgem has considered at SSMD/DD

Sources:
1. Ofgem (24th May 2019) RIIO-2 Sector Specific Methodology Decision – Finance, p.9
2. Ofgem (July 2020) Consultation – RIIO-2 Draft Determinations – Finance Annex, p. 29

As per Ofgem's DD, we do not support use of break-even inflation (BEI), as reflects inflation risk premium and liquidity premium, and biased market forecast

- In theory, breakeven inflation (BEI) provides a measure of market-based expectations of future inflation. It is derived as the difference between the nominal government bond yield and inflation-linked government bond yield with the same maturity :
  - Breakeven inflation = (1+nominal bond yield)/(1+ inflation-linked bond yield) -1
- In practice, breakeven inflation reflects not only expected inflation, but also:
  - inflation risk premium, which compensates investors for the risk of *unexpected* changes in inflation, and
  - liquidity premium, which compensates investors for holding less liquid inflation-linked gilts compared to nominal gilts (thus offsetting the inflation risk premium to a degree)
- These risk premia in breakeven measures are widely acknowledged by central banks around the world:
  - Bank of England notes that "*Illiquidity in the conventional and index-linked gilt markets could distort this measure, and in practice there will be an 'inflation risk premium' incorporated in the implied inflation rate"* [1]
  - European Central Bank notes that *"It is important to bear in mind, however, that break-even inflation rates are not a completely reliable measure of market participants' inflation expectations since they are influenced by several premia… the break-even inflation rate… may also contain a positive premium related to inflation uncertainty and a negative premium related to the higher liquidity of the nominal bonds used to calculate the break-even inflation rate."*[2]
  - Federal Reserve Bank of San Francisco notes that *"Idiosyncratic market forces and inflation risk premiums appear to be important drivers of market-based inflation expectations. Overall, it is important to keep this caveat in mind when interpreting market-based inflation expectations."*[3]

Sources: 1) Bank of England Note on the Bank of England UK Yield Curves, 2) ECB (2002) Deriving long-term euro area inflation expectations from index-linked bonds issued by the French Treasury, 3) RBSF Economic Letter (September 21, 2015), Can We Rely on Market-Based Inflation Forecasts?

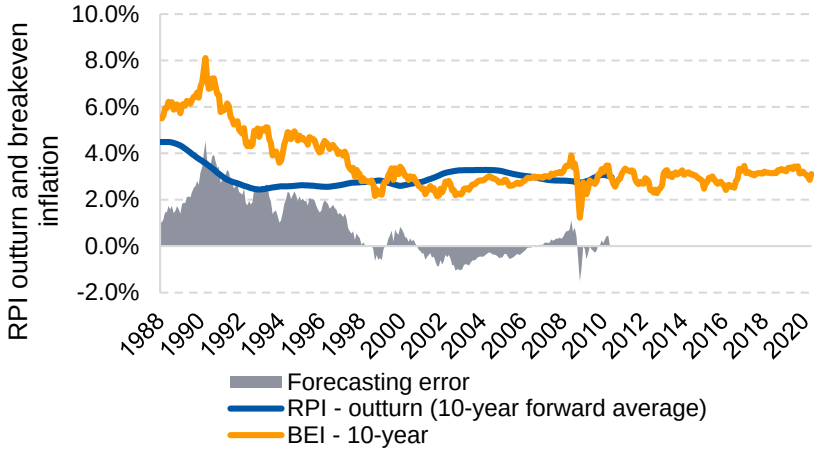
20 year BEI is even more problematic as a measure of inflation expectations, as inflation risk and/or liquidity premium compounded by structural imbalance for real gilts at the long-end

- The use of a 20-year breakeven inflation (e.g. to align with the average remaining tenor of the iBoxx index) is even more problematic, given the well documented distortions in the index-linked gilt market for long maturities.
- For example, market reports note the structural imbalance in the supply and demand for long-dated index linked gilts which suppresses yields, and leads to biased break-even measures of inflation. For example, a report from Schroders' notes:
  - "*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****.*"

Sources: i) Schroders (June 2016), Pension funds and index-linked gilts – A supply/demand mis-match made in hell; ii) Competition Commission (March 2014), Northern Ireland Electricity Limited price determination, p.13-21

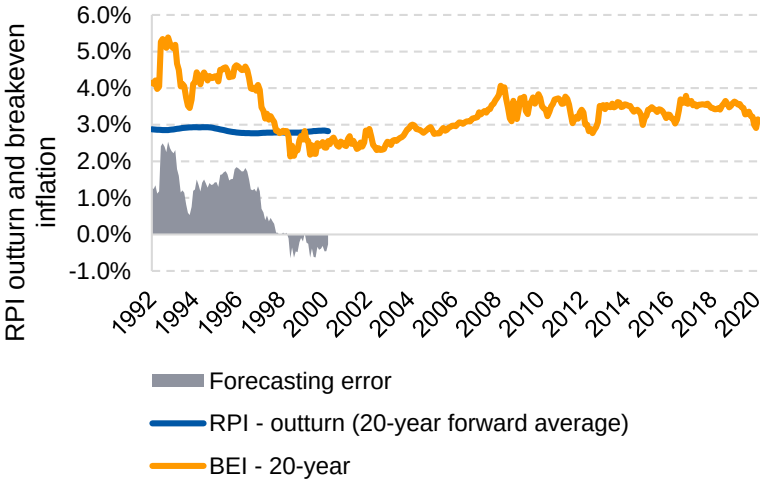
Empirical evidence shows that BEI has diverged from outturn inflation over the comparable period, providing some limited (historical) evidence for inflation risk premium

- We compare gilt BEI with outturn inflation over the same period, to quantify any systematic difference
  - If we assume outturn inflation is a good measure of expected over long periods, then comparison provides an indication for the inflation risk premium
- 10-year gilt BEI systematically overstated outturn RPI before 2000, but since then there has been no systematic bias relative to outturn



Sources: NERA analysis

- Similarly, 20-year gilt BEI overstated outturn RPI over before 1998, but less clear since then
  - very limited data to consider forecasting error of 20-yr gilts BEI

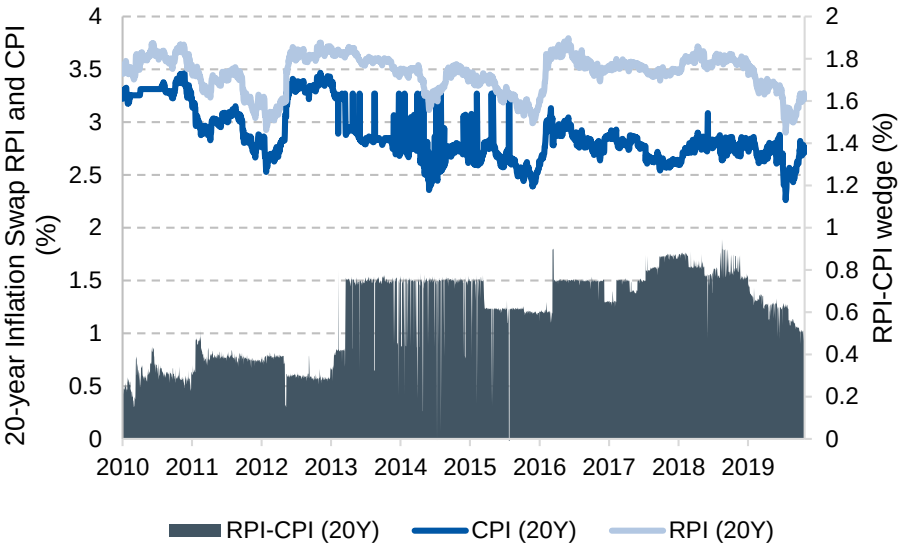


Sources: NERA analysis

The adoption of CPIH indexation further complicates the use of gilt BEI given the need to adjust BEI for RPI-CPIH wedge. Wedge uncertain given UKSA proposals to align RPI with CPIH

- The adoption of CPIH indexation further complicates the use of BEI given the need to adjust BEI for RPI-CPIH wedge
  - Ofgem will need to make a further adjustment to the RPI break-even inflation estimates for the RPI-CPIH wedge.
  - use of break-even would retain the use of supposedly discredited RPI measures despite Ofgem's switch to a CPIH framework
- There are market measures of RPI-CPI wedge from swap based inflation, but these have been volatile
  - Swap based measures of long-term RPI-CPI wedge have declined from around 100 bps in 2017/18 to around 50 bps today
- The recent decline in marked based measures of RPI-CPI may be explained by UKSA's proposal to bring the methods of CPIH into RPI between 2025 and 2030
  - In March 2019, UKSA proposed to address RPI's shortcomings by aligning RPI calculation with that of the CPIH[1]
  - In March 2020, the UK government announced a consultation on the UKSA proposal and on the issue of timing, i.e. whether to implement the proposal between 2025 and 2030[2]

Swap based measures of RPI-CPI wedge over 20 year period have declined sharply over the past year

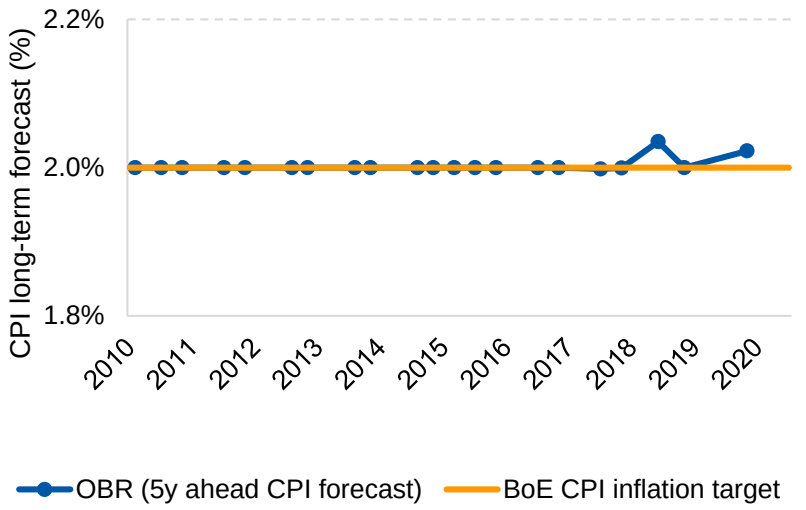


Sources: NERA analysis

Sources: 1) UKSA (2019) UK Statistics Authority Statement on the future of the RPI, 2) UK government (2020) A consultation on the Reform to Retail Prices Index (RPI) Methodology

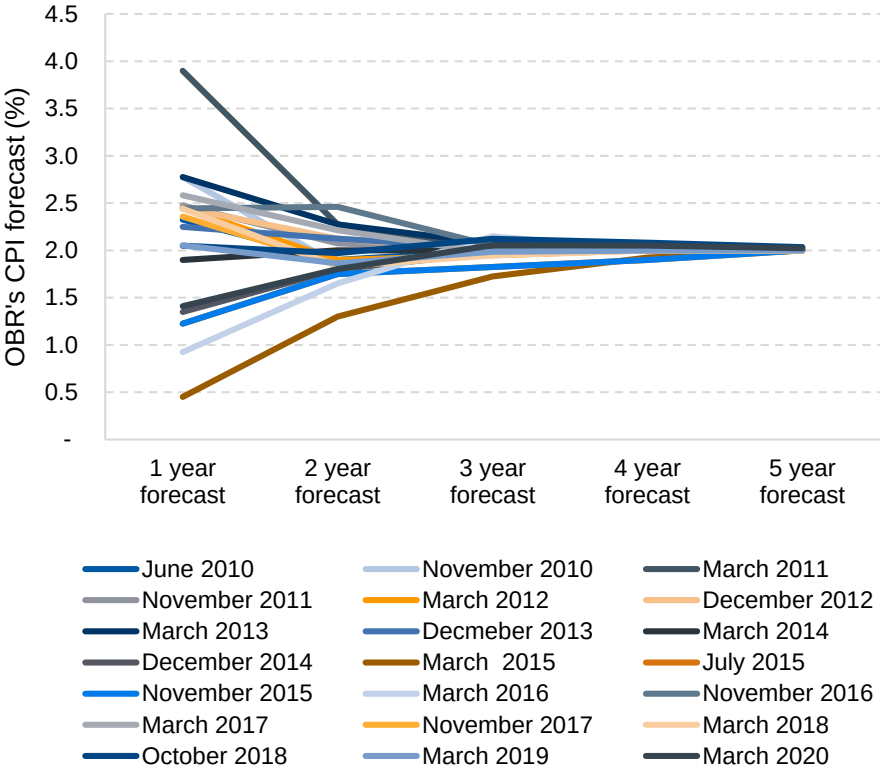
In terms of direct measure of CPI(H), OBR's 5-year ahead CPI forecasts are stable at around 2% over time, and is close to Bank of England's inflation target

- Ofgem considers the direct measures of CPI(H) should be based on:
  - OBR CPI 5 yr forecast as a proxy for CPIH, as per Ofgem's DD
    - OBR publishes five-year forecasts on an bi-annual basis, generally in March and October/November
  - Bank of England CPI inflation target of 2 per cent
- OBR is commonly used by UK regulators such as Ofwat as a basis of forecasting inflation
  - OBR's long-term inflation forecast of CPI has been closely aligned with BoE's inflation target of 2 per cent



Sources: OBR and BoE

OBR's past CPI forecasts (over period 2010-2019) have been stable over time

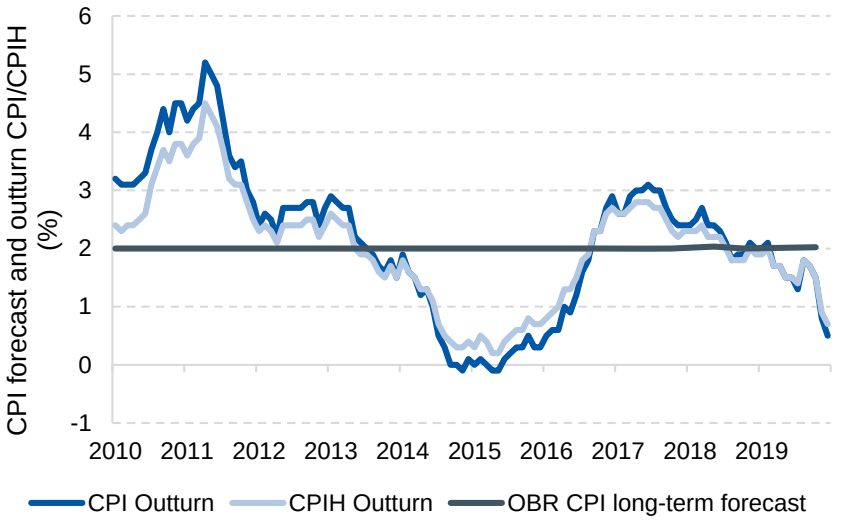


Sources: OBR

Alternative approach would be to use outturn inflation applied to RAV to derive real cost of debt allowance, but this could lead to cash-flow risk

- An alternative approach would be to derive real cost of debt allowance based on the inflation measure used to index energy networks' RAVs
- The approach has the advantage that it ensures investors recover their nominal cost of debt in full:
  - the inflation element of the cost of debt is recovered as a capital gain on the RAV, and the remaining real element is recovered as a return on the RAV
- By contrast, Ofgem's proposed use of OBR forecasts (effectively 2 per cent) means that investors may not recover their costs in any one year or indeed over regulatory period
- There is a potential downside from using outturn inflation:
  - in any one year outturn inflation may vary substantively. In this case, the real cost of debt allowance recovered in any year through allowed revenues may be low (or indeed high) creating cash-flow risk
    - The resulting volatility in the allowed real cost of debt component of revenues could potentially be avoided by using an average inflation measure, e.g. using an average inflation measure calculated over a number of years

OBR forecasts deviate from outturn inflation; Ofgem's approach may not allow for investor to recover nominal debt costs



Sources: NERA analysis

Conclusion: We agree with Ofgem's DD that BEI is not a reasonable approach to derive real cost of debt allowance. OBR's CPI inflation forecast is a reasonable measure – an alternative is to use outturn inflation

- Ofgem could use gilt BEI as a market measure to derive the real cost of debt allowance
  - Difficulty is that BEI likely to include inflation risk premium, potentially offset by liquidity premium. Both are difficult to estimate and may vary over time
- Compounding the issues associated with BEI, Ofgem would need to account for expected RPI-CPIH wedge to derive a CPIH real cost of debt
  - Our analysis of swaps, shows markets expectation of wedge has been volatile, and has declined substantively over recent year
  - UKSA proposal to align RPI with CPIH which could take place from 2025 may explain volatility. In any case, makes it difficult to estimate a RPI-CPI wedge for a period consistent with the BEI
- In terms of a direct measure of CPI, Ofgem has considered that OBR and BoE inflation target could be used as to measure inflation expectations over RIIO-2
  - OBR's 5-year ahead CPI forecasts are stable at around 2% over time, and is updated bi-annually
  - As with Ofgem, we do not support use of BoE target as inflation could systematically deviate from target
- An alternative is to use outturn inflation used to index RAV to derive real debt costs, as this would ensure investors recover nominal debt costs through allowed cost of debt+RAV indexation. This could lead to greater volatility in allowed revenues if CPIH were volatile, but could be managed using an expected value with ex-post true-up over a number of years

NERA

ECONOMIC CONSULTING