Appendix 13c:
Estimating retail cost risk

Estimating retail cost risk from economic and labour market performance

PR19 Support

A note for Yorkshire Water | July 2018

This note briefly sets out the RoRE risk associated with costs being 'higher' or 'lower' than in the base case for Yorkshire Water's (Yorkshire) residential and business retail segments. Our approach rests on two steps: (i) we model uncertainty by determining a triangular probability distribution for key risk factors; and then (ii) we apply these distributions to the base case, where the difference between the base case and these predicted values is the overall risk impact. Finally, we run a Monte Carlo simulation, to reflect the fact that the chances of being at the 'extremes' of multiple risk factors simultaneously is low.

This note sets out the results of our analysis of the underlying risk, and related 'high' and 'low' case scenarios (defined in terms of P10 and P90 values), for both Yorkshire's residential and business retail segments. The scope of our work was focused on analysing two specific retail cost risks, relating to:

- the impact of variation in UK economic performance on bad debt related costs; and
- the impact of variation in labour market performance on staff related costs.

To provide Yorkshire with a view on the *total* retail cost risk it faced, we also incorporated Yorkshire's own internal 'bottom up' analysis of additional potential retail cost factors (although these are relatively immaterial, compared to the above). Our key results are shown in the table below.

Table 1: Key results for table App26 (£m 2017/18 prices)

	2020 / 21	2021 / 22	2022 /23	2023 / 24	2024 / 25	Total over AMP	Av over AMP
Residential retail							
Residential retail cost impact - high RoRE case	£0.81	£0.78	£0.72	£0.78	£0.65	£3.74	£0.75
Residential retail cost impact – low RoRE case	-£0.84	-£0.61	-£0.68	-£0.75	-£0.74	-£3.62	-£0.72
Business retail							
Business retail cost impact - high RoRE case	£0.17	£0.15	£0.17	£0.15	£0.17	£0.81	£0.16
Business retail cost impact - low RoRE case	-£0.18	-£0.16	-£0.17	-£0.17	-£0.17	-£0.85	-£0.17

Source: Economic Insight analysis
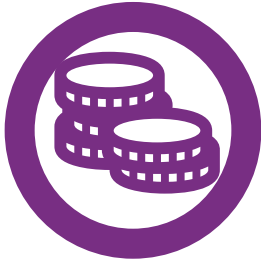
In the following, we set out our analysis and findings in relation to: (i) the variation in bad-debt related costs, due to variation in the UK's economic performance; (ii) the variation in staff related costs, due to underlying labour inflation; and finally (iii) we briefly describe Yorkshire's additional 'bottom-up' risk assessment. We conclude by setting out the results of our overall retail cost risk Monte Carlo analysis (which incorporates bad-debt, labour and all additional risk impacts simultaneously).

1. Risk from variation in UK economic performance on bad-debt related costs

In the context of across company benchmarking, it is established that variation in socio-economic factors can affect customers' propensity to pay their water bills – and thus, bad-debt related costs. Logically therefore, variation in the UK's economic performance *over time* should also impact debt-related costs. Consequently, we developed an analysis that examines how 'uncertainty' regarding the UK's economic performance over PR19 could translate into impacts on Yorkshire's debt-related costs for the residential and business retail segments. Our method rests on three key steps, as set out below.

- **Probability distribution.** We derived a probability distribution for UK GDP, based on the OBR's latest forecasts (which identify 'percentile' values to be used in our subsequent Monte Carlo simulation). This was converted into a distribution for GVA by applying the 'wedge' between GDP and GVA.

- **Regression analysis.** The variation in economic performance we identified above was translated into a £s of retail cost by assuming a 'coefficient' value between GVA and debts costs for Yorkshire, as derived from our across industry retail cost benchmarking.

  Risk impact. The risk 'impact' of this was then calculated as the 'difference' between the predicted and baseline retail costs – thus giving a distribution of retail cost impacts arising from economy related bad-debt risks.

1.1 Probability distribution

To derive a probability distribution for GDP, we had to define the 'minimum', 'most likely' and 'maximum' estimates for a triangular distribution. We used the OBR's central estimates as the 'most likely', and then derived the minimum and maximum values by extrapolating from the OBR's P10 and P90 values, as shown below.

Table 2: OBR real GDP growth forecasts

	2020 / 21	2021 / 22	2022 / 23	2023 / 24	2024 / 25
Minimum	-2.0%	-2.0%	-2.0%	-2.0%	-2.0%
P10 (OBR)	-1.3%	-1.3%	-1.3%	-1.3%	-1.3%
Most likely (OBR central case)	1.5%	1.5%	1.5%	1.5%	1.5%
P90 (OBR)	3.4%	3.4%	3.4%	3.4%	3.4%
Maximum	4.0%	4.0%	4.0%	4.0%	4.0%

Source: Economic Insight analysis, OBR March 2018 forecasts

1.2   Regression analysis

In order to estimate the impact of variation in GDP / GVA on bad debt costs, we used a coefficient as estimated using our cross-industry benchmarking work for Yorkshire.

1.3   Risk impact

Finally, we calculated the predicted bad debt related costs in £m, using the probability distribution estimates, and deducted this from the base case £ retail bad debt, to obtain the bad-debt related *retail risk.* As a result, we obtained the following underlying probability distributions of retail cost impacts.

Figure 1: Distribution of (debt related) retail cost impacts arising from variation in UK economic performance – residential retail
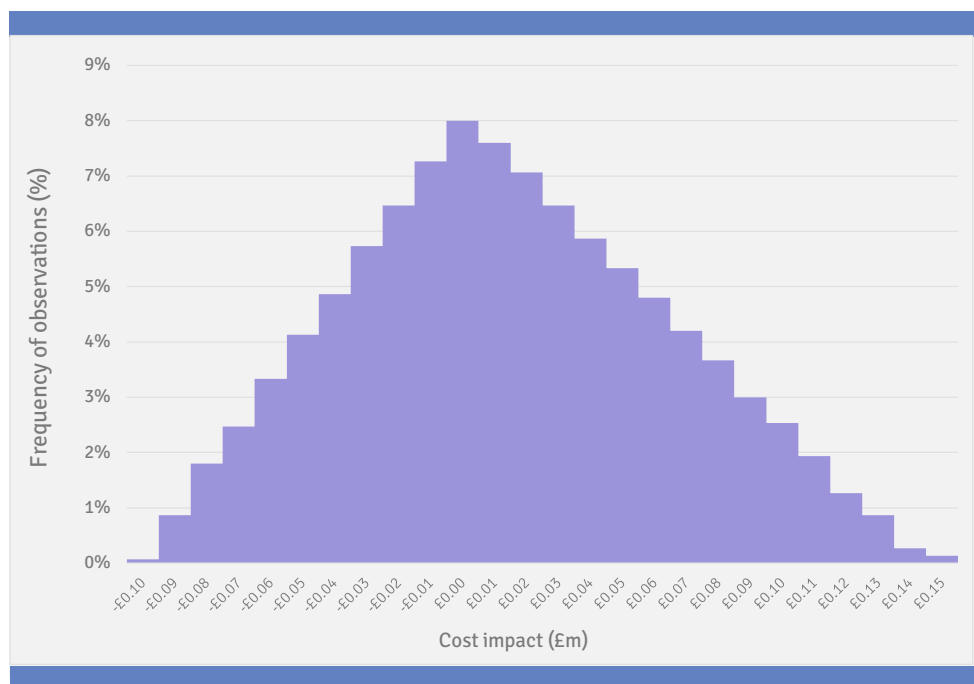
Source: Economic Insight analysis

2.   Risk from variation in UK labour market performance on retail costs

Further to the analysis set out above, we developed analyses to understand the 'extent' of underlying labour market cost risk Yorkshire faces in its residential and business retail segments. The approach is similar to that for bad-debt risk above.

- **Probability distribution.** We derived a probability distribution for labour cost inflation, based on the OBR's latest forecasts, as well as our real price effects analysis for Yorkshire.[1]

- **Risk impact.** The risk 'impact' of this was then calculated by taking the difference between the percentages from the distribution and the base case labour cost inflation percentage and multiplying this by Yorkshire's base case residential and business retail costs.

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[1] *Economic Insight (2018), "PR19 Real Price Effects: Input Price Inflation Forecasting – A report for Yorkshire Water".*

2.1   Probability distribution

To derive a probability distribution for UK labour cost inflation, we had to define the 'minimum', 'most likely' and 'maximum' estimates for the triangular distribution. We used the central estimates from our RPE report as the 'most likely' case. We then calculated the average 'wedge' between our 'lowest' case and the OBR's estimates for national wage inflation and applied this wedge (3.0%) to the central case to derive our 'maximum' and 'minimum' estimates. This is illustrated in the table below.

Table 3: Labour cost inflation forecasts

	2020/21	2021/22	2022/23	2023/24	2024/25
Minimum	-1.11%	-0.92%	-0.76%	-0.74%	-0.73%
Most likely	1.87%	2.06%	2.22%	2.24%	2.26%
Maximum	4.85%	5.04%	5.20%	5.22%	5.24%

Source: Economic Insight analysis

2.2   Risk impact

The figure below shows the underlying probability distribution of impacts implied by the analysis (for residential retail).

Figure 2: Distribution of (labour related) retail cost impacts arising from variation in labour inflation – residential retail
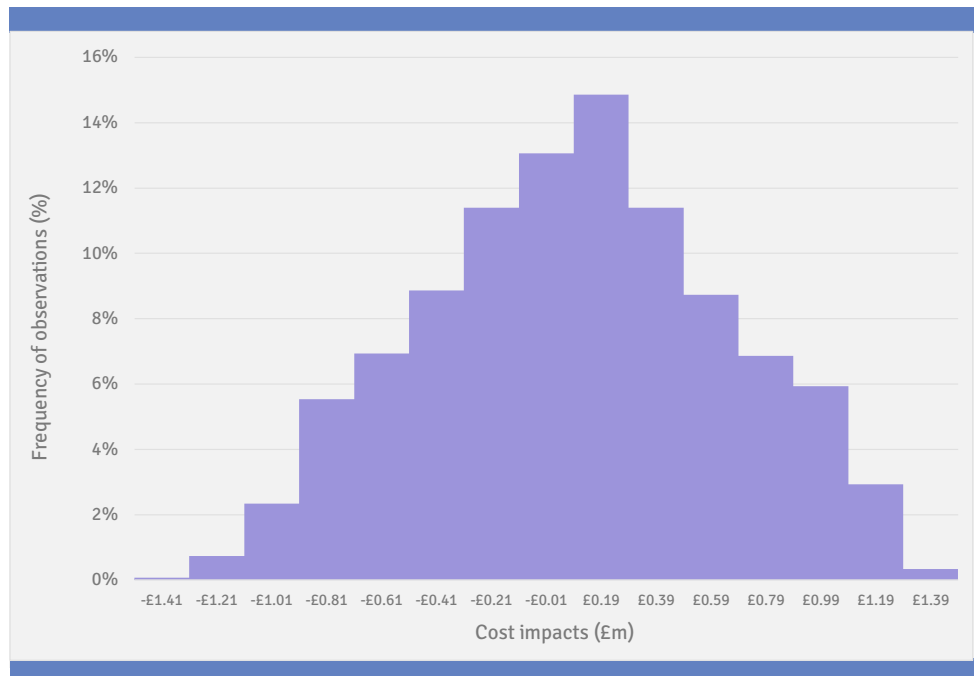
Source: Economic Insight analysis

3. 'Bottom-up' assessment of additional retail cost risk factors

Finally, to capture all potential cost risks for residential retail, we also incorporated Yorkshire's 'bottom-up' estimates for various additional retail risks. For each we similarly derived a probability distribution, so as to determine their respective 'risk impact'. Yorkshire's underlying calculations and explanatory notes indicate that these are all relatively immaterial, compared to the above 'economy / bad debt' and 'labour market' risks.

4. Monte Carlo analysis to derive overall retail cost risk

Using the methodologies above, we arrived at a set of 'potential' cost impacts for each underlying risk factor. To derive the overall risk impact in £m, we then applied a Monte Carlo analysis. Again, this is to reflect the fact that the chances of being at the 'extremes' on multiple risk factors simultaneously is low.

The Monte Carlo analysis 'randomly drew' cost impacts from each of the above individual risk factors. From this, an overall distribution of £m retail cost risks impacts was calculated (for residential and business retail separately).

Figure 3: Distribution of all retail cost impacts using Monte Carlo – residential retail
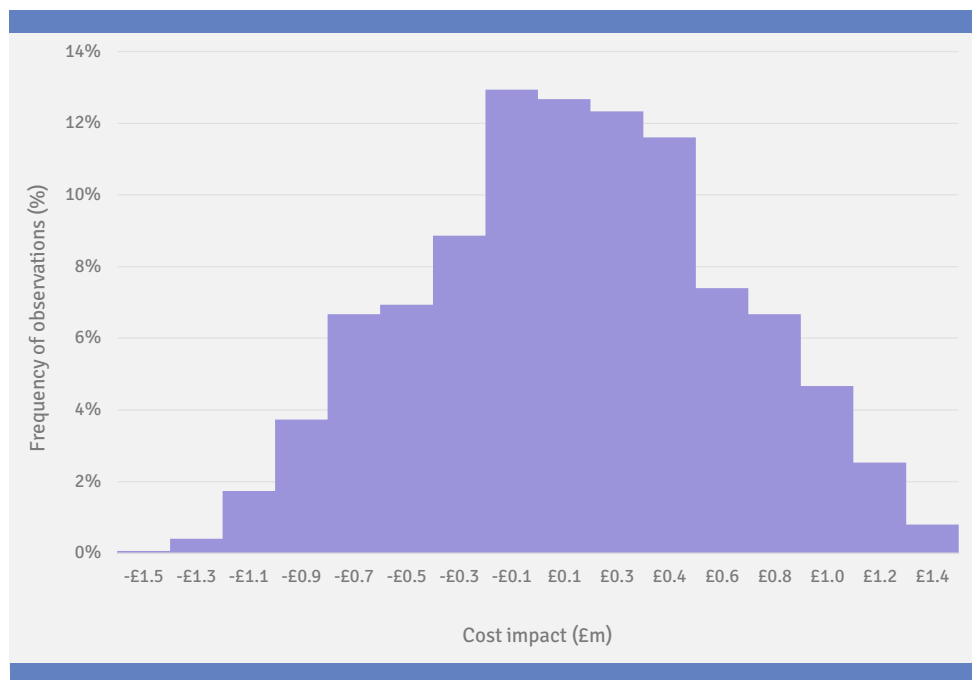
Source: Economic Insight analysis

Overall, we find the results to be plausible. In particular:

- The distribution of retail cost risk impacts is broadly symmetrical. Given the nature of the two most important risk factors (economic performance on bad debt and labour costs) this is intuitively sensible.

- The magnitude of the implied risks appears credible, implying P10 and P90 impacts for residential retail of a little under £1m pa.

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