Description of Excel model

The calculation measures the increase in value through RAV indexation, which is paid by customers over time through return and depreciation but may or may not be turned into cash by companies through financing strategies (regearing the RAV inflation).

The model does not do "actual company" calculations but is easy to adapt by adding in actual gearing and inflation-linked debt levels.

CPIH-RPI basis risk is not covered by this model as the costs of hedging this risk was provided an allowance within the allowed return on debt.

Tabs

1. **Data**: Contains data source from the Price Control Financial Models and OBR
2. **Single Year Example**: Performs the calculations set out in the appendix to this note.
3. **Multi Year Example**: The same calculations but shows impacts over multiple years.
4. **Sector values**: Calculations based on raw data to start price base at the beginning of RIIO-1, sum RAV values
5. **ET-GT-GD:** Indicative impacts for the ET/GT/GD sectors in RIIO-1 and RIIO-2.
6. **ED:** Indicative impacts for the ED sector in RIIO-1 and RIIO-2.
7. **Totals:** Summaries of combined impacts for all sectors.

Appendix: Explanation of model calculations

Single-Year Example

The "extra" RAV (R') in a period, ie the amount RAV increases above the amount from a long-run inflation expectation is:

$$R' = R\pi - R\pi^{A}$$

Or

$$R' = R \cdot \underbrace{(\pi - \pi^{A})}_{inflation\ variance} \tag{1}$$

Where:

- R' is the increase in nominal prices
- R is the RAV in a constant price base before the inflation occurs
- π is outturn inflation scalar to inflate the value of R (eg 1.06)
- π^{A} is assumed long-term inflation scalar (eg 1.02)

The extra debt cost or principal accretion (D') due to inflation over the long-run assumption is:

$$D' = D \cdot L(\pi - \pi^A)$$

- D is the "current" debt before the inflation occurs
- L is the proportion of debt which is inflation linked

The amount of debt D is:

$$D = R \cdot g$$

Where g is gearing, the ratio of debt to RAV.

Substitute this into the change in debt formula above and re-arranging:

$$D' = g \cdot L \cdot \underbrace{R(\pi - \pi^A)}_{eq\ (1)}$$

$$D' = g \cdot L \cdot R' \tag{2}$$

The total increase in equity return is given by:

$$E' = R' - D'$$

That is, the extra equity return is the extra RAV minus the extra debt. You can substitute in (2) for D' to get:

$$E' = R' - g \cdot L \cdot R'$$

Or

$$E' = R'(1 - g \cdot L) \tag{3}$$

This increase in equity return can be divided into two components:

- The increase in equity returns which maintains a constant real equity return
- The "excess" equity return over and above a constant real equity return

Define the excess amount X as:

$$X = E' - N' \tag{4}$$

Where N' is the "normal" amount of extra equity to maintain a constant real return, and is given by:

$$N' = \underbrace{R(1 - g)}_{equity\ RAV} \cdot \underbrace{(\pi - \pi^A)}_{infl.variance}$$

Or substituting (1) in:

$$N' = R'(1 - g) \tag{5}$$

Substituting (3) and (5) into (4):

$$X = R'(1 - g \cdot L) - R'(1 - g)$$

Which reduces to,

$$X = R' g(1 - L)$$

(6)

Multi-year calculations: compounding and annual calculations with changing real RAV

When assessing the impact over a period, the impact of an inflation divergence compounds and RAV in constant prices is changing. Define Π_t as the <u>cumulative</u> outturn inflation to year t:

$$\Pi_t = \prod_{t=0}^{t} \pi_t$$

(7)

Where π_t is the outturn inflation scalar (eg 1.03) in year t, and $\pi_0 = 1$.

If one compared outturn nominal RAV to an alternative nominal RAV, like equation (1), ie:

$$R_t \Pi_t - R_t \Pi_t^A$$

then this would measure the impact of the inflation differential on **both**:

a) historical RAV; and

b) the RAV additions themselves.

For example, if there was less inflation in the alternative scenario, then the nominal RAV additions themselves would be lower.

To isolate the impact of the inflation differential on <u>historical</u> RAV, assume A_t is independent of the inflation scenario and based on outturn inflation π_t. The real RAV growth converted into nominal (A_t) in year t is:

$$A_t = (R_t - R_{t-1})\Pi_t$$

(8)

Nominal RAV with inflation indexation can then be written as:

for t = 0

$$R_0^N = R_0$$

for t > 0

$$R_t^N = R_{t-1}^N \pi_t + A_t$$

Which if substituting in (8), would simplify to the outturn nominal RAV:

$$R_t^N = R_t \Pi_t$$

(9)

but one can use the same formula to illustrate that $R_t \Pi_t^A$ reflects an assumption that $A_t^A = (R_t - R_{t-1})\Pi_t^A$.

Also, we can use this form to create a counterfactual RAV by only indexing historical RAV to the long-term inflation scalar:

$$R_t^A = R_{t-1}^A \pi_t^A + A_t \tag{10}$$

Then, the cumulative impact of the inflation differential in year t is:

$$R_t^N - R_t^A$$

And the marginal annual impact is:

$$R_t' = (R_t^N - R_t^A) - (R_{t-1}^N - R_{t-1}^A) \tag{11}$$

where R_t' can be used with the formulas in the single year example above.

Additional NPV and bill impact calculations

The outcome of equation (1) provides the increase in equity return in nominal prices. In the ET-GT-GD and ED tabs, these results are then discounted by the nominal WACC in order to express them a present value terms. 2023 is used as the base year for the present value discounting.

Once the total excess returns are expressed in net present values, they are used to estimate the potential impact to an average domestic consumer's bill. First the overall figure is reduced to just the proportion which would be charged to domestic consumers, using high-level assumptions of revenue attribution and domestic versus non-domestic customer numbers. This figure is then annuitized over 45 years using the nominal WACC in order to estimate the annual impact.