

SHORT-TERM RELATIONSHIP BETWEEN EQUITY AND ASSET BETAS¹

INTRODUCTION

Standard financial theory suggests that the equity beta and asset beta are linked through the level of gearing. However, anecdotal evidence from the mid-90s onwards suggests that this relationship may not hold in the short-term, or within certain reasonable ranges for the level of gearing. If the relationship does not hold this has important implications for the way that regulators set the Weighted Average Cost of Capital (WACC).

This section begins with an overview of the theory about betas and their relationship with the gearing ratio. We examine some evidence from regulated (and stock-market listed) UK water companies with regard to the extent to which the traditional relationship has held up in empirical observation.² We consider a number of possible explanations as to why the relationship might break down, at least in the short term. Lastly, we conclude and draw implications for the regulatory approach to setting the WACC.

PREMISE

The regulatory approach in the UK has been to set the cost of capital allowance with reference to the Capital Asset Pricing Model (CAPM), which involves relying on the following relationship between the asset beta, gearing and the equity and debt betas:

$$\beta_a = \beta_d(g) + \beta_e(1 - g) \quad (1)$$

Where: β is the beta coefficient, for which the subscripts a, d and e refer to the asset beta, debt beta and equity beta, respectively; and g is the gearing ratio.

The common assumption has been of a zero debt beta, in which case the above equation can be rearranged as:

$$\beta_e = \frac{\beta_a}{(1 - g)} \quad (2)$$

Where data is available, the equity beta (left hand side of the above equation) and gearing ratio (the denominator on the right hand side of the equation) can be estimated, unlike the asset beta, which is a theoretical concept. Regulators have relied on the above relationship in setting their cost of capital allowances.

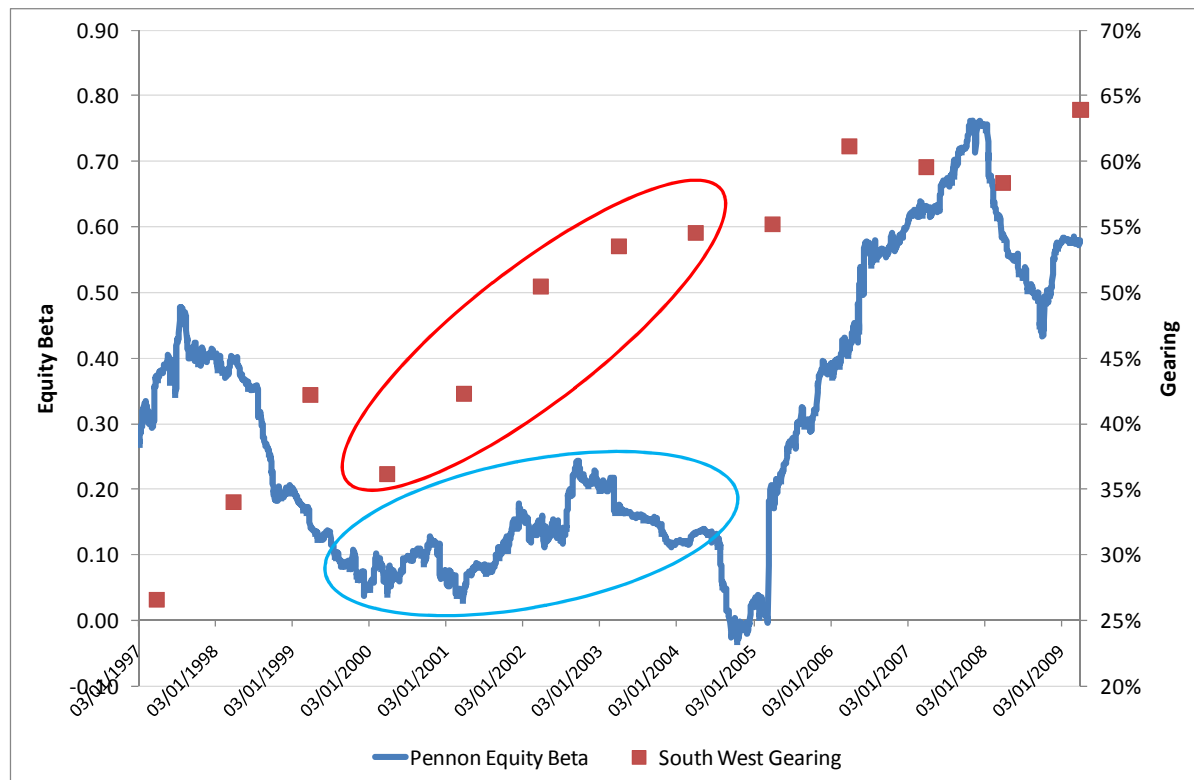
However, there has been some evidence that the standard relationship between the equity beta and the asset beta has not behaved according to equation (2), at least in the short term. Figure 1 shows that between 2000 and 2005, the equity beta for Pennon Group (the owner of South West Water, among other non-regulated assets) has remained essentially stable while South West Water's gearing increased by 20 percentage points. Based on equation (2), for this to hold the

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² Information on other regulated UK utilities is provided in an annex to this note.

asset beta would have needed to decline over the same period, but we do not think that such a decline in the risk profile of South West Water (or water companies in general) relative to the market as a whole occurred during the time in question.

Figure 1: Equity beta and gearing for Pennon Group / South West Water³

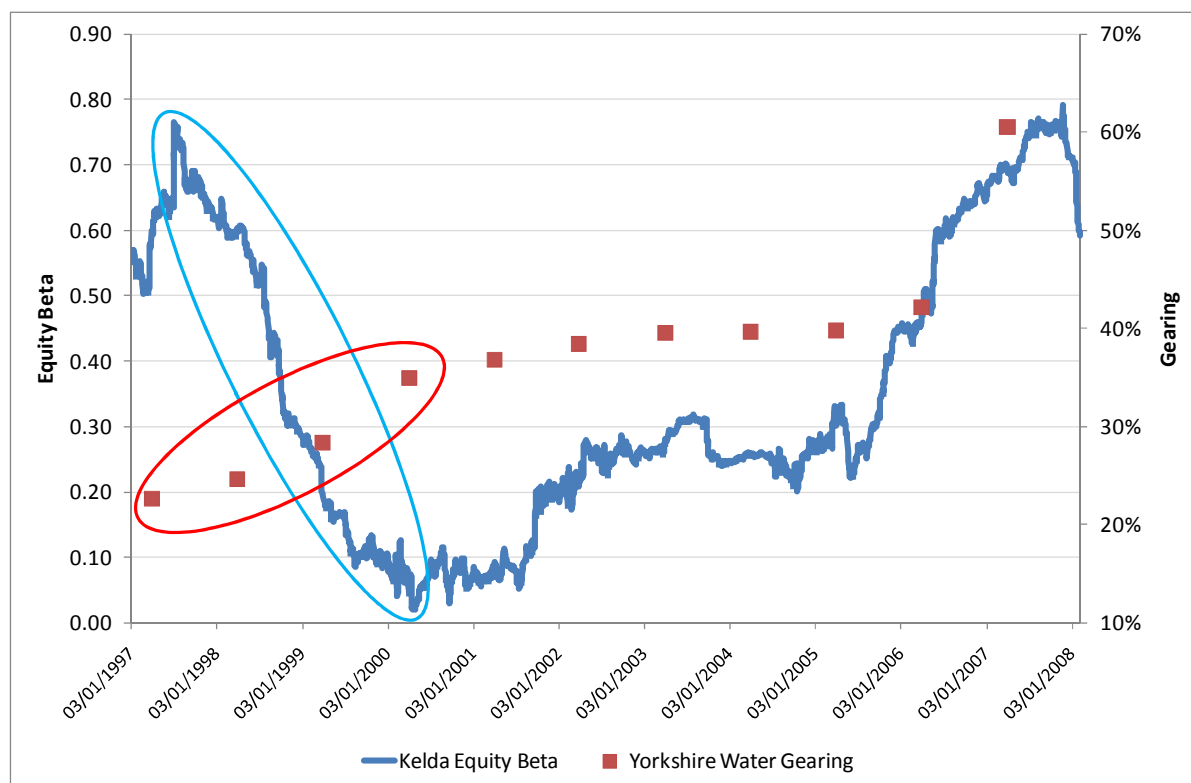


Sources: Bloomberg, Ofwat, CEPA analysis

Further evidence that the relationship in equation (2) has sometimes broken down, at least in the short-term, is shown in Figures 2 and 3, which plot the equity betas and gearing ratios of Yorkshire Water (and its parent company) and Severn Trent. Both figures show that over the period 1997-2000 the equity betas of both companies fell by a magnitude of about 70 basis points, while the gearing ratios of both companies doubled. If equation (2) were to hold, this would have required a substantial drop in the asset betas of both companies during this time, which we consider unlikely.

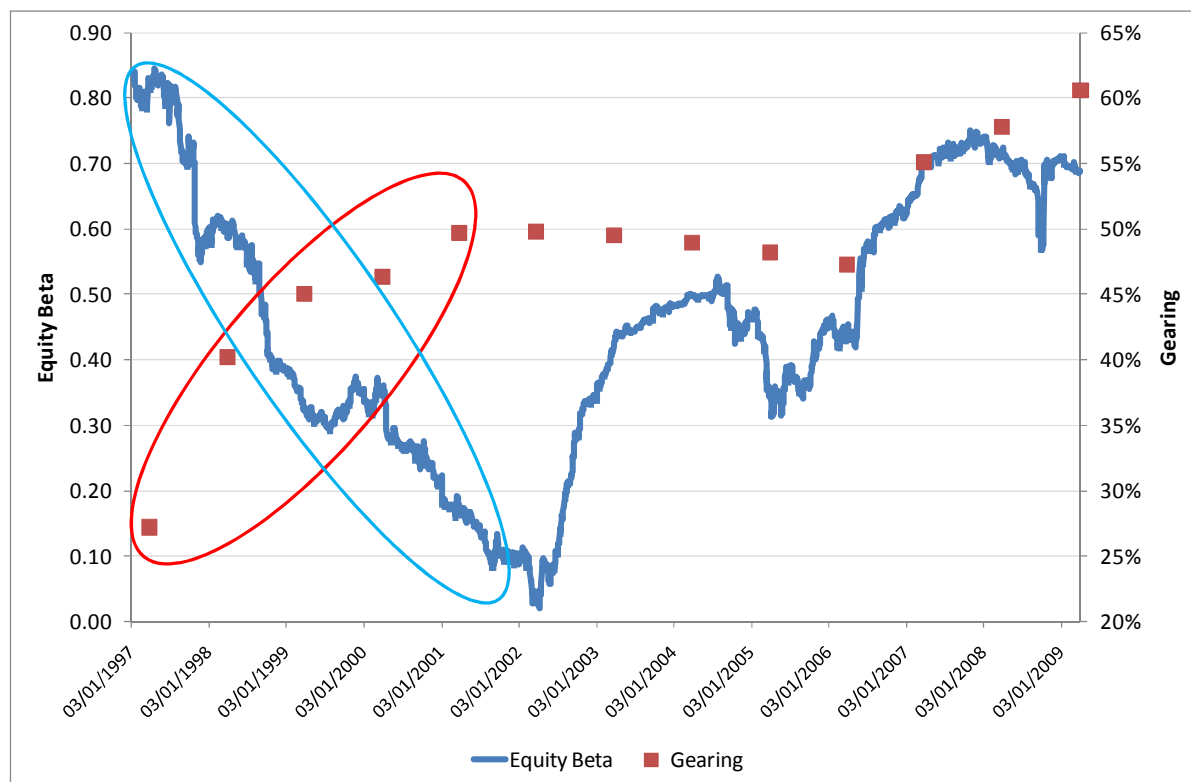
³ Unless stated otherwise in this report, the equity betas are 2-year trailing averages of the daily equity beta, gearing is the ratio of net debt to Regulatory Capital Value (RCV) provided by Ofwat in its annual report on the 'Financial performance and expenditure of the water companies in England and Wales.'

Figure 2: Equity beta and gearing for Kelda / Yorkshire Water



Sources: Bloomberg, Ofwat, CEPA analysis

Figure 3: Equity beta and gearing for Severn Trent



Sources: Bloomberg, Ofwat, CEPA analysis

It is worth noting that for all three companies shown above, the traditional relationship between gearing and equity beta – the one that is represented by equation (2) – appears to have been re-established in the later years of the period shown (i.e. 2005 onwards). In the section that follows we consider some of the possible explanations for the apparent breakdown of the relationship between the asset and equity betas.

POSSIBLE EXPLANATIONS

We consider that there are two possible sets of explanations for the above observations. One possibility is that the relationship presented in equation (2) does not hold, either because of the existence of non-zero debt betas or due to non-linearities in the way gearing affects investors' perceptions of risk. An alternative explanation is that the trends shown above are highly dependent on the way in which the equity betas and gearing ratios are calculated. Below we discuss each argument in turn.

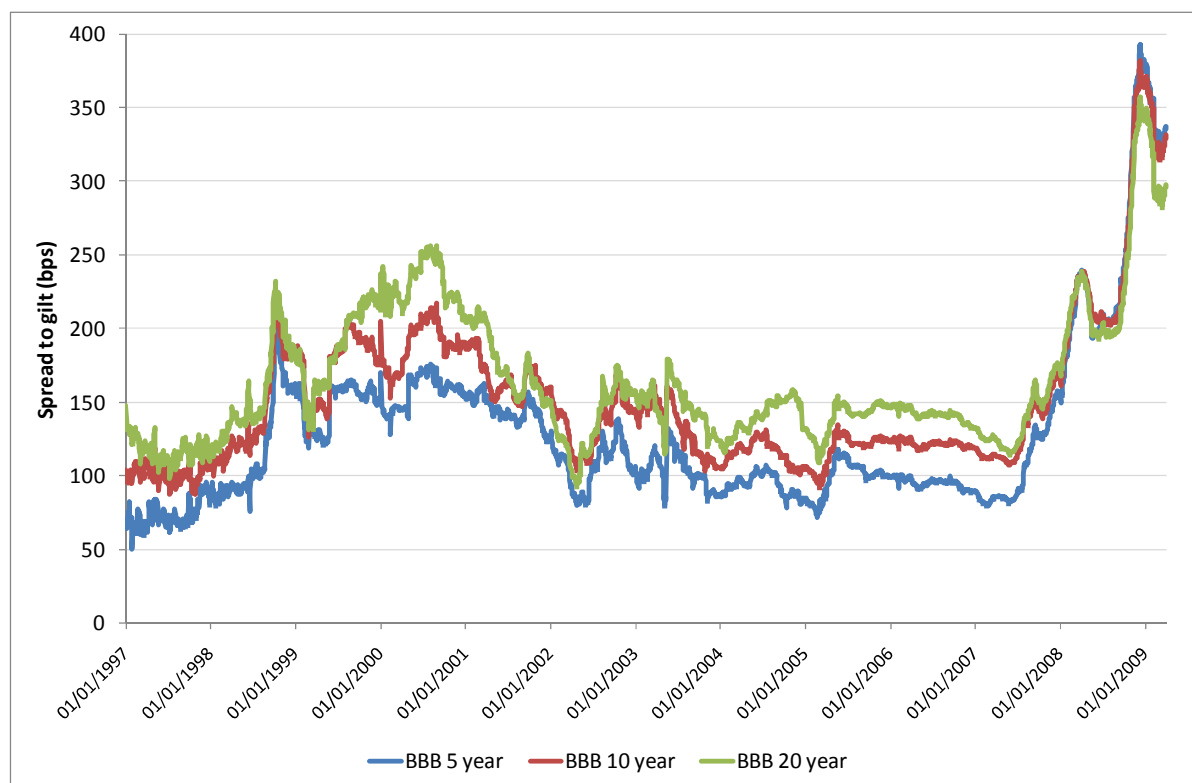
The relationship does not hold in the short-run

The relationship between the asset beta and the equity beta presented in equation (2) would need to change if there was a non-zero debt beta. The concept of a meaningful debt beta has been widely discussed both in academic literature as well as specifically within the context of economic regulation. While there appears to be a lack of definitive view on the matter, we note that the general trend, both among UK regulators and those of other jurisdictions, has been to adopt a zero debt beta. In the UK, only the recent review of London airports by Civil Aviation Authority / Competition Commission (CC) and the Bristol Water Provisional Findings published in June 2010 by the CC included a non-negative debt beta in the calculation of the WACC.⁴

An interesting observation is that there appears to be some agreement, among the regulators who do allow a non-zero debt beta, that it only exists when the debt premium is above a certain level, usually around 100bps. Figure 4 shows that the debt premia for BBB-rated UK corporate bonds was above or close to 100bps from 1999 onwards.

⁴ Although we note that Ofcom has expressed the view that the debt beta is different from zero when the debt premium is greater than 100bps, but is yet to apply a non-negative debt beta.

Figure 4: UK debt premiums on BBB-rated corporate bonds of a range of maturities



Sources: Bloomberg, CEPA analysis

Hence, the evidence with regard to the debt beta is inconclusive and unclear. We note that academic work is similarly divided over the issue, with several empirical studies identifying that although the debt beta is non-zero, it is very close to zero and thus effectively negligible.

It is interesting to note that the time at which the short-term relationship appears to have returned is during the financial crisis. This is interesting as it is also the time when a non-zero debt beta is most likely! It is difficult, given the situation faced, that a general reversal of the previous evidence can be claimed from the recent observations.

A related but distinct argument is that the relationship between the asset beta and the equity beta, is not as described by equation (2) but is in fact non-linear or subject to “trigger” levels. That is to say, that investors are largely indifferent to changes in gearing ratios within certain bounds, and that it is only when the gearing exceeds a certain level that investors adjust their views of the company’s risk profile. This argument has some appeal in that it corresponds to economic theories that stress the different impact of incremental changes compared to step changes. However, this is also a concept that would be difficult to prove empirically.⁵

⁵ Although a survey of investors might shed some light on this issue. There is evidence however of triggers/elbow points in debt pricing which provides supporting evidence for the fact that non-linear relationships hold in the financial markets.

Calculations of the equity beta and gearing ratio are problematic

An alternative set of explanations is based around the idea that the observations gathered for the equity beta and gearing are highly dependent on the particular approach in which these two variables were calculated from raw data.

Equity beta

There is a lack of consensus about what data frequency to use in calculating the equity beta (daily, weekly, monthly) and the length of time that the trailing average should cover. We note that the Smithers Report advocated the use of daily data and up to a 2-year trailing average and hence used that in the previous section. In Table 1, however, we show that the beta estimates can vary considerably by changing either the frequency used (we compare daily and weekly estimates of the equity beta) or the length of the trailing average.

Table 1: Comparison of different equity beta estimates (1995-2010)

	1-year daily	2-year daily	2-year weekly	5-year weekly
Severn Trent				
Median	0.49	0.47	0.06	0.09
Highest	1.04	0.85	0.76	0.72
Lowest	-0.22	0.02	-0.13	-0.03
Standard Deviation	0.24	0.20	0.23	0.22
Kelda⁶				
Median	0.30	0.27	0.06	0.12
Highest	0.97	0.79	0.23	0.21
Lowest	-0.07	0.02	-0.10	0.01
Standard Deviation	0.25	0.22	0.08	0.05
Pennon				
Median	0.31	0.25	0.05	0.06
Highest	0.85	0.76	0.76	0.72
Lowest	-0.14	-0.03	-0.11	-0.04
Standard Deviation	0.23	0.21	0.22	0.22

Sources: Bloomberg, CEPA analysis

Gearing

With regard to the calculation of the gearing ratios, a key point of debate relates to whether it is measured as the ratio of net debt to RCV (henceforth ‘regulatory gearing’) or as the ratio of net debt to the sum of net debt and market value of equity (henceforth ‘market gearing’). Table 2 shows that according to Ofwat-published gearing ratios for Severn Trent, Yorkshire Water and South West Water there have been consistent differences between the values produced by the

⁶ Figures for Kelda refer to the period January 1995 – February 2008.

two approaches. The way in which the market value of equity has been implied is important and there is no simple “right” approach to that.

Table 2: Comparison of gearing ratios

	Severn Trent		Yorkshire Water		South West Water	
	Regulatory Gearing	Market Gearing	Regulatory Gearing	Market Gearing	Regulatory Gearing	Market Gearing
1999-00	46.3	46.6	35.0	33.0	36.2	34.3
2000-01	49.7	48.1	36.8	37.0	42.3	36.6
2001-02	49.8	52.2	38.4	40.1	50.5	44.3
2002-03	49.5	53.7	39.6	42.7	53.6	48.9
2003-04	48.9	54.9	39.7	43.6	54.6	51.8
2004-05	48.2	55.6	39.8	44.2	55.2	54.4

Source: Ofwat

It is worth noting that in the previous section we compared 2-year daily betas with gearing ratios taken on the last day of every financial year (31st March). However, there is an argument that the gearing should be calculated as a trailing average over the same period as the equity beta, which could influence the strength of our observations, although probably not the overall trends.

IMPLICATIONS

We have presented here compelling evidence that the relationship between the equity beta and the asset beta has historically deviated, at least in the short-run, from the simple relationship that is most often applied to calculate one or the other.⁷ While a range of potential explanations exists for this, we do not consider that any single explanation fully captures the reasons behind the observed trend.

Given the observation that the relationship does not necessarily hold in the short-run (but does appear to hold in the long-run) and the sensitivity of the outcomes to the way in which the equity beta and gearing are calculated, regulators should be careful not to base their decisions on recent trends alone. Indeed, the analysis presented here suggests that in the regulatory context, best practice would be to rely on established long-term trends when setting the equity beta and asset beta in particular, and the cost of equity in general.

⁷ This is further supported by the evidence from other regulated utilities as shown in the annex. This additional data has to be viewed as illustrative owing to the impact of group activities, including the changing nature of the groups owning the UK utilities, and the fact that regulated gearing levels are being used for the whole group.

ANNEX: EVIDENCE FROM UK REGULATED COMPANIES

The analysis presented in the main body of the report relies on a number of factors, the most important of which are data availability and the extent to which the gearing and beta figures reflect regulated activities, as opposed to wider group activities. In the main body of the report we presented figures for the three companies that had the best combination of having a long time-series of data and having “clean” figures. However, some insight may also be gained from examining companies for which these two conditions do not hold as strongly.

In this annex we present figures for two further water and sewerage companies – Anglian Water and Northumbrian Water – for which only a relatively short time-series is available. We also provide figures for National Grid and for the electricity distribution network operators (DNOs) Scottish Power and Scottish and Southern Energy (SSE). For these three energy companies, our main concern is the impact of the different range of business activities, some of which are not subject to price control regulation, on the observed beta estimates. This, in turn, can cause a decoupling of movements in the equity beta from movements in the gearing level. As such, caution should be exercised when drawing conclusions from the trends observed for National Grid, Scottish Power and SSE.

A.1. Anglian Water

Figure A.1 plots the gearing and equity beta trends for Anglian Water over the period January 1997 to April 2004. This corresponds to the period in which the relationship between the equity beta and the gearing level appeared to break down for Kelda/Yorkshire Water (Figure 2) and Severn Trent (Figure 3). It is interesting to note, therefore, that Anglian Water exhibits a trend that is largely in line with equation (2).

Figure A.1: Equity beta and gearing for Anglian Water



Sources: Bloomberg, Ofwat, CEPA analysis

A.2. Northumbrian Water

Figure A.2 plots the gearing and equity beta trends for Northumbrian Water over the period May 2005 to March 2009. This is a short period of time, which makes it very difficult to draw any meaningful conclusions from Figure A.2. We note however, that there appears to be no clear relationship between changes in the gearing level and movements in the equity beta estimate over the period shown. This supports our main conclusion from this study – that regulators should aim to rely on long-term rather than short-term observations when it comes to betas.

Figure A.2: Equity beta and gearing for Northumbrian Water

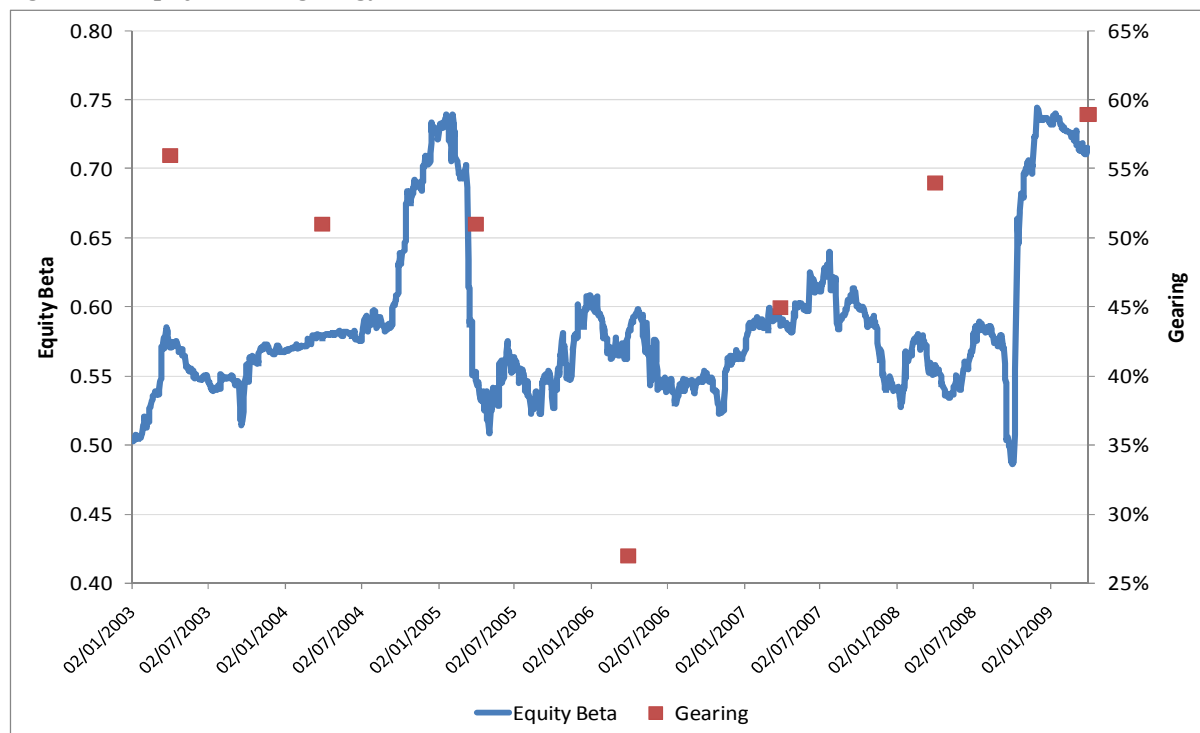


Sources: Bloomberg, Ofwat, CEPA analysis

A.3. National Grid

Figure A.3 presents the gearing level of NTS, the gas transmission network operator subsidiary of National Grid. This is plotted against the equity beta estimates for listed National Grid shares, which are held at group level. As noted above, this creates an inconsistency between movements in the gearing level and the movements observed in the equity beta. This is clearly apparent in Figure A.3.

Figure A.3: Equity beta and gearing for National Grid

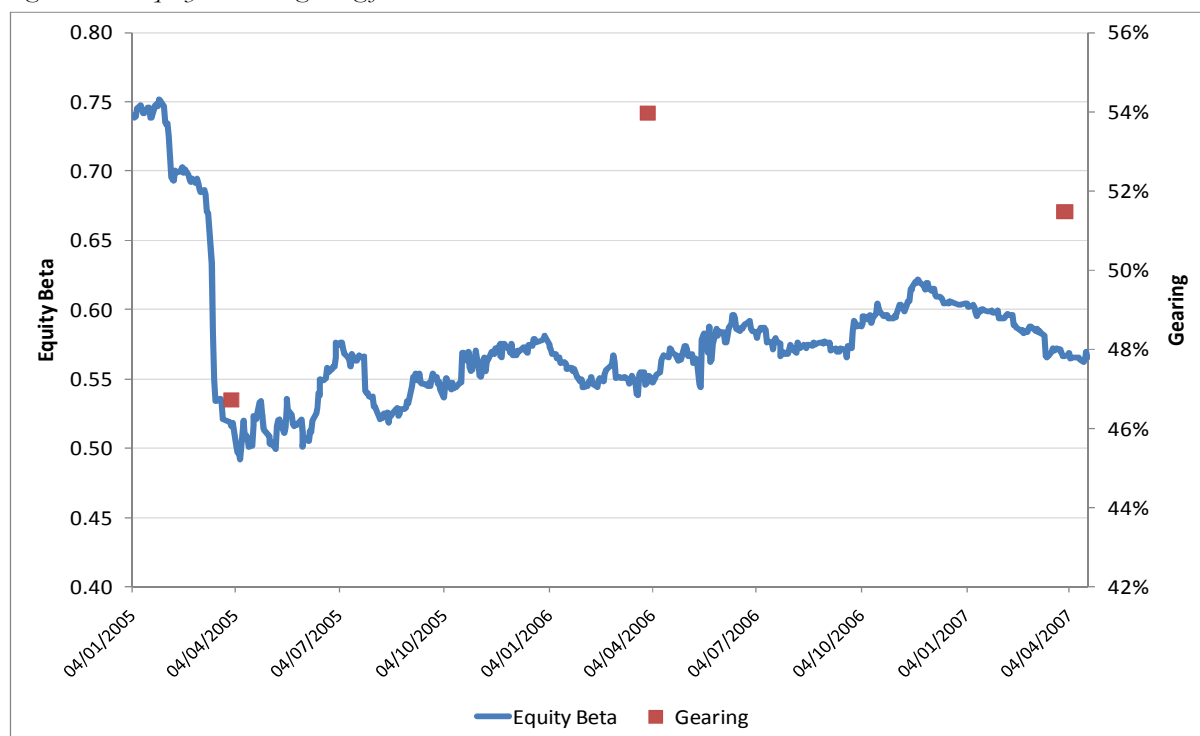


Sources: Bloomberg, National Grid regulatory accounts, CEPA analysis

A.4. Scottish Power

Figure A.4 plots the gearing and equity beta of Scottish Power during the period from January 2005 to April 2007. This is a very short period from to draw conclusions on the extent to which the traditional relationship between the equity beta and gearing level hold for Scottish Power.

Figure A.4: Equity beta and gearing for Scottish Power

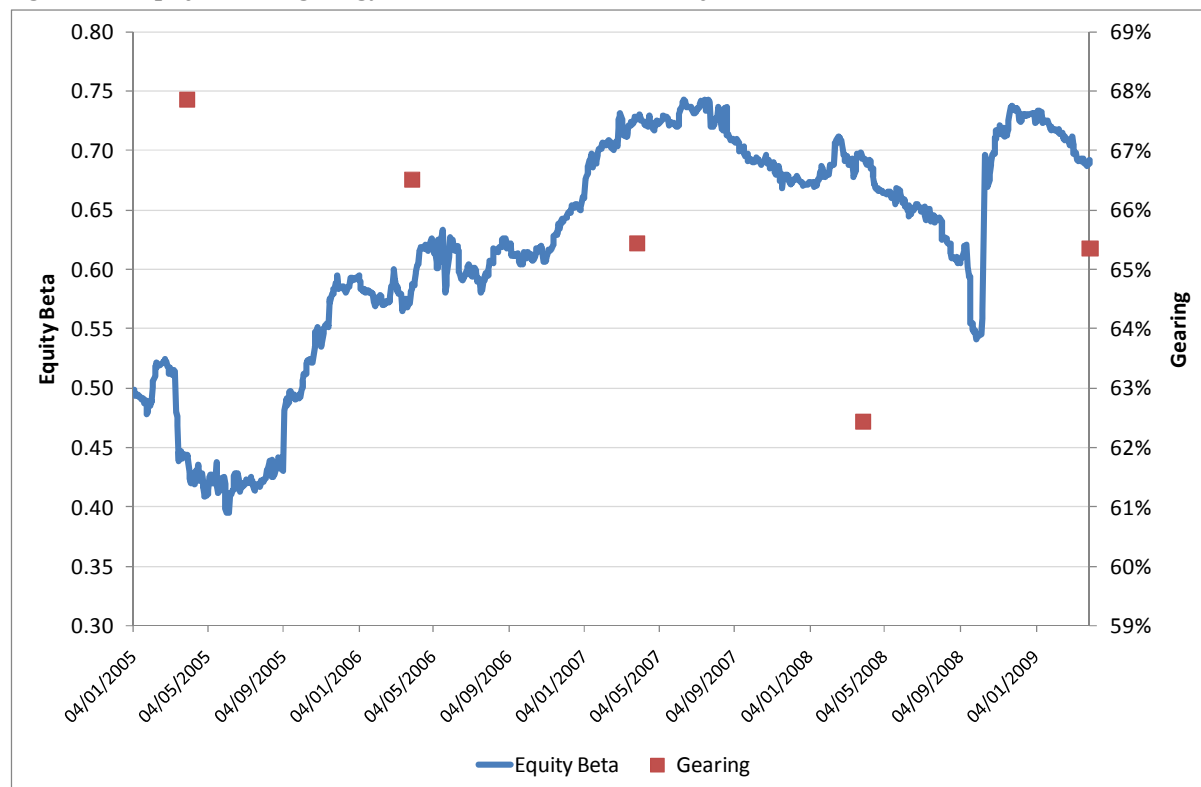


Sources: Bloomberg, Scottish Power regulatory accounts, CEPA analysis

A.5. Scottish and Southern Energy

Figure A.5 presents the gearing and equity beta of SSE for the period January 2005 to April 2009. As noted above, while the gearing figures refer to SSE's two DNOs (Southern and Hydro), the equity betas refer to the group level, which also owns a transmission network and a number of non-regulated assets. This could be one of the reasons for the lack of a clear observed relationship between the equity beta and the gearing level in Figure A.5.

Figure A.5: Equity beta and gearing for Scottish & Southern Electricity



Sources: Bloomberg, SSE regulatory accounts, CEPA analysis