Europe Economics

Update of PwC analysis on the risk-free rate

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Introduction

In April 2013 PwC published, on behalf of the Civil Aviation Authority (CAA) the report "Estimating the cost of capital in Q6 for Heathrow, Gatwick and Stansted" ("April 2013 report" hereafter).[1] The aim of the report was to inform the CAA on the suitable range for the estimate of the cost of capital for Heathrow, Gatwick and Stansted airport for the upcoming price control review (Q6).

The analysis conducted by PwC in their Aril 2013 report uses 28 March 2013 (unless stated otherwise) as the cut-off date. Without necessarily agreeing with the PwC's proposed methodology, this document replicates PwC's methodology for estimating the risk-free rate (up to 31 July 2013).

Conclusions are drawn on the implications that recent market evidence would have on the risk-free rate suggested by PwC April 2013. The current report makes also some methodological remarks on certain aspects of PwC's overall methodology.

[1] http://www.caa.co.uk/docs/78/CAA_CostofCapital_Final_250413_CLEAN.pdf

1 Risk-free Rate

In order to obtain a range for the real risk-free rate, PwC considers evidence from both UK index-linked and UK nominal gilts.[2]

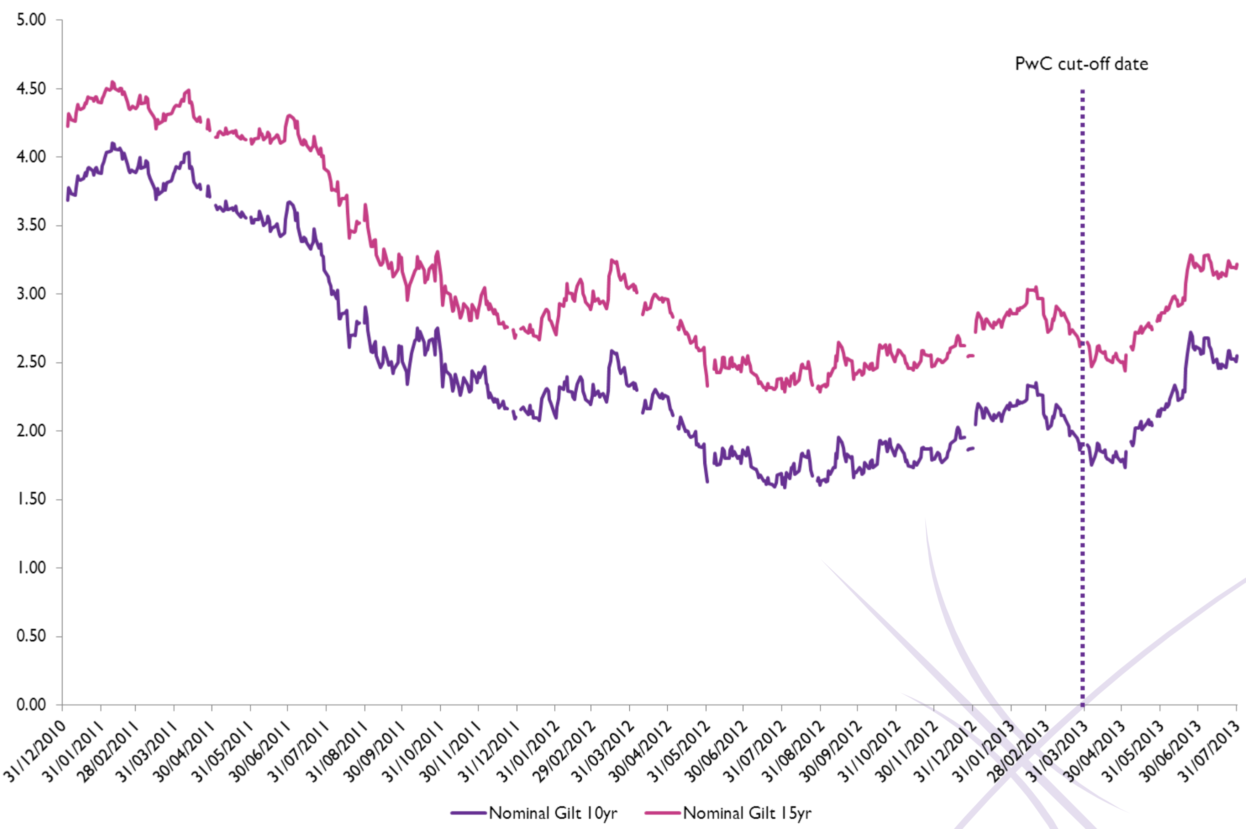
1.1 Update of UK nominal bonds analysis

In relation to the analysis of nominal gilts, at page 55 of the Aril 2013 report, PwC states that:

"Current evidence on the yields on 10-15 year maturity nominal Government bonds suggests spot estimates of around 1.9% to 2.7%. Taking into account expectations of trends in the future, as some of the factors influencing current yields unwind over time, implies an uplift of around 100 basis points – thus leading to a range of around 2.9% to 3.7% for the nominal risk-free rate. Adjusting for our RPI inflation assumption of 2.8% implies a real risk-free rate of around **0.1% to 0.9%."**

We provide below a chart showing how yields on 10-year and 15-year UK nominal bonds, have evolved since March 2013.

Figure 1-1: Nominal UK government bonds yields (01/01/2011-31/07/2013)



Source: Bank of England, EE analysis

[2] They also adopt an approach based on long term (10- years) historical yields but this is used mainly as a cross-check (see page 57 of the April 2013 report).

We notice that the yields have risen materially since March 2013. The following table compares the spot rates at 31/07/2013 with those at 28/03/2013.

Table 1.1: Changes in spot rate yields on UK nominal bonds since March 2013

	10 Years	15 Years
28/03/2013 (PwC cut-off date)	1.89	2.65
31/07/2013	2.55	3.22
Change	**0.66**	**0.56**

Based on the most recent spot rates, the methodology adopted by PwC (which consists of an uplift of 100 bps, and an inflation adjustment assuming an inflation rate of 2.8 per cent), would lead to a risk-free rate range of **0.8-1.4** per cent (as opposed to the range of 0.1-0.9 per cent of March 2013).

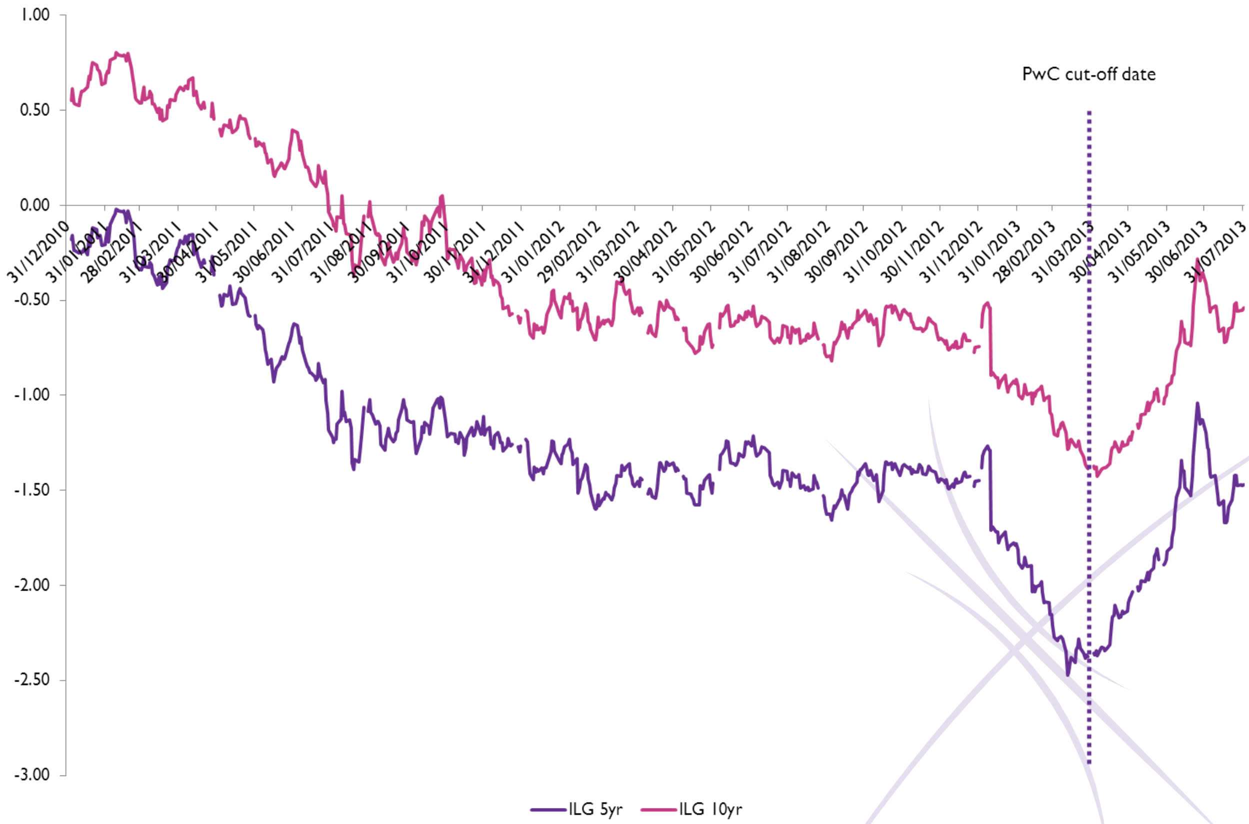
1.2 Update of UK index-linked bonds analysis

In relation to the analysis of nominal gilts, at page 51 of their Aril 2013 report, PwC states that:

> Our analysis of current evidence of yields on ILGs suggests spot estimates ranging between -1.39% to -0.78% across the 10-15 year maturity gilts. Incorporating an uplift of around 1.0% - broadly consistent with evidence from forward rates, would suggest forward looking rates of around **-0.39% to 0.22%.**

We provide below a chart showing the how yields on 10-year and 15-years UK index-linked bonds, have evolved since March 2013.

Figure 1-2: Index-linked UK government Bonds yields (01/01/2011-12/08/2013)



Source: Bank of England, EE analysis

Again, the yields have risen materially since the cut-off date used by PwC in the Aril 2013 report. The differences between recent spot rates and those of 28/03/2013 are shown below.

Table 1.2: Changes in spot rate yields on UK index-linked bonds since March 2013

	10 Years	15 Years
28/03/2013 (PwC cut-off date)	-1.39	-0.78
At: 31/07/2013	-0.54	-0.10
Change	**0.85**	**0.68**

Based on the most recent spot rates, and after applying an uplift of 1 per cent (which PwC considers broadly consistent with evidence from forward rates), would lead to forward looking rates of **0.46** and **0.90** per cent (as opposed to the rates of -0.39 and 0.22 per cent of March 2013).

1.3 Update of PwC's overall view on the risk-free rate

Based on their analysis of nominal gilts and index-linked gilts, at page 58 of their April 2013 report PwC concludes that:

> —evidence on the current risk-free rate estimates based on ILGs suggest a range of around -**0.39% to 0.22%** whereas evidence from RPI inflation adjusted nominal government bonds suggests a range of around **0.1% to 0.9%** [*footnote omitted*]. We combine the evidence from ILGs and nominal yields to derive our estimate for the real RFR under the current market approach, giving slightly more weight to evidence from nominal government bonds. Overall, our analysis suggests a mid-point of 0.5% with a reasonably tight range of **0.25 % to 0.75%**. This allows for future increase in yields during Q6, as suggested in current forward rates.

In light of the most recent data, risk-free rate estimates based on index linked gilts range now between **0.46** and **0.90** whereas, inflation adjusted nominal yields fall within **0.8** and **1.4** per cent. The mid-point of the latter range (we note that PwC gives more weight to nominal gilt rate) is 1.1. Applying a confidence error of 0.25 (consistently with PwC's methodology) would result in a risk-free rate range of **0.85 per cent to 1.35 per cent**. We notice that even the top-end of the range suggested by PwC in April 2013 is below the low-end range supported by the more recent market evidence.

2 Some methodological remarks

As per Table1.1 of their April 2013 report, PwC envisages two separate costs of capital scenarios. In the "current market" approach, the risk-free rate falls within the range 0.25-0.75 and the cost of debt for Heathrow ranges between 2.3 and 3.0 (with a midpoint of 2.65). In the "long term return" approach the risk free rate is 1.7 per cent and the cost of debt of Heathrow is 2.7.

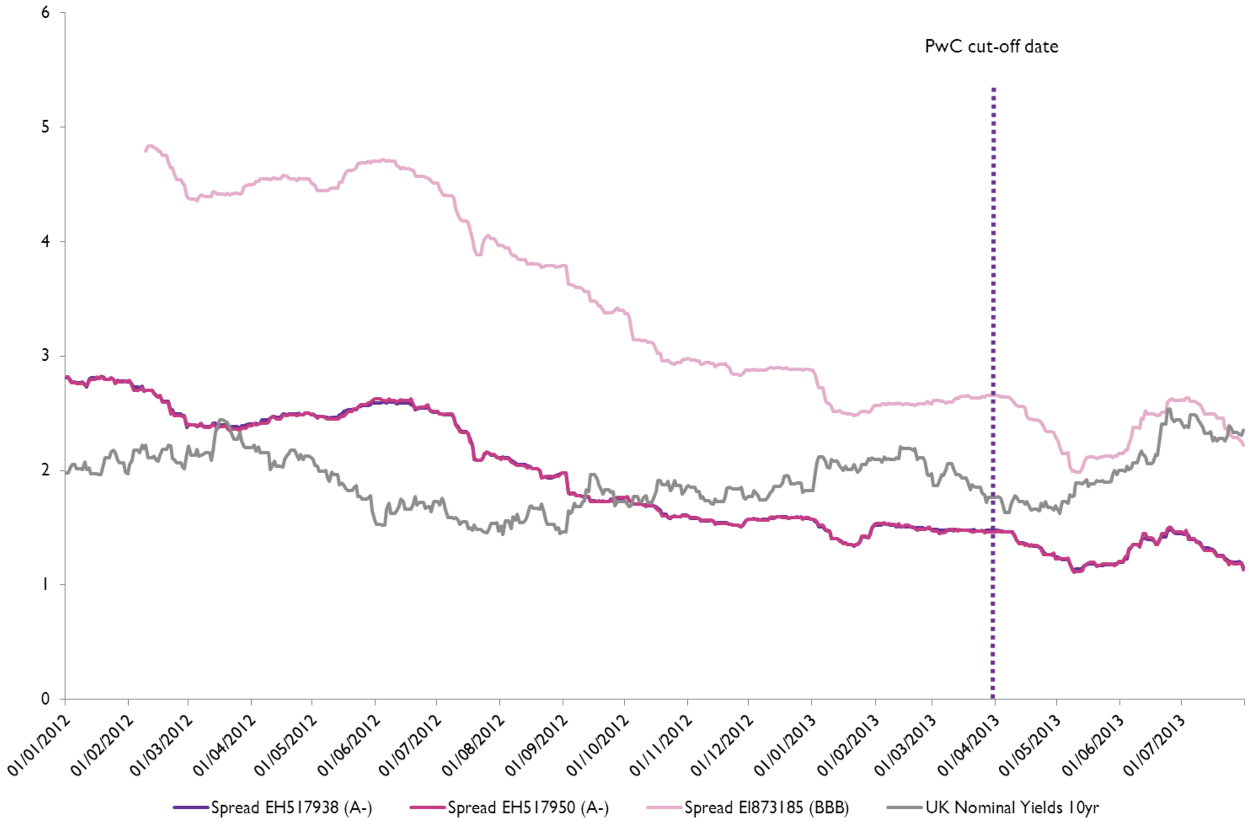
The fact that across scenarios characterised by materially different risk-free rates the cost of debt remains virtually unchanged, implies a view of the world in which movements in the risk free rate are to a large extent compensated by a movements in the opposite direction of the debt premium. This is emphasised by the following table which reports, for the two scenarios, the implied debt premium for Heathrow.

Table 2.1: Implied debt premium for Heathrow

	Long-term returns approach	**Current market approach**	
		Low	High
Risk-free rate (PwC)	1.6	0.25	0.75
Heathrow cost of debt (PwC)	2.7	2.30	3.00
Implied debt Premium	1.1	2.05	2.25

The recent movements in the UK gilt rates can provide insights as to whether changes in UK government bond yields are indeed negatively correlated with Heathrow corporate bond spreads. In the chart below movements in the yields of the 10-year UK nominal bond since 2012 are shown together with the movements in the spreads of a set of Heathrow bonds that will mature in approximately 10 years.

Figure 2-1: Movements in the spreads of Heathrow 10-year bonds (rated A- and BBB), and in the nominal yields of the 10-year UK Government bond



Source: Bloomberg, EE analysis

A visual inspection of the chart above suggests that:

- Spreads experienced a general decline in 2012, but there may have been levelling off in 2013
- The spread on Heathrow investment grading bonds (BBB or above) is currently about 2 per cent (the average spread for the BBB rated bond during 2013 has been 2.47— cf the Europe Economics recommendation of a notional spread for BBB+ in the range of 2.1-2.7, before issuance costs).
- There is no evidence of negative correlation between gilt movements and A-/BBB bond spreads movements. In fact, since 2012, the average correlation between gilt movements and the spreads reported in Figure 2-1 is -0.07.