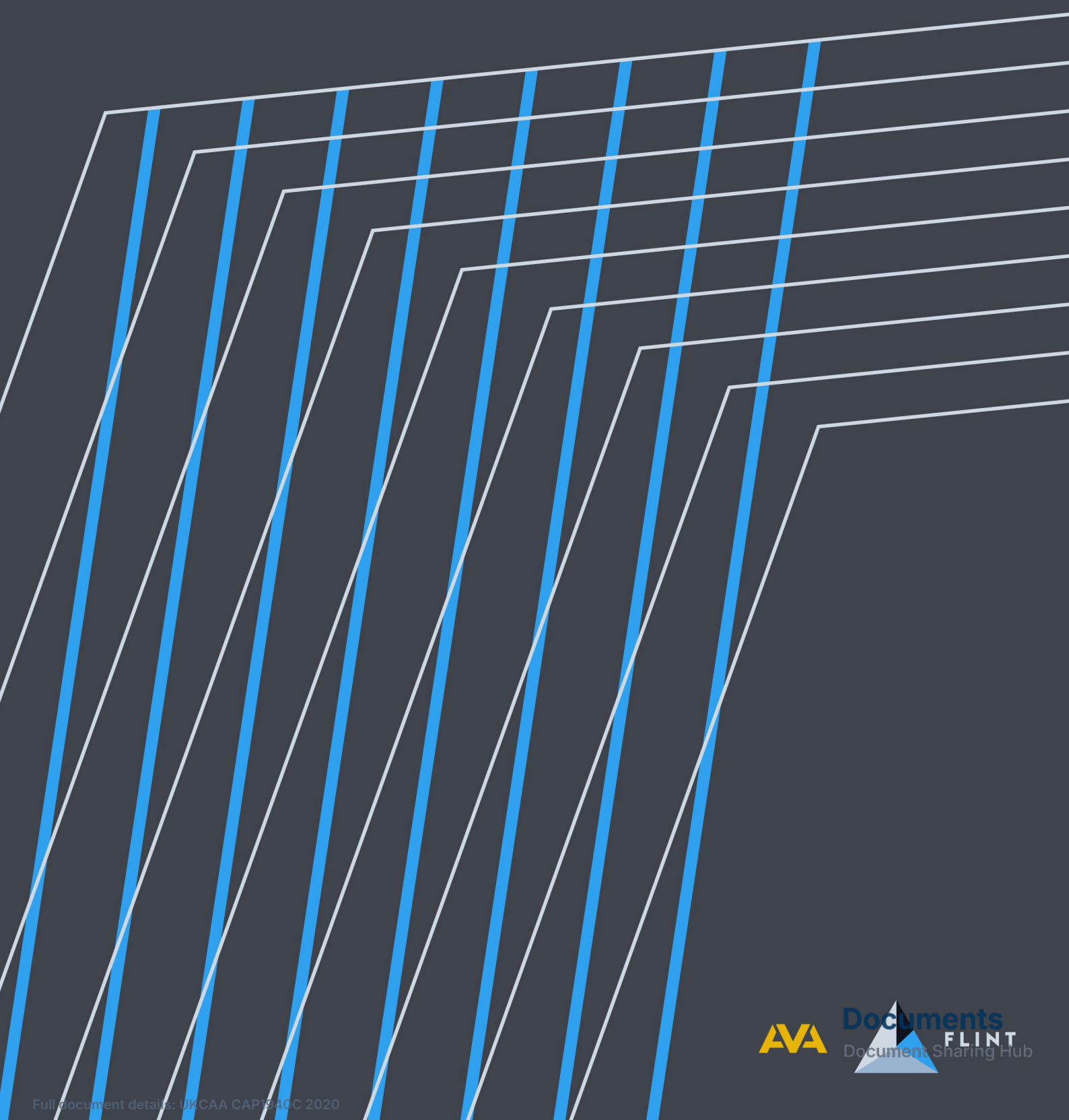


Support to the Civil Aviation Authority: Business as Usual WACC for H7



Executive Summary

Flint was commissioned by the Civil Aviation Authority (CAA) to assess the weighted average cost of capital (WACC) for Heathrow Airport Limited (HAL), for the H7 control period. Our assessment focuses on “Business as Usual” (BAU) mode – ignoring plans for expansion.

The WACC is important – a 1% change in the WACC prompts a 6% change in allowed revenues for HAL.

Since 2017, the CAA has commissioned analysis from PwC and HAL has provided inputs to the CAA, with support from its advisor, NERA. There have been significant differences of view in key areas. In addition, in March 2020 the Competition and Markets Authority (CMA) issued provisional findings on the price control for NERL, including a WACC assessment which has significant read-across implications for HAL.

In this report, we provide our views on the WACC and the key underpinning assumptions. We set out our assessment of the areas of disagreement between PwC and HAL and consider the implications of the CMA’s provisional findings for NERL.

Importantly, our assessment is based on the evidence available at the end of February 2020. This predated the major COVID-19 outbreak, which has significantly affected the aviation sector, and the economy more broadly. This should be the subject of extensive further review and analysis as it will directly affect the WACC.

Our central case recommendations are set out in Table 1:

TABLE 1: FLINT’S ESTIMATES OF KEY PARAMETERS

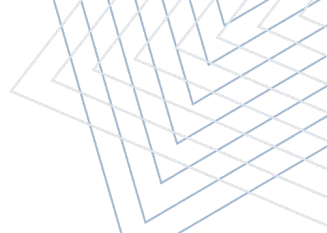
	Lower Bound	Upper Bound	Central Case
Risk-free Rate	-2.10%	-2.10%	-2.10%
Equity Risk Premium	7.10%	8.10%	7.60%
Equity beta	0.96	1.35	1.14
CoE (post tax)	4.7%	8.8%	6.5%
Cost of embedded debt	1.48%	1.80%	1.64%
Cost of new debt	-0.48%	0.12%	-0.18%
Real CoD (pre-tax)	1.6%	1.7%	1.6%
Gearing	52.50%	60.00%	56.25%
Vanilla WACC	3.1%	4.6%	3.8%

Source: Flint estimates with cost of equity, cost of debt and WACC rounded to the nearest decimal point.

Note: The cost of debt estimate includes issuance and liquidity costs.

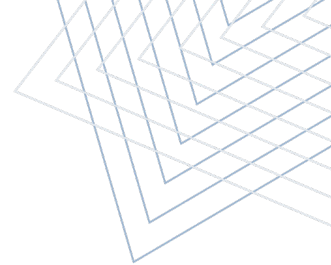
We would emphasise certain key aspects of our recommendations:

- On the cost of equity, we align closely with the CMA in all methodological regards. This leads us closer to the recommendations of PwC on market parameters, but aligns us more closely with HAL in relation to asset and equity beta estimation.
- On the cost of debt, we recommend an approach based on a debt index, rather than observation of HAL’s actual cost of debt. Our debt index recognises the term of HAL’s debt and the expected



evolving cost of both new and embedded debt up to and through H7, based on analysis of predicted yields.

- We undertake a detailed analysis of a change in notional gearing on the WACC – consistent with emphasis given to this by the CMA in the NERL provisional findings. The CMA noted that, in the case of NERL, higher gearing gave rise to an increasing WACC in a way that it thought undermined the CAA’s proposed assumption for NERL’s notional gearing.
- In light of our analysis of gearing and associated effects, we adopt a range for notional gearing of 52.5% to 60%. Our central case is based on the mid-point of this range. This recognises the considerations raised by the CMA and points to a reduction relative to the notional gearing previously assumed by the CAA.
 - However, we are mindful of the need to review this in light of the CMA’s final determinations for NERL and for the water companies in the price control redetermination processes currently underway.



1 Introduction

Flint was commissioned by the Civil Aviation Authority (CAA) to provide an independent evaluation of the weighted average cost of capital (WACC) for Heathrow Airport, ahead of consultation on prices for the H7 control period.

Specifically, we were asked to focus on the assessment of the WACC for Heathrow in “Business as Usual” (BAU) mode – as though there were no plans for significant expansion of Heathrow, through the construction of a third runway. Consideration of the implications of expansion for the WACC are subject to separate assessment by the CAA.

Since 2017 there have been several reports produced by PwC for the CAA on BAU WACC estimation for H7, and following publication these have prompted inputs from key stakeholders, most notably Heathrow Airport Limited (HAL) and its advisor, NERA. These reports indicate significant disagreement in key areas.

Also, in March 2020, as part of an appeal process, the Competition and Markets Authority (CMA) issued provisional findings of its review of the price control for NERL. This included the CMA’s estimation of the WACC for NERL, and underlying assumptions.

In this report, we provide a view on the WACC and the key underpinning assumptions, focusing in particular, on those parameters that generated disagreement between PwC and HAL (supported by its advisor, NERA) – and in light of the implications of the CMA’s provisional findings for NERL.

Importantly, we were asked by the CAA to provide estimates based on the evidence available at end of February 2020. This predated the major COVID-19 outbreak, which has significantly affected the aviation sector, the economy more broadly and, hence, current WACC estimates.

The implication of COVID-19 will potentially be significant for regulation of HAL in the future, including the basis of allowed returns and prices. Nonetheless, consistent with the CMA’s provisional assessment of the WACC for NERL, we evaluate the evidence based on a cut-off date as at the end of February 2020.

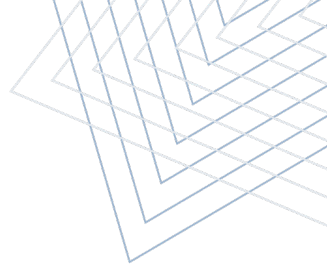
There are three key components to the WACC: cost of equity, cost of debt and gearing, which interact through the formula below:¹

$$WACC = \text{Cost of Equity}_{\text{post-tax}} * (1 - \text{gearing}) + \text{Cost of Debt}_{\text{pre-tax}} * \text{gearing}$$

The structure of the report is anchored around the WACC formulation, as follows:

- Section 2 provides our views on the cost of equity. This is divided in two subsections:
 - Section 2.1 CAPM (market) parameters – Total Market Returns (TMR), Risk-free Rate (RfR), and Equity Risk Premium (ERP).

¹ Regulators typically define the WACC in “vanilla” form, with respect to tax. The cost of debt is considered a “pre-tax” cost of debt (because debt interest is paid from earnings before corporation tax). The cost of equity is considered a “post-tax” cost of equity, because payments to equity investors (dividends) are made from earnings after corporate tax.



- Section 2.2 Beta estimation for HAL.
- Section 3 provides our view on the cost of debt. This section is divided in five subsections:
 - Section 3.1 Cost of embedded debt.
 - Section 3.2 Cost of new debt.
 - Section 3.3 Weighting of new debt.
 - Section 3.4 Issuance costs.
 - Section 3.5 Inflation
- Section 4 explains our view on gearing, and the impact of changes in gearing.
- Section 5 provides a summary of our recommendations and conclusions.

In the sections where we discuss the main WACC parameters, we provide a brief explanation of each parameter, a description of the approaches adopted to estimation, and evidence relied upon by PwC, HAL, and the CMA, respectively. We then set out our own view on the appropriate basis for evidencing and deriving the appropriate parameter values.

2 Cost of Equity

The cost of equity (CoE) is the return required by equity holders. In this context, it is the notional return that would be required by equity holders, in line with the notional capital structure assumed by the CAA for HAL.

Our estimates for the cost of equity are based on the Capital Asset Pricing Model (CAPM). The CAPM is widely used in corporate finance to capture the relationship between systematic risk and the expected return of assets. It is also commonly used across regulated sectors, and by the CMA, for the estimation of the required equity returns. Both PwC and HAL proposed a CAPM based approach for estimating the cost of equity.

The CAPM formula requires three key input parameters:

- The Risk-free Rate (RfR): the return available on a risk-free asset.
- The Equity Risk Premium (ERP): the premium required to remunerate investors for the additional risk of investing in equities in general:
 - To estimate the ERP, PwC, HAL and the CMA relied on a total market return (TMR) approach, which requires estimating the TMR directly, then deconstructing it into RfR and ERP; and
- The equity beta: which measures the systematic risk of (notional) equity relative to with reference to the market portfolio. The equity beta for HAL reflects the risk associated with investing in HAL's (notional) equity that cannot be eliminated through diversification.

The CAPM formula is as shown below:

$$\text{Cost of Equity} = \text{Risk free Rate} + \beta_{\text{Equity}} * \text{Equity Risk Premium}$$

Although both HAL and PwC make use of the CAPM to estimate the cost of equity, each proposed different estimates for all three parameter values. These are summarised in Table 2 below, alongside the CMA assumption set out in the provisional findings for NERL:

TABLE 2: COMPARISON OF PWC, HAL AND CMA COST OF EQUITY PARAMETERS

	PwC (Aug 2019)		HAL		CMA at RP3 (NERL)	
	Lower Bound	Upper Bound	Lower Bound	Upper Bound	Lower Bound	Upper Bound
RfR	-1.50%	-1.00%	-1.71%	-1.20%	-2.25%	-2.25%
ERP	6.60%	6.60%	7.71%	7.70%	7.25%	8.25%
TMR	5.10%	5.60%	6.00%	6.50%	5.00%	6.00%
Equity beta	0.90	1.15	1.20	1.40	0.71	0.86
CoE (post tax)	4.44%	6.59%	7.54%	9.58%	2.93%	4.82%

Source: PwC (Aug 2019), *Estimating the cost of capital for H7 and RP3 – Response to stakeholder views on total market return and debt beta*, p.9. HAL (Dec 2019), *Heathrow's Initial Business Plan Detailed Plan*, pp. 304. CMA (Mar 2020), *NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report*, p.202.

The differences between the parties, and the reasons for these are covered in the sections below.

1 The CAPM Market Parameters: Total Market Return, Risk-free Rate and Equity Risk Premium

The TMR, RfR, and ERP estimates relate to the equity market as a whole, and describe the relationship between the returns on equities in general, and the returns on risk free assets (commonly taken to mean very low risk securities, such as government bonds).

Regulatory practice and pure corporate finance principles

In a pure corporate finance sense, the market parameters are intended to be forward-looking, describing the expected returns required by today's equity investors.

The assumed values for these parameters are often based on observed long-term historical evidence of the relationship between returns in equity markets and returns on very low risk securities, such as government bonds. This assumption is made on the basis that the "long-run" past is a useful indicator of future expectations.

However, interpretations of current or forecast market behaviours can also be used to infer values for prospective future equity returns – for example, surveys of analyst forecasts or dividend growth / discount models (DGM/DDM).

PwC and HAL considered both historic and forward-looking evidence. The CMA, on the other hand, largely disregarded any forward-looking evidence on the basis that:

*"[...] forward-looking approaches are largely assumption-driven, with little evidence to support the use of one set of assumptions over others, and they produce a wide range of estimates."*²

In summary, the differences between PwC and HAL are:

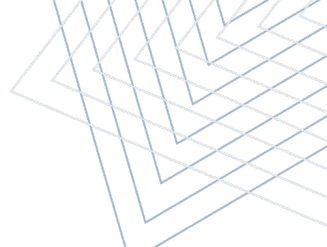
- The interpretation of historic evidence – including, significantly, the approach adopted to convert observed nominal equity market returns (i.e. the TMR) into real returns with respect to CPI and RPI.
- The consideration of forward-looking evidence, in particular the prospect for dividend growth in UK equity markets, and the implications of this for implied future equity returns.

Collectively, these differences in approach drive a significant "wedge" between the PwC and HAL views of the market parameters – the TMR proposed by HAL was 6.0% to 6.5%, which was 0.9% greater than the number of 5.1% to 5.6% put forward by PwC.

Historical v. Forward-looking estimates

A critical point of disagreement between PwC and HAL is the reliance on historical and forward-looking TMR estimates:

² CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.173.



- HAL disagreed with PwC's approach to the assessment of the effects of inflation on the TMR; and
- While PwC placed some weight on its in-house DDM, NERA, HAL's advisor, argued that the Bank of England DDM was more reliable. However, NERA also challenged the dividend growth assumption adopted by PwC.

We have reviewed the differences between PwC and HAL's approach to estimate the TMR, and concluded that:

- The approach adopted by PwC in deflating historic returns is reasonable, on the basis that it had done so using the best available independently sourced data on historic inflation.
- HAL's view, supported by NERA, is that the appropriate basis for dividend growth forecasts for UK equity should be a weighting of long-term GDP forecasts for the different regions present in the FTSE All-share index. We consider, in principle, that this is also reasonable.
- However, this approach has important caveats – notably that such evidence is potentially not representative of the long term. Widely available GDP forecasts, often used in such models, typically refer to a relatively short-term horizon. This is a general problem of populating models – such as the DDM/DGM – that require forecast information over an infinite horizon. Our general view is that forward-looking evidence should be given very limited weight due to its high sensitivity to largely speculative assumptions.

Most importantly, since the PwC reports were published and the HAL evidence submitted to the CAA, the CMA has published its provisional findings on NERL. In summary, the views adopted by the CMA on the CAPM market parameters are:

- A RfR derived from 10-year index-linked gilt (ILG) rates averaged over 3 and 6-months, and cross checked against the 15-year and 20-year ILG rates:

*"We consider that current ILG rates continue to provide the most appropriate basis for the measurement of a notional investors' achievable risk-free returns."*³

- A TMR based on Dimson, Marsh and Staunton (2020) (DMS) and the Barclays Equity Gilt Study dataset (2018):
 - The DMS data underpinned an ex-post assessment of observed returns, considering a range of assumptions regarding – for example – holding periods averaging methods, and inflation.
 - An ex-ante approach that decomposed observed returns into average dividend yields and average rate of dividend growth using the Barclays dataset.

*"Taking this evidence in the round, our provisional view is that the TMR estimates produced under both the historic ex-post and historic ex-ante approaches are consistent with a figure of between 5 and 6% on an RPI-real basis."*⁴

³ CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.194.

⁴ CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.190.



- An ERP was then adopted, consistent with the observed RfR and the assumed TMR.

The CMA acts as an anchor point for UK regulatory WACC assessment, in particular in regard to the values assumed for the market parameters. Regardless of this, we consider that the values proposed for the generic CAPM parameters, at the NERL/CAA appeal provisional findings, are reasonable for the following reasons:

- The CMA placed significant weight on the recent returns observed in the market for the RfR. This is without doubt the most appropriate reference point for equity investors, as the “risk-free” alternative location for their funds. The (relatively short) averaging period avoids undue volatility.
- The CMA estimates are consistent with the expected TMR remaining more stable in absolute value than the RfR, albeit exhibiting slight decline. This suggests an increasing “price” of risk, – or ERP – and is reflective of the apparent consensus view amongst academics that the TMR remains broadly stable, despite the currently low level of, and changes in, the RfR:

“[...] we do not see any obvious evidence in the history of returns themselves to cast doubt on the key evidential basis for the treatment of the EMR: that long-run stock returns are stable in real terms.”⁵

Conclusion

As set out above, we consider the values proposed by the CMA for the CAPM market parameters are reasonable. For that reason, we have, in principle, adopted the CMA’s approach for the estimation of TMR, RfR, and ERP.⁶

We have made a minor adjustment in arriving at our values for the market parameters, but these are consistent with the CMA methodology. Our assumptions adopt a forward adjustment to the RfR – derived consistently with the CMA method – to match the timing of the middle of H7. In its provisional findings, the CMA had estimated an RfR forward adjustment for the middle of RP3, NERL’s regulatory period.

Specifically, we have estimated the RfR at the midpoint of H7, deriving forward yields in line with the approach used by the CMA. The impact of this is a +0.15% increase to the CMA estimate of the RfR, and a RfR of –2.10%.⁷

- We have therefore adapted the CMA’s provisional view of the ERP range in line with this, to give a range of 7.10% to 8.10%. Our range holds the TMR consistent with the CMA provisional approach.

Our overall central case recommendations for the CAPM market parameters are shown in Table 3:

⁵ Wright et al. (2018), Estimating the cost of capital for implementation of price controls by UK Regulators, p.38.

⁶ CMA (Mar 2020), NATS (En Route) Plc/CAA Regulatory Appeal, Provisional findings report, pp.179-190 and pp.194-197.

⁷ We note that our forward adjustment to the RfR is based on a 3-month and 12-month average of ILG. While this is a slightly longer averaging period than that used by the CMA, 6-months of end-of-month yields, it is consistent with our approach to the rest of the WACC parameters. CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.196.

TABLE 3: COMPARISON OF CMA AND FLINT CAPM MARKET PARAMETERS

	CMA			Flint		
	Lower Bound	Upper Bound	Central Case	Lower Bound	Upper Bound	Central Case
Risk-free Rate	-2.25%	-2.25%	-2.25%	-2.10%	-2.10%	-2.10%
Total Market Return	5.00%	6.00%	5.50%	5.00%	6.00%	5.50%
Equity Risk Premium	7.25%	8.25%	7.75%	7.10%	8.10%	7.60%

Source: Flint analysis as of 28 February 2020. CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.202.

In the following section, we discuss our views and estimate for HAL's beta.

2 Asset and Equity Beta

Beta reflects systematic risk. This type of risk cannot be eliminated by diversification. It therefore commands a price – reflected within the market parameters by the ERP. If systematic risk is in line with the equity market as a whole (reflected in an equity beta equal to one), then the required returns on equity will align with the required return on the market as a whole (the TMR).

The beta is company – in fact, project – specific. It reflects the particular risks associated with a particular set of activities.

Regulatory practice and pure corporate finance principles

Estimation of betas can be challenging, as is the case here.

If a company is quoted on the stock exchange, its share price movements can be used to derive a (historic) equity beta directly. Even if the company itself is not quoted, very similar comparator businesses can sometimes be observed and evaluated.

If the company is focused on a very specific business or set of activities, the equity beta reflects a combination of the relative (systematic) risk of those activities. However, the observed equity is also affected by debt, or gearing.

If the company has debt (is “geared”) then the observed equity beta is higher than the beta of the underlying assets. This is because the beta of debt is always lower than the beta of equity and, at typical debt levels, is generally taken to be low, or zero. This reflects the fact that debt holders have a priority claim on the cash-flows of the business. The corollary of this is that debt has the effect of “amplifying” the equity beta.

This effect can undermine the direct comparison of equity beta between companies.

The amplification effect of gearing on equity beta can be neutralised through the process of “de-gearing” to infer a beta that reflects the underlying systematic risk of the assets or activities of the business. This is referred to as the asset beta. The equity beta would be equal to the asset beta if the company had no debt. Comparison between companies is best undertaken at the asset beta level.



An assessment of underlying asset beta can then be “re-gearred” to infer an equity beta – and hence a required return on equity – that would prevail at a different level of gearing. Such a re-gearing exercise also requires assumptions to be made about how the debt beta might behave as gearing changes, particularly at higher debt levels. Specifically, the de-gearing and re-gearing process might need to reflect a different debt beta, if they involve a change in gearing between companies (as in this case, between the moderately geared comparator businesses and a higher geared HAL).

In estimating a required return, the equity beta we need is, in principle, forward-looking. It should reflect the expected relationship between equity returns, and the returns on the market as a whole. Whilst it is common to base equity beta estimates for the future on such historical analysis, caution should be exercised in doing so.

Similarly, caution must be exercised when using asset betas of comparator businesses traded in a different stock market. The equity betas of these comparators, underpinning the asset beta estimates, may be affected by the constituency of the specific stock markets and may not reflect the risk of the business under assessment. This must be considered in the context of the CAPM parameters being used, which are, in this instance, derived for application in the UK equity market.

These historical estimates of equity beta will also be representative of all the activities undertaken within a company. If an equity beta is required for a particular subset of these activities, then judgement may be required.

Having established these general observations, it is important to put them in the context of equity beta estimation for HAL:

- “Pure play” equity in HAL was never traded. The last point in time at which equity of any form in HAL was traded was as a part of the BAA Group. BAA also owned other UK airports, including Gatwick, which represented a non-trivial part of its overall value.
- BAA was delisted from the London Stock Exchange in 2006. So, the last available share price data for HAL – which in itself was not representative of a pure play equity beta – will be over 20 years old by the end of H7.
- Heathrow operates in the UK, under a specific, tailored, regulatory regime, and within a UK aviation market that exhibits characteristics that – whilst potentially similar to other markets – are likely to have some unique features.

In light of this – notably the absence of robust recent share price data for HAL – both PwC and HAL reviewed the evidence for comparator airport groups. In order to make for appropriate comparison, both parties focused on asset betas, as did the CMA in its review of the comparator betas for NERL.

Asset beta

The asset beta reflects the systematic risk of an existing asset – the exposure to risk that is shared with the broader market.

Comparator evidence has played an important part in the estimation of asset beta for HAL.

PwC based its asset beta approach on determining whether “*there is [...] reason to make a fundamental change [...]*”⁸ to the Q6 asset beta range adopted by the CAA – the Q6 asset beta remained unchanged from the Q5 asset beta, which was based on BAA’s actual share price. However, PwC also placed weight on asset beta estimates for two international comparator businesses, Fraport and Groupe ADP, at Q6 – however, PwC’s approach to estimate comparators asset beta differed from that of HAL.

For H7, PwC’s initial recommendation in April 2017 was that comparator asset betas provided support for the continued adoption of the Q6 asset beta range for HAL (originally estimated from the BAA stock price).⁹ Observed comparator asset betas had declined since 2011. In its February 2019 report, PwC reiterated the conclusion that comparator asset betas were within HAL’s range adopted at Q6.¹⁰

HAL’s advisor, NERA, instead suggested that the appropriate asset beta estimate for HAL should be made by reference to comparators only, disregarding the Q6 historical range. The upper bound of the NERA range is based on an up to date spot estimate of the 2-year, daily, asset beta for ADP, using the European (STOXX 600) index, and gives no weight to asset beta data from earlier time periods.

Although HAL and PwC placed different relative emphasis on the comparator evidence to estimate HAL’s asset beta, the dataset that underpinned their analyses exhibited significant overlap:

- PwC considered the asset beta values for a set of comparator airport groups. PwC gave weight to the observed asset betas for these companies based on analysis against national and regional (international) market returns, and considered differing observation periods (two years and five years) and frequency of observations (daily and monthly).¹¹
- PwC also gave weight to the asset beta range previously adopted by the CAA at Q6 and Q5, and, as mentioned above, its overall recommendation was that the CAA adopts an asset beta range consistent with the existing historical range for Q5 and Q6.¹²
- HAL, on the other hand, argued for a higher asset beta. Its view was consistent with current spot estimates of comparator airports’ asset beta, Fraport and ADP, estimated only against the regional STOXX 600 index (rejecting the use of national indices). HAL’s asset beta estimates placed strong emphasis on a specific time period and frequency (2-year, daily data).¹³

In light of the discrepancies between PwC and HAL estimates, we set out our preferred approach below.

1. Methodological assumptions

1.1. Frequency of data and estimation window

⁸ PwC (Nov 2017), Estimating the cost of capital for H7, p.48.

⁹ PwC (Nov 2017), Estimating the cost of capital for H7, p.51.

¹⁰ PwC (Feb 2019), Estimating the cost of capital for H7 – Response to stakeholder views, p.71.

¹¹ PwC (Feb 2019), Estimating the cost of capital for H7 – Response to stakeholder views, p.61.

¹² PwC (Feb 2019), Estimating the cost of capital for H7 – Response to stakeholder views, p.71.

¹³ HAL (Dec 2019), Heathrow’s Initial Business Plan Detailed Plan, p.300

In estimating equity and asset betas, it is common for regulators and companies to consider daily, weekly and monthly estimates over a range of horizons (e.g. 1-year, 2-year, 5-year and 10-year).

- NERA advocated that “[...] the choice of the estimation window should be sufficiently long to produce robust statistical estimates and should also consider the impact of wider market conditions on beta estimates and to what extent these factors are expected to prevail over the next regulatory period.”¹⁴
- However, NERA’s preferred asset beta estimate and central case WACC proposal was essentially based on the spot value of the 2-year daily asset beta.
- A UKRN commissioned study supported the “long-run” view “If regulators are concerned with long-horizon risks, then they should ideally be attempting to estimate long-run, rather than short-run values of beta [...]”¹⁵

We also note that confidence levels associated with more frequent data observations are superior, leading us to the view that daily observations provide the most robust asset beta estimates. We therefore recommend caution on the interpretation of asset betas based on less frequent data, due to lower statistical confidence levels. We would also note the apparent instability of beta estimates based on lower frequency observations – for example, the potential for choice of a day of the week / month to materially impact the estimates – with no apparent reason.

Given the periodic nature of the regulatory regime that is applied to Heathrow (the 5-year term of the price control), we also advocate giving weight to the observed asset beta statistics over the full regulatory period (i.e. the period since the last price control determination) – this would imply that all asset beta observations are, broadly, equally recognised over a cycle of regulatory periods.

We would depart from this approach only if there is clear and unambiguous evidence that systematic risks have materially changed. We would not, therefore, support using asset beta estimates based only on the most recent 2-year daily spot rates in this instance – because we are not aware of evidence to this effect for HAL’s business as usual operations. In summary, we would place greatest emphasis on 2-year, daily, asset beta statistics, and look at the 5-year history of these numbers. Alternatively, a 5-year, daily, asset beta statistic can also provide a useful view of the asset beta over the full price control period, though we recognise that there is a close statistical relationship between both these numbers. Our analysis later in this section examines these and other beta estimates for the comparator group.

We do not consider that reliance on a spot, 2-year daily, estimate is a robust basis for asset beta estimation. The 2-year estimate would implicitly disregard three years’ worth of share price data entirely, at each 5-year periodic price control review, potentially without good reason. It would also potentially give rise to less stable regulatory outcomes. Given the inherent uncertainty in asset beta estimates, and the limited statistical certainty of spot rates, we give weight to all information from the recent period in which there is no *a priori* reason to believe the asset beta to have fundamentally changed.

¹⁴ NERA (Apr 2019), Cost of Equity for HAL at H7, p.19.

¹⁵ Wright et al. (2018), Estimating the cost of capital for implementation of price controls by UK Regulators, p.52.

Our view is consistent with the CMA's approach in its provisional findings in the NERL/CAA appeal, where the CMA adopted an approach to estimate NERL's asset beta based on comparator aviation businesses. For its proposed range, the CMA considered 2-year daily, 5-year daily and 5-year weekly asset beta estimates:

"Daily data is often used because it has the lowest standard error. However, there is also a body of evidence that daily data may understate betas. [...] We found that there was sufficient liquidity for daily betas to be accurate, and we found no evidence of autocorrelation in the daily prices.

However, the daily data did in some examples result in a significantly lower beta [...] Given that the choice of beta is ultimately a matter of judgement, we have included both two-year and five-year weekly betas in the analysis below. When using weekly data we gave greatest weight to the five-year weekly betas, because the standard error around two-year weekly betas was high, and also because in practice some of [these two year]¹⁶ weekly betas appeared to be outliers."¹⁷

Our own observations are that, whilst weekly betas are an interesting potential cross check, they exhibit significantly lower statistical confidence levels than daily data and should therefore be regarded with caution. Only in the presence of known liquidity issues would we place meaningful weight on betas estimated using weekly or less frequent observations.

1.2 Choice of market index

The choice of index (against which an asset beta is properly measured) should reflect the fundamental basis of portfolio theory on which the CAPM is anchored, that (marginal) investors rationally hold a "fully diversified" portfolio of stocks, so as to optimise the trade-off between risk and expected return.

PwC and HAL disagreed in selecting the relevant index benchmark against which to estimate the asset beta: PwC preferred local large cap indices while HAL advocated for the use of a regional index.

We recognise HAL's arguments and consider the STOXX 600 is a more relevant index against which pure asset beta measurement is made, recognising the perspective of the marginal investor:¹⁸

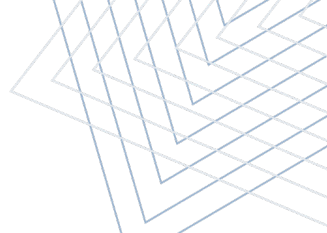
- Local indices are (by definition) not geographically diversified, and do not faithfully reflect marginal investor diversification.
- CAC 40 and DAX, domestic large cap indices, do not include the local comparator companies' stocks, ADP and Fraport, and are highly concentrated indices which do not reflect appropriate levels of diversification.
- Whilst there remains evidence of home bias in equity investment, there is evidential support for a decline in European home bias over time,¹⁹ particularly across the most developed countries within the Eurozone:

¹⁶ Corrected for inferred typing error.

¹⁷ CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, p.148.

¹⁸ NERA (Apr 2019), Cost of Equity for HAL at H7, pp.9-13.

¹⁹ See, for example, Darvas, Z., and Schoenmaker, D., Institutional investors and home bias in Europe's Capital Markets Union.



- The absence of barriers to diversification (notably tax and currency risk) allow effective diversification on the part of investors.
- The observed diversification trend is entirely in line with greater European market integration in general, and may also be more strongly driven by the behaviour of marginal investor (than the average).
- HAL’s assessment of the relevant market index is consistent with the CMA provisional findings:

“The theoretical benefits of using an international index need to be balanced in practice against a number of challenges in defining a suitable international index [...] In the case of the four firms in our sample, we found a consistent pattern that international betas relative to the Eurostoxx 600 index were higher than domestic betas. This suggested that the effect of systematic risk on ‘shocks’ to the share prices were more highly correlated to the European indices than to the domestic indices, and this in turn indicates that these are likely to be more relevant indices.”²⁰

In relation to the comparators selected, we support the regional asset beta estimates using the closest available index to an “All-share” index within the Eurozone. In consideration of the index against which the comparator statistics should be measured, we recognise the arguments made by NERA.²¹ We consider NERA’s arguments that the STOXX Europe 600 may be a more relevant index against which pure beta measurement is made, recognising the perspective of the marginal investor, are robust. We therefore give significant weight to the STOXX 600 based asset beta calculations.

Similarly important, however, is the requirement for internal consistency of the CAPM model. Asset beta values should be derived by reference to an index that properly reflects the diversification of investors. The CAPM model must also reflect these assumptions in other parameters – such as the RfR and ERP. Consistency is important, regardless of how the “imported” benchmark is defined.

This embodies the principle that similar companies should exhibit a similar WACC, regardless of where their equity trades, and regardless of how the WACC calculation is undertaken (barring, for example, different tax and gearing effects, or other international corporate financing constraints). Otherwise, international capital markets would not be working efficiently. Thus, one needs to be careful in taking an asset beta statistic calculated against one index and applying it to a CAPM that has been designed around a different index, if the different indices exhibit different features (such as volatility, and/or expected returns).

Any consideration of the likely effect of using the non-UK national asset beta statistics, or a diversified European Index as a basis for asset beta calculation must be based on the likely outcome for the WACC, not the asset beta alone. This would, in principle, require similar analysis of the European market to that undertaken in relation to the UK TMR. Such an exercise is beyond the scope of our review. However, we note the potential for further uncertainty that results.

1.3 Use of spot values and trailing averages

²⁰ CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, pp.149-150.

²¹ NERA (Apr 2019), Cost of Equity for HAL at H7, pp.9-13.

Many parameter inputs to the CAPM can exhibit volatility over time and considerable estimation error. As suggested above, asset beta estimation, in particular, is highly challenging and, even using recent directly relevant share price data, the reliability of the estimates can be low.

In light of the volatility of asset beta observations over time and considerable estimation error, we caution against the use of overly precise methodologies. Instead, we considered different options to test the robustness of our estimates – this is aligned with the CMA provisional findings at the CAA/NERL appeal:

“Where data is available, we have also considered both current betas and ‘rolling betas’ over a 1-year, 2-year and 5-year period. Given the uncertainty over measuring beta, this reduces in our view the risk of error, and allows us to take into account whether betas have been stable when interpreting the current beta estimates.”²²

1.4 De-gearing and re-gearing

To estimate the asset beta, regulators usually use the formula:

$$\beta_{Asset} = \beta_{Equity} * (1 - gearing) + \beta_{Debt} * gearing$$

This requires an assumption of notional gearing for HAL, so that a cost of equity (and hence WACC) can be estimated for the notional efficient entity.

In its provisional findings for NERL, the CMA highlighted the issue of notional gearing. Specifically, the CMA noted that WACC was significantly affected by the assumption for notional gearing, under the formula used by the CAA. Using the CAA formula, the WACC could be observed to rise materially as the assumption of notional gearing was increased.

The CMA suggested that this did not align with accepted principles of corporate finance – that the WACC should essentially be stable with gearing:

“According to standard finance theory, the cost of capital (WACC) does not, at least in a theoretical model, vary with gearing, other than for tax reasons.”²³

This led the CMA to change the CAA’s assumption for NERL’s notional gearing.

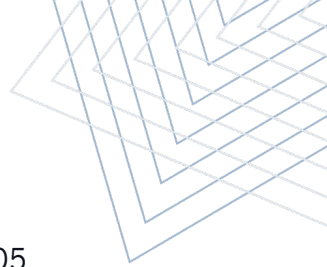
We will expand on the issue of gearing on the WACC in Section 4. This will explain our proposed approach to notional gearing, along with our proposed assumptions regarding debt beta at different levels of (notional) gearing for HAL, and for the comparator airports.

However, for the purposes of the WACC calculation we assume the following as our central case – and as the basis for our de-gearing and re-gearing calculations:

- Notional gearing for HAL of 56.25%.
- HAL’s debt beta at this notional gearing level is assumed to be 0.09.

²² CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Provisional findings report, pp.150-151.

²³ CMA (Mar 2020), NATS (En Route) Plc / CAA Regulatory Appeal, Appendices and glossary, p.D2.



- The debt beta of the comparator airports at their observed gearing levels is 0.05.

We consider the sensitivity of the resulting WACC to these assumptions in Section 4.

Both PwC and HAL assumed a debt beta for the purposes of de-gearing the comparator airports equity betas that matched their debt beta assumption for HAL:

- PwC assumed a debt beta for the comparators of 0.10.
- HAL assumed a debt beta for the comparators of 0.05.

We do not agree that the same debt beta should be assumed for both steps of the de-gearing and re-gearing process. The gearing level assumed for Fraport, ADP and AENA, around 30%, is significantly below our proposed notional gearing for HAL.

In line with the CMA approach, and given that the actual gearing of comparator airports is significantly below that of HAL, we use a debt beta of 0.05 to de-gear comparators equity beta estimates. A debt beta of 0.05 for comparator airports is the same as the assumption adopted within the CMA provisional findings in the NERL/CAA appeal.²⁴

2. *Flint's estimates*

We consider Fraport, ADP and AENA the most relevant comparators to HAL.

There is some disagreement between PwC and HAL over the relative systematic risk of HAL and the comparators. HAL argues its higher systematic risk justifies a higher asset beta than the comparators.²⁵

We understand that, in practice, a precise assessment of HAL's systematic risk in comparison to other airports is challenging:

- Different market context, and regulatory regimes, may both have a material bearing on risk and asset beta levels. Operational choices around, for example, tariffs and cost structure may also have an effect.
- Fraport and ADP are not entirely dominated by their main respective airports – so the contribution of Frankfurt and Charles de Gaulle (CDG) airports to the observed group systematic risk may be blurred by the risk of other group activities. Therefore, even if Frankfurt and CDG have lower systematic risk than HAL, the groups asset beta may be polluted by other activities with different systematic risk.

Following discussion with the CAA, we have not considered the assessment of relative systematic risk between HAL and its comparators in detail – there is already material uncertainty over asset beta estimates, and the lack of clear evidence of materially different risk presented either by PwC or HAL.

²⁴ We note CMA's asset beta range seems to have been updated from 0.50 to 0.60 in p.161, to 0.52 to 0.62 in Table 12-17, p.202. This updated range is consistent with the use of a 0.05 debt beta for comparators.

²⁵ NERA (Apr 2019), Cost of Equity for HAL at H7, p.17.

We therefore base our view of HAL's asset beta on the beta estimates for comparators. To estimate the comparator asset betas, we have followed the principles set out in the methodological assumptions, above, and we have used:

- Daily observations and an estimation horizon of 2-years and 5-years.
- STOXX 600 as the relevant market index.
- Spot values and 2-years / 5-years rolling averages.
- Specific levels of gearing at comparator companies to de-gear the equity beta.
- Debt beta of comparators: 0.05, in line with the CMA provisional findings at the NERL/CAA appeal for the same airport comparators.

We have used the same cut-off date as the CMA in its provisional findings, with the purpose of estimating an asset beta prior to the COVID-19 pandemic outbreak. Our asset beta estimates are in Table 4 below.

TABLE 4: ASSET BETA ESTIMATES

	Fraport	ADP	AENA
2-years, daily frequency			
Spot	0.58	0.59	0.57
2-years average	0.56	0.56	0.60
5-years average	0.49	0.54	
5-years, daily frequency			
Spot	0.50	0.56	0.52
2-years average	0.47	0.53	
5-years Average	0.48	0.53	

Source: Flint analysis of Thomson Reuters data as of 28 February 2020.

Based on Table 4 above, our estimates might suggest an overall range of 0.47 to 0.60, based on the individual comparators range of:

- 0.47 to 0.58 for Fraport;
- 0.53 to 0.59 for ADP; and
- 0.52 to 0.60 for AENA.

In our view, this suggests that the previous range adopted by the CAA – of 0.42 to 0.52 – is no longer supportable. The latest estimates appear to show a meaningful increase in asset betas during Q6, as can be seen in Figure 1 below. We would also observe some apparent convergence of beta values for the different airport comparators.