



**HCA'S RESPONSE TO THE
CMA'S ASSESSMENT OF THE COST OF CAPITAL**

9 May 2016

1. EXECUTIVE SUMMARY

- 1.1 The CMA has published an updated assessment on the weighted average cost of capital ("WACC") for a hypothetical stand-alone private hospital operator in the UK (the "WACC Paper"). This updated assessment gives rise to an estimated range of 7.6% to 10.5% for WACC, with a mid-point of 9.0%. The CMA goes on to state that for the purposes of its analysis in the Private Healthcare Remittal Inquiry ("Remittal Inquiry"), it will use a benchmark of 10% for WACC.
- 1.2 The CMA uses the WACC as the benchmark for a 'normal' level of profits. Where the returns in an industry (measured by the Return on Capital Employed ("ROCE")) are above the WACC, that difference is characterised by the CMA as 'economic' or 'excess' profit. For a given level of ROCE, therefore, the lower the estimated WACC, the higher the alleged excess profits, and vice versa. As a result, the CMA's assessment of WACC for a stand-alone private healthcare operator is directly related to its assessment of whether HCA makes 'excess profits'.
- 1.3 In conjunction with Professor Alan Gregory, professor of Corporate Finance at Exeter University, HCA has reviewed the CMA's approach to measuring WACC, including the CMA's underlying calculations. HCA has identified three errors in the CMA's calculations. Correcting these errors alone has a material impact on the calculation of WACC, and therefore the assessment of HCA's profitability. In addition, HCA has identified several other shortcomings in the CMA's methodology for measuring WACC for a stand-alone private hospital operator, which undermine the reliability of the CMA's conclusions.
- 1.4 At a high level these errors and concerns are:
- The CMA makes errors in its calculations including:
 - a) incorrectly measuring firm leverage (or gearing) for the purposes of unlevering beta (in some instances, the gearing ratios adopted by the CMA could apply only if HCA's equity had a negative market value in certain years – which was not the case);
 - b) relying upon statistically insignificant beta estimates; and
 - c) incorrectly calculating the impact of inflation on the equity risk premium ("ERP").
 - In HCA's view, the CMA further understates WACC through:
 - a) placing too much weight on certain estimates of the equity market return ("EMR"), that are not representative of the time period being analysed for the purposes of the Remittal Inquiry – being 2007 to 2015 (referred to as the "Relevant Period" in the rest of this submission);
 - b) understating asset beta, due to selection of inappropriate overseas proxies; and
 - c) understating the cost of debt by using assumptions as to the cost of debt which do not reflect the market rates which in fact applied during the Relevant Period.

- 1.5 Correcting for these errors and methodological flaws results in an adjusted WACC range of 10.3% to 11.7%, with a mid-point of 11.0%. This adjusted figure is a more robust estimate of the WACC for a hypothetical stand-alone private hospital operator, and therefore as a benchmark of a normal rate of return for the private healthcare industry in the UK.
- 1.6 The CMA cited its estimate of HCA's excess profit to support its provisional conclusion that there is an Adverse Effect on Competition ("AEC") with respect to the provision of private healthcare in central London, and also to quantify the benefits of a potential divestment remedy. In HCA's view, as previously explained to the CMA and summarised at the end of this submission, it is inappropriate for the CMA to use its estimate of HCA's excess profit in these ways.¹ However, and without prejudice to that view, if the CMA continues to rely on its profitability analysis, it must take into account the errors and flaws that HCA has identified in the CMA's analysis of WACC, and base its analysis of profitability on the revised WACC figures HCA presents in this submission.

2. INTRODUCTION

- 2.1 The WACC Paper sets out the CMA's analysis of the WACC for a hypothetical stand-alone private hospital operator in the UK, updating the analysis that the CMA had previously set out in its Final Report in the original inquiry.²
- 2.2 HCA's analysis and comments in this submission have been developed in conjunction with Professor of Corporate Finance at Exeter University, and expert in the analysis of cost of capital, Alan Gregory. Professor Gregory is also a former Reporting Panel Member of the Competition Commission (now the CMA), and is currently an External Advisor on the CMA's Cost of Capital/Finance and Regulation Group.³
- 2.3 HCA has made a number of submissions which have commented on the CMA's approach to measuring WACC during the Remittal Inquiry:
- HCA's Response to the Remittal Provisional Findings (the "Remittal PFs");
 - an independent submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons (the "Academics' Paper"); and
 - HCA's Response to the post-remittal Provisional Decision on Remedies ("PDR").
- 2.4 Many of the issues identified in these previous submissions have either not been acknowledged or have been inadequately addressed by the CMA in the WACC Paper. In this submission, HCA sets out the errors and methodological flaws in the CMA's analysis in the WACC Paper, including those which have been raised previously but not addressed by the CMA, providing further evidence where necessary. The submission proceeds as follows:
- Section 3 sets out, at a high level, how the CMA's estimate of WACC relates to its broader analysis and provisional findings in the Remittal Inquiry.

¹ See the independent submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons.

² Paragraphs 1 to 3 of the WACC Paper.

³ In addition, Professor Gregory has undertaken expert witness work including in relation to cost of capital and the analysis of fair rates of return both in the UK and Australia. He has published extensively on cost of capital and valuation of companies, has contributed to an OECD Roundtable publication on Excessive Prices and is the author of the Financial Times book "Strategic Valuation of Companies". He was lead researcher on an ESRC funded research project "Cost of Capital and Asset Pricing in the UK", which ran from April 2013 to March 2016 at the Xfi Centre, University of Exeter Business School.

- Section 4 provides a brief introduction to what the WACC is and how the Capital Asset Pricing Model (“CAPM”), from which the cost of equity is derived, works.
- Section 5 sets out the errors that HCA has identified in the CMA’s calculations.
- Section 6 sets out HCA’s other concerns with the CMA’s methodology for estimating the WACC.
- Section 7 summarises the overall impact of correcting for the CMA’s errors and methodological flaws on its estimate of the WACC.

2.5 As well as having previously identified shortcomings with the CMA’s WACC estimate, HCA has also previously explained why it is inappropriate for the CMA to have provisionally relied on its profitability analysis in the Remittal Inquiry, to support its provisional AEC finding and to quantify the impact of a potential divestment remedy.⁴ In HCA’s view, these concerns provide important context for the CMA’s analysis of WACC. At the end of this submission, HCA therefore briefly summarises the concerns it has expressed previously about the CMA’s use of profitability analysis in the Remittal Inquiry.

3. THE CMA’S USE OF ITS ESTIMATES OF WACC IN THE REMITTAL INQUIRY

3.1 The CMA’s profitability analysis aims to assess whether market-wide profitability has been above a ‘normal’ rate in the Relevant Period. If the CMA estimates that market-wide profits (measured by ROCE) are substantially in excess of this ‘normal’ rate, the CMA characterises such profits as ‘excessive’.

3.2 A proxy for a ‘normal’ level of profits is the WACC of the industry for the same period.⁵ For a given level of ROCE, therefore, the lower the estimated WACC, the higher the estimated excess profits, and vice versa.

3.3 In the Remittal Inquiry, the CMA estimates HCA’s ROCE and seeks to compare this to its benchmark estimate of WACC for a hypothetical standalone private hospital operator in the UK between 2007 and 2015. The CMA provisionally concludes that HCA earns excess profit, since it considers that its estimate of HCA’s ROCE is substantially in excess of its benchmark WACC. The CMA then cites this estimate of excess profit to support two of its provisional conclusions in the Remittal Inquiry:

- First, in its Remittal PFs, the CMA refers to its estimate of HCA’s excess profit to support its provisional conclusion that there is customer detriment arising from a lack of effective competition in central London.⁶
- Second, the CMA cites its estimate of HCA’s excess profit as evidence that a divestment remedy would lead to reductions in HCA’s prices, using its estimate of HCA’s excess profits to quantify the price benefits of a potential divestment remedy as part of its NPV analysis.⁷

⁴ See the independent submission on the CMA’s analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons.

⁵ At a high level, this benchmarking to the industry WACC relies on the assumption that in a competitive market, firms will generate enough profits to adequately remunerate their debt and equity providers, and no more.

⁶ Paragraph 6.284, CMA’s provisional findings, 28th August 2013.

⁷ Paragraphs 2 and 38 of the Profitability and Net Present Value Appendix to the CMA’s Remittal Provisional Decision on Remedies.

- 3.4 The CMA's estimate of the WACC is, therefore, directly related to the CMA's allegation that there is detriment from its provisional AEC and to the CMA's assessment of the proportionality of remedies.
- 3.5 The next sections focus on the CMA's estimate of WACC, first setting out the key components for estimating WACC and then setting out the errors and flaws that HCA has identified in the CMA's analysis.

4. THE COST OF CAPITAL AND THE CAPM MODEL

- 4.1 Providers of funds to a firm require a certain level of remuneration, to compensate them for the risk associated with their investment. This necessary remuneration is a cost to the firm receiving those funds, and this is what the "cost of capital" seeks to measure. Given that firms ordinarily use a combination of debt and equity funding, a WACC is used, being the cost of equity and the cost of debt, weighted based on the gearing⁸ of the firm.
- 4.2 In the rest of this section, HCA briefly sets out the key components for estimating the cost of equity and the cost of debt in turn.
- 4.3 The **cost of equity** is ordinarily derived using the CAPM. The CAPM estimates the cost of equity, by quantifying the risk of a given asset, such as a firm's stock, relative to the market as a whole. This relative riskiness (labelled "beta"), is then combined with market wide levels of expected return to calculate the return investors might expect for investing in the stock.
- 4.4 Below, HCA sets out the CAPM formula before summarising each component.

$$\text{Cost of equity} = RFR + \beta(EMR - RFR)$$

Where:

β = beta

RFR = risk-free rate of return

EMR = expected return on the market

- 4.5 Beta is a measure of the risk associated with an asset (e.g., a share in a particular firm), based on whether the returns on a given asset are more or less risky than returns on the market as a whole. A beta less than one suggests that a firm's stock is less risky than the overall market and beta greater than one suggests that a firm's stock is more risky than the overall market. The underlying calculation of beta compares returns on a particular firm's stock (being the increase in share price plus dividends) with returns on the market, measured at given intervals (daily, weekly, monthly or quarterly) over a given period of time. The covariance between these stock and the market returns is then used to derive the beta estimate.⁹

⁸ Ratio of debt to equity.

⁹ Precisely, the beta is the slope of a regression of the firm's return on the market return, which is equivalent to the covariance between the firm's return and the market return, divided by the variance of the market return. For example, HCA Holdings Inc.'s (HCA Group, listed in the US) monthly beta would be the covariance between returns on HCA's stock each month and returns on the US stock market each month divided by the variance in the market return.

- 4.6 The risk free rate (“RFR”) is the level of return that can be expected for an investment with zero risk.
- 4.7 The EMR is the return expected from investing in a given stock market. It is equivalent to the RFR plus an ERP, which reflects the additional return that investors expect to earn from investing in stock, since this is more risky than a risk free asset.
- 4.8 Overall, therefore, the cost of equity derived from the CAPM takes the market wide estimates of what returns investors might expect to earn from investing in the stock market but allows for different, stock-specific, risks through using an appropriate beta value.
- 4.9 The **cost of debt** is composed of the RFR plus a debt premium, to compensate investors for the additional risk of investing in debt rather than in a risk free asset. Typically the debt premium is estimated by observing the premia (compared to the risk free rate) on debt with comparable credit ratings.
- 4.10 The cost of equity and the cost of debt are then weighted by the gearing to derive the WACC. The WACC can be presented in real terms i.e., stripping out the impact of inflation, or in nominal terms.
- 4.11 In the context of a market investigation the *market-wide* WACC must be determined, rather than a WACC for an individual firm. In the WACC Paper, therefore, the CMA seeks to measure a market-wide WACC – or equivalently, a WACC for a hypothetical stand-alone private hospital operator in the UK. It is therefore important that the various inputs used by the CMA for its WACC calculation are suitable approximations for the UK private healthcare market.
- 4.12 The RFR and ERP apply across industries, and therefore do not require particular proxies for the private healthcare industry (general UK data can be used). However, beta needs to be measured for the private healthcare industry specifically. In order to do so, data on stock market returns for listed private healthcare operators are needed as comparators. Given the lack of UK-listed private healthcare operators, it is necessary to seek suitable overseas proxies. However, different overseas private-healthcare markets may have significantly different risk profiles, which would limit the usefulness of proxies from those countries. Therefore, when using overseas proxies to measure beta for a UK private healthcare operator, care must be taken to ensure they are suitable.
- 4.13 More generally, there are many areas that require judgement and assumptions in estimating the WACC in the context of a market investigation. These include, but are not limited to:
- what proxy firms to use for estimating beta;
 - what sampling frequency to use for beta;
 - whether to base EMR on historical returns or expected future returns, and how much reliance to place on recent trends;
 - what observed cost of debt and RFR data to use;
 - what inflation assumption to use; and
 - what gearing assumption to use when weighting the cost of equity and cost of debt in the final WACC calculation.

- 4.14 Having reviewed the WACC Paper in detail, HCA has identified errors in the CMA's calculations and flaws in the CMA's methodology. These are discussed in turn in the following sections of this submission.

5. ERRORS IN THE CMA'S CALCULATIONS

- 5.1 In this section HCA sets out three errors in the CMA's calculations of WACC, as detailed in the WACC Paper.

(i) Errors in beta unlevering

- 5.2 As set out in paragraph 4.12, suitable international proxies are required to estimate beta for a hypothetical UK stand-alone private hospital operator. The observed betas (known as equity betas) for proxy firms will be influenced, however, by each's firm's gearing – a firm with higher gearing (more debt) will have a higher equity beta than a firm with lower gearing. The CMA, therefore, correctly uses observed equity betas for its chosen proxy firms but then unlevers these equity betas at the firms' reported gearing levels to generate an "asset beta", which is the same as the beta that an ungeared/unlevered, or "all equity financed", firm would have. To estimate the beta for a hypothetical stand-alone private hospital operator in the UK, these unlevered asset betas are then re-levered at an appropriate level to take into account the gearing required for a hypothetical stand-alone UK private hospital operator. The gearing levels used to unlever the observed equity betas for the proxy firms are therefore important in order to generate an appropriate beta estimate for a hypothetical stand-alone private hospital operator in the UK.
- 5.3 The CMA sets out the gearing ratios it has used to unlever the equity betas for its proxy firms in Table 5 and Annex A of the WACC Paper. These gearing ratios appear to be incorrect. For example, according to the CMA, in 2012 HCA Holdings Inc.'s ratio of debt to the total amount of debt plus equity was 103.5%, which would not only imply bankruptcy, but be arithmetically impossible.
- 5.4 HCA has recalculated the debt to equity ratio using the market value of equity (and the book value of debt)¹⁰, for each of the CMA's chosen proxy firms. The market value of equity, rather than the book value is the relevant benchmark, since an investor would require a return based on the market value of its invested capital, not the historical book value.¹¹ These corrected values are set out in in Table 1 below, alongside, for reference, the CMA's incorrect debt to equity ratios that were set out in the WACC Paper.

¹⁰ Whilst the book value of equity is not a good approximation for the market value of equity and information on the market value of equity is easily obtainable, the opposite is true for debt. The book value of debt is a good proxy for market value and not all firms have listed debt so information on the market value of debt is less readily available. Consequently, it is common practice to use market value of equity and book value of debt.

¹¹ It is important to realise that the theory underpinning the relationship between gearing and return (originally due to Modigliani and Miller) rests upon the possibility of arbitrage between debt and equity. Such arbitrage in financial markets would take place at market values not book values.

Table 1: Average D/E ratios from 2007 to 2015 for CMA proxy firms

Firm	CMA debt/equity ratio as per the WACC paper	HCA corrected debt/equity ratio
Netcare	1.60	1.37
Ramsay	0.74	0.35
HCA	13.01	1.69
Lifepoint	0.89	0.88
Tenet	3.09	2.99
Rhoen Klinikum	0.32	0.33
HMA	1.04	1.98
Universal	0.77	0.55
CHS	3.41	3.90
Apollo	0.24	0.13
Fortis	0.50	0.64
Mean	2.32	1.35

Source: CMA figures – Annex A, *The WACC Paper*; HCA figures – *Capital IQ and HCA analysis*

- 5.5 Table 1 shows that the CMA overstates the average gearing across its proxy firms. This causes the CMA to over-adjust the equity betas it observes for its proxy firms in its calculation of an appropriate asset beta for a hypothetical stand-alone UK private hospital operator. The impact of correcting this error is therefore to increase the CMA's mid-point¹² asset beta (i.e. the simple average of the asset betas for the firms listed in Table 1) from 0.47 to 0.59. Increasing beta increases the cost of equity and therefore the CMA's estimate of WACC. In paragraph 6.19 of this submission HCA presents the cumulative impact on WACC of the various adjustments to the CMA's estimates of asset beta set out in this submission.

(ii) Reliability of CMA's observed equity betas

- 5.6 The CMA takes its beta estimates from Bloomberg,¹³ drawn from weekly, monthly and quarterly data, but placing more weight on betas estimated using monthly and quarterly data. In line with recent academic evidence (see Gilbert et al (2014) and Gregory et al (2016)¹⁴), and as discussed in previous submissions,¹⁵ in HCA's view *all* weight should be placed on the monthly and quarterly betas, and none on the betas estimated using weekly data.
- 5.7 Furthermore, as discussed in previous submissions to the CMA,¹⁶ the CMA's data source, Bloomberg, publishes only the resulting beta estimates and not the underlying analyses that give rise to those estimates. As a result, it is not possible to take a view on either the statistical reliability of the beta estimates obtained from Bloomberg, nor is it possible to assess whether the trend over time makes commercial sense, and therefore whether the beta estimates from Bloomberg data draw on appropriate time periods to calculate the overall asset beta (e.g. if a beta value drops significantly due to a take-over or other substantial change in the underlying business).¹⁷

¹² Taken as the mid-point between the monthly and quarterly data.

¹³ Financial data platform.

¹⁴ See http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2597467.

¹⁵ Paragraphs 4.29 – 4.31, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016 and paragraphs 5.245-5.247, Appendix 5, HCA response to the Provisional Findings, 11 November 2013.

¹⁶ Paragraph 4.35, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016 and footnote 180, Appendix 5, HCA response to the Provisional Findings, 11 November 2013.

¹⁷ HCA notes that the CMA has also not made it clear which market indices it has used to benchmark betas.

5.8 HCA has recalculated the beta values for each of the CMA’s chosen proxy firms, and these are presented in Table 2. HCA’s recalculation of beta values has followed best practice in beta estimation and HCA has attached a technical appendix to this submission setting out the methodology used.

Table 2: Calculated equity beta values for CMA’s chosen proxy firms

Company	CMA monthly equity beta	CMA quarterly equity beta	HCA monthly equity beta	HCA quarterly equity beta	Statistically different to zero?	
					Monthly	Quarterly
Netcare	0.66	0.42	0.76	0.57	Yes	Yes
Ramsay	0.38	0.27	0.40	0.41	Yes	No
HCA	1.10	1.51	1.11	1.61	Yes	Yes
Lifepoint Hospitals	1.06	0.93	1.06	1.06	Yes	Yes
Tenet Healthcare	2.01	2.76	2.01	3.36	Yes	Yes
Rhoen Klinikum	0.33	0.29	0.34	0.23	Yes	No
HMA	1.05	0.87	2.23	2.70	Yes	Yes
UHS	1.23	1.12	1.23	1.28	Yes	Yes
CHS	1.38	1.62	1.38	1.68	Yes	Yes
Apollo Hospitals	0.29	0.46	0.33	0.34	Yes	Yes
Fortis Healthcare	0.78	0.62	0.80	0.55	Yes	Yes
CMA Mean and HCA corrected mean	0.93	0.99	1.06	1.25		

Source: The WACC Paper table 4 and HCA analysis

5.9 The analysis in Table 2 shows that:

- The quarterly estimates for Ramsay’s beta and Rhoen Klinikum’s beta are not statistically robust¹⁸ and should be removed from the list of beta proxies.¹⁹
- The CMA has understated the beta for Health Management Associates (“HMA”). This is probably due to the CMA taking beta readings post the acquisition of HMA by Community Health Systems (“CHS”).²⁰

5.10 The CMA should remove beta values from its analysis that are statistically insignificant and use the beta value for HMA before the takeover by CHS. Correcting for these errors, alongside the unlevering correction set out in paragraph 5.5 above, increases the mid-point asset beta from 0.47 to 0.63. Increasing beta increases the cost of equity and therefore the CMA’s estimate of WACC. In paragraph 6.19 of this submission HCA presents the cumulative impact on WACC of the various adjustments to the CMA’s estimates of asset beta set out in this submission.

(iii) Incorrect treatment of inflation understates the Equity Risk Premium

5.11 As explained in paragraph 4.7, the ERP should always be calculated as the residual of the EMR less the RFR. It is important that this principle is applied when converting the ERP into nominal terms, to ensure that the impact of inflation is calculated correctly. The rationale being that within the EMR, a) investors only need to be compensated once for the impact of inflation on their returns but b) the inflation adjustment is not a fixed premium – rather it is

¹⁸ Where statistically robust is defined as 95% of the underlying beta readings falling within two standard deviations of the mean.

¹⁹ Although we have not excluded these firms from the monthly averages, there is a case for doing so given the quarterly betas are not robust.

²⁰ See the attached technical appendix for more detail.

dependent on the size of underlying real return, to which the inflation adjustment is applied.²¹ Point (b) here is important as it means that one cannot simply uplift one element of the EMR for inflation, such as the RFR, and not adjust the other element of the EMR, the ERP. To address this calculation issue, two approaches can be followed, with the same results:

- uplift the EMR as a whole for compound inflation, before deducting the nominal RFR to get the nominal ERP;²² or
- uplift the RFR by compound inflation and multiply the ERP by simple inflation.²³

5.12 However, the CMA fails to follow this principle and has simply summed the nominal RFR and the ERP, rather than following either of the approaches outlined above.

5.13 Taking the CMA's upper case estimate of the real EMR of 6.5%, the issue can be illustrated as follows:

- As a starting point take the CMA's real EMR of 6.5%
- Inflate this by the CMA's 3% inflation assumption
- This gives a nominal EMR of 9.7% i.e. $((1+6.5%)*(1+3%)-1)$
- However, the CMA's nominal EMR is 9.5% (4% nominal RFR + 5.5% real ERP), as it has uplifted the RFR for inflation but failed to consider the impact on ERP.

5.14 Table 3 sets out corrected estimates for nominal RFR, EMR and ERP (using the CMA's upper case estimates²⁴):

Table 3: Inflation impact on ERP, using CMA high case as an example

	CMA nominal	Adjusted nominal
RFR	4.0%	4.0%
EMR	9.5% - incorrectly calculated	9.7% - correctly calculated
ERP	5.5%	5.7%

Source: HCA analysis

5.15 Table 3 shows that the CMA's error in calculating the impact of inflation on ERP has led to the ERP and therefore cost of equity being understated. HCA has previously noted this error to the CMA,²⁵ but it has not been taken into account in the WACC Paper. Adjusting for this error results in an increase in the cost of equity of 0.2 percentage points and an increase in the overall WACC of 0.1 percentage points.

6. CONCERNS WITH THE CMA'S METHODOLOGY

6.1 Alongside the errors in the CMA's calculations identified in Section 5, HCA also has several concerns with the CMA's methodology for estimating WACC, which does not follow established best practice. This section explains those concerns, first in relation to the cost of equity, then in relation to the cost of debt.

²¹ With the calculation for compound inflation uplift being: $\text{nominal return} = (1 + \text{real return}\%)*(1 + \text{inflation}\%) - 1$.

²² Ibid.

²³ With the calculation for simple inflation uplift being $\text{ERP}*(1 + \text{inflation}\%)$.

²⁴ By upper case estimates, HCA is taking the higher EMR assumptions used by the CMA in its WACC assessment.

²⁵ Paragraph 4.39, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016.

(i) Cost of Equity

6.2 This section summarises HCA's concerns with the CMA's estimated cost of equity estimate set out in the WACC Paper. At a high level, in HCA's view, the CMA's estimated cost of equity is too low due to:

- too much weight being placed on certain EMR estimates, that are not representative of EMR in the Relevant Period, meaning that the CMA's low case EMR is too low; and
- understated asset beta, due to poor proxy selection.

6.3 The rest of this section discusses these points in turn.

The CMA's lower case EMR is too low

6.4 As acknowledged by the CMA, there are two approaches to estimating the EMR – the first being the use of long-run historical data on realised returns on equities; the second being the use of forward-looking approaches to estimate the expected return on the market using analyst forecasts.

6.5 The CMA presents evidence on the EMR using both of these approaches, citing historical returns which range from 5.4% (geometric mean) to 7.2% (arithmetic mean) and forecast returns of 5.0% to 6.0%. On this basis, the CMA sets a range of 5.0% to 6.5% for the EMR. HCA disagrees with the CMA's low case EMR of 5.0%, for three key reasons:

- First, as explained previously to the CMA, more weight should be placed on the arithmetic mean of 7.2%, rather than the geometric mean of 5.4%. The precise weighting placed on the arithmetic and geometric means can be calculated, in theory, for any given holding period and indeed the CMA/CC has done precisely this in previous cases. The correct estimate of the historical premium over the nine years investigated (being the Relevant Period) will be far closer to the arithmetic mean than the geometric mean.
- Second, the CMA is placing too much weight on a low case forecast return of 5.0%. Not only are forecast returns subject to significant uncertainty – being entirely based on analyst forecasts, rather than robust evidence – but the Relevant Period for the WACC estimate in this case is historical. As acknowledged by the CMA, the intention of the WACC paper is to determine what the WACC was in the Relevant Period, not to forecast the future expected WACC.
- Third, the most cited studies, commissioned specifically for regulatory practice, are the so called "Smithers Reports", the most recent being that of Wright et al, 2006. This most recent Smithers Report suggests an expected EMR range of 6.5% to 7.5% for the Relevant Period.

6.6 Recent decisions by other regulators in the UK also provide evidence that the CMA's low case of 5.0% is too low. Table 4 below shows the EMR used by UK regulators in recent decisions.

Table 4: Recent EMR decisions by UK regulators

Regulator/price control period	Low case EMR	High case EMR	Point estimate EMR
Ofgem, RIIO-GD1 (Dec '12) ²⁶	6.45%	7.50%	7.25%
Ofgem, RIIO-ED1 (Nov '14) ²⁷	5.00%	6.50%	6.50%
Ofwat PR14 (Dec '14) ²⁸	6.25%	6.75%	6.75%
CAA (Jan '14) ²⁹	n/a	n/a	6.25%
Smithers & Co. ³⁰	6.50%	7.50%	n/a
CMA, Bristol Water appeal (Sept '10) ³¹	5.00%	7.00%	7.00%

6.7 Table 4 above illustrates that:

- The CMA's mid-point EMR of 5.75% is lower than any of the point estimates detailed in Table 4.³²
- The CMA used a point estimate of 7.0% in the Bristol Water case in 2010. Given that 2010 is within the Relevant Period, this appears inconsistent with the CMA using 5.75% as a reasonable EMR in the WACC Paper.
- RIIO-ED1³³ and the CMA Bristol Water cases had low EMR estimates in the low case (which HCA considers to be at odds with the academic evidence³⁴). However, where 5.0% is used as the low case, the point estimate was based on the high case EMR (being 6.5% in RIIO-ED1 and 7.0% in the CMA Bristol Water case) – in other words limited weight was placed on the low case by the regulator.

6.8 The CMA refers to its own decision on EMR in the Northern Ireland Electricity case in support of its use of a range of 5.0% to 6.5% for the EMR.³⁵ However, HCA notes that in that case, the CMA itself commented that the low case estimate of 5.0% is less well supported than the upper case of 6.5% and that "...the weight of evidence tended to support numbers between 5.5 and 6.5%..." going on to comment that it kept 5% as the low case but felt "...less confident with this estimate..."³⁶

6.9 Based on the evidence above, it is HCA's view that the floor for the EMR used by the CMA in its WACC estimate should be 6.0%, not 5.0%. Increasing the low case EMR to 6.0% increases the CMA's mid-point WACC estimate by 0.4 percentage points.

²⁶ Table 3.4, RIIO-GD1: Final Proposals - Finance and uncertainty supporting document, December 2012.

²⁷ Table 2.2, RIIO-ED1: Draft Determinations for the slow-track electricity distribution companies, Financial Issues, 30 July 2014.

²⁸ Table A7.10, Setting price controls for 2015-20, Final price control determination notice: policy chapter A7 - risk and reward.

²⁹ Paragraph 6.20, Estimating the cost of capital: a technical appendix for the economic regulation of Heathrow and Gatwick from April 2014: Notices of the proposed licences.

³⁰ Page 3, Ofgem decision on methodology for assessing the equity market return for the purpose of setting RIIO-ED1 price controls, 17 February 2014.

³¹ Table 12, Appendix N to the Final Determination by the CMA on Bristol Water Plc Price Determination

³² In the WACC Paper, the CMA's range is 5.0% to 6.5% such that its point mid-point is 5.75%.

³³ It should be noted that in Ofgem's RIIO-ED1 price control, the low case was 5.00% but the top end of the range (6.50%) was used as the point estimate by the regulator i.e. it was the 6.5% that was relied upon.

³⁴ As cited at paragraph 6.5.

³⁵ Paragraph 38 of the WACC Paper.

³⁶ Paragraph 13.187, Northern Ireland Electricity Limited price determination, Final Determination, 26 March 2014.

Inappropriate beta proxies

6.10 As set out in paragraph 4.12, when estimating the beta element of the CAPM, it is necessary to identify suitable proxy firms, which can be used to estimate the beta of the market being analysed. As discussed in previous submissions,³⁷ in order to obtain a robust beta estimate using international firms, certain minimal criteria should be met, including:

- a) the proxy firms must be operating in the same industry;
- b) the markets should have similar country risk premia (“CRP”);
- c) the markets should be sufficiently liquid; and
- d) the markets in question should have similar integrity to the market for which the proxy is required. That is, governance, regulation, property rights and political risk should be similar.

6.11 Table 5 below details the proxy firms used by the CMA, alongside the country within which each firm is listed.

Table 5: Proxy firms used by the CMA

Company	Country
Netcare	South Africa
Ramsay	Australia
HCA	US
Lifepoint	US
Tenet	US
Rhoen Klinikum	Germany
HMA	US
Universal	US
CHS	US
Apollo	India
Fortis	India

Source: the WACC Paper table 4 and HCA desktop research

6.12 Table 5 above shows that Netcare, Apollo and Fortis trade in either South Africa or India. HCA has set out its concerns over the CMA’s use of these proxy firms in previous submissions³⁸ on the basis that these markets do not meet criteria (b), (c) and (d) set out in paragraph 6.10.³⁹ In its discussion of HCA’s comments on criteria for suitable proxy firms in the WACC Paper, the CMA addresses only criteria (c) – that markets in which proxy firms are listed should be sufficiently liquid.⁴⁰ The CMA also states that HCA has not produced evidence to support its claims that these proxy firms are inappropriate.⁴¹

6.13 The rest of this section summarises HCA’s concerns with the CMA’s use of Netcare, Apollo and Fortis as proxy firms (which extend beyond concerns over the liquidity of the markets in which they operate), providing new evidence demonstrating that they are indeed

³⁷ Paragraphs 5.205 – 5.244, Appendix 5, HCA Response to the Provisional Findings, 11 November 2013.

³⁸ Paragraph 5.218, Appendix 5, HCA response to the Provisional Findings, 11 November 2013.

³⁹ Paragraph 4.33, A Submission on the CMA’s analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016 and Paragraphs 5.204-5.212, Appendix 5, HCA response to the Provisional Findings, 11 November 2013.

⁴⁰ Paragraph 44 of the WACC Paper.

⁴¹ Paragraph 46 of the WACC Paper.

inappropriate proxy firms for determining the riskiness of operating in the UK private healthcare industry.

- 6.14 Damodaran (2016)⁴² shows that the countries in which Netcare, Apollo and Fortis are listed carry a substantial CRP. This is the premium attached to investing in countries that may be regarded as more risky than more established markets such as the US or UK. This additional risk may arise for a number of reasons including political risk, regulatory risk, property rights or differences in governance.
- 6.15 Table 6 sets out the CRP and relative volatility of the South African and Indian markets, compared to the UK.

Table 6: CRP and volatility data by country

Country	CRP (real)	Volatility
India	2.4%	1.30
South Africa	4.9%	1.27
UK	0.0%	n/a ⁴³

Source: Damodaran 2016

- 6.16 As set out in Section 4, the use of proxy firms as part of beta estimation rests on the assumption that: the relative riskiness of the overseas listed healthcare to the riskiness of the local stock market is a good proxy for the relative riskiness of a UK-listed private hospital operator to the UK stock market.
- 6.17 More specifically, the information set out in Table 6 demonstrates that Netcare, Apollo and Fortis should be excluded as proxy firms from the CMA's beta estimation for the following reasons:
- As set out in Section 4, estimating cost of equity from the CAPM for the UK private healthcare industry requires applying an industry-specific beta estimates to other, market-wide (i.e. non-industry-specific) parameters, namely the UK ERP and RFR. For the CAPM model to be valid, the industry-specific beta estimates should be from the same market (in this case, the UK) as the market-wide parameters to which they are being applied. When using proxy firms from other markets to estimate beta for a hypothetical stand-alone UK private hospital operator, it is therefore important to consider how the market-wide parameters might differ in the overseas markets in which the proxy firms are listed. For example, in countries such as India and South Africa, the ERP is likely to be substantially different from the ERP for the UK. As a result, applying beta estimates from firms listed in India and South Africa to a UK estimate of ERP will not produce reliable results.
 - A standard way for investors to adjust for differences across countries would be to use the CRP. For example, if a UK investor were trying to calculate the expected return on an overseas investment using the CAPM, then it might add the CRP for the overseas market to the UK to the cost of equity. In this case, the CMA's estimate of the real cost of equity for the UK private healthcare market, as set out in the WACC Paper, is 4.5%-7.7%.⁴⁴ The CRP figures for the Indian and South African markets, set out in Table 6, are therefore significant in comparison with the CMA's estimate of cost of equity, which

⁴² www.stern.nyu.edu/~adamodar/pc/datasets/ctryprem.xls

⁴³ Relative volatility for the UK stock market, as compared to the US, is not published by Damodaran, this is likely to be due to the relative volatility being close to 1. Exactly what the ratio is depends on the measurement interval chosen, but the evidence in Dimson et al (2015) suggests that the standard deviation of real equity returns in both countries is around 20%, suggesting that the volatilities are very similar.

⁴⁴ Low case = 1%+(0.87*4%) and high case = 1%+(1.22*5.5%).

suggests that it is not possible simply to apply the betas for companies listed in those markets to a UK CAPM.

- Third, the market volatility figures shown in Table 6 demonstrate that the underlying indices used in the beta calculation are highly volatile, suggesting that beta readings for the firms will be misleadingly low.⁴⁵ Consequently, taking a beta reading from these countries and then assuming it applies to the UK market is incorrect in principle.
- Fourth, for the CAPM to hold in any given market, frictionless market conditions are required.⁴⁶ These conditions are unlikely to apply in those emerging markets where significant political risk is present, and where governance and regulatory standards are not the same as in mature markets. This further undermines using firms listed in these markets to estimate beta for a hypothetical, stand-alone UK private hospital operator. HCA is not aware of any robust evidence to support the use of the CAPM in either the Indian or the South African market and the CMA has not provided any to justify the use of proxy firms listed in those markets.

6.18 Overall, therefore, this evidence, along with evidence previously submitted,⁴⁷ shows that Netcare, Apollo and Fortis should be excluded from the CMA's set of proxy firms for beta estimation. The substantial CRP and market volatility associated with the South African and Indian markets suggests that any measure of riskiness relative to these markets will be misleading.

6.19 HCA has calculated the impact of excluding these proxy firms, in combination with correcting for the other errors in the CMA beta estimation, set out in Section 5 (the CMA's error in unlevering (paragraph 5.4) and the inclusion of beta values that are statistically unreliable (paragraph 5.10)). The mid-point asset beta increases from 0.47 to 0.76, calling into question the CMA's range of 0.5 to 0.7 and the CMA's statement that its upper range of 0.7 is "conservative".⁴⁸ In HCA's view, a more appropriate asset beta range would be 0.71 to 0.81 (i.e. ± 0.05 from the mid-point).⁴⁹ Using this beta range increases the CMA's estimate of the WACC by 0.9 percentage points. More detail on beta estimation can be found in the technical appendix to this submission.

(ii) Cost of debt

6.20 This section now turns to the other component of the CMA's WACC calculation, the estimate of the cost of debt (see paragraph 4.9 above). In determining the cost of debt, the CMA:

- starts with its estimate of the nominal cost of debt from its Final Report (2014), of 5.5% to 7.0%. This estimate was based on CMA analysis of effective interest rates paid by UK private healthcare operators and yields on UK BBB-rated corporate debt.⁵⁰
- updates its view on the nominal cost of debt by reviewing the trend in UK corporate debt yields over time from January 2010 to January 2016. From this analysis, the CMA

⁴⁵ As set out earlier, beta is the covariance of a firm's returns with the market returns, divided by the market variance. Take a hypothetical scenario where private healthcare operators actually had similar volatility no matter whether they operated in Country A or Country B. The only difference in circumstances is that Country B has exactly twice the market variance of Country A. Assuming an identical *correlation* between healthcare returns and market returns in both countries, the beta of a healthcare operator in Country A will be exactly twice that of a healthcare operator in Country B.

⁴⁶ Being minimal transaction costs.

⁴⁷ Paragraph 5.218, Appendix 5, HCA response to the Provisional Findings, 11 November 2013.

⁴⁸ Paragraph 48 of the WACC Paper.

⁴⁹ This is a judgmental range around our mid-point.

⁵⁰ Paragraph 54 of the WACC Paper. BBB rating is in line with the CMA's approach in the WACC Paper and seems reasonable given the ratings of private healthcare firms in the Relevant Period.

concludes that the cost of debt for a UK private hospital operator is likely to have declined in the period from 2012 to 2015 by around 1 percentage point,⁵¹ and, on the basis of the above

- deducts 1 percentage point from its cost of debt assumption, giving a low case estimate of the cost of debt of 5.0% and a high case of 6.5%.⁵²

6.21 In HCA's view, as with the CMA's assessment of the EMR, the CMA places too much weight on recent figures, rather than arriving at an estimate of WACC which is representative of the Relevant Period.

6.22 In placing more weight on the most recent evidence the CMA significantly underestimates the cost of debt in the Relevant Period. This is evident in the CMA's implied debt premium:

- Taking into account the CMA's inflation assumption of 3.0%⁵³ and its real RFR of 1.0%, the implied debt premium in the CMA's cost of debt estimate is 0.9% to 2.4%.⁵⁴
- However, the average debt premium for BBB UK firms⁵⁵ from 2007 to 2015 was 2.9%.

6.23 Given that the purpose of the WACC Paper is to estimate the WACC for the Relevant Period and that the CMA's debt premium is much less than the debt premium observed in the market for the Relevant Period, it seems reasonable to assume a debt premium range of 2.5% to 3%, rather than the CMA's 0.9% to 2.4%.

6.24 After adjusting for HCA's suggested debt premium, this increases the mid-point nominal cost of debt from 5.8% to 6.9% and increases the CMA's mid-point estimate of WACC by 0.6 percentage points.

7. OVERALL IMPACT ON WACC

7.1 This section calculates the cumulative impact of the errors and concerns that HCA has set out in this submission on the CMA's estimate of an industry WACC over the Relevant Period. Table 7 shows the cumulative impact of correcting for the errors and flaws identified by HCA in the CMA's analysis, and Table 8 shows the breakdown of each element in the WACC, after all adjustments set out in this submission have been made.

⁵¹ Paragraph 59 of the WACC Paper.

⁵² Paragraph 59 of the WACC Paper.

⁵³ Which is evident from the CMA's real RFR being 1% and its nominal RFR being 4%.

⁵⁴ Calculated as: $((\text{Nominal cost of debt}+1)/(\text{Inflation}+1)-1) - \text{RFR}$, for example in the CMA's low case scenario this is $((5\%+1)/(3\%+1)-1) - 1\% = 0.9\%$.

⁵⁵ Taken as the difference between 7-10 year UK corporate bond yields less the 7-10 year RFR over the period 2007 to 2015.

Table 7: Cumulative impact of HCA's concerns with the CMA's WACC

Adjustment	Low Case	High Case	Mid-point
CMA WACC	7.6%	10.5%	9.0%
Incorrect calculation of inflation impact on ERP (paragraphs 5.11 to 5.15)	7.6%	10.6%	9.1%
Beta range uplifted following removal of insignificant betas and inappropriate overseas proxies (paragraph 6.19)	8.7%	11.4%	10.0%
Low case EMR uplifted to 6.0% (paragraph 6.4 to 6.9)	9.5%	11.4%	10.4%
Uplift debt premium to reflect cost of debt in the Relevant Period (paragraphs 6.21 to 6.24)	10.3%	11.7%	11.0%

Source: HCA analysis

Table 8: Adjusted WACC breakdown

	Adjusted CMA Low Case	Adjusted CMA High Case
Real risk free rate	1.0%	1.0%
Implied real risk premium (EMR - RFR)	5.0%	5.5%
Real EMR	6.0%	6.5%
Asset beta	0.71	0.81
Gearing	50%	50%
Corporate tax rate	26%	26%
Debt premium	2.5%	3.0%
Inflation rate	3.0%	3.0%
Implied equity beta	1.24	1.41
Real post-tax cost of equity	7.2%	8.8%
Equivalent nominal cost of equity	10.4%	12.0%
Real pre-tax cost of debt	3.5%	4.0%
Equivalent nominal cost of debt	6.6%	7.1%
Pre-tax nominal WACC	10.3%	11.7%
Mid-point	11.0%	

Source: HCA analysis

7.2 Tables 7 and 8 above demonstrate that the CMA's WACC estimate is understated. A more robust and reliable WACC benchmark would be 11.0%.

8. HCA'S VIEWS ON THE CMA'S USE OF PROFITABILITY ANALYSIS IN THE REMITTAL INQUIRY

- 8.1 As set out in the introduction to this submission, in addition to its specific concerns relating to the estimation of the WACC, HCA has a number of serious concerns about the weight that the CMA has provisionally placed on its profitability analysis in the Remittal Inquiry. In HCA's view, these concerns provide important context for the CMA's analysis of WACC and so in this section, HCA briefly summarises these concerns.
- 8.2 As set out in Section 3, the CMA has provisionally relied heavily on its profitability analysis in the Remittal Inquiry, broadly speaking in two ways:
- First, in its Remittal PFs, the CMA refers to its estimate of HCA's excess profit to support its provisional conclusion that there is customer detriment arising from a lack of effective competition in central London.⁵⁶
 - Second, in its analysis of the impact of a potential divestment remedy, the CMA cites its estimate of HCA's excess profit as evidence that a divestment remedy would lead to reductions in HCA's prices, using its estimate of HCA's excess profit to quantify the price benefits of a potential divestment remedy as part of its NPV analysis.⁵⁷
- 8.3 HCA submitted the Academics' Paper and also made further comments itself on this issue in its response to the PDR.⁵⁸ Both of these submissions show that the CMA would be incorrect to rely in its Final Report on profitability analysis in the way set out in paragraph 8.1, for the following reasons.
- 8.4 First, any analysis of excess profit requires difficult judgement. Indeed, in this submission, HCA has shown that reasonable adjustments to the CMA's assumptions underlying its WACC calculations significantly alter the CMA's results. Similarly, in other submissions, HCA has shown that errors in the CMA's judgements have led it to substantially overestimate HCA's ROCE.⁵⁹ In this context the CMA should, therefore, be very cautious in determining that any particular level of profit is clearly "excessive", and even more cautious in using such profit levels as evidence of a lack of effective competition. In the remittal PDR, the CMA recognises that this gives rises to significant uncertainty surrounding its estimates of HCA's excess profit.⁶⁰ However, in continuing to use profitability analysis to support a provisional AEC decision and to quantify the benefits of remedies, the CMA is continuing to put too much weight on a highly uncertain analysis.
- 8.5 Second, even setting aside the concerns explained in the previous paragraph, the CMA has not shown that there is a link between any high estimated profitability and a lack of effective competition in the provision of private healthcare in central London. It is entirely to be expected that at least some firms in a well-functioning, competitive market will make profits in excess of the WACC, for example as a reward for superior efficiency and/ or as compensation for undertaking investment. There is good evidence that these pro-competitive

⁵⁶ Paragraph 6.284, CMA's provisional findings, 28th August 2013.

⁵⁷ Paragraphs 2 and 38 of the Profitability and Net Present Value Appendix to the CMA's Remittal Provisional Decision on Remedies.

⁵⁸ A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016 and Paragraphs 4.52 – 4.52, HCA's Response to the Provisional Decision on Remedies.

⁵⁹ Paragraph 4.52, HCA's Response to the Provisional Decision on Remedies and paragraph 1.5, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016.

⁶⁰ Paragraph 29, Appendix to the Remittal Provisional Decision on Remedies.

explanations for higher profitability apply to HCA.⁶¹ Furthermore, the CMA has no evidence that HCA charges prices that are any higher on a like-for-like basis than those charged by The London Clinic, and therefore no evidence that HCA's profit is linked to higher prices.⁶² Since the CMA has not set out any robust evidence linking HCA's profitability to market power or a lack of effective competition, the CMA is incorrect to rely on its profitability analysis to justify its provisional AEC finding or to quantify the benefits of remedies.

8.6 Third, and as a result of the concerns set out in the previous paragraphs, the CMA's use of its profitability analysis to quantify a supposed detriment to consumers creates a risk of serious adverse consequences. It risks punishing efficiency and sending perverse signals to the market, in relation to the rewards that can be expected from investment.⁶³

8.7 Given these concerns, alongside the errors and flaws in the CMA's methodology for estimating both WACC and ROCE, in HCA's view the CMA should not rely on its profitability analysis – neither as evidence of an AEC nor to quantify the impact of potential remedies.

⁶¹ Paragraph 3.13 – 3.23, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016.

⁶² Paragraph 2.41, Remittal Provisional Decision on Remedies.

⁶³ Paragraph 1.5, A Submission on the CMA's analysis of profitability in the Private Healthcare Market Investigation Remittal Inquiry, by Professors Alan Gregory and Bruce Lyons, dated 20 January 2016.

TECHNICAL APPENDIX: ASSET BETA CALCULATION

In the main body of this submission, HCA sets out the errors and methodological flaws in the CMA's calculations of asset beta for a hypothetical standalone private hospital operator in the UK, and sets out revised estimates of asset beta, correcting for these errors and flaws.

This appendix sets out a step by step summary of how HCA arrived at its corrected asset beta range.

Estimating equity and asset betas for each proxy firm

This section sets out how HCA arrived at the equity betas and asset betas for each of the proxy firms for a hypothetical standalone private hospital operator in the UK, used by the CMA.

- 1) HCA downloaded total return indices ("TRI") (increases in share price plus dividends) from Datastream for each proxy firm and the relevant market indices. HCA then calculated returns for every month/quarter when a firm was quoted on the market. The one exception is for Health Management Associates where a takeover was announced on July 30th 2013.¹ After the acquisition date the firm's price simply reflected the offer terms, so any relative returns metric (or beta) in the post-acquisition period, will not be representative of firm specific risk, and should be excluded from the analysis. Further, there are increases in stock prices pre-merger announcement² and so a period pre-announcement should also be excluded. Given that quarterly and monthly betas are needed, HCA calculated beta up to 31st March 2013, to exclude a 'run-up' period pre-merger and the entire period post-merger.
- 2) The market indices are the S&P 500 for US firms, and the MSCI³ Country TRIs for Australia, Germany, India and South Africa. There is some judgement around which benchmark index is the most appropriate, but HCA used the MSCI because it provides consistency across countries and because it represents the universe of potentially investable firms in each of those countries.⁴
- 3) HCA then estimated beta by regressing firm level returns against total returns on the appropriate index.^{5,6} HCA ran these regressions on both a quarterly and monthly basis. HCA does not consider running regressions using weekly data to be appropriate as the evidence in Gilbert et al (2014) suggests low frequency estimates are more reliable, and the evidence in Gregory et al (2016) specifically shows that weekly estimates of beta are less reliable than monthly or quarterly estimates.
- 4) These equity betas are then used to estimate asset betas, applying the tax rates used by the CMA in the WACC Paper and HCA's corrected gearing estimates.⁷ These corrected gearing estimates correct the ratios used by the CMA. As explained in the body of this submission, the CMA's ratio implied a market value of equity of over 100% for HCA in 2012, which is incorrect. HCA's base estimates of monthly and quarterly betas are shown in Table 1:

¹ <http://dealbook.nytimes.com/2013/07/30/h-m-a-to-be-sold-to-community-health-for-3-6-billion/>

² See, for example, Schwert 1996

³ MSCI is an index created by Morgan Stanley Capital International and measures equity market returns across global emerging markets

⁴ Note, for Germany and Australia HCA obtained qualitatively and quantitatively similar results using the DAX 30 and ASX 200 indices respectively.

⁵ With standard errors being Huber/White/Sandwich estimates.

⁶ Specifically, HCA estimated regressions in Stata using the "Robust" standard error function.

⁷ HCA also holds the debt beta at zero, in line with the CMA's assumption. Debt beta can be calculated in the same way as equity beta, where the firm's debt is traded. HCA accepts that a debt beta close to zero may be a reasonable approximation when leverage is around 50%. However, should one assume higher leverage, with poorer debt rating, then it would logically imply a higher debt beta for the relevant firms. A higher debt beta would increase the unlevered beta. Thus our estimates of unlevered betas are biased downwards by this assumption of a zero debt beta in all cases.

Table 1: Equity (levered) beta estimates and asset (unlevered) beta estimates.

Proxy	D/D+E	Tax rate	Monthly beta	Quarterly beta	Monthly ungeared (asset) beta	Quarterly ungeared (asset) beta
Netcare	0.578	26%	0.755***	0.571***	0.375	0.284
Ramsay	0.259	30%	0.398***	0.411*	0.320	0.330
HCA	0.629	40%	1.106***	1.613**	0.549	0.800
Lifepoint	0.469	40%	1.059***	1.061***	0.692	0.693
Tenet	0.749	40%	2.009***	3.357***	0.720	1.202
Rhoen Klinikum	0.250	30%	0.341***	0.225	0.276	0.182
HMA	0.665	40%	2.227***	2.697**	1.017	1.232
Universal	0.354	40%	1.228***	1.275***	0.924	0.959
CHS	0.796	40%	1.376***	1.675***	0.412	0.502
Apollo	0.114	34%	0.325**	0.341***	0.300	0.314
Fortis	0.391	34%	0.800***	0.546***	0.562	0.383
Calculated Mean	0.478	N/A	1.057	1.252	0.559	0.626
CMA Mean	N/A	N/A	0.930	0.990	0.470	0.460

Source: HCA analysis

Note: ***, ** and * indicate statistical significance at the 99% level, the 95% level and the 90% level, respectively. Table 3 at the end of this Appendix provides the Stata outputs in more detail.

Deriving an appropriate range for UK private healthcare asset betas

Having calculated the asset betas for each of the CMA's proxy firms, HCA then considered how to derive a suitable range for a hypothetical standalone private hospital operator in the UK, from these proxy firms. The process followed to derive HCA's final asset beta range of 0.71 to 0.81 was as follows:

- 5) HCA excluded beta estimates that are not statistically significant. HCA found that the quarterly estimates for Rhön-Klinikum and Ramsay were not statistically different from zero and so excluded these from the analysis.
- 6) HCA excluded betas from emerging markets (being South Africa and India), given that they are inappropriate proxies when estimating the riskiness of private healthcare provision in the UK. This results in the asset betas for Netcare, Apollo and Fortis being disregarded.

The results of HCA's analysis, detailed above, are shown in Table 2 below:

Table 2: Summary beta statistics

Summary Numbers	Monthly	Quarterly	Mid-point
CMA	0.470	0.460	0.465
Mean correctly unlevered betas	0.559	0.626	0.592
Mean excluding emerging markets	0.614	0.738	0.676
Mean excluding statistically unreliable estimates	0.559	0.708	0.633
Mean excluding statistically unreliable & emerging markets	0.614	0.898	0.756

Table 2 illustrates that if both statistically unreliable and emerging market beta estimates are excluded (note that the corrections to the CMA's gearing assumptions have already been applied) the mid-point asset beta estimate is 0.76. HCA therefore considers that its recalculation of the betas from raw data

supports an asset beta range of 0.71 to 0.81 i.e. ± 0.5 from the mid-point, which compares to the CMA's estimate of 0.50 to 0.70.

Table 3: Detailed regression outputs

Company	Index	Monthly			Quarterly		
		Levered betas	Standard error	R-sq	Levered betas	Standard error	R-sq
Netcare	MSCI_SA	0.755***	(0.147)	0.226	0.571***	(0.189)	0.123
Ramsay	MSCI_AUS	0.398***	(0.152)	0.073	0.411*	(0.205)	0.154
HCA	S&P 500	1.106***	(0.370)	0.181	1.613**	(0.758)	0.281
Lifepoint	S&P 500	1.059***	(0.150)	0.337	1.061***	(0.208)	0.435
Tenet	S&P 500	2.009***	(0.492)	0.225	3.357***	(1.140)	0.463
Rhoen Klinikum	MSCI_GER	0.341***	(0.110)	0.074	0.225	(0.247)	0.037
Health Management	S&P 500	2.227***	(0.501)	0.387	2.697**	(1.042)	0.453
Universal	S&P 500	1.228***	(0.184)	0.406	1.275***	(0.207)	0.453
Community	S&P 500	1.376***	(0.329)	0.214	1.675***	(0.423)	0.395
Apollo	MSCI_IND	0.325**	(0.143)	0.089	0.341***	(0.101)	0.199
Fortis	MSCI_IND	0.800***	(0.177)	0.270	0.546***	(0.136)	0.249

Source: HCA analysis

Note: ***, ** and * indicate statistical significance at the 99% level, the 95% level and the 90% level, respectively.