

AGGREGATES, CEMENT AND READY-MIX CONCRETE MARKET INVESTIGATION

Current cost accounting profitability assessment for cement

Introduction and summary

Introduction

1. This working paper assesses the profitability in the cement market over the period 2007 to 2011 in line with our *Planned approach to assessing profitability in aggregates, cement and ready-mix concrete markets*¹ (the Approach Paper) published on 23 November 2012. In this Approach Paper we set out that we planned to determine profitability on a return on capital employed (ROCE) basis over the period 2007 to 2011 and then assess that profitability in relation to the industry's cost of capital.

2. In the Approach Paper we set out the six purposes of this profitability analysis,² namely to help answer the following questions:
 - (a) Does profitability in the market indicate that prices for cement are too high?
 - (b) What evidence does the profitability analysis give us about entry conditions?
 - (c) What is the trend in profitability in this market over the period of review?
 - (d) What has been the impact of the demand shock during the period of review on profitability?
 - (e) How efficient (ie profitable) are the companies relative to one another?
 - (f) Does the profitability analysis highlight the potential materiality of certain issues?

Background

3. On 23 November 2012 we sent to each of the five largest vertically-integrated construction materials companies in GB ('the Majors')³ a paper setting out our prelimin-

¹ www.competition-commission.org.uk/assets/competitioncommission/docs/2012/aggregates-cement-and-ready-mix-concrete/profitability_approach_housestyled_excised.pdf.

² See the [Approach Paper](#), paragraphs 10–17, for the full justification.

ary view of its profitability on a historical cost accounting (HCA) basis (the HCA paper) in each of the referred markets. This preliminary view reflects the financial information supplied to us in response to our financial questionnaire (FQ) request, adjusted, where this data allowed, to be consistent as far as is possible with the Approach Paper but on an HCA basis. In terms of assessing cement profitability, we identified in particular that we needed to adjust fixed asset values to reflect their value to the business.

4. We have now assessed the value of the cement fixed assets for each of the four cement producers by applying 'value to the business' valuation principles and therefore are able to set out our initial assessment of ROCE levels both on a current cost accounting (CCA) as well as an HCA basis.⁴ For reference the summary profit and loss account and balance sheet for each cement producer are set out at the back of this paper (Tables 12(a) to (d)).
5. We have also assessed our estimate of the companies' cost of capital. We include this assessment as an annex to this working paper.

Conclusions

Does profitability in the market indicate that prices for cement are too high?

6. One of the objectives of this profitability analysis is to help us judge whether prices are above the competitive level.⁵ Profitability will not be the only factor we are likely to take into account when making this judgement, so we do not draw any conclusion on this question here.

³ These are (in alphabetic order): Aggregate Industries, Cemex, Hanson, Lafarge and Tarmac. Aggregate Industries does not, however, produce cement in GB.

⁴ The CC acknowledges the comments each of the Majors—including all four cement producers—have provided on both the [Approach Paper](#) and on the CC's HCA analysis for each of them. This paper is intended to address these comments, which were received over the period 21 December 2012 to 22 February 2013, to the extent that we agree to the substance of the points made. We have also taken into account the comments' likely materiality to our conclusions when deciding whether to quantify the impact of an issue.

⁵ [Guidelines for Market Investigations: Their role, assessment, remedies and procedures, CC3, Draft for public consultation, June 2012 \(the draft guidelines\)](#), paragraph 115.

7. In our analysis, we distinguish between profits based on the continuing costs of supply⁶ and those of a more temporary nature. Profitability determined on the basis of continuing costs of supply indicates economic profitability.⁷ Based on this measure, we estimate that profitability across the four GB cement producers has been in excess of their cost of capital over the period, although not exceptionally so. Given the severe and persistent downturn since 2008, and the fact that when estimating profitability we have not adjusted for the higher operating costs undoubtedly associated with some older and less well-located plants, the size of the gap between our estimate of companies' ROCE and their cost of capital may not reveal the extent of the limitation, if any, in the competitive process over this period.⁸

8. Based on our analysis to date, [X] of the four companies incurred very significant impairment losses following the slump in demand in 2008. These impairment losses relate to the unexpected diminution in the value of their assets due to the emergence of excess capacity in the sector following the reduction in demand. However, together with income earned from carbon credits, it would appear that the cement producers as a whole earned their cost of capital of around 10 per cent during the period. So, even during a substantial unexpected drop in demand across the construction sector, cement producers appear to have been able in aggregate to remain profitable when producing cement.

9. We would also contrast the levels of economic profitability estimated for the cement producers with the much lower low levels of profitability associated with the Majors' RMX operations. Companies' cement and RMX businesses operate in the same broad economic sector, namely the provision of heavy building materials, and both sets of businesses have been subject to a drop in demand of a similar scale.

⁶ An alternative terminology would be economic profits or profits based on economic costs.

⁷ The [draft guidelines](#), paragraph 120.

⁸ The [draft guidelines](#), paragraph 124.

What evidence does profitability give us about entry conditions?

10. The level of profits in this market based on the continuing costs of supply suggests that it would be attractive to enter the cement market. However, we note that the GB cement market currently needs at most ten cement plants, each of which can be expected to last around 50 years and once built represents a sunk cost. This means that in practice the scope for large-scale entry into the market may in practice be limited.

What is the trend in profitability in the market over the period of review?

11. Profitability determined on the basis of continuing costs of supply, ie economic profitability, suffered during 2008 and 2009 as the slump in demand bit hard and companies sought to adjust to the new circumstances. Our estimates indicate that profitability on this measure has since recovered.

What has been the impact of the demand shock during the period of review on profitability?

12. Profitability measured on the basis of all costs incurred also slumped in 2008 and 2009 following the demand shock: companies incurred significant impairment losses arising from the emergence of permanent spare capacity following the reduction in demand. However, since the spare capacity has been written off profitability has been restored.

How efficient (ie profitable) are the companies relative to one another?

13. According to our estimates, [Producer 1] and [Producer 2] are the most profitable cement producers in GB. Their precise ranking is more difficult to establish confidently because variation in calculated company profitability may be in part a function of the age of their plant, [%]. [Producer 2] has a [%], whereas [%] at the beginning of the period of review, [%]. [Producer 3] profitability based on the

continuing costs of supply appears to have been adversely affected by its decision [X]. [Producer 4] is the least profitable company, which is likely to result from [X].

Does the profitability analysis highlight the potential materiality of certain issues?

14. The analysis has highlighted the fact that in order to compete successfully in this market, a very large lumpy investment, currently of the order of £200 million,⁹ is required in an asset with a potentially very long asset life which is ideally operated at full capacity. Returns can be healthy so long as economic demand for the output of the asset remains. Thus the economics of cement production can be viewed as giving rise to enhanced incentives to ensure continuous supply.

Key findings

Cost of capital

15. In order to understand our assessment of the Majors' ROCE, we need to define a benchmark against which we compare it. The benchmark we typically use is the return required by parties for the risk involved in having capital invested in the business (also expressed as the cost to the parties of not being able to invest that capital elsewhere). We have included as an annex our assessment of the parties' cost of capital, which we estimate to be approximately 10 per cent. This is consistent with the range of costs of capital provided by the Majors, which are largely between 9.5 and 11.5 per cent.

Returns on capital employed

16. The analysis set out below assumes that one needs to invest in the order of £170 million at 1 January 2007 prices to obtain a cement production facility capable of producing 1.0 Megatonnes (Mt) of clinker a year. Furthermore it assumes that

⁹ This £200 million is based on 2013 prices. Elsewhere in this paper we focus on the cost of a plant as at 1 January 2007 of about £170 million.

assets decline in value by 3.5 per cent a year on a reducing balance basis. It also assumes that asset price inflation is 2.5 per cent in nominal terms over the period (equivalent to 13 per cent rise over the period).

Average returns assessed on a pan-producer basis

17. Below we summarize profitability across all GB cement producers averaged across the period of review, 2007 to 2011. We also distinguish between returns established on the continuing costs of supply and those elements of return during the period which are temporary in nature. We believe such a presentation gives the most informative analysis of profitability of GB cement producers during the period of review.¹⁰

TABLE 1 **Calculated ROCE for GB cement producers averaged over the period 2007 to 2011**

	%
Profits based on continuing costs of supply	13.3
<i>Arising from</i>	
Carbon credits	2.3
Impairment losses	<u>-4.0</u>
Profits reflecting all costs incurred	11.6

Source: Table 10.

18. Income from the sale of carbon allowances which have proved excess to requirement during the period ('carbon credits') have been significant during the period, [X]. Whilst we consider that the cement producers are unlikely in future to generate profits from this source to the same extent, we also believe it likely that [X].

19. We have summarized profitability across all GB cement producers because each of the individual cement producers' results are influenced to a significant extent by the weighted average age of their cement plant portfolio, with Lafarge at one extreme

¹⁰ This calculation of the five-year average ROCE does not allow for general inflation between 2007 and 2011. Allowing for this factor would reduce overall ROCE by approximately 0.7 percentage points, a reduction of 0.3 in continuing profits, an increase of impairment losses of 0.5, and an increase in carbon credits of 0.1. There is a trade-off here between transparency of calculation and technical accuracy of approach.

owning a portfolio of older plants and Tarmac owning a single, almost brand new, plant at the other extreme. Both Hanson and Cemex are in between these two extremes, with Hanson tending to own older plant and Cemex newer plant. By calculating a weighted average across all four cement producers, we are able to even out the impact of the precise depreciation profile adopted on our assessment of CCA asset values to some extent, and therefore in turn even out the impact of the depreciation profile adopted on our assessment of the level of CCA profitability in this sector.

20. We have averaged profitability across the five years of review because of the materiality and nature of the impairment losses incurred during the period. The emergence of permanent excess capacity following the slump in demand has caused these impairment losses. In practice, we would expect these losses in asset value to crystallize in one, or perhaps two, accounting periods within the period of analysis. However, the modelling approach taken to quantify assets surplus to requirements (ie spare capacity), an approach that needed to be able to be applied systematically across each of the cement producers, has meant that impairment losses as well as the reversal of impairment losses¹¹ are recognized in each of the five accounting periods under review. In consequence, we believe that profitability assessed on the aggregate of these losses is more meaningful than looking at the values calculated for each year.
21. The sale of carbon allowance have proved a non-trivial source of income for all the cement producers: the scale-back in production following the demand shock has allowed them to sell unused carbon allowances gifted to them by the EU based on historical production levels. [X]These revenues are unlikely to persist to the same extent in future as the EU tightens the carbon emissions scheme.

¹¹ Where clinker output has in fact expanded over the period, the approach taken generates net gains. [X]

- *Sensitivity analysis*

22. We have conducted a sensitivity analysis. For example, were we to assume that the cost of a new cement works at 1 January 2007 had been £200 million, then the calculated ROCE over the period would have been 9.2 per cent with ROCE assessed on the continuing costs of supply at 11.4 per cent.
23. Were we to assume that the decline in asset values is not so rapid, and therefore as a result useful lives are expected to be longer, for example at 2.5 per cent rather than 3.5 per cent a year, then the calculated ROCE over the period would have been 9.3 per cent with ROCE assessed on the continuing costs of supply at 12.1 per cent.

Year by year returns assessed on a pan-producer basis

24. In Table 2 below, in addition to presenting year by year ROCEs, we also provide the volume of cement sold and clinker produced in each year. This volume information gives an indication of the extent of the downturn experienced in this market during the period of review. Clinker production is important in this context, as it is clinker rather than cement sales which have determined the current values we put on each company's cement assets.

TABLE 2 **Volumes and calculated ROCE for GB cement producers over the period 2007 to 2011**

	2007	2008	2009	2010	2011
Mt sold/produced					<i>Mt</i>
<i>Volumes</i>					
Cement sales	12.3	10.6	7.8	8.1	8.7
Clinker production	10.2	8.7	6.4	6.6	7.1
Profits/average capital employed					<i>per cent</i>
<i>ROCE</i>					
Profits based on continuing costs of supply	13.2	10.3	11.0	14.7	18.9
<i>Arising from</i>					
Carbon credits	0.1	2.8	2.5	3.8	2.9
Impairment losses	3.3	-10.3	-18.2	0.2	6.3
Profits reflecting all costs incurred	16.6	2.7	-4.8	18.7	28.1

Source: Table 10 and CC analysis and parties' data.

25. This presentation demonstrates how profits based on continuing costs of supply remained relatively steady through the period 2007 to 2010 even as companies readjusted to the new economic environment. However, [X] companies incurred extensive impairment losses in the period, in this analysis recognized in both 2008 and 2009, which meant that overall returns were minimal in 2008 and negative in 2009.

Structure of the paper and introduction into analysis

<i>Section topic</i>	<i>Detail</i>	<i>Paras</i>
Introduction and summary	The purpose of this paper and brief background Conclusions based on assessment to date Key findings	1–25
Structure of paper and introduction to analysis	Outline of approach The validity of focusing on profitability in an individual market on a stand-alone basis	26–33
Specification of the modern equivalent asset	Basics of cement production The MEA plant: <ul style="list-style-type: none"> • type of cement plant • capacity of cement plant • location of cement plant 	34–54
Estimate of the cost of MEA plant	The rationale and supporting evidence for our range estimate as at 1 January 2007	55–64
Approach to valuing each company's operating capacity	Justification for valuing capacity as a whole The GB cement producers' responses to the slump in demand Description of the approach used to value operating capacity	65–79
Objective of depreciation and the depreciation profile for cement assets	Objective and definition of depreciation Factors determining asset life Factors influencing the depreciation profile Review of evidence to inform selection of asset life/depreciation profile Implications of different depreciation profiles	80–111
Application of chosen depreciation profile	Specification of chosen depreciation profile Impact of chosen profile on individual companies' returns Description of approach employed to derive for each period: <ul style="list-style-type: none"> • MEA valuations in both real and then nominal terms • depreciation and impairment losses 	112–134
Treatment of higher operating costs associated with non-MEA plant	Justification for treatment adopted	135–139
Choice of how we present the results	Profits based on continuing costs of supply v temporary profits Aggregate v individual company profitability Averaged profitability v year-by-year analysis	140–152
Results	Aggregate profit & loss and balance sheet statements and ROCE based thereon (Table 10) Summarized ROCEs for each cement producer (Table 11) Year by year company-specific results detail (Tables 12(a) to (d)) Sensitivity analysis (Tables 13(a) & (b))	153–155

Interpretation of results	Points to bear in mind when reviewing and interpreting the results Comparability of the companies' results	156–160
Glossary of financial terms	See glossary in Table 9 in the Approach Paper: www.competition-commission.org.uk/assets/competitioncommission/docs/2012/aggregates-cement-and-ready-mix-concrete/profitability_approach_housestyled_excised.pdf	
Annex 1	Cost of capital	

Approach to assessing value to the business asset values and detailed results

Outline of approach

26. The rest of the paper sets out:
- (a) an expansion on the underpinnings of the approach taken to assess CCA values for cement assets beyond that set out in the Approach Paper; and
 - (b) the results of applying that approach.
27. We determine profitability on a ROCE basis over the period 2007 to 2011 and then assess that profitability in relation to the industry's cost of capital.
28. The approach taken to determine profitability is to value cement plants on an MEA basis and then reduce the 'as new' cost solely to take account of their age. In other words, we value cement plants as though the only difference between them is their age.

We believe it is valid to assess the profitability of each reference market on a stand-alone basis

29. In this paper we determine the profitability of the Majors in one of the reference markets and compare it with its cost of capital, ie we assess the cement market on a stand-alone basis. As already set out in the Approach Paper, the essential prerequisites for such an approach are that all costs, revenues, assets and liabilities are

attributed to each separate market on a cost causal basis¹² and that the pricing of internal revenues reflect market prices.¹³

30. [X]

31. [X], we note that *all* costs need to be taken into account when setting prices for a market to be sustainable. And *all* costs are variable in the long run, albeit some of costs in the case of cement may vary only in the very long run (about 50 years).

32. Our view is that, so long as internal prices are consistent with the external (upstream) market prices, then if companies are unable in the medium term to make a genuine profit in the downstream market, the company should exit the downstream market. In other words, they should leave downstream operations to those operators which can make a profit—assuming that the external price does not constitute a margin squeeze.

33. We also respond to [X] arguments regarding the handling of transfer pricing in this market investigation in our working paper on margins.

The modern equivalent asset is a fully integrated dry cement plant with production capacity of at least 1 Mt clinker per year and rail-linked

34. As set out in the Approach Paper, we believe that the modern equivalent technology at the beginning of this period was a dry process plant adapted to use alternative fuels on a brownfield site.

¹² Approach Paper, paragraph 70.

¹³ Approach Paper, paragraphs 181–187.

35. There are a number of facets to the specification of a modern cement plant which we have further analysed. This has allowed us to specify in greater detail what a modern plant would look like. We deal with these in turn:
- (a) type of cement plant;
 - (b) capacity of cement plant; and
 - (c) location of cement plant.

Basics of cement production

36. Before going on to specify what we believe to be the modern equivalent plant, it is helpful to spell out some basics. The necessary raw materials, of which limestone comprises around 80 per cent by weight, are typically quarried locally and then ground down before being fed into the kiln plant. The horizontal rotary kiln must be heated up to more than 1,400°C, and kept at this temperature, in order that the required chemical reactions occur and the nodules of clinker are produced. Once cooled, this clinker is ground together with equivalent to 5 per cent gypsum, and possibly other cementitious material blended in, to produce cement. Cement is either supplied in bulk or bagged, the latter option requiring bagging plant. If rail links exist, cement can then be transported in cement wagons to distribution depots more local to the final customer by train. In any case, the delivery to the final customer will almost always be by lorry.
37. Cement production is a very energy-intensive process, not least because the rotary kiln needs to be maintained at above 1,400°C. In addition, electricity is used both to crush and grind the raw materials prior to entry to the kiln, to drive the kiln, to grind the nodules of the clinker produced into cement and to transport the material between the process sections. In addition, fuel is required to transport non-locally-sourced raw materials by road to the plant and then distribute the finished product to the customer.

38. As a consequence of the need to maintain the cement kiln at more than 1,400°C, if a company operates a plant it will want to operate it round the clock so as to minimize unit costs. The company will also think carefully about which customer locations are economic for it to deliver to as final leg distribution costs are a significant proportion of its variable costs.
39. It is also the case that the larger the clinker-producing capacity, the lower the unit cost of producing cement should be. A larger plant will cost more but the relationship will not be 1:1.

Type of cement plant: kiln technology and production process integration

40. We sought to double check the working assumption set out in paragraph 34 by examining the features of new cement plants commissioned in the British Isles during or shortly before the period of our analysis. Tarmac and Irish Cement commissioned new fully-integrated¹⁴ rail-connected plants at Tunstead (2004) in Derbyshire's Peak District in England and at Platin (2009) near Dublin in the Republic of Ireland respectively. In the case of Padeswood, the then Castle Cement (now Hanson) commissioned a new kiln (2005) to modify the original cement works.

¹⁴ By the term fully integrated, we mean that the facilities not only produce clinker but are also able to grind/mill the clinker output and blend other cementitious materials to produce cement.

TABLE 4 Recently-commissioned cement works/kilns in the British Isles

Company	Plant	Year	Process	Technology	Cost (£m)	Clinker production capacity	
						Per day (t)	Per year (mt)
Tarmac	Tunstead	2004	Dry	Four-stage suspension preheater plus air-separate precalciner	110	2,205	0.7
Irish Cement	Platin (Ireland)	2009	Dry	Single-string 5-stage suspension preheater with air-separate precalciner	150–190	4,000	1.3
Hanson	Padeswood	2005	Dry	Single-string 5-stage suspension preheater with air-separate precalciner	[£]	2,650	0.9

Source: CC tabulation of company-supplied information.

Notes:

1. Cost in £ of Irish Cement plant at Platin depends on €£ exchange rate used (range 1.46:1 (2007) to 1.12:1 (2009)).
2. Nameplate capacities converted into annual Mt per year capacity assuming a 90 per cent utilization rate. Effective capacities of individual kilns/plants, however, may vary.
3. [£]
4. Since Tunstead was commissioned in 2004, Tarmac invested £[£] million in 2008 to increase its cement production capacity to [£] Mt per year.

41. We also looked at the investment in a new integrated cement works, including two-stage precalciner kiln¹⁵ at Rugby commissioned in 2000 which cost its then owner (now Cemex) £200 million.¹⁶ Of course, this represents an investment in year 2000 prices or potentially earlier if payment to suppliers were phased. If asset price inflation is allowed for over seven years to cover the period of, say, 1999 to the end of 2006 based on price movements for output in the construction industry¹⁷ of 50 per cent,¹⁸ then this translates to a figure of £300 million. The Rugby cement works, however, appear to be on a similar scale capacity-wise¹⁹ to the new Platin works which cost around €200 million in 2009.

42. Having reviewed the evidence, we judge the most relevant benchmark on which to value the assets which actually produced cement over the period of analysis to be that relating to fully integrated cement works of the suspension preheater with air-separate precalciner type.

¹⁵ We note that the plant at Rugby is not a dry process plant.

¹⁶ See also www.bbc.co.uk/coventry/content/articles/2005/12/13/rugby_cement_works_ugly_building_feature.shtml.

¹⁷ See Table 9, Output price indices, non seasonally adjusted (2005 = 100), accessible via 'references tables' hyperlinked on www.ons.gov.uk/ons/rel/construction/output-in-the-construction-industry/october-2012/sum-consout-oct-2012.html.

¹⁸ The index for 'private industrial excluding infrastructure' was 69.1 for 1999 and 103.7 for 2006 (and for future reference 103.5 for 2011).

¹⁹ Production capacity for both the Rugby and Platin works is 4,000 tonnes per day according to company-supplied information.

Type of cement plant: grinding and milling technology

43. The kiln is one part, albeit the most costly element, of a cement plant. We also understand that technology needed both to grind raw materials prior to processing within the kiln (the raw mix) and then mill the clinker into cement has improved in recent years. Previously ball mills were used for both purposes, which use around 30 per cent more electricity than the modern vertical roll mills and roll presses.
44. We therefore conclude that the MEA plant would feature these modern energy-efficient mills.

Capacity of cement plant

45. We note that the capacity of any new plant in terms of clinker production is likely to be at least 1.0 Mt per year. All other things being equal, we would expect higher-capacity plants to have higher overall fixed²⁰ costs but *lower* overall lifetime unit production costs. This fact explains the tendency over time for individual plant capacities to have grown whilst at the same time the number of plants in GB to have shrunk.²¹
46. A 1.0 or even 1.3 Mt cement works is not by international standards particularly large scale. For example, in 2006 in both Saudi Arabia and China kilns with nameplate capacities of 10,000 tonnes per day, roughly equivalent to 3.2 Mt clinker output per year, were commissioned.²² However, the size of the cement market in Saudi Arabia is roughly five times that of the UK cement market, and the Chinese cement market is more than 150 times the size of the UK cement market.

²⁰ These costs are not fixed over the long term, however.

²¹ [Barriers to entry paper when discussing economies of scale](#), paragraph 92. Lafarge illustrated that there had been an increase in the average scale of an integrated cement works and kiln capacity from 0.1 million tonnes per year in 1959 to 1.05 million tonnes per year in 2009.

²² As described in the article 'Maxi or mini?' by Dr Michael Clark, published in March 2007's edition of *International Cement Review*. http://whitehopleman.com/sites/default/files/Maxi%20or%20Mini_0.pdf.

47. We therefore conclude that a plant size of at least 1.0 Mt clinker per year is a reasonable assumption for the purposes for this analysis.

Location of cement plant

48. There are three facets to bear in mind: proximity of raw materials, efficiency of getting the finished product to market and re-use of an existing site or not.

Proximity of raw materials

49. We note that nearly every cement plant in GB is either on or adjacent to its primary raw materials: limestone or calcium carbonate. Not least because 44 per cent of limestone is driven off as CO₂ in the kiln, it makes sense to minimize haulage costs of this heavy raw material.
50. In this context, it is worth noting that the cement producers included within their cement business assets their limestone reserves and the equipment needed to extract these reserves. Whilst technically these assets and the associated extraction activity relate to a (specialist) aggregates market,²³ the activities of quarrying the limestone and producing cement are so closely related that we believe this treatment is understandable.

Efficiency of getting the finished product to market

51. What appears to be key is that either sources of local demand are on a sufficient scale (ie 1+ Mt per year) to make the plant economic or that the plant has the ability to distribute its output to local depots by rail. Cement is a high-bulk but relatively low-value product. Rail transport can be approximately three to four times lower on a £

²³ This separation is illustrated in the [Approach Paper](#), Figure 2, Transfer charges between activities of vertically integrated construction materials producers (plus sales to external parties).

per tonne kilometre compared with road transport over long distances.²⁴ We note that Lafarge, Hanson and Tarmac have invested in their rail distribution networks during the period of review and in some cases shortly before. It is also worth noting that access to the track network in the UK (but not the trains) is at regulated prices.

Re-use of existing site

52. Each of these companies previously mentioned in paragraphs 40 and 41 invested in new/replacement capacity on an existing ('brownfield') as opposed to a brand new ('greenfield') site. Indeed the most recent examples of investment in greenfield sites in GB have been Tarmac at Tunstead in 1966²⁵ and by Blue Circle (now Lafarge) at Cauldon in 1957, 50 years ago or more. When a firm reinvests in an existing site, it tends to spend less, or in some cases entirely avoid expenditure, on necessary items such as:

- (a) roads;
- (b) connectivity to mains water;
- (c) compressed air;²⁶ and
- (d) electricity connectivity.

53. It follows from the discussion of the proximity of raw materials in paragraph 49 that a company is only likely to reinvest in an existing location if sufficient reserves of raw material are present.

Conclusion

54. We therefore also conclude that an MEA plant would be situated handily for its key raw materials and rail-linked unless it could sell all its output locally. We also believe

²⁴ [Barriers to entry paper](#), paragraph 94, quoting evidence supplied by Lafarge. Similar evidence of the scale of the economies potentially achievable has also been found in relation to Hanson. VTG Rail UK in a press release stated that the cement trains it had supplied could carry an average of 1,040 tonnes compared with just 29 tonnes per lorry²⁴ (ie 35 times as much). 'TG Rail UK's pioneering cement wagons celebrate first birthday' (8 April 2009): www.vtg-rail.co.uk/v/s/content/25122/54690.

²⁵ There have been lime kilns, however, at Tunstead since the 1930s.

²⁶ We note, however, that compressed air systems are likely to be renewed at some point.

that a new plant in GB is likely to be located on or adjacent to an existing (brownfield) site.

We estimate the cost of a new 1.0 Mt cement production facility to have been £170 million at 1 January 2007

The overall approach we have taken

55. In this analysis we focus on the cost of a complete replacement cement works, ie that all the necessary assets were acquired at the same point of time. This is a simplifying assumption. We are aware that companies may need to replace periodically some elements of their asset base as individual parts wear out, and such replacement in particular is necessary to maintain the kiln. In line with standard accounting practice,²⁷ we would only expect those parts which were originally capitalized with their own (shorter) individual asset life to be subsequently capitalized. Otherwise we would expect these costs to fall within operating costs under repairs and maintenance.
56. It is also worth mentioning that a number of other tangible fixed assets apart from plant and machinery were identified by the cement producers. These have been included in our analysis at the values provided.

How we arrived at our estimate of the cost of a new cement works

57. We have looked at a number of sources to inform our estimate of the costs for a 1.0 Mt MEA cement works at 1 January 2007, the beginning of our period of analysis, and in particular:
- (a) the normalized cost of actual investments in integrated cement plant assets in the British Isles during the period of analysis and shortly before; and
 - (b) Hanson's bottom-up estimate of replacing the cement works assets at each of its three GB plants.

²⁷ FRS12, Tangible Fixed Assets, quotes the example of a furnace which requires relining every five years (paragraph 38 on p24): www.frc.org.uk/Our-Work/Publications/ASB/FRS-15-Tangible-Fixed-Assets/FRS-15-Tangible-Fixed-Assets.aspx.

58. We have also reviewed the estimates provided by each of the Majors in response to questions. These are summarized in our 'Barriers to entry'²⁸ paper as they were wide ranging and not necessarily informed by specific cases. We have therefore not placed so much weight on these estimates as other evidence.

The normalized cost of actual investments in cement plant assets in the British Isles during the period of analysis and shortly before

59. We have calculated the equivalent cost of a 1.0 Mt integrated cement plant at 1 January 2007 prices using the two actual examples we have for new cement works.²⁹

60. Tarmac stated that, although it had cost it only £110 million³⁰ to have its cement works built in 2004, it believed that a replacement cost now would be in the order of £[redacted] million. This plant currently produces just under 1.0 Mt of cement (not clinker). Tarmac reiterated that the new plant was delivered on a turn-key³¹ basis and it understood that the actual costs of construction were some £[redacted],³² [redacted] in excess of the [redacted] price paid by Tarmac. We note that this extra £[redacted] would represent over [redacted] per cent of the [redacted] price.

61. So that we have a wider range of possible data points we have also included a number of estimates, including Tarmac's estimate of the underlying cost of its Tunstead plant and the normalized average of Hanson's bottom-up estimates (summarized in paragraph 63 below).

²⁸ www.competition-commission.org.uk/assets/competitioncommission/docs/2012/aggregates-cement-and-ready-mix-concrete/barriers_to_entry_expansion_amendments_following_putback.pdf, paragraphs 81 & 82.

²⁹ [redacted]

³⁰ See also http://cement.mineralproducts.org/cement/cement_makers/tarmac_buxton_lime_and_cement.php.

³¹ Turn-key means that the risk of cost overruns/underspends lay with the supplier(s) rather than with Tarmac.

³² [redacted]

62. In all instances we have assumed asset price inflation of 2.5 per cent³³ covering the period 2004 to 2009.

TABLE 5 Cost estimate for a 1.0 Mt integrated dry-process clinker production plant

		1 January 2007 £					
	Company	Plant	Clinker production capacity Per year (mt)	£/year	Cost (£m)	Cost normalized for Capacity	£ of 1.1.07
Actual examples	Irish Cement Tarmac	Platin (Ireland)	1.3	2009	150–190	115–145	105–140
		Tunstead	0.7	2004	110	148	159
Estimates	Tarmac	Tunstead	0.7	2004	[ⓧ]	[ⓧ]	[ⓧ]
	Hanson	Ketton/Ribblesdale/ Padeswood	1.0	2012	[ⓧ]	[ⓧ]	[ⓧ]

Source: CC based on information in Tables 4 & 6.

Notes:

1. Cost in £ of Irish Cement plant at Platin depends on €£ exchange rate used (range 1.46:1 (2007) to 1.12:1 (2009)).
2. CC's calculation of average replacement cost for Hanson's three cement works (see Table 6 below) has been divided by 0.9 to allow for a 90 per cent utilization rate.

Hanson's bottom-up estimate of replacing the cement works assets at each of its three GB plants

63. Hanson told us that it had attempted to estimate the cost of replacement each of its cement plants. Hanson was able to employ Heidelberg's cement engineers to help generate its bottom-up³⁴ estimates using cost information associated with a variety of recently-developed Heidelberg cement plants in Russia, Belgium, Kazakhstan and Togo. Hanson applied a variety of uplift factors to account for differing labour and regulatory costs between GB and these other locations. The figures were provided current values, ie at 2012 prices.

³³ We discuss our choice of the level of asset price inflation at paragraphs 126 to 127.

³⁴ [~~ⓧ~~]

TABLE 6 Hanson's estimate of the cost of replacing its existing cement plants' assets

	Value as new		Normalized value		Stipulated
	£m	Capacity (Mt)	£m	Capacity (Mt)	capacity
Ketton	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Ribblesdale	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Padeswood	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total/average	[REDACTED]		[REDACTED]		

Source: Hanson.

Notes:

1. Mt capacity calculations assume 365 days output.
2. Stipulated capacities (tonnes per day) are the starting point for Hanson's estimates.

Conclusion

64. Using the information in Table 5, we currently estimate the capital investment required to have constructed a 1.0 Mt fully integrated cement works operating from an existing (brownfield) site was between £150 million and £180 million at 1 January 2007 prices. We have placed more weight on actual examples rather than estimates. However, we note that all data points, with the exception of [REDACTED] estimate of the underlying cost of [REDACTED], fall within our range. We have used the figure of £170 million in our modelling.

We look at each company's productive capacity (including surplus capacity) as a whole

65. We have evaluated a company's productive capacity in terms of its ability to produce clinker rather than cement. It is the production of clinker that requires the investment in a kiln, an investment on a scale of magnitude of at least five times that required for the facilities to turn clinker into cement.³⁵ It is also true that different cement producers blend non-clinker-based cementitious material extenders to produce both bulk and bagged cement, so that there is not a consistent relationship across the producers between clinker and cement production. This is an additional reason for us to focus on clinker rather than cement production in our analysis.

³⁵ [REDACTED]

66. As set out in Table 9, of the four current cement producers, all but Tarmac have had at least two plants in operation at any one time over the period of review. This then begs the question what is more appropriate: to value each plant individually and then sum these values up to arrive at an estimate of the current cost, or alternatively, work out each company's overall capacity and then translate that overall figure into the value of the capital invested.
67. Related to this issue is whether there is surplus operating capacity in each company's network of plants, and if so, how any surplus operating capacity should be valued. Surplus operating capacity is the difference between total operating capacity less current operating capacity. Current operating capacity, however, is not necessarily the capacity that is actually being used in any one period: it includes any normal planning margin for dealing with possible fluctuations in demand over the business cycle.³⁶
68. A CCA approach dictates that operating capacity which is worth retaining for future use, either as demand rises or existing capacity wears out, should be valued as a separate investment.³⁷ This spare capacity should be valued at the discounted present value of the cost of the capacity which it would otherwise be necessary to build at the future date. In subsequent periods that investment would be expected to earn its cost of capital.
69. To the extent that any surplus operating capacity arising is unplanned, then this is likely to have resulted from changed expectations. At the beginning of the period of review, 1 January 2007, it would have been the reasonable expectation of all the cement producers that demand would continue for the foreseeable future roughly at

³⁶ *Accounting for Economic Costs and Prices (1986): A Report to HM Treasury by an Advisory Group (the Byatt Report)*, Volume II, Her Majesty's Stationery Office, paragraph 5.41.

³⁷ [X]

present levels of demand.³⁸ In 2007, a year in which there was a shortage of cement in GB, all cement plants in GB were operating close to their maximum capacity.

70. The closest recent parallel to the slump that occurred in 2008/09, when, for example, demand in the construction sector fell to between 30 and 40 per cent of previous levels, and did not bounce back, is perhaps the 1973 oil crisis. The oil crisis led to the rise in the real price of fossil fuels, rendering certain existing UK industrial assets, if not totally commercially unviable, impaired in terms of their replacement (MEA) values. It is noteworthy that some commentators see the current economic crisis, which began in 2007 with the bursting of the housing bubble in the USA, has resulted in the greatest economic contraction that the USA and Europe have seen since the end of the Second World War.³⁹

The GB cement producers responded differently to the slump in demand

71. With the notable exception of Tarmac, all the GB cement producers responded to the slump in demand by taking out productive capacity to a greater or lesser extent. The largest GB cement producer by volume, Lafarge, had coincidentally and perhaps fortuitously already planned to close down one of its biggest cement works at Northfleet in 2008. It then also decided to mothball and then close both its kilns at its Westbury plant in late 2008/early 2009. Each of these closures related to wet-process plants, a technology which had become obsolete in the face of increase in the real cost of fuel. During the period of review, Lafarge also decided not to invest in a new works at Medway (for which it had obtained planning permission) to replace Northfleet.

³⁸ The demand for cement is in long-term structural decline in GB. See graph on p2 of BCA Economic Briefing Note, February 2008: http://cement.mineralproducts.org/news/news_archive2008.php.

³⁹ Opening paragraph in 'Financial reporting and the crisis' by Professors Mary Barth and Wayne Landsman as published in January 2013 edition of *By All Accounts* (Institute of Chartered Accountants in England and Wales's Financial Reporting Faculty).

72. Cemex also closed its subscale wet-process plant at Barrington in 2008 and then one of its kilns at South Ferriby. By way of contrast, Tarmac, operating a single plant at Tunstead primarily to satisfy internal demand for cement by its RMX operations, expanded its cement-making capacity somewhat. In 2008 it invested £[x] million to increase the nameplate capacity of its plant from [x] to [x] Mt per year.
73. Hanson reacted differently from Lafarge and Cemex in that, while it closed one smaller-scale kiln at its Ketton plant, it decided to continue operating all three existing works, often at well below maximum capacity. It appears to have taken this approach because it calculated that this was the optimal outcome for it once it took into account the value it could realize for selling its excess carbon allowances.
74. The slump in demand coincided with a real increase in fossil fuel costs. This real increase led to the full abandonment of wet-process plants in GB during the period of analysis. The wet process requires more energy than a dry process and therefore plants have become technically obsolete.⁴⁰
75. When it becomes clear that a strategic error has been made in the determination of operating capacity, beyond the bounds of cyclical variations in demand, a reassessment of the value of capacity to the business is called for. If the conclusion is that there has been a diminution in the value of assets, unlikely to be reversed by any future revival of optimism, then assets should be revalued downwards. The term 'asset impairment' is the accounting terminology used for this downward revaluation and is the terminology we use in this paper.

⁴⁰ A wet-process plant has at least 50 per cent higher thermal energy costs simply to evaporate the water, and thermal energy is the single largest element of manufacturing costs.

We have valued each company's operating capacity in the same way

76. We have taken 2007 as our reference year as this is a year where the GB cement industry was operating at close to or at full capacity. We summed the clinker production figures by plant provided to us for each of the years 2007 to 2011. To allow us to incorporate spare operating capacity within the asset valuations, we value an additional 30 per cent of clinker production capacity. 30 per cent appears to us to be a reasonable figure to apply to allow companies to have built sufficient capacity to satisfy expected normal fluctuations in demand.
77. We have used overall clinker productions figures to calculate the gross MEA values for each company. We have used the *previous* years' clinker production volumes to value assets at the beginning of the *following* period: as will be explained later, it is logical to value assets on the basis of reasonably held expectations for the following and subsequent periods.
78. This approach allows for the systematic write-down of asset values regardless of whether and when the individual company chooses to reduce capacity at its plants. As a result, there may not be a close relationship between the write-downs calculated as part of this profitability analysis and those, if any, which may have appeared in the individual company's financial statements.⁴¹ To the extent that clinker output increases from one year to the next, then this approach would generate a reversal of impairment losses. We note that output in 2007 across the four cement producers was higher than in 2006, meaning that this calculation for some companies leads to the reporting of an impairment gain.

⁴¹ Impairment losses are much less likely to be reported in HCA than CCA financial statements because accounting asset lives are often shorter than their actual economic useful life (and therefore more likely to be largely or wholly written off) and the reported value of long-lived assets historic amounts will have been eroded by asset price inflation (and therefore it is less likely that HCA values compared with MEA values will fall below the asset's recoverable amount). In the context of this analysis, impairment losses are more likely to arise because the benchmark for valuing assets is what price they would fetch in a competitive market; the prices actually observed for second-hand assets may reflect the capitalization of any economic rents associated with operating in that market.

79. In summary, we have been able to calculate the *gross* MEA value of assets used by each company at 1 January 2007 prices at each of the balance sheet dates for the period of review. The next logical step would be to set out the approach taken to establish the associated *net* value of these assets for each company. However, before we do that it is necessary to set out what we mean by net values and, by extension, depreciation.

Objective of depreciation and the depreciation profile for cement assets

80. The objective of depreciation in the context of this profitability analysis is to allocate the original real cost of assets through time such that the total real costs per unit of output (depreciation, running costs and normal profit) will fall in line with the prices which a potential competitor would expect to be able to charge in a competitive market.

81. As explained in the Approach Paper, paragraphs 102 to 109, the appropriate basis on which to value plant and machinery worth replacing for the purpose in hand is the modern equivalent asset (MEA) basis. The MEA is the cost of replacing an old asset with a new one with the same service capability, allowing for any differences both in the quality of output and in operating costs.⁴² Implicit in this definition is the idea that an older asset would be worth less than a newer asset, not least because the newer asset should, absent any unforeseen shocks, be able to offer a service capability further into the future than an older asset.

82. Net asset values are gross asset values less accumulated depreciation and, if relevant, accumulated impairment losses.

⁴² This is the definition given in the [Approach paper](#), paragraph 78.

Depreciation defined

83. In order to assess profitability, however, we need to establish not only the net value of these assets at each of the balance dates between 2007 and 2011 but also how that value should be expensed across all future accounting periods expected to benefit from the use of that asset.
84. Viewed from the perspective of the expense charged to the profit and loss account, depreciation is the measure of the amount of economic benefits of the tangible fixed asset that have been consumed during the period. Consumption includes the wearing out, using up or other reduction in the useful economic life of a tangible fixed asset, whether arising from use, effluxion of time or obsolescence through either changes in technology or demand for the goods and services produced by the asset.⁴³
85. This can be contrasted with other sources of loss over time in economic value embodied in tangible fixed assets. The losses arising from these other sources are normally described as impairment losses. Impairment can occur because something has happened to the economic environment in which the fixed assets are operated such that the carrying value, here the value of the business as determined on CCA principles, falls below the recoverable amount⁴⁴ for that asset.⁴⁵ One example of a change of economic circumstances would be an unexpected permanent slump in demand leading to excess capacity within the industry.
86. Alternatively, and viewed more from the perspective of the balance sheet, depreciation is the expected decline in the value to the business of assets through time after

⁴³ Definition as per FRS15, paragraph 2, p11: www.frc.org.uk/Our-Work/Publications/ASB/FRS-15-Tangible-Fixed-Assets/FRS-15-Tangible-Fixed-Assets.aspx.

⁴⁴ The recoverable amount is the higher of net realizable value ('exit' value) and value in use. See the [Approach Paper](#), paragraphs 72–77.

⁴⁵ Definition as per FRS11, paragraph 2, p6: www.frc.org.uk/Our-Work/Publications/ASB/FRS-11-Impairment-of-Fixed-Assets-and-Goodwill/FRS-11-Impairment-of-Fixed-Assets-and-Goodwill.aspx.

excluding the impact of any acquisitions and disposals.⁴⁶ Because we adopt the financial capital maintenance (FCM)⁴⁷ concept, the whole of the expected change in the value to the business of its assets (after allowing for acquisitions and disposals) must be charged to the profit and loss account to reflect the continuing costs of supply.

Expectations are critical to establishing depreciation profiles

87. Some element of depreciation charged to the profit and loss account in any one accounting period can be predicted in advance; however, a charge to the profit and loss can sometimes arise as a result of unexpected events during the period. As determining the overall depreciation charge to the profit and loss in any one period necessarily involves taking a view about the value of the asset at both the beginning and end of the period, depreciation can only be assessed on the basis of expectations about the future. Such expectations may well not be fulfilled precisely as envisaged, and indeed usually are not. But a view about the future is always involved in estimating depreciation.

Factors determining asset life⁴⁸

88. Before determining the profile of depreciation (ie how that remaining value ascribed to an asset at the beginning of the period should be expensed across all future accounting periods including the next one), we first need to consider which factors, taken together, determine an asset's useful life. For those assets which are worth replacing,⁴⁹ the economic useful life of an asset ends at the time that would keep the average costs of holding and using the asset throughout its life within the business to a minimum. In principle, these costs will be influenced by:

⁴⁶ As a result, depreciation in this context would include changes to asset values resulting from the changing price of the asset but not asset impairment charges. These latter costs relate to unexpected losses in values.

⁴⁷ As explained in the [Approach Paper](#), paragraphs 80–82.

⁴⁸ The text in paragraphs 88 to 110 is heavily based on the Byatt Report, Chapter 2, 'Principles of Fixed Asset Valuation'.

⁴⁹ That is to say, expected revenues from use of the asset exceed economic costs, ie costs assessed on a replacement basis.

- (a) rising real running costs resulting from any increases in repairs and maintenance costs and/or in the value of production lost through increased breakdowns;⁵⁰
- (b) obsolescence resulting from technological progress embodied in newer assets;
- (c) the expected levels of output; and
- (d) the opportunity cost of capital.

89. The opportunity cost of capital, in this context the company's cost of capital, is relevant here because a big upfront investment which will only fully pay back years into the future will, all other things being equal, encourage further use of the existing asset if at all possible.
90. In any accounting system, determining the economic useful life involves taking a view of when technical progress, declining markets or rising operating costs will make continued use of the asset unprofitable. Under HCA there can be a tendency to use a deliberately short estimate of asset lives, either as a way of making profits prudently conservative, perhaps in part to deal with inflation, or as a way of dealing with rapid technical progress. In measuring economic costs, however, it is important that asset lives for our purposes be unbiased estimates of economic lives.
91. In principle, an integrated cement works will comprise a number of assets, each potentially having a different economic life. The most substantial element is the kiln itself. However, this element may not be the asset with the longest expected useful asset life. For example, Irish Cement provided the following summary in relation to its Platin works commissioned in 2009 with a clinker production capacity of 1.3 Mt per year.

⁵⁰ We understand, however, that once any teething problems have been ironed out, and provided that a plant is properly operated and maintained, there would be no reason to expect lower output or outages from a cement plant as it ages.

TABLE 7 An analysis of total expenditure capitalized re the new Platin cement works

Description	£m (at €:£ rates in)		€m	%
	2007	2009		
Kiln plant	[X]	[X]	[X]	[X]
Storage facilities/silos	[X]	[X]	[X]	[X]
Raw mill & materials	[X]	[X]	[X]	[X]
Cement mill	[X]	[X]	[X]	[X]
Cement mill feed, cement transport & conveyor system	[X]	[X]	[X]	[X]
Engineering & administration buildings	[X]	[X]	[X]	[X]
Electrical rooms & high tension power	[X]	[X]	[X]	[X]
Control equipment & instrumentation + laboratory	[X]	[X]	[X]	[X]
Subtotal	[X]	[X]	[X]	[X]
Capitalized interest	[X]	[X]	[X]	[X]
Grand total including capitalized interest	[X]	[X]	[X]	[X]
1 Mt equivalent	[X]	[X]	[X]	
<i>Summary by expected useful life as per Irish Cement's financial statements</i>				
40-year life			[X]	[X]
30-year life			[X]	[X]
15-year life			[X]	[X]

Source: CC analysis based on CRH (owner of Irish Cement) supplied information.

Note: Cost in £ of Irish Cement plant at Platin depends on €£ exchange rate used (range 1.4605:1 (2007) to 1.1222:1 (2009)).

92. Based on this analysis, we think it reasonable for us to simplify the analysis, at least in the first instance, by assuming a single expected useful asset life based on that of the kiln. It would only appear a small proportion of the total investment relates to assets with a relatively short (here 15 years) life. Other assets are expected to have even longer asset lives.

Factors influencing the depreciation profile

93. When companies invest in long-lived assets, particularly specialized assets for which there are not necessarily any alternative uses, they are in effect taking a view of over what time frame and to what extent in each period within the time frame over which they expect to reap the benefits of utilizing these assets. The companies make this judgement when they initially invest in these assets, and in effect subsequently review this judgement whenever they prepare financial statements.

94. So that an asset's depreciation profile reflects the pattern in which the asset's future economic benefits are expected to be consumed, we need to take into account, either explicitly or implicitly, the impact of:
- (a) *Rising running costs*: where running costs are expected to rise in real terms over the life of the asset, depreciation should fall as the asset gets older.
 - (b) *Technical progress*: if the real cost of capital equipment is expected to fall through time, depreciation should be accelerated ('tilted' depreciation).⁵¹
 - (c) *The opportunity cost of capital*: compared with straight-line depreciation, introducing the opportunity cost of capital as the only extra consideration raises depreciation in later years such that, once the expected return on the falling net asset value is factored in, the total capital charge is constant through time ('annuity depreciation').⁵² A mortgage payment is often based on the annuity principle.
 - (d) *Expected output levels*: to adopt straight-line depreciation is tantamount to assuming that an asset produces a constant output throughout its life.⁵³ If output is expected to change over the life of the asset, depreciation should be profiled over planned output levels (unit of production depreciation).
95. It is most unusual when preparing GAAP⁵⁴ financial statements to explicitly allow the time value of money, here the company's cost of capital, to influence the depreciation profile and therefore the asset values at the end of intermediate accounting periods. There is a natural suspicion of any argument which allows costs to be deferred into the future. Nevertheless, if the opportunity cost of capital is an important factor, as it

⁵¹ This is because in the typical case the real replacement cost of assets are falling as a result of technical progress in capital goods. In a competitive market, this will be translated into falling costs facing a new competitor.

⁵² However, in this profitability assessment we take account of this opportunity cost of capital by comparing the ROCE (excluding any consideration of this opportunity cost except for its impact on the depreciation profile) with the company's cost of capital. And, because we take into account one cost, depreciation, in our assessment of economic costs and the other cost, the opportunity cost of capital, in our assessment of the company's cost of capital, the depreciation charge to the profit and loss is not constant across time.

⁵³ Consistent with footnote 50, it may be reasonable to expect constant output over the life of the asset once any teething issues have been addressed. We understand that, rather than a drop-off in capacity with age, it may in fact be possible to boost output without incurring any further capital outlay.

⁵⁴ GAAP = generally accepted accounting principles. However, for the current purpose we are not constrained by GAAP.

is with long-lived assets, it is strictly necessary to take this into account in profiling the depreciation through time to get an accurate estimate of the current value of the asset. Only then will accounting costs be in line with economic costs.

96. When we are in fact able to take into account all these factors outlined in paragraph 94, then the total real costs per unit of output (depreciation, running costs and normal profit) will fall in line with the prices which a potential competitor would expect to be able to charge in a competitive market. In this world, the expected profitability of buying the asset at the beginning of the accounting period, using it during the period and selling it at the end will equal the normal profit rate. This will be true of any period during the life of the asset. A unique profile of decline in asset values or depreciation will be determined. Here depreciation is a forward-looking concept and the original real investment expenditure will only be recovered through the (expected) current cost depreciation if expectations are fulfilled.
97. It is a profile such as those illustrated in Figures 1(a) and 1(b) in paragraph 109 and again in Figure 2 (paragraph 115) which we would expect to determine the recovery of capital costs, both depreciation and the cost of capital, within prices in a competitive market.

Review of evidence to inform selection of asset life/depreciation profile

Asset lives

98. Cement kilns, the heart of the cement-making process and most expensive and technically complex part of the cement plant, appear at least in some cases to have (had) very long operational lives. These lives can be significantly longer than 40 years, the current upper limit to the economic useful life ascribed to these assets in the GB cement producers' financial statements.

TABLE 8 Analysis of age of kilns at the beginning of the period of analysis

		Year	Age at 1.1.2007 (years)	
<i>Kilns still in use at January 2013</i>				
Aberthaw A5	Lafarge	1967	40	
Hope B1	Lafarge	1970	37	
Hope B2	Lafarge	1970	37	
South Ferriby A3	Cemex	1978	29	
Ribblesdale A7	Hanson	1983	24	
Cauldon B1	Lafarge	1985	22	
Dunbar B1	Lafarge	1986	21	
Ketton A8	Hanson	1986	21	
Rugby A7	Cemex	2002	5	
Tunstead A2	Tarmac	2004	3	
Padeswood A4	Hanson	2005	2	
<i>Kilns shut after 1 January 2007</i>				
Westbury A1	Lafarge	1962	45	Closed 2007 (wet-process plant)
Barrington A4	Cemex	1964	43	Closed 2008 (wet-process plant)
Westbury A2	Lafarge	1965	42	Closed 2008 (wet-process plant)
South Ferriby A2	Cemex	1967	40	Mothballed 2008
Northfleet A2	Lafarge	1970	37	Reserves ran out/planning permission expired
Ketton A7	Hanson	1977	30	Mothballed 2008

Source: CC tabulation of company-supplied information.

Our interpretation of the evidence on asset lives

99. The basic technology for producing and grinding clinker to produce cement is mature, with only evolutionary developments seen in new plant and machinery in the last couple of decades. However, the context for cement production has changed significantly over the same time frame. The drive to limit harmful emissions, not least carbon emissions, did not begin until the 1990s and has become an ever more important consideration. Likewise the real cost of fossil fuels, used in particular to heat the kiln and transport materials by road, has risen significantly in real terms over the past decade. Because of the increasing complexity required to address these challenges cost effectively, the capital cost of new, more efficient, kiln technology has risen continually in recent years.⁵⁵

100. The payback rate on the investment can therefore be small. As a consequence, the cement producer can typically continue to operate its old assets long after they have ceased to be the latest model. Only much later does the time come when it becomes

⁵⁵ The greater complexity of modern plant, for example associated with more complex fan and drive systems, may also, we understand, lead to reliability issues compared with older plant.

the long-term cost-minimizing option to commission a new cement plant. In these circumstances, rapid technological catch-up may only be possible in an expanding market.⁵⁶

101. We also understand that companies will generally not consider investing in a new cement works unless there are at least 50 years' worth of limestone reserves readily available.⁵⁷ This suggests that investors aspire that their investment in a cement works will provide returns over a period of at least 50 years.
102. We understand that the biggest threat to the economics of older plant, and therefore their useful economic lives, is likely to be ever stricter environmental regulation. These regulations have become continually stricter over time and older plant is less likely than newer plant to be able to meet any given emissions limits. It seems likely that eventually it may not be economic to modify plant to meet any stricter emissions regulations that may be imposed, as the required investment in filters etc would simply be too great. Currently the economic viability of older plant does not appear to be threatened, but this may change in the longer term.
103. Given that investment in the cement kiln once incurred is a sunk cost, it currently appears to be the case that, so long as the technology of the kiln is not so obsolete⁵⁸ that current out-of-pocket operating costs are prohibitive when compared with the full costs of rival producers operating more modern kilns, operational lives can be, if not indefinite, very long indeed.
104. [✂]

⁵⁶ This and the preceding paragraph are the CC's summary of the analysis of the longevity of UK cement kilns as set out in *Trends in Innovation* (www.cementkilns.co.uk/trends.html#productivity (last edit 13 October 2012)—in particular, the paragraph beginning 'In the above few charts'). www.cementkilns.co.uk/ is a non-commercial independent educational site authored by Dylan Moore, an expert in the history and geography of the cement industry.

⁵⁷ [✂]

⁵⁸ Or unable to be upgraded to, for example, meet new environmental standards.

105. [X] This appears to indicate that the absence of the latest technology is not of itself a bar to profitable cement production operations.
106. Of course, for a cement plant to have such a long economic useful life (a) it would need to be located where sufficient demand for the cement within the plant's economic delivery distance endures; (b) there remains cost-effective access to the key raw material inputs such as limestone or chalk; and (c) the company continues to have a licence to operate from that site.
107. These limitations on useful economic life, however, hold true for all cement plants regardless of age. Even the most modern cement kiln located distant from its key raw material inputs, and in a position where, compared with other plants in the market, it is expensive to transport the finished product to centres of demand, may only operate on a marginally profitable basis. And if there is an unexpected change in input prices (eg an increase in the price of fuel for the lorries used to transport cement) not envisaged at the time of investment, or an unexpected permanent drop in demand, then it is likely that such a plant, as the producer with the highest short-run marginal costs, is likely to exit the market.⁵⁹
108. In this context, it is also worth noting that we do not see the production of cement becoming commercially obsolete over the next 50 years. Over the 20-year period up to the sharp fall in demand in 2008, there has, however, been a generally declining trend in production. This structural decline in cement production in part arises from the (partial) switch in use of construction materials for commercial buildings from concrete (whose key input by value is cement) to steel and glass.

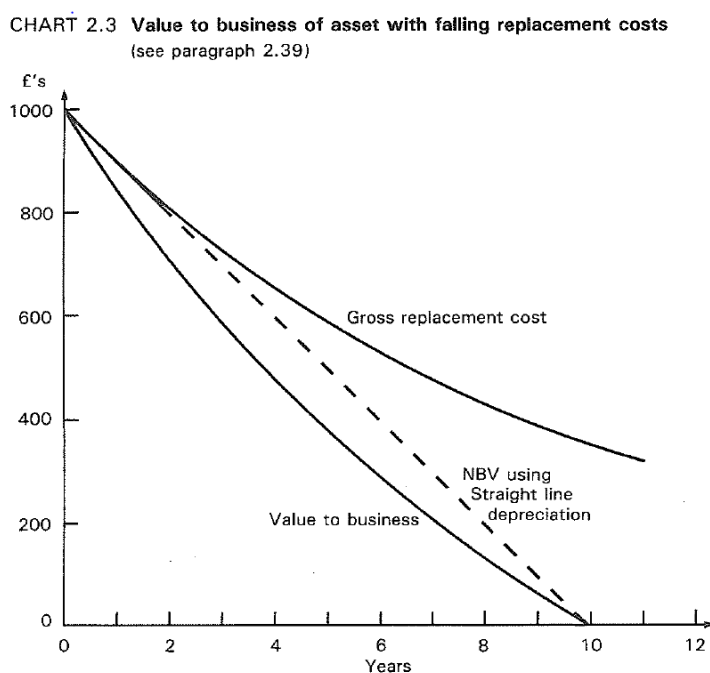
⁵⁹ [X]

Implications of different depreciation profiles

109. Paragraphs 93 to 97 have briefly set out the various sophistications that are likely to be most relevant to determining an asset's depreciation profile. Some of these considerations argue for accelerated depreciation (ie a concave profile for the associated MEA values over time as shown in Figure 1(a) compared with straight line, others for delaying depreciation (ie a convex profile as shown in Figure 1(b)). Whether on balance such sophistication is material in the light of necessarily imprecise assumptions concerning asset lives and use patterns is an empirical matter. With a fair mix of asset lives and a balance between old and new assets, straight-line or declining balance⁶⁰ depreciation may well prove an adequate approximation.

FIGURE 1(a)

Loss in value over time in the MEA value: concave profile

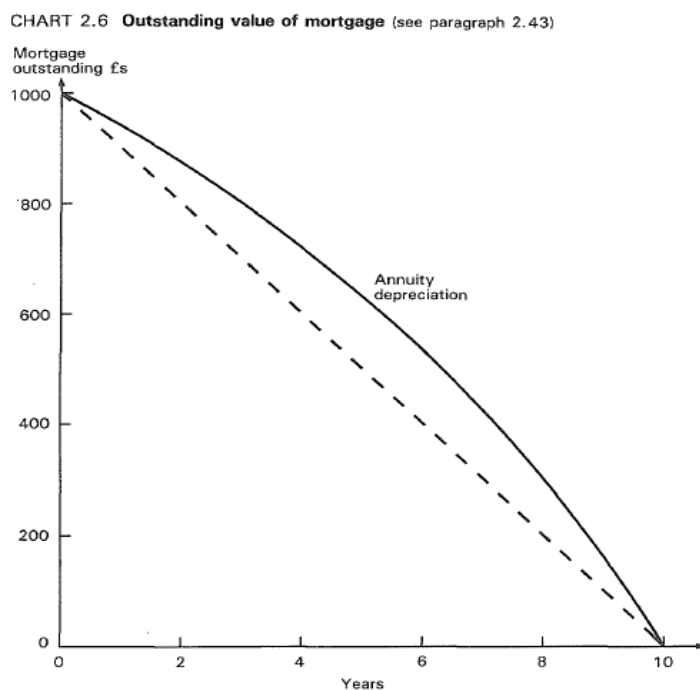


Source: Byatt Report Volume II, p21.

⁶⁰ Declining balance depreciation involves applying a set percentage against the non-depreciated balance for each period. Instead of spreading the cost of the asset evenly over its life, this system expenses the asset at a constant rate, which results in declining depreciation charges in each successive period.

FIGURE 1(b)

Loss in value over time in the MEA value: convex profile



Source: Byatt Report Volume II, p23.

110. More sophisticated techniques may, however, be needed for small numbers of individually expensive assets and where assets within a material class of assets are purchased or built unevenly over time so that a large number of them are of the same or very similar age.⁶¹ This is exactly the situation we have with the companies' cement asset portfolios, as summarized in Table 9 below.

⁶¹ This point is made within 'Straight Line Depreciation as an Approximation for Declines in Current Cost Values of Assets', Annex 4 of The Byatt Report, Volume II, p133, paragraph 14 ii).

TABLE 9 Age profile of cement assets in use by cement producer across period 2007 to 2011

	<i>Year commissioned</i>	<i>Type</i>	<i>Process</i>	<i>Withdrawn</i>	<i>Reason</i>
<i>Lafarge</i>					
Aberthaw A5	1967	Suspension preheater kiln	Dry		
Hope B1	1970	Suspension preheater kiln	Dry		
Hope B2	1970	Suspension preheater kiln	Dry		
Cauldon B1	1985	Precalciner kiln—4 stages	Dry		
Dunbar B1	1986	Precalciner kiln—4 stages	Dry		
Westbury A1	1962	Wet-process kiln	Wet	18/9/2008	Mothballed and then closed
Westbury A2	1965	Wet-process kiln	Wet	30/4/2009	Mothballed and then closed
Northfleet A2	1970	Semi-wet-process kiln	Semi-wet	3/5/2008	Closed—expiry of quarry planning permission
<i>Hanson</i>					
Ribblesdale A7	1983	Suspension preheater with air-separate precalciner—4 stages	Dry		
Ketton A8	1986	Suspension preheater with air-separate precalciner—4 stages	Dry		
Padeswood A4	2005	Precalciner kiln—6 stages	Dry		
Ketton A7	1977	Suspension preheater kiln—4 stages	Dry	30/6/2008	Mothballed
<i>Cemex</i>					
South Ferriby A3	1978	Lepol	Semi-dry		
Rugby A7	2002	Precalciner kiln—2 stages	Wet		
Barrington A4	1964	Wet process kiln	Wet	10/11/2008	Closed—size not economically viable
South Ferriby A2	1967	Lepol	Semi-dry	31/3/2009	Mothballed
<i>Tarmac</i>					
Tunstead A2	2004	Precalciner kiln—4 stages	Dry		

Source: CC tabulation of company-supplied information.

111. We do not have detailed insight into all the factors influencing decisions on economic useful lives and their associated depreciation profile for individual (groups of) cement assets: this detailed insight can only come from deep experience of commissioning and operating a portfolio of cement including the individual cement works in question. However, we can use the information and understanding we have gained during the course of our investigation to seek to establish the dominant factors which appear to be determining the behaviour in the market we observe with regard to the use of cement assets, and then use that information to establish our best estimate of both the asset values at each period end and the associated depreciation.

We have chosen the ‘declining balance’ depreciation profile to reflect the economic benefits firms derive from using their cement assets

112. Having set out all the factors likely to influence the depreciation profile for cement assets in paragraphs 94 to 97 and illustrated in paragraph 109, we have chosen a

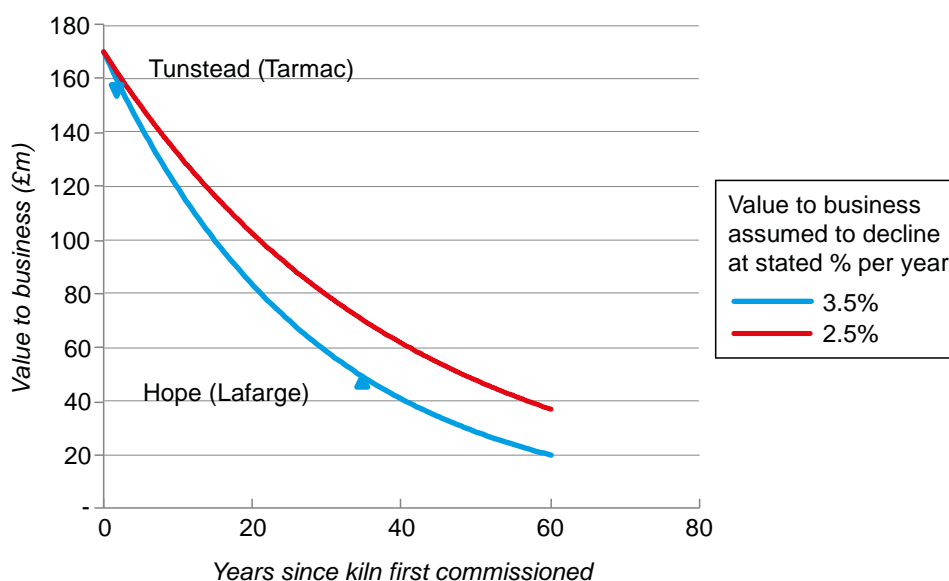
declining balance 'concave' depreciation profile, declining at 3.5 per cent per year in perpetuity. Two of the four factors which *taken together* determine this profile (and asset lives), namely rising running costs and technical progress, predicate a concave profile, the third factor expected output levels predicate a straight-line depreciation profile and the final factor, the opportunity cost of capital, predicate a convex profile.

113. We have chosen the declining balance profile primarily because it is consistent with our observation that:
- (a) cement plants/kilns, so long as they have economically viable locations, can and do have very long economically useful asset lives; and
 - (b) there is no clear use-by date for a cement works such that older plants/kilns typically can remain commercially viable so long as they are properly operated and maintained.
114. We have selected a yearly diminution rate of 3.5 per cent because it does not appear to result in an unrealistically high MEA value for older assets and is consistent with a realistic expected useful asset of the order of 50 years but with no sharp cut-off.
115. To illustrate what this profile looks like, we have graphed over time the asset valuations which are generated from the application of this profile. It assumes that a brand new MEA plant capable of producing 1.0 Mt of clinker per year would have cost £170 million at 1 January 2007. This profile of asset values over time is in real terms, ie each single data point is determined based on 1 January 2007 prices.

FIGURE 2

Modelled decline in values as a function of age for reference cement plant, ie capable of producing 1.0 Mt clinker per year

(All £m are real as at 1 January 2007)



Source: CC.

116. The Tunstead plant was two years old⁶² as at 1 January 2007 and therefore its 'normalized' MEA value is assessed as £158 million. By way of contrast, the Hope plant was 36 years old and therefore its 'normalized' MEA value is assessed at £47 million. 'Normalized' means that these values have been generated as if the plants in each case were capable of producing 1.0 Mt per year rather than their actual capacity, and therefore do not reflect the value placed on these plants within our analysis

117. As we have established the gross value of assets on the basis of the MEA plant, the selected depreciation profile should not in principle capture any reduction in valuation between the like-for-like replacement value and the MEA value for that asset.⁶³ To do otherwise risks double counting this loss in value, once in valuing the assets at the

⁶² The computed ages for Tunstead and Hope have been calculated with reference to 31 December 2006.

⁶³ It is not, however, quite as straightforward as this because we do not attempt to factor into MEA values the higher operating costs associated with operating older plant.

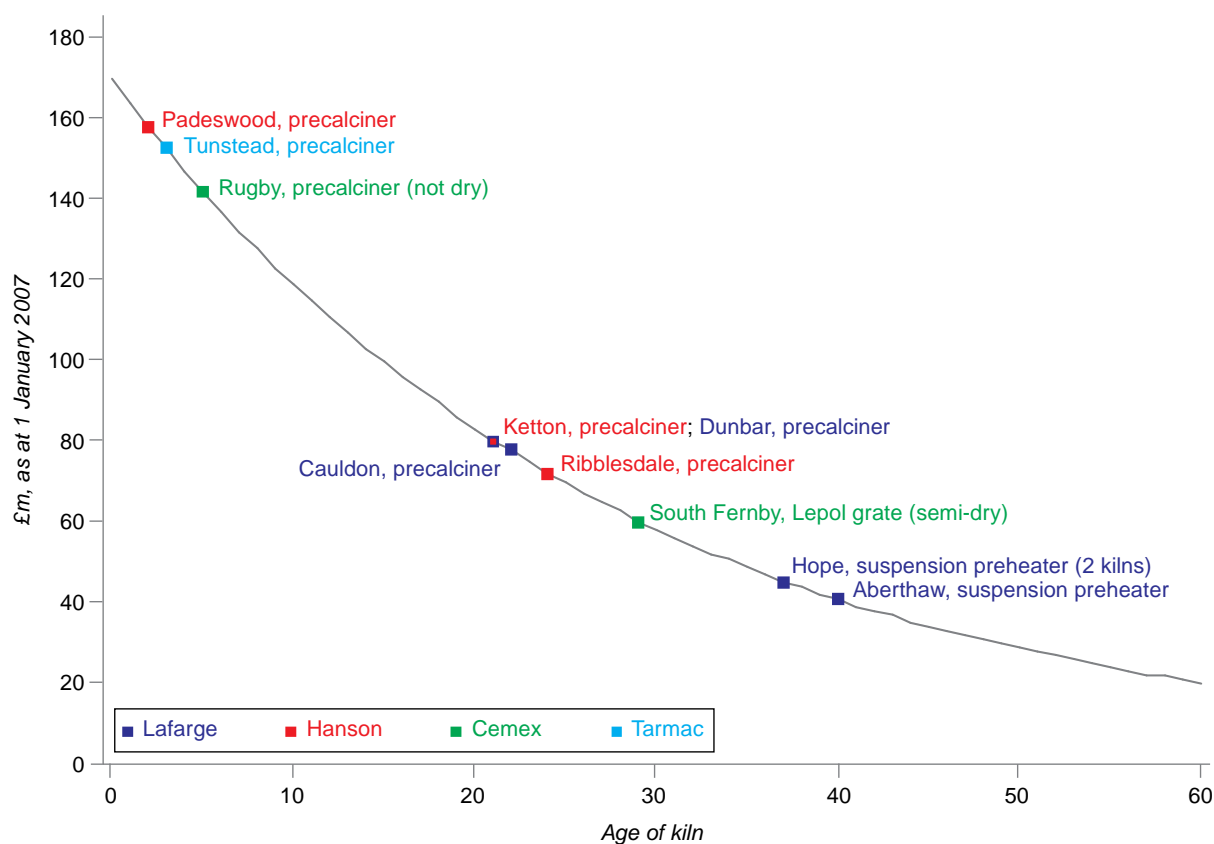
outset and secondly by an overly accelerated depreciation profile during the period of analysis.

Impact of chosen profile on individual firms' calculated returns

118. Our chosen depreciation profile is an approximation of the expected loss of value over time and it is not plant or firm specific. Consequently each of the individual cement producers' results are therefore influenced to a significant extent by the weighted average age of their cement plant portfolio, with Lafarge at one extreme owning a portfolio of older plants and Tarmac owning a single almost brand-new plant at the other extreme. Both Hanson and Cemex are in between these two extremes, with Hanson tending to own older plant and Cemex newer plant. This distribution is illustrated in Figure 3.

FIGURE 3

Relationship between ages of cement plant kilns and CCA asset values at 1 January 2007 (kilns in operation at 31 December 2011 only)



Source: CC based on company-supplied information.
Notes: [X]

119. We therefore believe that caution on this account should be exercised when interpreting individual company ROCEs. However, as can be seen from Figure 3, across all companies we have a reasonable spread across time of investment in cement works. We believe that by calculating a weighted average across all four GB cement producers, we are able to even out the impact of the precise depreciation profile adopted on our assessment of CCA asset values to some extent, and therefore in turn even out the impact of the depreciation profile adopted on our assessment of the level of CCA profitability in this sector.
120. Figure 3 also highlights the different generations of cement kilns in use. Currently there are three types of kilns in use in GB: precalciner⁶⁴ (seven examples), suspension preheater⁶⁵ (two examples) and Lepol grate (one example).

The final abandonment of the remaining wet-process kilns in the period of review

121. A wet-process plant has at least 50 per cent higher thermal energy costs than a dry-process plant simply to evaporate the water, and thermal energy is the single largest element of manufacturing costs.⁶⁶
122. As evidenced by Table 9, no fully wet-process kilns were commissioned after the oil price crisis in 1973: the real price of energy rose so substantially as to make them uneconomic to build. In other words, in terms of their then current replacement cost, their value was impaired. However, these plants were still worth operating as the original investment was sunk.

⁶⁴ Precalciner: there is a separate furnace at the base of the preheater which calcines the limestone before it enters the kiln. The precalciner uses 60 per cent of the overall fuel burnt. For a given dimension for the size of the rotary kiln, one would get more than double the capacity of clinker output than with a suspension preheater kiln.

⁶⁵ The preheater is at the back part of the rotary kiln. The rotary kiln has to do more thermal work than with the precalciner type and as a result the rotary kiln has to be longer.

⁶⁶ See footnote 40.

123. This history is relevant to the calculation of impairment described here in that we ascribed these plant—the most notable example being Lafarge’s plant at Northfleet—assets values as though they were in fact dry plants. In reality, the true MEA values of these wet-process plants would have been much lower as one would also take into account their substantially higher operating costs.
124. It is a testament to the economics of cement production that much plant whose value was substantially impaired in the wake of the 1973 oil price crises only exited commercial production in the following century.

We estimate the value of each company’s cement assets as follows

125. Having established individual normalized value for each plant at $t=0$ (1 January 2007), we calculated a weighted average normalized value to take account of the actual portfolio of cement assets owned by each cement producer. Individual values were weighted by the output of each plant in the period. We also worked out how many plants, or fractions of plants, were needed to support the actual clinker output produced in the preceding year. We then applied this multiple to our weighted average normalized figure to generate a valuation for total cement plant and machinery assets. We allowed an operating capacity margin of 30 per cent, ie we increased asset values by 30 per cent. Most production-line businesses do not operate at full capacity all the time, and therefore we consider it appropriate that we take account of this in our asset valuations.

We convert real asset valuations into nominal valuations

126. Finally, we converted all our figures from real into nominal pounds by applying our cement asset price inflation estimates to our 1 January 2007 values. We have assumed 2.5 per cent rise in each of the five years.

127. It appears to be the case that the rising real cost of kilns should be seen, at least in part, as a trade-off between upfront capital costs and operating costs: a higher upfront investment should repay through lower operating costs over the lifetime of the asset.⁶⁷ Hence it would be wrong to point to the rising cost of replacement kilns to argue that the overall cost of producing cement has gone up to the same extent.
128. It is these modelled CCA asset value estimates in nominal £ that we substituted for the previously given HCA asset values.
129. These modelled values, however, do not allow for the fact that, in principle, these calculated MEA asset values should be reduced if the out-of-pocket costs of operating the existing plants are higher than with the MEA plant. To the extent that existing plants do have higher cement production costs, then the modelled asset values will be overstated.

Using these asset values we calculate expected depreciation and impairment losses in each period

130. Once we have obtained our estimates of the net CCA asset values at each balance sheet date, the final step we need to complete is to model what changes in asset values from one period to the next arise from the consumption of economic benefits (depreciation) and what changes arise from other sources (eg impairment losses).
131. We first of all established the depreciation charge (in real terms) by comparing asset values at the beginning of the accounting period with the values for those assets *expected* at the beginning of the period to prevail at the *end* of the accounting period. As previously explained, depreciation is a forward-looking concept.

⁶⁷ See paragraph 99 for the basis of this interpretation.

132. We then inflated these depreciation charges into the nominal £ of the period. This element of depreciation is sometimes referred to as operating capital maintenance (OCM) depreciation, as it is the amount of depreciation required to maintain the operating capability of the plant.
133. We also worked out the inflationary 'holding' gains element to depreciation accruing in each period as a result of assuming that asset prices increased by 2.5 per cent a year over the period of analysis.
134. Impairment losses were the balancing difference. In this way, the charges to the profit and loss account, be they labelled depreciation, holding gains or impairment losses, are consistent with the values we ascribe to the assets at every period end. Our approach assumes that any assets surplus to requirements do not have a value. As previously explained in paragraph 68, these assets are worth something if there is the prospect in the distant future (eg the economy bounces back to previous levels of production) that they can be used once more in cement production. To the extent that these assets are worth something (ie option value), then the numbers we generate will overstate the extent of the impairment losses.

We have not adjusted net asset MEA values to take account of any higher operating costs

135. In principle, we should adjust net MEA values to take account of the lower running costs (for example, energy consumption and maintenance etc) and any higher functionality associated with more modern plant. The superior operational performance offered by more modern plant makes it worthwhile to the new entrant to pay more for the modern asset than for an identical replacement of the old one.⁶⁸ In a

⁶⁸ As explained in the Byatt Report, Volume II. paragraph 2.7.

similar way, a new entrant into a competitive market would pay less for a plant sub-optimally located to its reserves and sources of demand.

136. To make these adjustments, one must estimate the net present value associated with the cost disadvantage (ie both forecast the annual disadvantage and time frame over which it is expected to persist) and deduct that from the net MEA value. The objective of such adjustments is to neutralize any cost disadvantages embedded in the commercial further use of existing plants.
137. These adjustments would not be trivial. For example, we understand that the more modern precalciner kiln has around a 15 per cent advantage in thermal energy costs over the earlier generation of suspension preheater kilns.⁶⁹ Likewise older ball mills use around 30 per cent more electricity than the latest generation of vertical roller mills and roll presses. This 30 per cent disadvantage translates into a 20/25 per cent disadvantage in overall electricity consumption, one of the major costs of operating a cement plant. As already explained in paragraph 51, the ability to distribute cement to local depots by train is much cheaper than using road transport.
138. We have decided against adjusting MEA values in this way on account of the complexity, the need for granular information and the inherent subjectivity of these calculations. We therefore allow individual companies' ROCE to vary on account of some of them owning more modern efficient assets and some of them owning plants situated in superior locations and/or rail linked. This, however, does mean that, to the extent that these adjustments could justifiably have been made, that certain companies' profits will be understated and capital employed overstated. These companies' ROCEs will therefore be understated, and to the extent that these companies' profits are understated, so will our calculation of overall profitability be understated.

⁶⁹ See footnote 64 for an outline description of the two types of kilns.

139. A by-product of this approach, however, allows individual company profitability to vary on account of any locked-in operational 'inefficiencies'. Were we to adjust asset values further on this account, then this would act to level the (expected) playing field between each of the companies.

Choice of how we present the results

We distinguish between profits based on continuing costs of supply and those of a more temporary nature

140. In our presentation of profitability over the five-year period 2007 to 2011, we distinguish between profitability that is of a continuing nature and that which is of a temporary nature. By continuing, we mean profitability reflecting the values of resources used in the production of goods, when values are determined in competitive markets with no barriers to entry or exit for potential competitors.⁷⁰
141. There are clearly two sets of costs and/or income in the time period of review which fall into the category of being temporary in nature, namely income from the sale of carbon allowances and impairment losses arising from the emergence of permanent spare capacity following the demand slump.

Income from the sale of carbon allowances

142. [X] argued that any earnings from selling spare carbon allowances should be stripped out as extraordinary or exceptional items. Any assessment of the outlook for the cement business and the associated economic value could not possibly include assumptions regarding recurring carbon revenues. Given the short-term nature and exceptional windfall nature of such earnings, building these earnings into the profitability analysis would distort results. The only view of results that would be reflective of forward-looking profitability would be one that excluded carbon allowances.

⁷⁰ This definition is taken from the glossary of the Byatt Report, Volume II, p135. Continuing costs include a normal profit on capital employed. The term is used synonymously with the term *economic costs*.

143. Our view is that it is valid to include all the profits arising from carbon allowances (described as carbon credits in the tables) when assessing the level of profitability *actually earned* during the period of review. However, we agree with [X] that this income is unlikely to be reflective of forward-looking profitability (in our terminology profitability based on continuing costs), at least not nearly to the extent as would be suggested by its prevalence during the period 2007 to 2011.
144. We therefore present this source of income in our results as though carbon allowances do not form any part of continuing costs.

Impairment losses arising from the emergence of permanent spare capacity

Expected depreciation in contrast to unanticipated change in the value of assets

145. The total of the charges to the profit and loss in respect of tangible fixed assets, namely OCM⁷¹ depreciation, holding gains and impairment charges, reflects the total real change in the estimates of current cost values of assets between the beginning and end of a period, allowing for acquisitions and disposals. However, it is relevant to split these charges to the profit and loss during the period between their currently expected and unanticipated elements, that is between (a) the charges during the current period which it is now estimated would have occurred on the basis of current expectations of rates of change in technology, markets etc, and (b) the charges which occur because expectations have changed, ie the current view of the future was not anticipated in the previous period. Only costs expected to recur are relevant in measuring the continuing costs of supply.⁷²

⁷¹ Maintenance of the ability to supply the amount of goods and services which a business is able to supply with its existing resources in the relevant period. Definition as per glossary of Byatt Report, Volume II, p136.

⁷² The Byatt Report, Volume II, paragraph 2.17. This paragraph has been modified to reflect that the Byatt Report, which was published in 1986, distinguishes between *expected* depreciation and *unanticipated* depreciation. Nowadays we refer to unanticipated depreciation as impairment. The usage of the term impairment only came into common usage after the publication in 1998 of FRS11: Impairment of Fixed Assets and Goodwill: www.frc.org.uk/Our-Work/Publications/ASB/FRS-11-Impairment-of-Fixed-Assets-and-Goodwill/FRS-11-Impairment-of-Fixed-Assets-and-Goodwill.aspx.

Depreciation is a continuing cost whereas impairment is not

146. As a result, we also conclude that asset impairment losses are not continuing losses in as much as we believe that is unlikely that GB cement producers will incur further write-down of the value of their cement plants any time soon. We understand that what has recently happened to the demand for cement in GB to be unprecedented and the closest parallel to the severity of the current economic downturn is to be found in the wake of the 1973 oil crisis, which occurred 40 years ago.
147. There are undoubtedly other readjustment costs which the companies will have incurred during the period as they adjusted to the slump in demand. We have decided to include these costs within continuing costs for two reasons. First, re-organizing a business to adapt to changes in market conditions is a normal cost of doing business and it is only the degree of readjustment which will have occurred during the period of review that is likely to have been exceptional. Secondly, these readjustment costs will largely be revenue expenditure items rather than involve the write-down of capitalized assets which were intended to have brought economic benefits to the company far into the future.
148. We therefore have two measures of profitability over the period. The first one, based on the continuing costs of supply, therefore is our best current estimate of forward-looking profitability. The second one, which includes all costs incurred and income earned during the period, reflects the actual profitability experienced by the cement producers over the period.

We also present profitability in aggregate across all companies and summarize returns across the five-year period of review

149. As already explained in paragraphs 118 and 119, we believe that more reliable conclusions can be deduced from the pan-cement producer profitability figures than

company-specific profitability. This is because individual company profitability is heavily influenced by where they sit on our chosen depreciation profile.

150. The emergence of permanent excess capacity following the slump in demand has caused impairment losses. We would expect in practice these losses in asset value to crystallize in one, or perhaps two, accounting periods within the period of analysis. However, the modelling approach taken to quantify assets surplus to requirements (ie spare capacity),⁷³ an approach that needed to be able to be applied systematically across each of the cement producers, has meant that impairment losses as well as the reversal of impairment losses⁷⁴ are recognized in each of the five accounting periods under review.
151. Due to their significance and the nature of these losses, we have therefore also calculated a five-year average of profitability returns. This allows us to derive a net impairment loss across the period which we believe gives a much better indication of the extent of the underlying impairment losses incurred by cement producers over the period.
152. We set out in Tables 12(a) to (d) below the impact on the profit and loss account and balance sheet of our CCA adjustments for Lafarge, Hanson, Cemex and Tarmac.

Results

153. In this section we present the results of the profitability analysis in a number of different ways: in aggregate across for each year ('pan-company'), the calculated ROCEs for each year for each cement producer ('company-specific summarized'), company-specific detail for each year and lastly the results of our sensitivity level analysis.

⁷³ The modelling approach is set out in paragraphs 76–79.

⁷⁴ Where clinker output has in fact expanded over the period, the approach taken generates net gains. [X]

Pan-company results

TABLE 10 Aggregate CCA profit & loss and balance sheets for GB cement producers and ROCE calculated thereon

		Five-year		% of total	Prepared on a CCA basis (£m)					
		Aggregate	Average		2006	2007	2008	2009	2010	2011
Volumes	Cement sales	47.5	9.5		N/A	12.3	10.6	7.8	8.1	8.7
Mt	Clinker production	39.0	7.8		10.1	10.2	8.7	6.4	6.6	7.1
CCA profit & loss	Revenues	3,631	726	100		842	790	640	647	711
	Costs excluding depreciation	-2,874	-575	-79		-667	-655	-515	-504	-533
	CCA depreciation (OCM)	-164	-33	-5		-39	-39	-34	-26	-25
	CCA depreciation ('holding gains')	<u>112</u>	<u>22</u>	<u>3</u>		<u>27</u>	<u>27</u>	<u>23</u>	<u>18</u>	<u>17</u>
	Profit based on continuing costs of supply	705	141	19		163	123	114	135	170
	Carbon credits	121	24	3		1	33	26	35	26
	Impairment losses	<u>-213</u>	<u>-43</u>	<u>-6</u>		<u>41</u>	<u>-124</u>	<u>-189</u>	<u>2</u>	<u>57</u>
	Profit reflecting all costs incurred	<u>613</u>	<u>123</u>	<u>17</u>		<u>205</u>	<u>33</u>	<u>-50</u>	<u>172</u>	<u>253</u>
CCA balance sheet	Plant & machinery / AICC		937	88	1,097	1,127	990	790	784	832
	Other fixed assets		170	16	183	183	199	144	165	146
	Net current assets		21	2	36	36	43	37	-3	-22
	Provisions		<u>-68</u>	<u>-6</u>	<u>-92</u>	<u>-92</u>	<u>-84</u>	<u>-41</u>	<u>-38</u>	<u>-61</u>
	Total net assets		<u>1,060</u>	<u>100</u>	<u>1,224</u>	<u>1,254</u>	<u>1,149</u>	<u>930</u>	<u>907</u>	<u>895</u>
	Average of opening/closing balance					1,239	1,201	1,039	918	901
					Average profits (2007-2011)/average capital employed (%)					
ROCE	Profits based on continuing costs of supply		<u>13.3</u>			13.2	10.3	11.0	14.7	18.9
Arising from	Carbon credits		<u>2.3</u>			0.1	2.8	2.5	3.8	2.9
	Impairment losses		<u>-4.0</u>			<u>3.3</u>	<u>-10.3</u>	<u>-18.2</u>	<u>0.2</u>	<u>6.3</u>
	Profits reflecting all costs incurred		<u>11.6</u>			16.6	2.7	-4.8	18.7	28.1

Source: CC analysis based on Tables 12(a) to (d).

Note: N/A = not applicable.

Firm-specific results summarized

TABLE 11 Calculated ROCE for each GB cement producers over the period 2007 to 2011

			Profit/(CCA average) capital employed (%)				
			2007	2008	2009	2010	2011
Lafarge	HCA	reflecting all costs incurred	[X]	[X]	[X]	[X]	[X]
Hanson			[X]	[X]	[X]	[X]	[X]
Cemex			[X]	[X]	[X]	[X]	[X]
Tarmac			[X]	[X]	[X]	[X]	[X]
Lafarge	CCA	based on continuing costs of supply	[X]	[X]	[X]	[X]	[X]
		Arising from carbon credits	[X]	[X]	[X]	[X]	[X]
		Arising from impairment losses	[X]	[X]	[X]	[X]	[X]
		Reflecting all costs incurred	[X]	[X]	[X]	[X]	[X]
Hanson	CCA	based on continuing costs of supply	[X]	[X]	[X]	[X]	[X]
		Arising from carbon credits	[X]	[X]	[X]	[X]	[X]
		Arising from impairment losses	[X]	[X]	[X]	[X]	[X]
		Reflecting all costs incurred	[X]	[X]	[X]	[X]	[X]
Cemex	CCA	based on continuing costs of supply	[X]	[X]	[X]	[X]	[X]
		Arising from carbon credits	[X]	[X]	[X]	[X]	[X]
		Arising from impairment losses	[X]	[X]	[X]	[X]	[X]
		Reflecting all costs incurred	[X]	[X]	[X]	[X]	[X]
Tarmac	CCA	based on continuing costs of supply	[X]	[X]	[X]	[X]	[X]
		Arising from carbon credits	[X]	[X]	[X]	[X]	[X]
		Arising from impairment losses	[X]	[X]	[X]	[X]	[X]
		Reflecting all costs incurred	[X]	[X]	[X]	[X]	[X]
Total	CCA	based on continuing costs of supply	13.2	10.3	11.0	14.7	18.9
		Arising from carbon credits	0.1	2.8	2.5	3.8	2.9
		Arising from impairment losses	<u>3.3</u>	<u>-10.3</u>	<u>-18.2</u>	<u>0.2</u>	<u>6.3</u>
		Reflecting all costs incurred	16.6	2.7	-4.8	18.7	28.1

Source: CC analysis and information provided by parties in Tables 12(a) to (d).

Firm-specific results detail

TABLE 12(a) Lafarge: HCA and CCA summary results and ROCEs based thereon

		2006	2007	2008	2009	2010	2011
		Prepared on an HCA basis (all £m save volumes)					
Volumes	Cement sales	[X]	[X]	[X]	[X]	[X]	[X]
Mt	Clinker production	[X]	[X]	[X]	[X]	[X]	[X]
HCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	HCA depreciation		[X]	[X]	[X]	[X]	[X]
	Subtotal		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
HCA balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
		Prepared on a CCA basis (£m)					
CCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation (OCM)		[X]	[X]	[X]	[X]	[X]
	CCA depreciation ('holding gains')		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA balance sheet	Plant & machinery/AICC	[X]	[X]	[X]	[X]	[X]	[X]
	Other fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
	Net current assets	[X]	[X]	[X]	[X]	[X]	[X]
	Provisions	[X]	[X]	[X]	[X]	[X]	[X]
	Total assets	[X]	[X]	[X]	[X]	[X]	[X]
		Average of opening/closing balance					
			[X]	[X]	[X]	[X]	[X]
		Differences between CCA & HCA basis (£m)					
Δ Profit and loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
Δ Balance sheet	Plant & machinery/AICC	[X]	[X]	[X]	[X]	[X]	[X]
	Other fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
	Net current assets	[X]	[X]	[X]	[X]	[X]	[X]
	Provisions	[X]	[X]	[X]	[X]	[X]	[X]
	Total assets	[X]	[X]	[X]	[X]	[X]	[X]
		Profit/(CCA average) capital employed (%)					
ROCE							
HCA	reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA	based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Arising from carbon credits		[X]	[X]	[X]	[X]	[X]
	Arising from impairment losses		[X]	[X]	[X]	[X]	[X]
	Reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]

Source: CC analysis and information provided by Lafarge.

TABLE 12(b) **Hanson: HCA and CCA summary results and ROCEs based thereon**

		2006	2007	2008	2009	2010	2011
		<i>Prepared on an HCA basis (all £m save volumes)</i>					
Volumes	Cement sales	[X]	[X]	[X]	[X]	[X]	[X]
Mt	Clinker production	[X]	[X]	[X]	[X]	[X]	[X]
HCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	HCA depreciation		[X]	[X]	[X]	[X]	[X]
	Subtotal		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
HCA balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
		<i>Prepared on a CCA basis (£m)</i>					
CCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation (OCM)		[X]	[X]	[X]	[X]	[X]
	CCA depreciation ('holding gains')		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA balance sheet	Plant & machinery/AICC	[X]	[X]	[X]	[X]	[X]	[X]
	Other fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
	Net current assets	[X]	[X]	[X]	[X]	[X]	[X]
	Provisions	[X]	[X]	[X]	[X]	[X]	[X]
	Total assets	[X]	[X]	[X]	[X]	[X]	[X]
	<i>Average of opening/closing balance</i>		[X]	[X]	[X]	[X]	[X]
		<i>Differences between CCA & HCA basis (£m)</i>					
Profit and loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		-	-	-	-	-
	CCA depreciation		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
Balance sheet	Plant & machinery / AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
ROCE		<i>Profit/(CCA average) capital employed (%)</i>					
HCA	reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA	based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Arising from carbon credits		[X]	[X]	[X]	[X]	[X]
	Arising from impairment losses		[X]	[X]	[X]	[X]	[X]
	Reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]

Source: CC analysis and information provided by Hanson.

TABLE 12(c) Cemex: HCA and CCA summary results and ROCEs based thereon

		2006	2007	2008	2009	2010	2011
		<i>Prepared on an HCA basis (all £m save volumes)</i>					
Volumes	Cement sales	[X]	[X]	[X]	[X]	[X]	[X]
Mt	Clinker production	[X]	[X]	[X]	[X]	[X]	[X]
HCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	HCA depreciation		[X]	[X]	[X]	[X]	[X]
	Subtotal		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
HCA balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions						
	Total assets		[X]	[X]	[X]	[X]	[X]
		<i>Prepared on a CCA basis (£m)</i>					
CCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation (OCM)		[X]	[X]	[X]	[X]	[X]
	CCA depreciation ('holding gains')		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA balance sheet	Plant & machinery/AICC	[X]	[X]	[X]	[X]	[X]	[X]
	Other fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
	Net current assets	[X]	[X]	[X]	[X]	[X]	[X]
	Provisions	[X]	[X]	[X]	[X]	[X]	[X]
	Total assets	[X]	[X]	[X]	[X]	[X]	[X]
	Average of opening/closing balance		[X]	[X]	[X]	[X]	[X]
		<i>Differences between CCA & HCA basis (£m)</i>					
Profit and loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
Balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
ROCE		<i>Profit/(CCA average) capital employed (%)</i>					
HCA	reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA	based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Arising from carbon credits		[X]	[X]	[X]	[X]	[X]
	Arising from impairment losses		[X]	[X]	[X]	[X]	[X]
	Reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]

Source: CC analysis and information provided by Cemex.

TABLE 12(d) Tarmac: HCA and CCA summary results and ROCEs based thereon

		2006	2007	2008	2009	2010	2011
		<i>Prepared on an HCA basis (all £m save volumes)</i>					
Volumes	Cement sales	[X]	[X]	[X]	[X]	[X]	[X]
Mt	Clinker production	[X]	[X]	[X]	[X]	[X]	[X]
HCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	HCA depreciation		[X]	[X]	[X]	[X]	[X]
	Subtotal		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
HCA balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
		<i>Prepared on a CCA basis (£m)</i>					
CCA profit & loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation (OCM)		[X]	[X]	[X]	[X]	[X]
	CCA depreciation ('holding gains')		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA balance sheet	Plant & machinery/AICC	[X]	[X]	[X]	[X]	[X]	[X]
	Other fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
	Net current assets	[X]	[X]	[X]	[X]	[X]	[X]
	Provisions	[X]	[X]	[X]	[X]	[X]	[X]
	Total assets	[X]	[X]	[X]	[X]	[X]	[X]
	<i>Average of opening/closing balance</i>		[X]	[X]	[X]	[X]	[X]
		<i>Differences between CCA & HCA basis (£m)</i>					
Profit and loss	Revenues		[X]	[X]	[X]	[X]	[X]
	Costs excluding depreciation		[X]	[X]	[X]	[X]	[X]
	CCA depreciation		[X]	[X]	[X]	[X]	[X]
	Profit based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Carbon credits		[X]	[X]	[X]	[X]	[X]
	Impairment losses		[X]	[X]	[X]	[X]	[X]
	Profit reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
Balance sheet	Plant & machinery/AICC		[X]	[X]	[X]	[X]	[X]
	Other fixed assets		[X]	[X]	[X]	[X]	[X]
	Net current assets		[X]	[X]	[X]	[X]	[X]
	Provisions		[X]	[X]	[X]	[X]	[X]
	Total assets		[X]	[X]	[X]	[X]	[X]
ROCE		<i>Profit/(CCA average) capital employed (%)</i>					
HCA	reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]
CCA	based on continuing costs of supply		[X]	[X]	[X]	[X]	[X]
	Arising from carbon credits		[X]	[X]	[X]	[X]	[X]
	Arising from impairment losses		[X]	[X]	[X]	[X]	[X]
	Reflecting all costs incurred		[X]	[X]	[X]	[X]	[X]

Source: CC analysis and information provided by Tarmac.

Sensitivity analysis

154. The above analysis assumes that one needs to invest £170 million in 1 January 2007 prices to obtain a cement production facility capable of producing 1.0 Mt of clinker per year. Furthermore it assumes that assets decline in value by 3.5 per cent per year on a reducing balance basis. It also assumes that asset price inflation is 2.5 per cent in nominal terms over the period (equivalent to 13 per cent rise over the period).
155. In order to give some indication how sensitive the results are to change in assumptions, the results for a couple of alternative scenarios are set out below.

Results assuming £200m rather than £170m as at 1 January 2007 for a 1.0mt facility

TABLE 13(a) **Volumes and calculated ROCE for GB cement producers over the period 2007 to 2011**

	<i>Total</i>	<i>2007</i>	<i>2008</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>
	<i>Mt sold/produced</i>					
<i>Volumes</i>						
Cement sales	47.5	12.3	10.6	7.8	8.1	8.7
Clinker production	39.0	10.2	8.7	6.4	6.6	7.1
	<i>Average profits (2007–2011)/average capital employed (%)</i>					
<i>ROCE</i>						
Profits based on continuing costs of supply	11.4	11.2	8.7	9.4	12.6	16.1
<i>Arising from</i>						
Carbon credits	2.0	0.1	2.4	2.1	3.3	2.5
Impairment losses	<u>-4.1</u>	<u>-3.4</u>	<u>-10.5</u>	<u>-18.6</u>	<u>-0.2</u>	<u>6.4</u>
Profits reflecting all costs incurred	9.2	14.7	0.6	-7.1	16.1	25.1

Source: CC.

Results assuming 2.5 per cent declining balance depreciation profile

TABLE 13(b) Volumes and calculated ROCE for GB cement producers over the period 2007 to 2011

	Total	2007	2008	2009	2010	2011
<i>Mt sold/produced</i>						
<i>Volumes</i>						
Cement sales	47.5	12.3	10.6	7.8	8.1	8.7
Clinker production	39.0	10.2	8.7	6.4	6.6	7.1
<i>Average profits (2007–2011)/average capital employed (%)</i>						
<i>ROCE</i>						
Profits based on continuing costs of supply	12.1	11.9	9.5	10.2	13.3	16.6
<i>Arising from</i>						
Carbon credits	1.9	0.1	2.4	2.1	3.3	2.4
Impairment losses	<u>-4.7</u>	<u>-2.8</u>	<u>-11.5</u>	<u>-20.6</u>	<u>0.9</u>	<u>6.5</u>
Profits reflecting all costs incurred	9.3	14.8	0.4	(8.3)	17.4	25.5

Source: CC.

Interpretation of results

Points to bear in mind when reviewing and interpreting these numbers

156. We have not adjusted asset values for the higher running costs associated with less modern and well-located plant, as described in paragraphs 135 to 139. This means that companies' calculated profitability will vary on account of the generation of plant assets used and the situation of their individual plants.

157. Some of the cement producers seem to have more grinding/milling capacity than clinker production capacity. Some of this grinding/milling capacity is not co-located with clinker production. For example, Cemex invested £49 million in 2009 in a big new grinding and blending facility at Tilbury.⁷⁵ The current approach to asset valuation does not place any value on these separately located facilities beyond the value they would have as part of an integrated plant.

⁷⁵ www.cemex.co.uk/cemex-opens-new-49-million-cement-plant-in-the-south-east-of-england.aspx#CEMEXopensnewand#163;49millioncementplantinthesoutheastofEngland.

Comparability of the companies' results

158. There are a number of limitations on the conclusions we can draw from comparing the results of the individual GB cement producers, not least because we have not adjusted the values ascribed to those of their assets which are not the modern equivalents nor which are sub-optimally located as at 1 January 2007.
159. As already explained in paragraphs 118 and 119, individual companies' results may be heavily influenced by where their portfolio of cement assets sits on the depreciation profile we have adopted for this analysis.
160. There also may be differences in the way companies have attributed their costs to their cement business, particularly in relation to costs that are not incurred and/or managed at the site of production. In addition, we have the following company-specific observations: [✂].

Cost of capital

Introduction

1. In order to understand the profitability analysis (and specifically our assessment of the parties' ROCE) we need to define a benchmark against which we compare it. The benchmark we typically use is the return required by parties for the risk involved in having capital invested in the business (also expressed as the cost to the parties of not being able to invest that capital elsewhere). This annex sets out our estimate of the cost of capital for the main parties.
2. In summary, our estimated range for the industry WACC for the period January 2007 to December 2011 is 8.2 to 11.5 per cent with a midpoint of 9.9 per cent (see Table 1).

TABLE 1 Estimates of WACC parameters

	<i>per cent</i>	
<i>Cost of equity</i>	<i>Low</i>	<i>High</i>
Risk-free rate, nominal	3	4
ERP	4	5
Equity beta	1.0	1.2
Post-tax cost of equity	7	10.0
Tax rate	28	28
Pre-tax cost of equity	9.7	13.9
Pre-tax cost of debt	6	8
Gearing	40	40
Pre-tax WACC	8.2	11.5
Midpoint	9.9	

Source: CC calculations.

3. We intend to use a figure of 10 per cent as our midpoint estimate of the main parties' weighted average cost of capital (WACC). This is consistent with the range of WACC provided by the main parties which largely lie in the range of 9.5 to 11.5 per cent.

4. The remainder of this annex sets out our methodology and the analysis that we have conducted in support of this assessment. Where parties have provided detail on their calculations we have included these in this annex.

Methodology

5. The WACC is calculated using relative weights and costs of equity and debt in the firm's capital structure. We calculated a pre-tax WACC on a nominal basis as this was the appropriate figure for comparison with historical ROCE.¹ In the following sections, when we refer to WACC we mean the nominal pre-tax WACC.

6. The WACC is calculated using the following:

$$\text{WACC} = ((1-g) \times K_e \times (1/(1-t)) + (g \times K_d))$$

Where:

(a) g is the gearing level (debt divided by the sum of debt and equity);

(b) K_e is the cost of equity;

(c) K_d is the pre-tax cost of debt; and

(d) t is the corporation tax rate.

Cost of equity

7. We will generally look to the capital asset pricing model (CAPM) when considering the cost of equity, as this is the tool with the strongest theoretical underpinnings. The CAPM postulates that the opportunity cost of equity (K_e) is equal to the return on risk-free securities, or risk-free rate (RFR) plus the company's systematic risk as measured by beta (β) multiplied by the equity risk premium (ERP), which is the market risk premium/market return (R_m) minus the RFR:²

$$K_e = \text{RFR} + \beta (R_m - \text{RFR}) \text{ or}$$

¹ Historic ROCE is based on the accounting data of the operators which has not been adjusted for the effects of inflation, ie it is stated on a nominal basis. Pre-tax WACC is used to remove any differences between operators resulting from their tax position, eg group relief of losses brought forward.

² The same RFR is used in both the calculation of K_e and K_d .

$$K_e = RFR + \beta \cdot ERP$$

Cost of debt

8. The cost of debt can be calculated as the sum of the RFR and the debt premium; however, when assessing historical costs on a nominal basis it can also be observed using actual debt costs.

Main party submissions

9. In assessing the appropriate cost of capital we have had regard to the submissions made by the main parties and the data submitted by them, including their own estimates of their costs of capital and the hurdle rates that they use in their businesses.

The main parties WACC estimates

10. All of the main parties provided us with their estimates of the appropriate cost of capital to use, although the different parties responded in differing levels of completeness. The results of their analysis are set out in Table 2. The parties all use a single WACC for their UK businesses and do not distinguish between business lines.

TABLE 2 Summary of parties' estimates of their pre-tax WACC for the period 2007 to 2011

	<i>per cent</i>				
	2007	2008	2009	2010	2011
Hanson	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Lafarge SA	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Aggregate Industries	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Tarmac	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Cemex	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Hanson, Lafarge, Aggregate Industries, Tarmac, Cemex.

Notes:

1. The figure for Aggregate Industries is an average of the high and low estimates which it provided.
2. We have grossed up the figures submitted by Lafarge at corporation tax rates of 30 to 26 per cent.
3. Tarmac noted that whilst its benchmark post-tax WACC had been [REDACTED] per cent, individual projects may attract a higher discount rate based on their relative risk profile.

11. [REDACTED]

12. Apart from the figures for 2010 and 2011 submitted by [X] there is a fairly consistent range of 9.5 to 11.5 per cent with a few outliers slightly outside this range (both above and below).

CC estimation of WACC

13. The WACC calculation includes both generic components: (i) the RFR; (ii) the ERP; and (iii) taxation; as well as industry, or company-specific, components: (i) beta (β); (ii) debt premium; and (iii) gearing (g). In the following sections, we first look at the generic components, then the industry/company-specific elements.

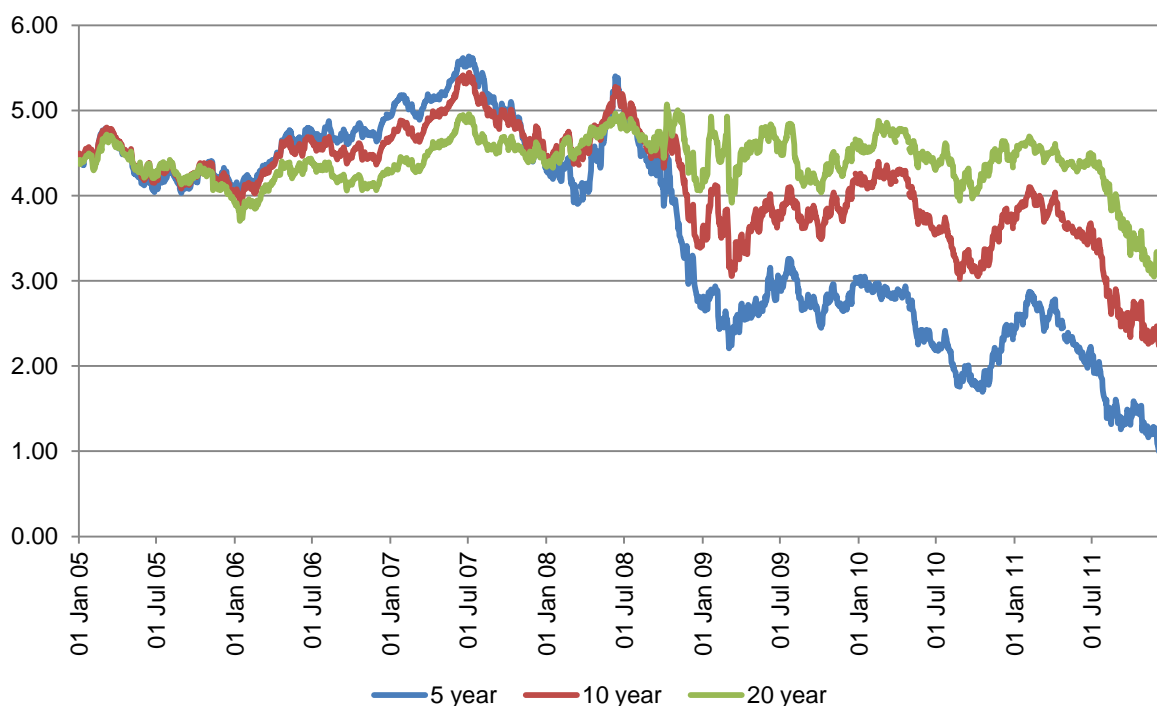
Generic components

Nominal RFR

14. In this section, we estimate the nominal RFR for use in our WACC calculation. We regard nominal UK gilt yields as the most appropriate source of estimating the RFR, as they have negligible default risk.
15. Figure 1 shows UK nominal gilt yields from January 2005 to December 2011. The 20-year nominal gilt yield has fluctuated between 3 and 5 per cent over the period. The ten-year nominal gilt yield has been slightly more variable but has also generally fluctuated between 3 and 5 per cent in the period dropping to almost 2 per cent by December 2011. The ten-year gilt yields averaged 4.1 per cent over the period and the 20-year yield averaged 4.4 per cent. The five-year nominal yield has fluctuated significantly more than the ten- and 20-year yields especially since mid-2008. It dropped to approximately 1 per cent in December 2011 and averaged 3.6 per cent over the period.

FIGURE 1

Nominal gilt yields 2005 to 2011



Source: Bank of England Monthly average yield on government securities.

16. In previous investigations, we have taken the view that long-dated index-linked gilt yields are in principle the most suitable basis for estimating the RFR as they match the long (indefinite) maturity nature of equities. We have, however, tended to use medium- and short-term gilt yields rather than long-term yields, as long-dated index-linked gilts have been affected by distortions (associated, for example, with pension fund dynamics).

17. Figure 1 shows that short-term gilt yields, like long-term gilts in the past, have in the period been affected by the specific actions of external bodies and as a result show significant variations. This reduces the likelihood that short-term yields are a reasonable basis for estimating the RFR. Medium-dated (ten-year) index-linked yields have tended to be more stable and, as a result, we believe provide a better estimate of the

long-run RFR. We have therefore reached a judgement about the RFR on the basis of medium-dated index-linked gilt yields.

Hanson

18. Hanson told us that for the period FY07 to FY10 it estimated the RFR based on the yield on ten-year German government bonds plus an adjustment for the difference in projected inflation between the UK and Germany. Bond yield data was sourced from Bloomberg. The inflation rates used were averages of forecast inflation for the following five years and were based on forecasts provided from a variety of sources (including Bloomberg, IMF and Global Insight).

19. Hanson's approach used to estimate the RFR changed in FY11. Hanson told us that following continued uncertainty associated with the outlook for the Eurozone economy, yields on both ten-year German and UK government bonds fell to historically low levels in 2011 and continue to remain low in 2012. These low yields were largely driven by both Quantitative Easing and flight to quality effects, both of which have increased the demand for UK and German government bonds. Hanson considered that yields were unlikely to remain at these levels over the medium to long term. Furthermore, it was not clear to Hanson that equity investors had necessarily lowered their medium-term return expectations in response to ultra-low interest rates. Due to these factors, the RFR was instead based on the estimated yield on a 30-year German government bond because reductions in 30-year yields have been less pronounced compared with the ten-year rates. Given the lower levels of longer-term government bond issuance, the RFR was calculated using the Svensson method, a fitted yield curve technique. The Svensson method is based on

yields on zero-coupon government bonds and, from 2011, the use of an RFR based on the Svensson method is a requirement of Heidelberg Cement auditors.³

20. To reflect differences in expected inflation, the difference in ten-year spot yields on UK and German government bonds was then added to this rate.

21. The results of Hanson calculations are set out below.

TABLE 3 **Hanson estimates of RFR**

	<i>per cent</i>				
	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>
RFR	[]	[]	[]	[]	[]

Source: Hanson.

Aggregate Industries

22. Aggregate Industries estimated that the nominal RFR estimate based []. The data was sourced from the Bank of England website and averaged over the relevant year.

23. By their calculations, the nominal RFR [].

Conclusion

24. Based on the above data, we have estimated that the nominal RFR has ranged between 3 and 4 per cent.

ERP

25. The ERP, calculated as the market return (R_m) less RFR, is the additional return that investors require to compensate them for the risk associated with investing in equities, rather than in risk-free assets.

³ RFRs based on the Svensson Method are sourced from <http://quaestorial.com>.

26. The ERP is not directly observable from market data because the future payout from equities, unlike that on bonds held to maturity (other than in respect of default risk), is uncertain. In the past, the CC and sector regulators have used two methods to estimate the ERP: historical data showing the difference between the realized return on equities over the RFR; and forward-looking data relating to investors' current expectations of the ERP. We look at both approaches below.

- *Historical approach*

27. The simplest approach under the historical method is to calculate the arithmetic average of historical returns. This is an appropriate method if there is a constant underlying return and the return in each year is independent of that in other years. Since returns have been highly variable, this approach requires us to look at long-run historical data. Table 4 shows average returns over the period 1900 to 2009. It is usual to quote figures for the average of one-year returns but investors in the equity market usually expect to invest in the market for longer than a year, and we therefore show average return for some longer holding periods as well.

28. The data suggests a historical market return (R_m) of between 6 and 7 per cent.

TABLE 4 Real returns, 1900 to 2009

	Return on equity		per cent	
	Simple*	Overlapping†	Blume‡	JKM‡
<i>UK market, DMS data</i>				
1-year holding period	7.2	7.2	7.2	7.2
2-year holding period	6.6	7.0	7.2	7.2
5-year holding period	7.0	7.0	7.1	7.0
10- to 11-year holding period§	6.8	7.0	7.0	6.7
22-year holding period	5.9	6.8	6.8	6.1
<i>UK market, Barclays data</i>				
1-year holding period	7.0	7.0	7.0	7.0
2-year holding period	6.3	6.7	7.0	6.9
5-year holding period	6.8	6.6	7.0	6.8
10- to 11-year holding period§	6.5	6.5	6.8	6.5
22-year holding period	5.6	6.3	6.6	5.8
<i>World market, DMS data</i>				
1-year holding period	6.9			
2-year holding period			6.9	6.8
5-year holding period			6.8	6.7
10-year holding period	7.5		6.8	6.5
22-year holding period			6.6	5.9

Source: CC calculations based on Credit Suisse Global Investment Sourcebook 2010, written by Dimson, Marsh and Staunton (DMS), covering the period 1900–2009, and Barclays Equity Gilt Study covering the period 1899–2009 for the UK.

*The mean is calculated from the formula $(\sum(R_{t+h}/R_t)/(110-h))^{1/h}$ where h is holding period, R_t is value of returns index at the end of year t and the expression is summed for (110/h) values of t for which non-overlapping data is available.

†The mean is calculated from the formula $(\sum(R_{t+h}/R_t)/(110-h))^{1/h}$ where h is holding period, R_t is value of returns index at the end of year t and the expression is summed for (110–h+1) values of t for which overlapping data is available.

‡The Blume unbiased estimator is a weighted average of arithmetic and geometric mean and the JKM small sample efficient estimator is calculated from the estimated mean and variance of lognormal returns.

§Average of 10- and 11-year holding periods.

Note: Returns for holding periods greater than one year are expressed as annual equivalent returns.

29. An alternative approach suggested by Fama and French is to estimate the underlying return from the sum of the average dividend yield and the average rate of dividend growth.⁴ Using the full run of historical data for the UK, this suggests an underlying market return (R_m) of 5.5 per cent.⁵
30. Fama and French's work on US securities provides evidence of a fall in expected returns over time, with expected returns being lower since 1950 than before. The statistical evidence for the UK is less extensive⁶ but, as illustrated in Figure 2, the

⁴ E F Fama and K R French, 'The Equity premium', *Journal of Finance*, April 2002.

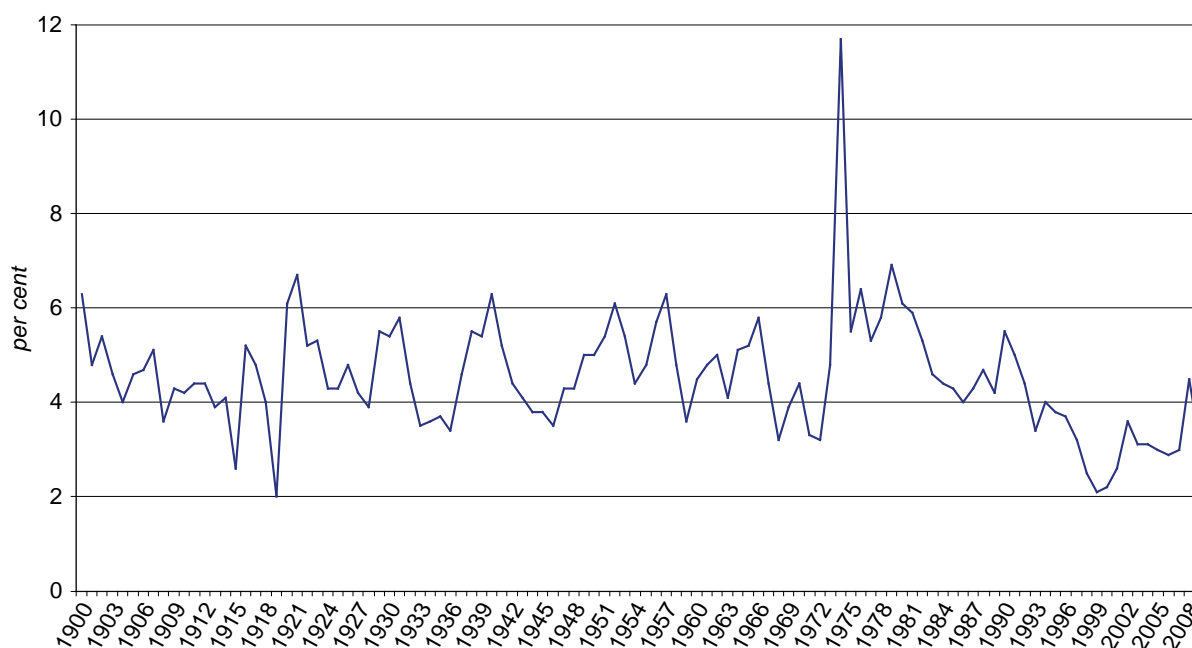
⁵ This result is derived from an average dividend yield of 4.5 per cent and dividend growth of 1 per cent a year (Barclays Equity Gilt Study data).

⁶ Two papers that did find evidence of a reduction in the expected market return or ERP for the UK (albeit at different times) are N Buranavityawut, M C Freeman and N Freeman, 2006, 'Has the equity premium been low for 40 years?', *North American Journal of Economics and Finance*, 17, pp191–205; and A Vivian, 'The UK equity premium, 1901–2004', *Journal of Business and Financial Accounting*, 2007. The first paper suggests that the expected equity premium may have fallen in the 1960s in the UK and other countries, while the second paper suggests that there was a permanent decline in the UK market dividend-price ratio during the early 1990s.

current dividend yield (about 3.5 per cent) is below the historical average (4.5 per cent). Unless future dividend growth is higher than in the past, this would suggest that expected returns are about 1 per cent lower than the past average, implying a market return (R_m) of about 4.5 per cent (using Barclays' data).⁷

FIGURE 2

Dividend yield for UK market (Barclays' data)



Source: Barclays Equity Gilt Study.

- *Forward-looking approaches*

31. DMS, noting that dividend yields are lower than in the past (paragraph 30), inferred that, for the world index, a forward-looking risk premium (over Treasury Bills) would be 4.5 to 5.0 per cent, implying a market return (R_m) of 5.5 to 6.0 per cent.⁸

32. ERP is also commonly estimated using projected dividends from analysts' forecasts (which extend out by four or five years) and a longer-term dividend growth rate. The expected return is then the discount rate at which the present value of future dividends is equal to the current market price. A limitation of this approach is that it is

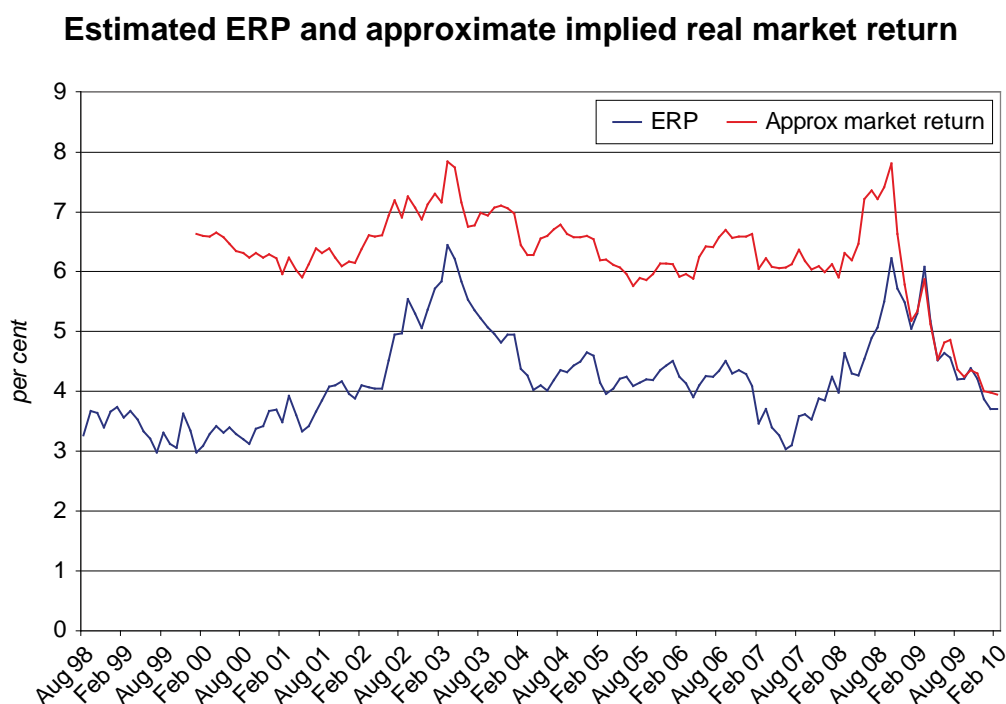
⁷ These figures do not take into account payments to shareholders other than dividends, for example share repurchases.

⁸ *Credit Suisse Global Investment Sourcebook 2010*, section 2.6.

necessary to make an assumption about future long-term growth of dividends (which has a major effect on the calculation since dividends beyond year four or five account for a large part of present value at plausible discount rates).

33. Figure 3 shows estimates of ERP using this methodology published in a 2010 article in the Bank of England Quarterly Bulletin. These estimates are based on the assumption that the future long-term growth in dividends per share is equal to an estimate of the potential growth of the economy. However, the authors of the article noted that this choice of future long-term growth rate is essentially arbitrary.⁹ The estimates in Figure 3 suggest that the expected ERP has fluctuated around 4 per cent. We have attempted to calculate the expected market return implied by these estimates of the ERP: this appears to have fluctuated around 6.5 per cent in the period up to the credit crunch, since when it has declined markedly.

FIGURE 3



Source: Mika Inkinen, Marco Stringa and Kyriaki Voutsinou: 'Interpreting equity price movements since the start of the financial crisis', *Bank of England Quarterly Bulletin*, 2010 Q1.

⁹ Mika Inkinen, Marco Stringa and Kyriaki Voutsinou, 'Interpreting equity price movements since the start of the financial crisis', *Bank of England Quarterly Bulletin*, 2010 Q1.

Parties' estimates

34. The parties' estimates of the market risk premium are set out in the table below.

TABLE 5 Summary of parties' estimates of market risk premium for the period 2007 to 2011

	<i>per cent</i>				
	2007	2008	2009	2010	2011
Hanson	[X]	[X]	[X]	[X]	[X]
Lafarge	[X]	[X]	[X]	[X]	[X]
Aggregate Industries	[X]	[X]	[X]	[X]	[X]
Tarmac	[X]	[X]	[X]	[X]	[X]
Cemex	[X]	[X]	[X]	[X]	[X]

Source: Hanson, Lafarge, Aggregate Industries, Tarmac, Cemex.

Note: The figure for Aggregate Industries is an average of the high and low estimates which it provided.

35. For the period FY07 to FY09, Hanson estimated the Market Risk Premium based on analysis performed internally of the returns on US and German equity markets in excess of government bond yields in those markets. For the period FY10 to FY11 its estimate of the Market Risk Premium was based on a broader range of recent evidence sources after discussions with Heidelberg Cement auditors. The range of sources examined includes historical ex-post returns data, forward-looking survey-based estimations, academic and regulatory precedents and 'implied' cost of capital approaches.¹⁰

36. Hanson noted that Dimson, Marsh and Staunton¹¹ analysed UK equity market returns over a 1900 to 2010 time period and estimated the resulting EMRP as 5.3 per cent. More recent forward-looking survey-based estimates suggest the EMRP may have increased between 2010 and 2011. Fernandez et al¹² conduct an annual survey of practitioners from 56 countries. His results show that the average UK EMRP used by analysts increased from 5.2 per cent in 2010 to 5.4 per cent in 2011. Studies which use implied market-based approaches for estimating the EMRP also point to a

¹⁰ Quantitative methodologies include outputs from DDM models, backing out the EMRP from corporate bond and CDS spreads using assumptions on the debt beta and from an analysis of equity market volatility data.

¹¹ E Dimson, O Marsh and M Staunton, *Credit Suisse Global Investment Returns Sourcebook*, 2011.

¹² P Fernandez, 'Market Risk Premium used in 2010 by Analysts and Companies: a survey with 2,400 answers', 2010, and 'Market Risk Premium used in 56 countries in 2011: a survey with 6,014 answers', 2011.

heightened Market Risk Premium in FY10 to FY11 as volatility in financial markets remained elevated above normalized levels. As of 31 December 2011, Professor Damodoran¹³ and Roger Grabowski¹⁴ both used a 6.0 per cent estimate for the EMRP using different implied valuation methods and the Bank of England's assessment of the EMRP using a dividend discount model was closer to 7 per cent in its December 2011 Financial Stability Review.

ERP estimate for WACC calculation

37. The arithmetic average of historical market returns over the last 110 years suggests a range for market return (R_m) of between 6 and 7 per cent; Fama and French's evidence suggest a long-run market return (R_m) of 5.5 per cent with a short-run (since 1950) of 4.5 per cent, although with less extensive statistical data. Forward-looking approaches suggest a market return (R_m) of 5.5 to 6.5 per cent. Based on this evidence, it would seem reasonable to use a range for the market return (R_m) of between 5 and 7 per cent. This results in a range for ERP of 4 to 5 per cent, based on the low-end market return (R_m) of 5 per cent minus the low end of the range of real RFR of approximately 1 per cent and the high end of the estimate of market return (R_m) of 7 per cent less the high end of real RFR of approximately 2 per cent.

Tax rate

38. The corporation tax rate in the period 2004/05 to 2007/08 was 30 per cent. This was lowered in tax year 2008/09 to 28 per cent and again to 26 per cent in 2011/12. For the purpose of estimating the WACC over the period 2005 to 2009, we intend to use the historical average tax rate over the whole period of approximately 28 per cent.

¹³ Professor Damodoran's implied EMRP estimates can be found on his website: <http://pages.stern.nyu.edu/~adamodar/>.

¹⁴ Duff & Phelps, 2011, 'Duff and Phelps Increase Equity Market Risk Premium to 6%'.

Industry/company-specific components

Gearing

39. We considered the level of gearing of each of the companies. In this section we refer to gearing as the percentage (debt/debt+equity). All of the companies submitted data on their gearing levels. We set these out below.

TABLE 6 Summary of parties' gearing estimates for the period 2007 to 2011

	<i>per cent</i>				
	2007	2008	2009	2010	2011
Hanson	[X]	[X]	[X]	[X]	[X]
Lafarge	[X]	[X]	[X]	[X]	[X]
Aggregate Industries	[X]	[X]	[X]	[X]	[X]
Tarmac	[X]	[X]	[X]	[X]	[X]
Cemex	[X]	[X]	[X]	[X]	[X]

Source: Hanson, Lafarge, Aggregate Industries, Tarmac, Cemex.

40. Aggregate Industries gearing estimate was calculated based on its review of the gearing levels of [X] using data provided by [X]. This data showed that [X] had gearing levels ranging from [X].

Conclusion on gearing

41. Having reviewed the parties' submissions we have adopted a figure of 40 per cent. This is broadly consistent with the parties' submissions and with their observed levels of gearing.

42. The level of gearing we adopt is also relevant to our consideration of the companies' betas as we discuss below.

Beta

Background

43. The beta (β) of a share measures the exposure of the firm to systematic risk. It is only this form of 'non-diversifiable' risk for which investors require compensation.

Non-systematic risk ('firm-specific risk') can be diversified by investors. Hence it is only systematic risk that is relevant to the cost of equity of the firm.

44. Within a CAPM framework, changes in gearing affect equity betas. Hence, it may be necessary to adjust for gearing differences in order to make comparisons between equity betas (for example, by calculating the asset beta, ie the beta at zero gearing).

Beta estimation

45. We asked the main parties to provide estimates of their individual company's equity betas for their last five financial periods. We set these out below and then describe the methodologies used.

TABLE 7 Summary of parties' estimates of beta for the period 2007 to 2011

	2007	2008	2009	2010	2011
Hanson	[X]	[X]	[X]	[X]	[X]
Lafarge	[X]	[X]	[X]	[X]	[X]
Aggregate Industries	[X]	[X]	[X]	[X]	[X]
Tarmac	[X]	[X]	[X]	[X]	[X]
Cemex	[X]	[X]	[X]	[X]	[X]

Source: Hanson, Lafarge, Aggregate Industries, Tarmac, Cemex.

Notes:

1. The figure for Aggregate Industries is an average of the high and low estimates which it provided.
2. The Cemex estimate is based on high gearing assumptions in re-levering the beta.

Hanson

46. Hanson had estimated a beta looking at a set of publicly listed companies comparable with Heidelberg Cement follows:¹⁵
- (a) Buzzi Unicem SpA;
 - (b) CRH PLC;
 - (c) Holcim Ltd;
 - (d) Italcementi SpA;
 - (e) Lafarge SA;

¹⁵ Hanson noted that Buzzi Unicem SpA, Italcementi SpA and Martin Marietta Inc do not have UK operations, but believed that they could still provide useful insights into the systematic risk of cement and building product markets.

- (f) Martin Marietta, Inc; and
- (g) Titan Cement Company SA.

47. Hanson told us that it collected raw equity betas and capital structure data for each of the peer group companies. The raw betas were sourced from Bloomberg and were based on two-years of weekly data, regressed against the company's local exchange (eg FTSE Allshare). Debt/Equity ratios were then estimated for each of the peer group companies using the reported book value of debt and the market capitalization of the company's equity. This data was also sourced from Bloomberg.
48. The raw equity betas were then de-levered using the observed Debt/Equity ratios to arrive at asset beta estimates. An equity beta was then estimated by re-levering the average of the peer group asset betas using the Debt/Equity ratio of Heidelberg Cement.

Aggregate Industries

49. Aggregate Industries looked at betas produced by [REDACTED] as well as the gearing levels described above. It had data for [REDACTED].
50. It determined an asset beta using the gearing levels in the data by unlevering the equity betas. Doing so generated asset betas of between [REDACTED]. Aggregate Industries then 're-gearred' these betas using its notional gearing level of [REDACTED] to estimate an equity beta of between [REDACTED].

Bloomberg data

51. We also reviewed Bloomberg data using weekly data for the period 2007 to 2011 for the three quoted companies set out below. The results were:
- (a) Lafarge: raw beta 1.3, beta (as adjusted by Bloomberg) 1.2;

(b) Holcim: raw beta 1.11, adjusted beta 1.07; and

(c) Heidelberg Cement: raw beta 1.07, adjusted beta 1.04.

The effect of gearing on Beta

52. A company's gearing level is reflected in its equity beta.¹⁶ As such, we considered whether we needed to adjust the main parties' equity betas to reflect our gearing assumption of 40 per cent. We concluded that as our chosen gearing level was within the range of observed gearing of the main parties during the period, we did not need to adjust equity betas to reflect our gearing assumption. Our assessment of the appropriate beta below is therefore based on the main parties' equity betas.

Conclusion on beta

53. We noted that there were variations in betas between parties and over time, hence we considered that it would be appropriate to adopt a relatively wide range for beta, rather than a point estimate. We have adopted a range of 1.0 to 1.2.

The cost of debt

54. In assessing the cost of debt, we looked at both general costs in the market, for example interest rates, as well as the actual costs incurred by the market participants during the period.

55. We asked the main parties to provide figures for their actual cost of debt during the period, which we have set out below:

(a) Hanson (pre-tax)—between [X]. This was calculated using Bloomberg data as the additional cost of EUR-denominated for a BB S&P rating company such as Heidelberg Cement. The debt spread was based on a weighted average of the

¹⁶ The theory behind adjusting betas for gearing differences is that a firm's exposure to systematic risk increases for a given increase in fixed costs (eg interest payments on debt). As a result, the beta of a firm increases as debt costs increase. This also applies to operating lease payments as they increase fixed costs although they are not shown on the balance sheet.

spreads (over AAA-rated EUR denominated sovereign bonds) of short term (1-year) and long-term (10-year) EUR denominated industrial benchmark bond indices with a BB S&P rating—consistent with Heidelberg Cement’s own rating. The weighting between the short- and long-term spreads was determined by the relevant amount of short- and long-term interest bearing debt on Heidelberg Cement’s balance sheet as at the WACC estimation date.

- (b) Lafarge—post-tax cost of debt of [X]. This is equivalent to a pre-tax range of approximately [X].
- (c) Aggregate Industries estimated two ranges of (post-tax) debt costs: the low case is the actual debt financing costs, being the weighted average interest rates during the period; the higher case is the RFR plus [X] bps:
 - (i) Range of low case—[X] (2010) to [X] (2007) post-tax, equivalent to a range of approximately [X] pre-tax.
 - (ii) Range of high case—[X] (2011) to [X] (2007) post-tax, equivalent to a range of approximately [X] pre-tax.

We are more interested in the actual cost of debt which it experienced (ie the low case figure).

- (d) Cemex submitted a range of pre-tax cost of debt of [X].

Actual debt raising

56. We also considered the actual debt raised by the parties and the interest rates of these bond issues. Many of the parties had substantial numbers of bond issues and so we have shown below the range of these:

- (a) Lafarge SA (excluding intercompany loans) between [X];
- (b) Heidelberg Cement’s recent bond issues had had fixed rates between [X];
- (c) Cemex (excluding intercompany loans) typically [X];
- (d) Aggregate Industries: bank loans at [X], overdraft at [X]; and

(e) Tarmac does not directly employ external loan funding and is instead provided with inter-company loans from its parent, Anglo American Plc, attracting interest of between [X]. Other than through publicly available information, Tarmac has no visibility of the rate at which Anglo American is able to raise external debt financing.

Market yield spreads

57. We then looked at bond yields using market yield spreads. Yield spreads are calculated on a basket of similar rated assets against gilt rates. We set out below the current credit ratings for the listed companies. The companies are rated between BB and BBB with Standard & Poor's (S&P) or the Moody's Investors Services (Moody's) and Fitch equivalent. We set out the parties current credit rating below:

(a) Lafarge SA: Ba1 (Moody's), BB (S&P);

(b) Holcim: Baa2 (Moody's), BBB (S&P); and

(c) Heidelberg Cement: Ba1 (Moody's), BB+ (Fitch), BB (S&P).

58. Figure 4 shows the nominal yield spread for BBB-rated debt over nominal gilts from Bloomberg. We considered that this index provided a reasonable basis for assessing nominal yields for the main parties and reflected their credit ratings. It shows that between 2005 and 2007 the spread was generally between 1 and 2 per cent. From 2008, the spread increased rapidly to almost 4 per cent in the first half of 2009, before falling back to just under 3 per cent in 2011.

FIGURE 4

BBB-rated spread over nominal gilts



Source: Bloomberg.

59. We compared these spreads (which appeared to range around 2 per cent) to the RFR described earlier of 3 to 5 per cent, noting that ten-year gilts fell below 3 per cent towards the end of the period at the time that spreads were increasing.

Proposed cost of debt

60. We chose to adopt a range of estimates for the cost of debt of between 6.0 and 8.0 per cent. We consider this to be a reasonable estimate noting that this is in line with the costs submitted by the parties and the observed costs in the market.