Discounting for CBAs involving private investment, but public benefit

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Contents

Section		Page
1	Introduction and summary	2
2	Background to discounting	5
3	What are the possible approaches?	7
4	Approaches taken by different regulators	10

Section 1

Introduction and summary

Purpose

1.1 This technical paper outlines the approaches to discounting that could be taken by regulators within the Joint Regulators' Group (JRG). The JRG brings together senior colleagues from the various regulators and meets four times a year to discuss issues of mutual concern and to report on recent developments in their own particular sector.

1.2 The focus of this paper is on discounting in the particular case of a cost-benefit analysis (CBA) where a firm finances the investment, but benefits mainly accrue to consumers and/or the wider public.[1] This paper does not seek to determine whether or not a regulator should be intervening, but rather if the regulator is considering intervening and using a CBA, what the appropriate technical framework for CBA might be. For example:

1.3 Regulators may need to consider whether to intervene in markets and require firms to do something which otherwise wouldn't happen (i.e. isn't profitable for them) but where the intervention proposed would involve investment by the firms in question.

1.4 Regulators may need to consider the costs and benefits of investment plans proposed by regulated firms.

1.5 The issue of discounting in CBAs is one which many sector regulators face, and therefore it is an area where regulators can benefit from sharing and promoting good regulatory practice. This paper is the outcome of discussions between regulators within the JRG on approaches taken to discounting.

1.6 However, we note that regulators will need to consider the appropriateness of the approaches set out in this paper to the specific issues and circumstances it is assessing, and with regard to their specific remits (which differ across regulators).

1.7 This paper focuses on the possible approaches to discounting the costs and benefits of the project under review. This is just one of the many issues that the regulator will need to consider in a CBA, and thus the accuracy or 'technical correctness' of the approach to discounting needs to be considered alongside other issues, such as the accuracy with which the undiscounted costs and benefits can be quantified.

Possible approaches

1.8 The issue of how a regulator should discount costs and benefits when assessing a CBA where a firm finances the investment but benefits mainly accrue to consumers and/or the wider public is not an area where there is firm consensus among academic economists. In principle, it is generally agreed that different cash flows may have different systematic risks, and that this should be reflected in the CBA. One way of doing this is to adjust the discount rate.

1.9 The key area of disagreement appears to be how this should be applied in practice.

[1] In some cases, a firm may be able to pass costs through to consumers. In other cases, it may not be able to pass through full costs, or may be able to pass through only a proportion.

1.10 One view is that in many cases, the actual underlying systematic risk is likely to be negligible, and that it is generally reasonable to use the social time preference rate (STPR) of 3.5%, as recommended by the HM Treasury Green Book[2], as the discount rate. An alternative view is that systematic risk is likely to be significant in some cases, and that using the STPR, which ignores systematic risk, is unlikely to be appropriate in the absence of any other adjustments; instead the relevant weighted average cost of capital (WACC), which does reflect some systematic risk[3] may be the correct discount rate to use.

1.11 In practice, it is likely to be very difficult to assess the systematic risk of any given cash flow within a CBA, and make specific adjustments or assign different discount rates to different cash flows. Therefore, the most practical options are likely to be:

i) Discount all costs (including financing costs as calculated based on a WACC) and benefits at the STPR. [The Spackman approach]

ii) Discount some costs and/or benefits at a WACC, and some at the STPR, depending on their likely systematic risk

iii) Discount all costs and benefits at a WACC

iv) Discount all costs and benefits at the STPR (excluding financing costs)

1.12 The discussion set out in this paper suggests that in general, it is likely that the "Spackman" approach is the most appropriate for the specific question that we are considering. However, we recognise that in some cases further adjustments for systematic risk and/or other factors may be necessary, if there is evidence on which to base these adjustments, and if it is proportionate to make such adjustments.

1.13 We welcome views on the appropriateness of the "Spackman" approach, or other approaches, for the types of CBAs considered in this paper.

Approaches taken by regulators

1.14 To some extent, the approach taken by regulators varies depending on the type of exercise being undertaken, and the objectives of the analysis.

1.15 Both Ofwat and the ORR have published guidance recommending a process that could be described as the two-stage "Spackman" approach. The Competition Commission has recently endorsed the Ofwat approach "because of the way prices are determined".[4]

1.16 None of the regulators appears to use Option 2, which involves discounting some elements of a particular CBA at the relevant WACC and others at the STPR, depending on their likely systematic risk. This may be because this option is arguably the least practical of the options, given the complexities of assessing the systematic risk of individual elements of a CBA.

[2] See HM Treasury Green Book, Chapter 5, http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

[3] The company WACC would reflect the systematic risk of the company as a whole. In some cases, project-specific WACCs may be available, which would reflect the systematic risk of the specific project.

[4] See Appendix C of http://www.competition-commission.org.uk/rep_pub/reports/2010/558Bristol.htm

1.17 In general, it is likely that the Spackman approach is the most practical for cases involving private investment but public benefit. In particular, it ensures that the financing costs of investments are adequately reflected as part of the costs in the CBA. However, in some cases, it may be proportionate to make some further adjustments, as set out in Section 3.

1.18 We note that in some cases, regulators may be seeking to answer a different question. For example, the CAA has in general adopted the approach that it is for the government to decide on whether total (private and public) benefits outweigh the total (private and public) costs of a project. It is then for the CAA to discharge its duties taking into account government's policy objectives. This exercise is different from the general question considered in this paper, and therefore is likely to require a different approach.

1.19 Therefore, we note that it is important to retain flexibility in the approach taken to CBAs, and the specific methodology may be different depending on context and specific circumstances.

We welcome views on particular issues that regulators may need to take into account in different contexts in deciding on the appropriate approach to discounting in different cases.

Section 2

Background to discounting

How are discount rates used?

2.1 Discount rates are used to calculate the net present value of streams of costs and benefits over a period of time. Such costs and benefits could be a company's cash flows over a period of time, or the costs and benefits to consumers of a particular investment.

2.2 Discounting future costs and benefits reflects the concept that a given amount today is worth more than the same amount tomorrow. The present value today of an amount, P next year would be calculated as:

$\frac{P}{1+r}$, where r is the discount rate.

Which possible discount rates could be used?

2.3 A number of possible discount rates (and costs of capital) are used or sometimes proposed in different circumstances: the private cost of capital, the social time preference rate (STPR), the government cost of capital and the social opportunity cost of capital.

2.4 The two rates most commonly used for discounting are the social time preference rate (STPR) and the company's private cost of capital (WACC).

STPR

2.5 The government uses the STPR as the discount rate in conducting appraisals of different options, for example, investment in different possible projects. The STPR is "the rate at which society values the present compared to the future[5]". The Treasury currently recommends a pre-tax real rate of 3.5%.

Company cost of capital (weighted average cost of capital – WACC)

2.6 The company's WACC reflects the return required by investors in a company or project, and is the cost of raising (or retaining) capital. It is made up of the weighted average of the cost of equity and the cost of debt:

WACC = (Cost of equity x (1 – Gearing)) + (Cost of debt x Gearing)

2.7 A WACC is used by companies to discount costs and benefits in investment appraisals. Where new projects are perceived to have a different (higher) level of risk, companies could reflect this by conservatively adjusting (e.g. discounting) the expected cash flows. In practice, to simplify the assessment of new projects, companies may leave cash flows unaltered and instead use a rate higher than their cost of capital (a hurdle rate) to reflect the uncertainties in the project cost / benefit

[5] HM Treasury Green Book, Chapter 5, available at: http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

analysis. As a result, companies often apply an incremental WACC for a new project which may differ to the company's average WACC.

2.8 The Capital Asset Pricing Model (CAPM) is often used to calculate the cost of equity. The cost of equity is the expected return and reflects a premium over the risk-free rate. This premium is the product of the equity risk premium for the equity market as a whole and a firm-specific or cash-flow specific element, known as the equity beta. The equity beta reflects the correlation of the firm's equity returns with equity market average returns. The cost of equity, therefore, reflects systematic risk, but not non-systematic risk. Systematic risk refers to risk that cannot be diversified away by investing in a broad diversified portfolio of projects.

2.9 The cost of debt is often estimated by observing the company's actual costs of debt and/or the yields on benchmark bonds traded (often on the basis of the credit rating). The cost of debt, therefore, reflects both systematic and company specific risk.

The Green Book guidance on systematic risk

2.10 The Treasury Green Book has always excluded risk from the discount rate. Systematic risk was first seriously addressed in the 1991 edition and it was agreed in the Treasury at that time, and subsequently maintained, that systematic risk associated with private financing with public impact is generally not quantitatively significant.

2.11 This suggests that optimism bias and variability (or systematic risk) should be accounted for explicitly in the CBA, for example, by adjusting expected cash flows rather than the discount rate.

Section 3

What are the possible approaches?

3.1 The issue of how a regulator should discount costs and benefits when assessing a CBA where a firm finances the investment but benefits mainly accrue to consumers is not an area where there is firm consensus among academic economists. However, there does appear to be some common ground and principles which experts from most backgrounds would agree on:

3.2 The values of costs and benefits should be adjusted for systematic risk. Theoretically, costs and benefits could be adjusted by using a "certainty equivalents" approach, which involves calculating the risk premium required to compensate for the risk incurred, and adjusting the value of the cash flow by this amount before discounting[6].

3.3 However, in practice, this may be difficult to calculate, and therefore this adjustment is often incorporated in the discount rate, in much the same way as companies sometimes use hurdle rates.

3.4 Different cash flows will have different systematic risk, so in principle, the discount rate should vary based on this (in the absence of any other adjustments).

3.5 The key area of disagreement appears to be how this should be applied in practice.

3.6 In practice, it is likely to be very difficult to assess the systematic risk of any given cash flow within a CBA, and assign different discount rates to different cash flows. The two practical candidates to use as the discount rates are likely to be the STPR and the relevant WACC since the former is effectively given by the HM Treasury Green Book and the latter is often already estimated by regulators for the firm(s) in their regulated market(s).

3.7 Therefore, where costs fall to firms to be financed but benefits accrue to consumers and/or society more widely, the most practical options are likely to be:

i) Discount all costs (including financing costs as calculated based on a WACC) and benefits at the STPR. [The Spackman approach]

ii) Discount some costs and/or benefits at the relevant WACC, and some at the STPR, depending on their likely systematic risk

iii) Discount all costs and benefits at the relevant WACC

iv) Discount all costs and benefits at the STPR (excluding financing costs)

3.8 One view is that in many cases, the actual underlying systematic risk is likely to be negligible, and that it is generally reasonable to use the STPR of 3.5%, as recommended by the HM Treasury Green Book[7], as the discount rate, without making any other adjustments for systematic risk. This view is based on calculations which look at the covariance of project returns with the GDP measure of income; this

[6] See "Economics of the Public Sector", J.E. Stiglitz, 2000
[7] See HM Treasury Green Book, Chapter 5, http://www.hm-treasury.gov.uk/d/green_book_complete.pdf

covariance is negligible, because GDP fluctuates much less than equity market[8]. The reason for using covariance of returns with income in this case is that it could be argued that the cost of systematic risk for public projects is in its correlation of costs and benefits with income, rather than in its correlation with equity market fluctuations.

3.9 Therefore in this view, the company's cost of capital (WACC) should not be used as the discount rate in CBAs for public intervention. However, where investment costs fall to firms to be financed, the question arises of whether and how those financing costs should be factored into the CBA. Spackman, a public sector appraisal and evaluation expert and former DfT Chief Economist, argues that such financing costs should be factored into the CBA undertaken by the regulator or public body and recommends the following 2-step process[9]:

3.10 Convert capital costs into annual costs using the company's cost of capital.[10] This gives a stream of financing costs, which should be included as part of the cost side of the cost benefit analysis.

- A related question is the assessment of the appropriate time profile of annualised costs. One straightforward approach is to assume a flat annuity, as applied in the example in Section 4.2. Nonetheless, there may be specific reasons for deviating from this assumption, and an alternative time profile may be deemed appropriate such as for instance a tilted annuity.

- There may be specific circumstances in which private financing costs are effectively funded upfront by the public sector and so may not need to be added.

3.11 Use the social time preference rate (STPR) of 3.5% in discounting all costs and benefits, as recommended by the HM Treasury Green Book.

3.12 An alternative view is that GDP does not provide a complete measure of economic income including fluctuations in wealth, and therefore any estimates of systematic risk based on this measure may under-estimate systematic risk. The following counter-arguments may be made to the approach outlined above.[11]

3.13 The STPR of 3.5% recommended by HM Treasury largely ignores systematic risk, and is therefore too low for cash flows where there is significant systematic risk (this applies to public as well as private sector projects). This would suggest that in some cases, it may be appropriate to make an adjustment for systematic risk, if it is proportionate to do so, and if there is evidence suggesting that the systematic risk is significant.

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[8] See Spackman (2004), "Time Discounting and of the Cost of Capital in Government", Fiscal Studies (2004), vol. 25, no.4, pp.467-518. The calculation is based on a theoretical cash flow that varies in exact proportion to GDP (which might be a reasonable assumption for wages of a fixed workforce, for example).

[9] See, for example, Spackman (2008), "Time preference, the cost of capital and PPPs", http://jdi-legacy.econ.queensu.ca/Files/Conferences/PPPpapers/Spackman-081002-final.pdf

[10] In some cases the company's average cost of capital may not reflect the cost of financing a particular project.

[11] See for instance Cooper, Brealey and Habib (2007), Investment Appraisal in the Public Sector, Oxford Review of Economic Policy, at: http://oxrep.oxfordjournals.org/content/13/4/12.abstract?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=ian+cooper&searchid=1&FIRSTINDEX=0&resourcetype=HWCIT

3.14 GDP does not provide a complete measure of economic income, and therefore the negligible covariance between GDP and project returns does not necessarily imply that systematic risk is negligible. However, set against this, it is likely to be very difficult to measure systematic risk based on a complete measure of economic income, and it is not clear that the use of GDP results in a significant underestimation of systematic risk.

3.15 In some cases, the STPR of 3.5% may not adequately reflect society's preferences for the particular project in question. For example, it may be argued that individuals place a higher value on the benefits from investments in health and safety as incomes increase, suggesting that these benefits should be discounted at a lower rate.

3.16 The discussion above would suggest that in general, it is likely that the "Spackman" approach is the most appropriate for the question that we are considering. However, we recognise that in some cases further adjustments for systematic risk and/or other factors may be necessary, if there is evidence on which to base these adjustments, and if it is proportionate to make such adjustments.

We would welcome views on approaches to discounting for the types of CBA we consider in this paper.

Section 4

Approaches taken by different regulators

4.1 This section outlines approaches taken by regulators in discounting for CBAs. In particular, we look at the approaches taken by the Civil Aviation Authority (CAA), Ofcom, Ofgem, Ofwat, Office of Rail Regulation (ORR) and Postcomm.

The duties and objectives of different regulators

4.2 Before looking at the approaches taken by different regulators to the specific question of discounting in CBAs involving private investment but public benefit, it is worth noting regulators have different statutory duties and, therefore, will need to undertake different types of analysis in different circumstances, and this can in some circumstances require different approaches to CBAs. The cases of Postcomm and the CAA in particular are worth noting.

Postcomm

4.3 Postcomm has to date not undertaken quantified social cost benefit analyses to support its policy decisions.

4.4 This is partly because its statutory framework is distinctive. For example, Postcomm has a primary Universal Service duty (with elements of the Universal Service defined in statute). This influences how the welfare maximisation objective of conventional cost benefit analyses can be interpreted and applied in practice. For example, to the extent that Postcomm's primary duty requires particular products to be provided at particular affordable and uniform prices, assessment of options to secure these outcomes is more characterised by cost-effectiveness analysis than full cost benefit analysis. In addition, it is not required under the Postal Services Act to undertake formal impact assessments to support its policy proposals, although it has recently indicated its intention to do so in line with the principles of good regulation[12].

4.5 In line with some other regulators, it does have a financing duty in relation to the exercise of its licensing functions, so that it has, for example, used a commercial WACC for the discounting required to set price controls for Royal Mail: the most recent WACC used in the 2006 price control was 8% (real pre-tax)[13].

4.6 However Postcomm is considering the issues relevant to the types of CBA explored in this paper in the context of its ongoing work to review the wider regulatory framework for postal services. This programme of work was set out in its Forward Work Programme in March 2010[14] and the first major output from this work – its consultation proposals for changes to Royal Mail's price controls from April 2011 - was recently published.[15]

[12] See for example http://www.psc.gov.uk/policy-and-consultations/consultations/may-2010-consultation.html para 11.1
[13] See http://www.psc.gov.uk/policy-and-consultations/consultations/price-control.html, December 2005 Final Proposals para 9.93
[14] http://www.psc.gov.uk/about-postcomm/annual-reports-and-plans/postcomm-forward-work-plan-2010-11.html
[15] http://www.psc.gov.uk/policy-and-consultations/consultations/may-2010-consultation.html

CAA

4.7 The CAA sets price caps for Heathrow Airport, Gatwick Airport, Stansted Airport and National Air Traffic Control.

4.8 The CAA is not aware of any situations where it had to consider investments with mainly wider public benefits that did not in some way accrue to the investing company. The CAA has therefore relied largely on commercial assessments and, therefore, used commercial discount rates reflecting the company's cost of capital.

4.9 In economic regulation, the CAA regulates to further the reasonable interests of users and has no wider duty to environmental, economy or social considerations, although in the regulation of Air Traffic Control the CAA is to take account of any guidance on environmental objectives given to the CAA by the Secretary of State.

4.10 Major airport infrastructure projects have significant public policy dimensions and span many issues (noise, CO_2 emissions, employment, etc). Furthermore, it is difficult to envisage major airport investment, of the scale that produces public costs and/or benefits, without implicit or explicit support from local and national government. This can be seen from the consequences of a change in government and accompanying policy for the third runway at Heathrow and the second runway at Stansted.

4.11 In general terms, the CAA has adopted the approach that it is for Government (including planning authorities) to decide on wider social and environmental policy issues – including whether the private and public benefits outweigh the private and public costs – in formulating its policy objective for major airport investment and when deciding whether to support and/or consent to major expansion projects. It is then for the CAA to use the tools available to it, in a manner consistent with its duties, to discharge its statutory duties, taking account of government's policy objectives.

4.12 This paper is particularly focused on the approach to CBAs where a private company undertakes an investment and the regulator needs to assess whether it is in the public interest for such an investment to take place. Other types of analysis, such as the ones outlined above, are focussed on different questions and may require different approaches.

Analysis undertaken by different regulators

Ofwat

4.13 Ofwat has published guidance on how companies should conduct CBAs for projects funded at price reviews[16]. This guidance recommends the Spackman two-step technique (Option 1), i.e. converting monetary cost streams into equivalent annualised values using the cost of capital, and then discounting the resulting annualised impacts, along with non-financial impacts at the STPR:

[16] PR09/08 Further Ofwat guidance on the use of cost benefit analysis for PR09, Dec 2007, http://www.ofwat.gov.uk/pricereview/pr09phase1/pr09phase1letters/ltr_pr0908_cbaguide

PR09/08: Further Ofwat guidance on the use of cost benefit analysis for PR09[17]

Discounting

Each company must take account of the difference between the values placed upon current impacts and those occurring in the future. Different discounting techniques should be used dependent on whether the impact is financial or non-financial. This is to ensure there is a direct comparison of the effects on consumers.

Financial impacts over the longer-term should be discounted using a two-step technique to ensure they are converted into the effect they have on consumers. Firstly, financial monetary streams should be converted into equivalent annualised values (EAVs) by converting the financial impacts of building, maintaining and operating the company's assets into the annualised impacts on customers' bills using its cost of capital (see section 3.1). The annualised impacts on customers' bills should then be discounted at the social time preference rate (STPR), as set out in HMT Green Book.

Future values of non-financial impacts require a one-step discounting technique. These impacts, whether positive or negative, should be discounted at the STPR to convert them from the date they accrue into present values.

4.14 The rationale for this approach was set out by Oxera in report undertaken for Defra as part of the Water Framework Directive (WFD) collaborative research programme[18], but in summary:

- "The analytical framework uses the principal–agent model to describe the relationships between parties involved in public policy. The government may be considered the principal in charge of introducing the policy. The private or public sector party executing the policy might be considered the agent.

- The principle underlying the proposed methodology is that private investments in projects driven by public policies are risky. They therefore require compensation for risk, which, within the principal–agent framework, should be seen as part of the social cost of the project.

- Once it is established that private risks constitute the social cost, they should be priced and considered as other policy costs in the numerator of the present-value calculation. The proposed basis for valuation of risk is the private sector cost of capital.

- The appropriate rate for discounting streams of future social costs (and benefits) is the 3.5% STPR when private sector capital costs reflecting embedded risks are incorporated in the cost (and benefit) streams.

- A number of adjustments to project costs might be required. First, costs should be included in the appraisal when they materialise as social costs. Second, costs at market prices (i.e., gross of taxes and financing costs) should be adjusted to obtain economic costs."

[17] PR09/08 Further Ofwat guidance on the use of cost benefit analysis for PR09, Dec 2007, http://www.ofwat.gov.uk/pricereview/pr09phase1/pr09phase1letters/ltr_pr0908_cbaguide

[18] Economic analysis for the water framework directive: Discounting and the calculation of the present value, Oxera for Defra, October 2006

4.15 The Competition Commission has recently endorsed the Ofwat approach "because of the way prices are determined"[19].

4.16 The Spackman approach has also been supported in a recent review of cost-benefit analysis and benefit valuation for UK Water Industry Research (UKWIR)[20]. This report provides a comprehensive guide to discounting and estimating whole-life cost as part of CBA in the water industry.

ORR

4.17 Through ORR's safety regulation, applying the Health and Safety at Work Act 1974, ORR must assess whether health and safety risks on Britain's railways are reduced "so far as is reasonably practicable".

4.18 During 2007, ORR reviewed the guidance on safety decision making inherited from the HSE (which was responsible for rail safety up to 31 March 2006), with a view to publishing revised guidance. As part of this work ORR reviewed the guidance on cost benefit analysis (CBA), which included external advice from NERA[21] on the appropriate discount rates to use in safety CBA. (Other issues related to CBA were also reviewed, including which costs and benefits to include in the CBA; the appropriate values per fatality and weighted injury to adopt; and how uncertainty should be treated.)

4.19 One key area of ORR's review was whether future costs and benefits of health and safety measures should continue to be discounted using public sector discount rates. ORR considered whether, as the costs of health and safety measures would fall on duty holders (predominately private sector organisations), it would be appropriate to use private sector rates to discount future costs and benefits.

4.20 ORR concluded that public sector discount rates should continue to be used, since the benefits of the measures would largely fall on society. The valuation of safety benefits is based on the value to society and so it is consistent that future societal values should be discounted using a societal discount rate. The costs of health and safety measures should include the costs of financing, reflecting the public or private sector cost of capital depending on the funder.

4.21 NERA suggested that, for Network Rail, instead of using a discount rate of 6.5% (which was previously Network Rail's allowed return) that it should use a rate of 3.5% for costs and 1.5% for safety benefits (the lower discount rate for safety benefits reflects safety values increasing in line with incomes). Scheme costs should include the costs of financing; for Network Rail this is generally RAB financing. (Uncertainties and risks would be treated as sensitivity tests in the appraisal.)

4.22 ORR therefore also uses Option 1, with a lower adjusted discount rate for safety-related benefits.

[19] See Appendix C of http://www.competition-commission.org.uk/rep_pub/reports/2010/558Bristol.htm
[20] Review of cost-benefit analysis and benefit valuation', for UKWIR, 2010, http://www.ukwir.org/ukwirlibrary/93550. The Spackman approach was also applied in the Department for Transport's published analysis on 2009 of a proposed third runway at Heathrow.
[21] See: http://www.rail-reg.gov.uk/upload/pdf/cnsltrep-NERA_disc_rates.pdf.

Ofcom

4.23 In Ofcom's 2005 "Better Policy Making"[22] document, Ofcom set out its general approach to discounting costs and benefits in CBAs:

"*Where it is possible to quantify costs and benefits, we will use the discount rate recommended by HM Treasury (unless there are specific reasons to do otherwise) to discount future costs and benefits and work out the net present value*."

4.24 To date, Ofcom has, in complying with the Green Book, discounted costs and benefits at the STPR (excluding financing costs). It has also tended to use the relevant WACC in sensitivity checks.

Ofgem

4.25 Ofgem regulates different elements of the energy sector in quite different ways, the generation and supply markets which are competitive are scrutinised by the Markets Division while the 'natural monopolies' of the transmission and distribution sectors are subject to price controls set by the Smarter Grids and Governance Division. Depending on the current task, Ofgem chooses the appropriate approach.

4.26 As the examples below illustrate, Ofgem generally opts for either the relevant Weighted Average Cost of Capital (WACC), or the Social Time Preference Rate (STPR), and may use one as a sense test with the other providing the base case (although there may of course be particular circumstances which call for a different approach). While it is true that the costs of the schemes analysed are borne by private companies and benefits accrue in part or in the whole to consumers, *these examples are all of cases where all costs (or almost all in the case of the Low Carbon Network fund) are borne, ultimately, by consumers* and the companies are compensated for investment required by the cost of capital determined for the appropriate price control.

4.27 Ofgem departs from this approach only where reduced carbon emissions are the objective. In these instances as well all, or nearly all, costs are recompensed by consumers and our application of the STPR appears a more appropriate balance of the needs of current and future consumers than the commercial cost of capital.

4.28 Ofgem has a duty to undertake Impact Assessments (IAs) for all important policy proposals that we make. Ofgem has developed an approach to IAs in line with best practice, while ensuring that its decisions are consistent with its wider statutory duties. It has recently carried out a review of its approach to conducting IAs and has published revised guidance[23]. Amongst other things, the guidance sets out the legislative background for producing IAs and outlines the basic framework that Ofgem will normally follow in producing them. The guidance has been revised to take account of best practice as it has developed, for instance in relation to sustainability issues, and it sets out Ofgem's approach to cost-benefit analysis.

Concluding remarks

4.29 As demonstrated in the above discussion of regulators' practices and the theoretical discussion in Section 3, the approach taken should and does vary depending on the type of exercise being undertaken. However, for the general case of assessing a

[22] http://www.ofcom.org.uk/consult/policy_making/guidelines.pdf
[23] http://www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=12&refer=About us/BetterReg/IA

private investment that delivers potential public benefit, the Spackman approach appears to be the established and most practical method.

4.30 A simple example of how the Spackman method works is outlined below (using simplified parameters, and ignoring tax and inflation effects for illustration only).

Scenario: we are conducting a CBA to understand whether it would be beneficial to society for a company to invest in software that would lower switching costs for consumers. All costs are passed on to the consumer in the form of higher prices, which impacts demand.

We know the following parameters:

Capital cost	£10,000
Cost of capital	10%
STPR	3.50%
Benefit to consumers per year, estimated from evidence gathered (unadjusted for the impact of higher prices on demand)	£3,000
Relevant period of time (years)	5

Using estimates of demand, we estimate the deadweight loss "triangle", the welfare loss per year due to the increase in prices, as £250. The benefit to consumers adjusted for this welfare loss is therefore £2750 per year (£3000 minus £250).

Year	1	2	3	4	5
Payment from consumers required for firm to earn 10% return on capital investment	£2,637.97	£2,637.97	£2,637.97	£2,637.97	£2,637.97
Adjusted benefit to consumers, estimated from evidence gathered	£2,750	£2,750	£2,750	£2,750	£2,750
Net benefit = benefit to consumers – payment made by consumers	£112.03	£112.03	£112.03	£112.03	£112.03
Net benefit discounted at the STPR (3.5%)	£102	£93	£84	£77	£70
Net present value = sum of discounted net benefits	**£425**				

Step 1: Convert capex into annual costs using WACC

Step 2: Discount costs and benefits at STPR

We welcome views on particular issues that regulators may need to take into account in different contexts in deciding on the appropriate approach to discounting in different cases.