

Returns in broadband market 1

Summary report prepared for BT

25 May 2010

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1 Introduction

1. On 23 March 2010, Ofcom issued its consultation entitled "Review of the wholesale broadband access markets". As part of this consultation, Ofcom has concluded that in Geographic Market 1,¹ BT holds a position of Significant Market Power ('SMP') and that, as a result, Ofcom proposes general access and non-discrimination obligations on BT. Ofcom also proposes the imposition of a charge control with a requirement that charges are based on cost orientation.
2. We have been asked by BT to comment on:
 - a) whether there is any evidence that would justify setting a price cap in Market 1; and
 - b) if nevertheless Ofcom were to decide that a price cap is appropriate, whether there is a valid economic rationale for any price cap on the provision of wholesale broadband services in geographic Market 1 allowing BT to recover more than its regulated average rate of return.

This document is a summary of our more detailed considerations presented to BT.

2 Key findings

3. Ofcom's usual approach to determining a regulated return only takes into account systematic risks that affect the WACC and does not take into account the large specific risks associated with investments such as broadband. There are strong arguments that a regulated return should take into account such risks, just as fully commercial companies do in competitive markets when making similar investment decisions. Indeed, Ofcom has itself acknowledged this principle, though has yet to take any significant practical action as a result.
4. Specific risks should be taken into account both for Ofcom's review of the historic returns from broadband to date and any forward-looking assessment of allowable returns to investment in ADSL2+.
5. Profitability assessment should not be based on snapshot accounting ratios such as ROCE at a single point in time. Such measures are highly sensitive to depreciation policy and cannot be considered a reliable indicator of true economic profitability.
6. There are sound arguments to support BT's case for a price cap that affords a significant uplift on the regulated WACC to reflect specific risks. Ofcom has tried to frustrate such arguments by laying out detailed conditions for allowing

¹ Geographic Market 1 consists of exchange areas where there are no competing providers at local exchanges and BT is currently the sole provider of broadband over fixed infrastructure (i.e. excluding satellite and wireless). In its current consultation, Ofcom proposes that Market 1 consists of about 14% of UK premises.

such uplifts that are difficult (if not impossible) to prove satisfied. We consider that this sets up an unreasonable burden of proof on BT.

3 Economic principles

7. What is an appropriate rate of return?² Broadly speaking, greater risk means that investors require correspondingly greater returns to compensate for that risk. Traditional regulatory approaches have involved regulators setting controls that allow investors to receive compensation for risks that cannot be diversified (so-called *systematic risk*).³
8. However, there are various objections to the dogma of regulated returns being solely a question of how much systematic risk investors face. These are issues that Ofcom itself has identified in other contexts, but not acknowledged in the context of wholesale broadband access:
 - *First, regulation itself creates risk.* It is not just risk that should determine regulated returns. Regulation itself creates its own risks and changes the exposure of regulated firms to demand and cost risks. This creates a feedback loop;
 - *Second, little if any account is taken of specific risks* – risks that do not affect the cost of capital if investors are well-diversified - but which might nevertheless have real effects on the behaviour of the regulated firm. General business practice in competitive, unregulated markets suggests that investment decision-making often depends not just on systematic risks (which influence the cost of capital) but also specific risks (which do not). Typical regulatory dogma that only systematic matters is borne out by neither theory nor practice.
9. The first theme - regulatory risk - itself contains a plethora of issues all of which are relevant here:
 - Regulation is contingent, in the sense that only successful products and services get regulated. Regulation typically caps the upside returns from an investment, but does not limit the downside exposure if the investment is unsuccessful. This creates the problem of *censored returns*, where regulation becomes a one-way bet. In essence, hindsight biases mean that regulated firms may not be compensated for the risks faced at the time of investment decisions. This hindsight bias, often called “survivorship bias”, has been acknowledged as important in the

² See [Annex A](#) for a more detailed discussion of the issues highlighted in this section.

³ Systematic risks differ from specific risks, which investors can lay off by holding small shares in many companies.

assessment of profitability by competition authorities.⁴ Broadband has proved successful, but we must not forget the situation during early product development, when BT sunk significant resources without any guarantee of success.

- The fine details of the price cap mechanism may affect *regulatory risk* significantly. Periods for price-cap regulation, provisions for re-opening regulatory determinations and cost-pass through change the distribution of risk between the regulated firm and its customers. Such issues are subject to current review by a number of UK regulators due to concerns that loading too much risk on the regulated firm may discourage investment. Ofcom appears less willing to consider the role of the regulator in reducing risk and encouraging investment than other sectoral regulators.
 - Underlying regulatory requirements to provide a particular service might preclude risk-reducing strategies that the provider could otherwise have adopted. For example, in an uncertain environment, there might be value to a “wait and see” approach, where a decision is deferred until there is greater clarity about its likely success. Forcing provision of a service now may entail a cost to the provider (as it forgoes a so-called *real option*) for which it should be compensated provided that this is not simply rewarding market power.⁵ Even in competitive markets, uncertainty and sunkness of investments can mean that returns need to rise significantly above the WACC in order to provide an incentive to invest.^{6,7}
10. There is a common thread to all these issues in that what brings them to the forefront is new investment, especially to provide new services or to upgrade the quality of existing ones. In the past, regulation has been able to take a much more steady state view of the world, but now there is need to provide sufficient incentive for new investment in a more dynamic environment.

⁴ In the UK supermarkets inquiry, the Competition Commission (2000b, paragraph 8.85) explicitly adjusted their interpretation of profitability for survivor bias, noting that: *'In a more competitive environment there is the potential for a so-called 'survivor bias'. If some companies earn more than their cost of capital and some less, and if some of the latter group, as a result, cease to trade, then the measured average IRR of the surviving companies will exceed their cost of capital, even if all of them are in a fully competitive market. As a result a degree of caution is needed when making comparisons of IRR and cost of capital.'*

⁵ See Dixit, A.K. & R.S. Pindyck (1994) “Investment under Uncertainty”, Princeton University Press, Princeton, N.J.

⁶ See Dobbs, M. (2004) “Intertemporal price cap regulation under uncertainty,” *Economic Journal*, Royal Economic Society, vol. 114(495), pages 421-440.

⁷ Busby, J. and G. Pitts (1997) “Real options in practice: an exploratory survey of how finance officers deal with flexibility in capital appraisal”, *Management Accounting Research*, Volume 8, Issue 2, June 1997, Pages 169-186.

11. Such considerations clearly apply to broadband Market 1 to the extent that inappropriate regulation could erode incentives to upgrade service quality, or replace existing broadband assets, in the future. However, they also apply retrospectively, in that Ofcom needs to treat BT's current broadband assets reasonably even though the investment has already been made; to do otherwise would undermine Ofcom's credibility in the future.
12. Moreover, Ofcom should also consider that averaging of the cost of capital across many projects raises a number of potential problems. First, if the average regulated return is forced down sufficiently close to the cost of capital, then it follows that, taking account of capital costs, a regulated company would actually be making an incremental loss on its more risky services.⁸ This issue is most obvious in the case of new services, which are by their very nature likely to be more risky than existing ones. Second, it makes no sense to compare the returns generated by one particular service with the average cost of capital for an entire company offering a mix of products. To do so would make relatively riskier services look artificially profitable and less risky ones look loss making.

4 Precedent from other regulated sectors

13. There is relevant precedent in the setting of regulated charges when there are uncertain, long-term investment decisions. Other regulators have been pragmatic and allowed uplifts to encourage investment. Some regulators in the UK – such as Ofwat and Ofgem – put considerable effort into reviewing the capital investment plans of operators and designing charge controls that account for the investment levels anticipated by firms. Whilst benchmarking the proposed costs where possible in order to ensure that investment levels are efficient, regulators generally incorporate significant capital expenditure allowances within a charge control, be it through an initial price adjustment to a control, or through permitting specified capital allowances year-on-year. Some regulators have also sought to address regulatory uncertainty associated with such investment by providing regulated firms with reassurance in relation to future price controls.
14. Recently, various regulators have been giving thought to upgrades of infrastructure, where current networks are reaching the end of their life or where large scale changes need to be made in order to meet new, say environmental, standards. For example, in the light of new European commitments in relation to carbon emissions within the UK, energy operators will be required to make wholesale infrastructure changes. In light of the need to better incentivise the regulated firms to make these considerable

⁸ Even though this loss might be covered by positive margins on its less risky services, there is potentially an incentive to reduce the supply of these risky services (or at the very least delay meeting an increase in demand for such services).

investments, Ofgem is – in consultation with industry players - currently undertaking a major review of the adequacy of its historic approach to price regulation in the energy sector.⁹

15. Some regulators have also considered allowing for contingency funds for more uncertain levels of investment. For example, the CAA has allowed for such a fund in its most recent control on BAA (e.g. a 25% contingency for the Heathrow East Terminal). However, such contingency options are less prevalent insofar as many regulators are already fairly generous in relation to capital investment allowances. Clearly these are somewhat ad hoc methods of dealing with the problem of providing investment incentives in the present of specific risk, but nevertheless they demonstrate other regulators coming up with practical solutions to address this issue.
16. Where similar types of upgrades and investments are required in the telecommunications sector, it is unclear why Ofcom should not give such investment due consideration either through a capital allowance within a control or through a contingency allowance, where options for future investment are concerned. Indeed, in the case of NGA there is already an appreciation at a European level that some uplift of returns may be needed given the particular risks of such investment.¹⁰
17. Ofcom has also considered the relationship between regulated prices and investment incentives in a number of its proceedings, most importantly in its review of the approach to risk in the assessment of the cost of capital in 2005 and the regulatory challenges posed by NGA from 2006 to 2009. However, as part of this consideration Ofcom has set out a formal list of criteria to be satisfied before it will accept real option arguments. The criteria include that:
 - a) there is an option to wait and see (that the investment must not be now or never);
 - b) the net returns must be uncertain; and
 - c) the investments must be irreversible.

In addition Ofcom has set out a set of more specific criteria, whereby the three conditions above can be assessed.¹¹

⁹ See Ofgem consultation of January 2010 entitled “Regulating energy networks for the future: RPI-X@20 Emerging Thinking”.

¹⁰ The current EC draft recommendation on NGA makes provisions for “risk premia” to be added to allowed rates of return for NGA investments.

¹¹ These include: “the presence of a significant amount of demand uncertainty (e.g. return on investment is dependent on demand growth); investment cannot be staged, reversed, or piloted; significant technology risk; risk of stranding due to investment being competitor-specific; the availability of other investment strategies (e.g. new demand can be served using existing network); and no chance that loss of wait and see will be mitigated by gaining a first mover advantage”. See “Ofcom’s approach to risk in the assessment of the cost of capital”, Ofcom August 2005.

18. Other regulators have expressed concerns about traditional approaches disincentivising investment and taken a pragmatic approach, for example entertaining a much wider range of forward looking solutions, including longer control periods, project contingency allowances and re-openers in regulatory determinations. In contrast, Ofcom has set up extremely formal criteria for accepting real options arguments and set an artificially high burden of proof on BT. We do not consider this burden of proof is justifiable given that one would expect real options issues to be endemic to investments in the telecoms sector. It is very important that theoretical perfection is not set as the standard to be achieved before the question of specific risk is considered in telecommunications regulation. Estimating what allowances might be required is undoubtedly a difficult question, but this has not stopped other regulators taking a more pragmatic approach.

5 Returns on existing broadband assets

19. We now turn to the question of whether BT's current returns on broadband services in Market 1 are reasonable. In making any profitability assessment, we would urge Ofcom not to put much store in accounting ratios such as ROCE or ROS calculated for single points in time. These are poor metrics of excess profitability for individual products and services as they are very sensitive to the accounting treatment of assets and, notably, the timing of depreciation.
20. Where assets are sunk, it may take some time for the investment to begin paying off. As a result, latter year snapshot profits may appear high, when in reality they are simply reflecting investments from preceding years. In addition, the accounting treatment of assets often entails a more rapid depreciation of assets than their true decline in economic way. That such accounting policies are used is not surprising, as they represent a way of businesses exercising internal control over risky projects. This leads to a common pattern in which ROCE is negative in the early years but then large later when the book value of the assets is low. This can happen even in a competitive market in steady state. The pattern of increasing ROCE does not mean that underlying profitability is increasing; this is purely an accounting artifact caused by accounting depreciation outstripping true economic depreciation.
21. Instead, longer-term metrics such as internal rates of return (IRR), are superior insofar as they can capture the profitability of the product over a longer timeframe or even its entire lifetime. Competition authorities are increasingly

using such metrics for this reason.¹² Such measures are a true measure of economic returns unaffected by depreciation policies and accounting artifacts. To the extent that it is difficult to estimate IRRs, this is not the fault of the methodology, but rather a reflection of unavoidable uncertainty in measuring economic returns. Metrics like ROCE might seem to require less data to calculate, but any precision they seem to offer is specious. Ofcom has failed to acknowledge sufficiently these weaknesses of metrics such as ROCE, and has failed to assess more appropriate alternatives such as IRR.

6 Returns and upgrading

22. There are two key arguments for why BT should be allowed an uplift on the cost of capital – avoiding hindsight bias and to make allowance for real options effects:
- a) Despite comprehensive reviews by Ofcom in 2003/4 and 2007, there has been no price cap imposed on wholesale broadband to date, nor any obligation for cost orientation. Therefore, any intervention now could not have been anticipated earlier in terms of timing or severity. Under these circumstances, Ofcom should not discount risks faced by BT early in the life of the service. If Ofcom were to cap BT at the cost of capital now, in effect, Ofcom would be limiting BT's returns without regard to the downside risks that have been faced previously and potentially expropriating the value of the assets.
 - b) Uplift can also be justified by considering, as a benchmark, what returns might be obtained in a comparable competitive market with similar conditions of investment irreversibility and uncertainty. In practice, returns in competitive markets with these characteristics are not eroded down to the cost of capital. Investment is risky which creates a natural reluctance to invest, waiting and seeing what happens to the marketplace can reduce risks, a so-called "real option".
23. As noted, above Ofcom has already acknowledged that this issue should be reflected in regulation in cases where investment incentives are important (e.g. NGAs). However, Ofcom has set out a formal list of criteria to be satisfied before it will accept real option arguments. We consider that this sets a very high, if not unachievable, burden of proof on BT. Other regulators, on the other

¹² The OFT's Economic Discussion Paper 6 "*Assessing profitability in competition policy analysis*" has supported the use of alternative metrics to ROCE and other snapshot profitability measures, notably highlighting Internal Rate of Return (IRR) measures that are more suited to accounting for returns over the life of an investment. Such measures have been regarded as relevant where snapshot metrics can be expected to fail to capture the underlying features of the product (e.g. its highly capital nature) or the circumstances of the market (e.g. the finite time horizon for the recovery of asset costs or other reasons why the market cannot be in a steady state). Such metrics have been used by competition authorities, such as the Competition Commission's Classified Directories Advertising Services Inquiry (2007), SME Banking Inquiry (2002) and the CC assessment of profitability of supermarkets (2000).

hand, are less formal when taking account of investment uncertainties. Rather than setting criteria for option uplifts, UK regulators have used allowances for investment incentivisation (in the water industry) and allowed contingency budgets for project risks as part of the regulated asset base (for new airport capacity).

24. Upgrading Market 1 exchanges would boost connection speeds, enable services for more remote customers and go part way to meeting the Digital Britain ambitions. It would allow future increments in bandwidth to be provided at lower marginal cost. However, it would also require a large investment from BT that would be largely sunk, where it is not obvious how much more customers would be willing to pay for the greater bandwidth. At the same time, ADSL2+ services would be still at risk from unexpected dislocating innovations, which might limit the economic life of the assets. There are also significant regulatory risks as a price cap might be shorter than the economic life of ADSL2+ investments, creating the risk of BT being held up at the end of price control and demand assumptions are critical in determining prices and there are few re-openers of the price cap if forecasts prove too optimistic.
25. We consider that in order to continue to incentivise BT with respect to undertaking investment, Ofcom should both reflect in its modelling a higher WACC on which a return may be earned, or uplifts to account for the various risks associated with the investment (including those relating to demand uncertainties, technology and obsolescence). Where new investments upgrading Market 1 exchanges are made, there are two economic arguments for returns above the average BT cost of capital:
 - The upside from investing is curtailed by regulation, whereas the downside is not, tending to lower expected returns overall in the case that investment cannot be unwound. This is especially important if there is no provision for relaxing regulation in unexpected adverse outcomes.
 - The obligation to provide a regulated service precludes various risk mitigation strategies. The regulated party should be compensated for not being able to use these risk mitigation strategies (a loss of so-called real options), provided that this is not simply rewarding market power.
26. Failure to reflect a higher WACC or allow for uplifts to account for the risks, presents the real risk of damaging BT's incentives to invest in this market.

Annex A: Economic assessment of regulation in the context of uncertainty

27. In this Annex we discuss in greater detail the themes brought out above. In particular, we describe regulation in the context of censored returns, regulatory induced uncertainty and real options.

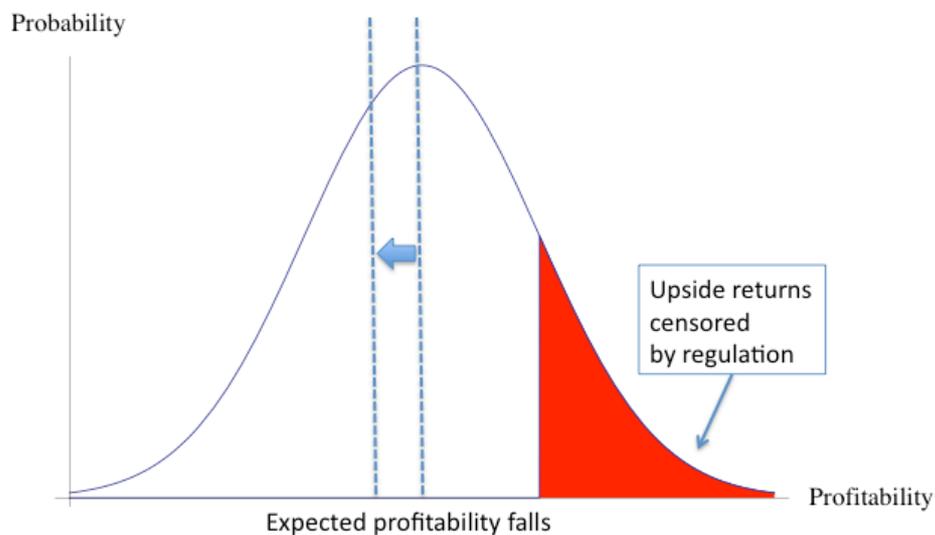
A.1 Regulation and censored returns

28. Regulation acts as a limit on the returns that can be earned from an investment. However, for regulation to be applied, the investment needs to be sufficiently successful to create a service that is attractive enough to customers to create an SMP position. Therefore, from the perspective of the original investor, regulation may cap the upside, but still leave the investor exposed to the full downside. This is the problem of *censored returns*.

A simple example

29. At the time of investing, future returns are uncertain. The figure below shows a typical distribution of returns. Because regulation snips off the upside returns (shown in red), this shifts down the expected profitability of the investment.

Figure 1: Example of censored returns



30. Ofcom has clearly recognized this censorship effect in the context of NGA investment and the potential for depressing investment incentives.¹³ It would be difficult for Ofcom to push returns for broadband down to 11% now without having this statement quoted back at them on appeal. Although the question of appropriate returns for NGA investments (as put by Ofcom) was clearly forward-looking, whereas ADSL investments are already here, both situations are closely comparable.

Lack of regulatory commitment

31. Timing has an important role in these arguments. Provided there is clarity about the future regulatory process at the time the investment is made, the regulated party can anticipate the potential impact on project profitability and factor this in.
32. However, the problem is that there may not be a clear, long-term regulatory commitment and regulation may change over time. Under these circumstances, the regulated party may find that regulation is imposed in conditions where an investment has been successful, but without regard to the risks that the investor faced when the original investment was made. The regulated party will not have been compensated for the risks that it faced during the earlier life of asset and regulation has been applied with the benefit of hindsight.

Hindsight biases

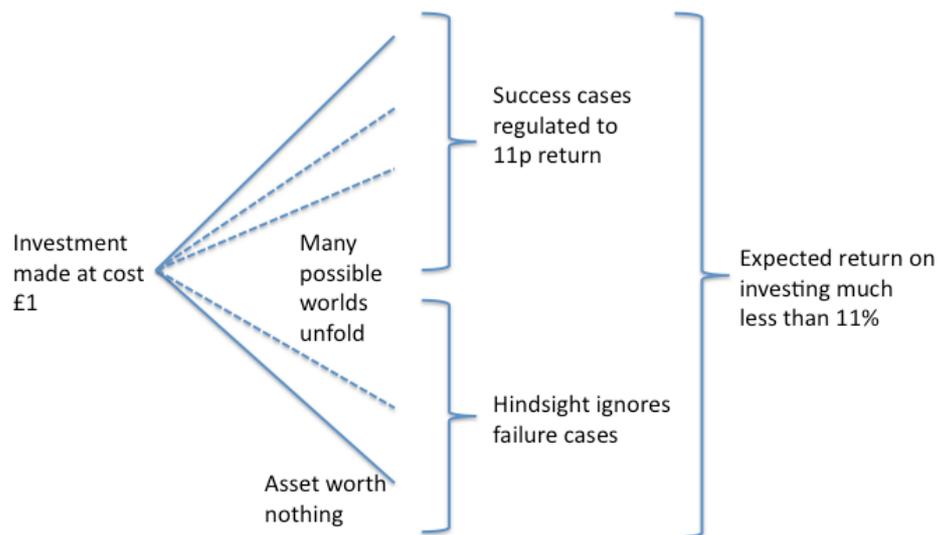
33. This hindsight bias is often called “survivorship bias”, in the sense that only firms who survive get regulated and this may not compensate them for facing risks that would have annihilated them along the way. Survivorship bias has been acknowledged as important in the assessment of profitability by competition authorities.¹⁴ However, the issue of hindsight bias is more general, and includes all manner of risks, such a dimensioning networks for demand that does not materialize.
34. If profitability is assessed *ex post* later in the life of an asset once many of the original investment risks have resolved, then no regard will be give to the risks that the investor faced *ex ante*. Figure 2 below shows a simple example. To the extent that *ex post* profitability is then regulated down and this was unanticipated by the investor, there will have in effect been a “hold-up”. With sunk investments, the regulator may reckon that the regulated party has little option but to continue operating, as it may be uneconomic to wind up the

¹³ See “Future Broadband: A policy approach to next generation access”, Ofcom, September 2007, available at http://www.ofcom.org.uk/consult/condocs/nga/future_broadband_nga.pdf.

¹⁴ In the UK supermarkets inquiry, the Competition Commission (2000b, paragraph 8.85) explicitly adjusted their interpretation of profitability for survivor bias, noting that: *'In a more competitive environment there is the potential for a so-called 'survivor bias'. If some companies earn more than their cost of capital and some less, and if some of the latter group, as a result, cease to trade, then the measured average IRR of the surviving companies will exceed their cost of capital, even if all of them are in a fully competitive market. As a result a degree of caution is needed when making comparisons of IRR and cost of capital.'*

assets at that point. However, if we could turn the clock back to when the investment was originally made, the expected return would then be insufficient to provide an incentive to invest.

Figure 2: An example of hindsight bias



Regulatory credibility in future

35. From a broader policy perspective, the most significant problem is not that the investor has lost out, but that this may undermine the credibility of the regulatory system. Future investors may be reticent to invest if there is a risk of future regulation that cannot be anticipated or quantified at the time of the investment. Therefore, failure to take account of hindsight biases ultimately leads to a regime in which investors are not prepared to take risks as there is insufficient reward.

A.2 Regulatory-induced uncertainty

Control period length

36. A key determinant of regulatory uncertainty is the length of any price control period and the extent to which commitments might be given in one price control period that limit regulatory discretion in the subsequent price control period. As one control period ends, the regulated firm faces a risk of the regulator setting a new price cap, possibly even with a P_0 adjustment, that lowers its returns. As most investment is sunk, there is the risk of "hold-up" – that the returns fall below the level at which the operator would choose to invest if making the decision now, but that the operator nevertheless carries on providing services as it is uneconomic to unwind the assets.
37. Using a longer duration of control may mitigate such regulatory uncertainty. Our review of precedent (see below) suggests that such risks are being increasingly considered in the case gas and electricity networks where a comprehensive review is underway by Ofgem, to review the efficacy of the

controls in the context of considerable long-term investment required to meet EC emission targets. In this way, Ofgem is making recommendations to allow for longer duration investment plans to be considered.

Cost pass through and the distribution of risk

38. In some instances, regulators may agree to costs being passed through (CPT) directly to consumers. Theory suggests that where a firm is price capped (without CPT), regulated firms would generally choose a project with lower levels of risk than an unregulated firm would. Where CPT is permitted, however, both regulated and unregulated firms would make the same project decisions.¹⁵ Therefore, there are sound reasons for using CPT, though this is not something that Ofcom has done, unlike Ofgem (and its predecessors) and Ofwat.
39. Where demand uncertainties exist, price controls may include re-openers or self-correction mechanisms depending on outturn demand year-on-year within the control. Self-correction mechanisms may also include quality adjustment factors (i.e. if a company is able to deliver a higher level of quality than originally anticipated), then the regulator may allow additional revenue to be released in the next year within the control.

A.3 Real options

40. Unregulated, competitive markets often demonstrate returns that are significantly above the cost of capital. This observation is quite a challenge for regulators: why is regulation trying to force returns below the level seen in other markets where competition is adequate? This issue has been the subject of fierce debate between regulators and economists for the last decade, with regulators now starting to accept the principle that if regulation is seeking to achieve similar outcomes to competition then rates of return should not be pegged to the cost of capital.
41. Why then does competition not force returns to the cost of capital? This all turns on how easy it is for firms to entry and exit a market.

Competitive markets may not be contestable

42. The most optimistic assumption about entry and exit we could possibly make is that a market is *contestable*. This means that an entrant can come in, operate for a short time, and then exit the market again; there are no costs associated with investing and then later disposing of assets other than economic depreciation and capital charges. In effect, it would be as if there is a perfectly functioning secondhand market for the assets, so entering, operating for a short time and exiting again is feasible.

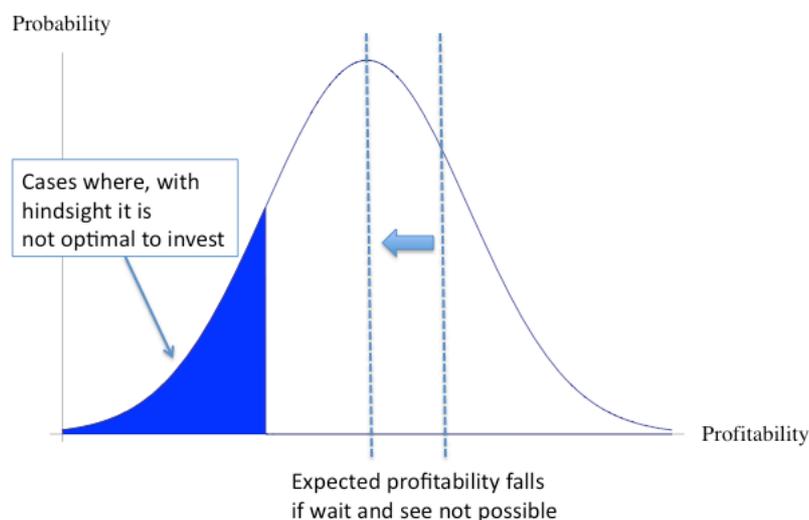
¹⁵ See "A study into certain aspects of the cost of capital for regulated utilities in the UK", S. Wright, R. Mason and D. Miles, 2003.

43. If a market is contestable, returns must be forced down to the cost of capital, as otherwise there are profits to be made by someone entering, operating for a short time while prices remain high enough to make profits and then exiting. However, in most markets, such a business strategy would be suicidal as it would not be possible to enter, operate and exit rapidly. Rather, the initial investment is often sunk and it is far from costless to exit. There is no certainty that prices will remain high enough to provide profits over the period that an entrant is committed to being in the market.
44. The fact that assets are sunk in an uncertain world makes potential entrants more cautious about entering than the contestability model would suggest. In effect, the difficulty of exiting cleanly from the market gives rise to a disincentive to enter in the first place.¹⁶ Therefore, in a real world markets, there is a friction to the entry process that keeps returns above the cost of capital. Even though there is a friction, it is still reasonable to call these markets competitive; they may have many competitors with small market shares.

Wait and see as a risk-reducing strategy

45. There is another way of looking at this issue in the context of regulation. If a regulated firm making sunk investments is forced to supply a service with a return pegged at the cost of capital, then in effect it is being forced to do something that a firm in a competitive market would not choose to do.
46. Unregulated firms typically have a wide range of strategies available to them to manage investment risks. In situations where investments are to some extent sunk (and cannot be economically unwound after being made), there is often an incentive to wait. By doing this, some of the uncertainty surrounding the investment can resolve and a more informed decision made.
47. Figure 3 below shows this effect at work. Suppose, as in the previous subsection, that investment returns are uncertain. If the investment is made now, there are some situations (the blue area) in which the investor will find that, with the benefit of hindsight, it would have preferred not to have made the investment. However, because the investment is sunk, it cannot be unwound and there is no alternative but to continue in these cases.
48. In contrast, if the investment decision had been deferred, it is possible that the investor would have better information whether or not the unprofitable cases are likely to occur; indeed, it might even know where on the range of possibilities project profitability will lie. Therefore, "waiting and seeing" is a useful strategy, as in effect allows the blue cases to be pruned off.

¹⁶ That exit costs in effect induce entry costs was shown first in the context of labour market hiring and firing decisions. See Bentolila, S. and Bertola, G. (1990) "Firing Costs and Labour Demand: How Bad Is Euroclerosis?," *Review of Economic Studies*, vol. 57(3), pages 381-402, July.

Figure 3: Example of a curtailed real option

Regulation causes foregone real options

49. Where a firm is subject to regulatory obligations, this option to “wait and see” may be precluded. The regulated party may be under an obligation to invest now to provide a service and waiting to gain better information may not be possible. However, there is then a real cost on the regulated party (a so-called real option) from having to give up the wait-and-see strategy. This is a cost of investing now for which the party needs to be compensated. Without such compensation, the expected value of the project will fall as a result of not being able to wait and see and incentives to invest eroded.

Return uplift as a compensation for lost options

50. This is a strong argument for an uplift above WACC in cases where investments are irreversible (or largely so) and made in conditions of uncertainty. In many cases, this uplift can be expected to be material, as even small amounts of uncertainty can have strong discouraging effects on investment.¹⁷
51. However, it rests on a forward-looking assessment of the risks of investing, which can make calculating the uplift difficult. In particular, it is necessary to create a calibrated model of the uncertainty facing the investor at the time of the investment (much as with assessing hindsight biases). This makes it very difficult to make these arguments in practice, as regulators have the easy exit route of claiming that the approach is too complex and the implications unknowable. This has very much been Ofcom’s attitude to date¹⁸, even though it has now accepted the underlying logic of real options.

¹⁷ See Dixit, A.K. & R.S. Pindyck (1994) “Investment under Uncertainty”, Princeton University Press, Princeton, N.J.

¹⁸ Some arguments about real options justifying an uplift to the cost of capital were made in the first two calls to mobile enquiries. Ofcom rejected these arguments as being too complex to assess.

Options created by market power

52. A further matter for debate is the extent to which compensating for lost real options is in effect compensation for holding market power. What if a “wait and see” strategy to reduce investment risk is only possible by virtue of being insulated from competition? In this case, the real option derives from market power and should not be reflected in regulated prices.
53. This is the most difficult and controversial aspect of applying real options to regulation. To apply this approach, we need to ensure that regulated firms are not being compensated for foregone options that they only hold only because of having SMP. In practice, some options will arise because of market power, but others would still exist even in a competitive market.

Real options can exist in competitive markets

54. One should not assume that “wait and see” is the prerogative only of monopolists. Even in competitive markets, uncertainty and sunkness of investments can mean that returns need to rise significantly above the WACC in order to provide an incentive to invest. If returns are sufficiently high to overcome option values, suppliers will enter or expand production. This in turn erodes returns through greater competition, but only up to the point where it is not profitable for any further suppliers to enter. This process will not force returns down to the WACC, as new entry will occur before this point due to the effects of option values. Therefore, option values are still important even in competitive markets.¹⁹
55. That returns are not eroded down to the WACC is borne out if we look at real-world investment practice. Firms take account not just of systematic risks, but also specific risks when they invest. Authorities from boards usually require business cases that demonstrate returns much above the WACC or which have short payback periods. There may be various reasons for this, but wait and see effects appear to be at least part of the explanation. Even though managers do not necessarily know that they are taking account of real options, the evidence suggests that they are behaving as if they are.²⁰

¹⁹ See Dobbs, M. (2004) "Intertemporal price cap regulation under uncertainty," *Economic Journal*, Royal Economic Society, vol. 114(495), pages 421-440.

²⁰ Busby, J. and G. Pitts (1997) "Real options in practice: an exploratory survey of how finance officers deal with flexibility in capital appraisal", *Management Accounting Research*, Volume 8, Issue 2, June 1997, Pages 169-186.