

**Comments on the Ofcom consultation document:
Ofcom's approach to risk in the assessment of
the cost of capital**

The equity market risk premium

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Ofcom's approach to risk in the assessment of the cost of capital

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Annexes to main response

This document includes the following two separate documents referred to in BT's main response:

Annex 1: "The equity market risk premium"
by Professor Ian Cooper, London Business School

Annex 2: "The risk of the copper access network"
by Professor Ian Cooper, London Business School

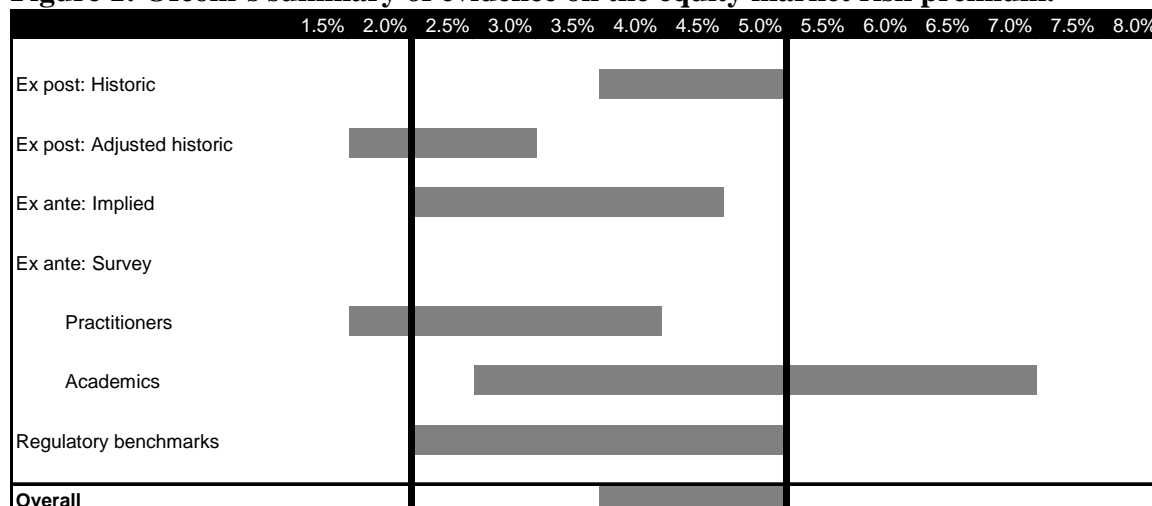
This document is available electronically at <http://www.btplc.com/responses>.

SUMMARY

Ofcom is reviewing various elements of its regulatory treatment of risk.¹ One is the equity market risk premium it uses to estimate the cost of capital. In September 2004 its estimate was 5.0% for the UK equity market risk premium.² Now it is proposing to reduce its estimate to somewhere in the range 4.0%-4.5%. This note examines the evidence on this matter.

Figure 1 reproduces Ofcom's summary of the evidence. The shaded bars show the ranges of the equity market risk premium that Ofcom says are implied by each type of evidence.

Figure 1: Ofcom's summary of evidence on the equity market risk premium.



Within each category, Ofcom selects particular evidence and omits other evidence. It is not clear what criteria Ofcom uses to select its evidence, but the omitted evidence appears to systematically point to a higher risk premium than that given by Ofcom. Furthermore, the interpretation by Ofcom of the evidence it actually uses is taken at the low end of the possible range in several cases. In addition, some of the evidence used by Ofcom is not appropriate for current use in cost of capital estimation. Also, the risk premia cited by Ofcom are often measured relative to interest rates more than one percent higher than market interest rates.

The result is a range that is inconsistent with important evidence. For instance, two of the main authorities on which Ofcom relies, the two most recent regulatory rulings, and a leading provider of current market estimates, all give estimates of the equity market risk premium that

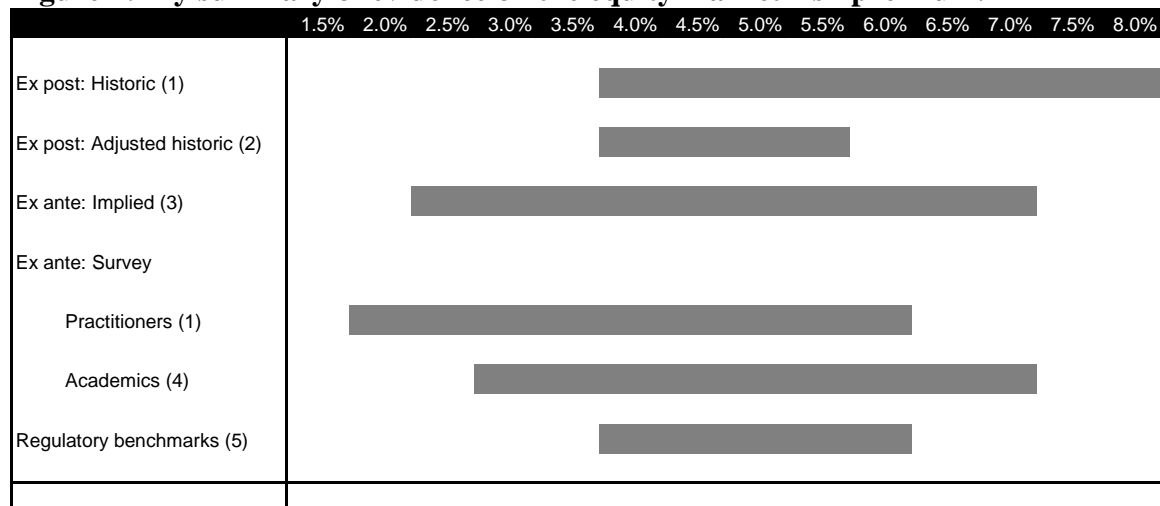
¹ Ofcom (2005).

² Ofcom (2004b).

contrast with Ofcom’s conclusions. Their *central* estimates are equivalent to 5.0%, 5.3%, 5.8%, 5.6%, and 5.3%, compared with the *range* of 4.0%-4.5% now proposed by Ofcom. Similarly, the single statistic that is favoured by many experts, the arithmetic historical mean of about 5.1%-5.3%, also lies outside Ofcom’s range. This suggests that the proposed Ofcom range is not consistent with the conclusions reached by experts.

Figure 2 shows my summary of the evidence, in the same form as Ofcom’s. The main difference is that I base my ranges on more evidence, evidence that is in a form more directly relevant to estimation of the cost of capital, evidence that is more recent in some cases, evidence that is not chosen to be at the bottom of a particular range, and actual risk premia measured relative to a current interest rate rather than headline numbers or those measured relative to non-market interest rates.

Figure 2: My summary of evidence on the equity market risk premium.



Sources: (1) Ogier et al, (2) Dimson et al estimates, my calculation, (3) Ofcom range adjusted to include other studies, (4) Ofcom, (5) My calculation of implications of regulatory rulings adjusted to current interest rate.

My review of the evidence suggests that a reasonable range for the risk premium is 4%-6%, with a central estimate around 5%. This is the same as the conclusion reached by Ogier et al in their recent independent study. It is consistent with the central estimates implied by the views of a number of experts cited by Ofcom.

The range does include the estimates of 4.0%-4.5% proposed by Ofcom. However, it does not support Ofcom’s conclusion that 2%-5% is a ‘reasonable range’. In my opinion, Ofcom derives the low end of this range from evidence that should not receive much weight. Nor does the evidence support the view that 4.0%-4.5% is towards the top end of the reasonable range, as Ofcom suggests. Rather, the evidence suggests that it lies at the bottom end of such a range.

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APPENDIX 2: DISCUSSION OF OFCOM'S EVIDENCE ABOUT REGULATORY ESTIMATES OF THE EQUITY MARKET RISK PREMIUM

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1. Introduction

Ofcom is reviewing various elements of its regulatory treatment of risk.³ One is the equity market risk premium it uses to estimate the cost of capital. In September 2004 its estimate was 5.0% for the UK equity market risk premium.⁴ Now it is proposing to reduce its estimate to somewhere in the range 4.0%-4.5%.

This note examines the evidence on this matter.

2. Ofcom's new position

Ofcom reviews a variety of evidence on the equity market risk premium. According to Ofcom, the evidence indicates the following:

1. A reasonable range for the equity market risk premium is 2.0% - 5.0%.
2. The current evidence indicates a risk premium lower than its previous estimate of 5.0%.
3. A central estimate of 4.0% - 4.5% is unlikely to be 'too low'.

Ofcom's previous estimate of 5.0% was made as recently as September 2004.⁵ None of the evidence now cited by Ofcom is new since then. Therefore, it appears that the revision results from reassessing existing evidence rather than information contained in new evidence.

3. Is the picture portrayed by Ofcom consistent with the evidence?

The debate on the equity market risk premium can become very technical. It involves potentially huge amounts of evidence, from which Ofcom has chosen a sample. Before addressing the details of the evidence, I first examine whether the general picture portrayed by Ofcom is consistent with the conclusions reached by various experts. I focus particularly on sources cited by Ofcom.

Ofcom refers to two general authorities on the cost of capital.⁶ One is Brealey and Myers, who favour an estimate of the market risk premium

³ Ofcom (2005).

⁴ Ofcom (2004b).

⁵ Ofcom (2004b).

⁶ Ofcom (2005) footnote 3.

much higher than Ofcom. However, they may be one of the academic authorities whose views Ofcom largely discounts.

The other standard source on which Ofcom relies is PwC, which has recently published an independent survey of the evidence on the UK cost of capital.⁷ Ofcom also refers to other PwC work several times. It does not, however, report the conclusion of the PwC survey regarding the market risk premium for use in the cost of capital. This is that: ‘there is common ground around the 4% to 6% mark’. The authors themselves favour an estimate of 5%, which PwC has used for the Office of Government Commerce as its estimate of the equity market risk premium when setting the cost of capital.⁸

Ofcom relies for technical details on a study produced for a panel of UK regulators, including Oftel.⁹ The study was written by a combination of practitioners and academics to ‘gain an independent view’ of estimation of the cost of capital. Ofcom does not report its conclusion regarding the equity market risk premium:

‘A commonly used estimate of the equilibrium short rate .. is of the order of 2.5%. Using this figure, the implied equity risk premium is of the order of ... 4-5 percentage points (arithmetic). Given our preferred strategy ... any higher (or lower) desired figure for the safe rate would be precisely offset by a lower (or higher) equity premium...’

In other words, when the real interest rate is 2.5% the equity market risk premium is between 4.0% and 5.0%. This results from the study’s strongly stated conclusion that the real expected return on the equity market is 6.5% to 7.5%, regardless of the interest rate. With the current market real interest rate of 1.7%, it implies an estimate of the equity market risk premium between 4.8% and 5.8%, with a central estimate of 5.3%.

Another type of evidence on which Ofcom relies is UK regulatory rulings. The most recent ruling it refers to is the Ofwat ruling in 2004.¹⁰ Ofcom reports that Ofwat uses a risk premium of 4.0%-5.0%. This is the headline range from which Ofwat, advised by Cambridge Economic Policy Advisers/Europe Economics, derived its estimate of the cost of

⁷ Ogier et al (2004).

⁸ PwC/Franks (2002).

⁹ Wright et al (2003).

¹⁰ Ofwat (2004).

capital.¹¹ However, the range is misleading for two reasons. First, Ofwat's final estimate is close to the top of the range. Second, as with Wright et al, the premium is added to an 'equilibrium' interest rate approximately one percent greater than the market interest rate. Relative to the current market interest rate at the time, Ofwat's estimate was equivalent to about 5.8%.¹² This is very similar to the 5.75% that Ofwat reports as being the estimate made by NERA. Similar adjustments apply to the recent estimate used by Ofgem, which corresponds to an estimate of 5.6% relative to the current market interest rate.¹³

Ofcom also refers to evidence from a number of surveys. The problems with survey evidence in this area are well known, but the benefit of survey evidence can be that it reflects current market conditions. Some of the survey evidence used by Ofcom is from the US, which limits its relevance to the UK. Other parts of it are old, which largely negates its value in capturing current market conditions. There is, however, one survey-based estimate that is UK specific, up-to-date, and widely used. This is the Bloomberg estimate based on current surveys of investor expectations and current market prices. According to Bloomberg, the UK equity market risk premium is currently 5.3%.¹⁴ Ofcom does not report this.

In summary, two of the main authorities on which Ofcom relies, the two most recent regulatory rulings, and a leading provider of current market estimates, all give estimates of the equity market risk premium that contrast with Ofcom's conclusions. Their *central* estimates are equivalent to 5.0%, 5.3%, 5.8%, 5.6%, and 5.3%, compared with the *range* of 4.0%-4.5% now proposed by Ofcom. This suggests that the proposed Ofcom range is not consistent with the conclusions reached by experts.

To investigate whether the evidence used by Ofcom implies that one should ignore these opinions and adopt the Ofcom view, I now examine that evidence. Appendix 1 and Appendix 2 give the details of this analysis. The next section presents a summary. Appendix 1 discusses the details of the empirical evidence, Appendix 2 discusses the opinions of regulators.

¹¹ Ofwat also reports that NERA estimated the market risk premium as 6%.

¹² The Competition Commission also used its risk premium estimate in a non-standard way in the mobile telecommunications review. The headline premium was used in a way that made it equivalent to a higher number in the standard application of the capital asset pricing model.

¹³ See section 4.4 below.

¹⁴ As of 11 February 2005.

4. The evidence used by Ofcom

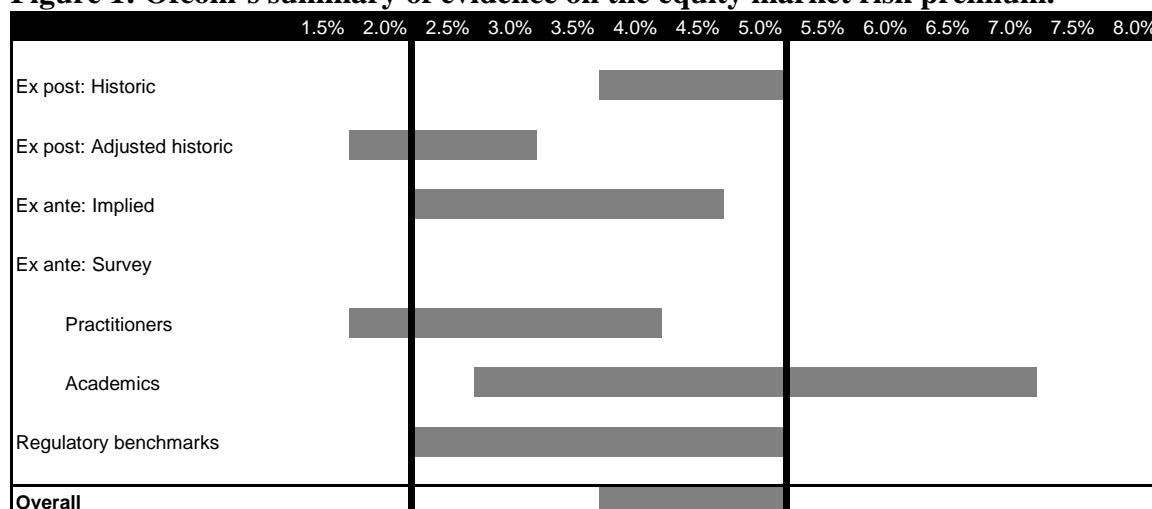
4.1 Introduction

Ofcom uses five types of evidence:

- Historical average returns,
- Adjusted historical returns,
- Estimates based on the dividend growth model,
- Estimates based on survey evidence,
- The opinions of regulators.

Figure 1 reproduces Ofcom's summary of the evidence. The shaded bars show the ranges of the equity market risk premium that Ofcom says are implied by each type of evidence.

Figure 1: Ofcom's summary of evidence on the equity market risk premium.



Ofcom largely discounts the views of academics. This leaves evidence that points to a range of 2%-5%. Within this range, an estimate of 4.0%-4.5% appears to be towards the upper end. The question that Ofcom does not address is why, if this is a balanced view of the evidence, the various experts whose views are discussed in section 3 above produce *central* estimates of the market risk premium that fall outside the Ofcom range.

4.2 Ofcom's use of historical evidence

Ofcom reports that historical evidence leads to a possible range for the risk premium of 4.0%-5.0%. Apart from any specific arguments about how to interpret historical data, its conclusion contrasts markedly with

that reached by Ogier et al. They report a range of 4%-8% based on historical evidence. The major differences are that Ofcom relies exclusively on a subset of the evidence provided by one set of authors (Dimson et al), whereas Ogier et al report a wider range of evidence, and Ofcom gives more weight to geometric averages and adjusted averages than do other experts.

One way to judge Ofcom's interpretation of the historical evidence is to examine the statistic from the historical evidence that is favoured by most experts. This is the arithmetic mean. In Dimson et al (2004) it is reported as 5.3% for the UK and 5.1% for the world. The Ofcom range based on historical evidence does not contain these numbers. Thus, even if discussion is limited to the Dimson et al evidence, the Ofcom *range* does not include the statistic that would be used as the *central* estimate by many experts.

Ofcom places weight on the geometric mean of historical returns, which is about two percent lower than the arithmetic mean. For its reliance on this number, it depends on Wright et al. Yet these authors favour the use of the geometric mean only as an interim step in the calculation of the arithmetic mean, not as an estimate in its own right, as used by Ofcom. Dimson et al reach a similar conclusion, and the vast majority of experts argue that unadjusted geometric averages are not the correct ones to use in setting the cost of capital for the application envisaged by Ofcom.

Ofcom also forms an estimate based on adjusted historical averages, using adjustments proposed by Dimson et al. These adjustments lower the raw averages. The large adjustment it uses has since been re-estimated by its authors as being much smaller. These authors also say that the adjustment is 'simplistic' and 'should not be taken too seriously'. Applying the more recent estimates gives a range of 4.2%-5.3% based on this method. Other adjustments that might be made to historical averages would raise this. It contrasts with the range of 2% to 3% that Ofcom reports.

4.3 Ofcom's use of 'forward-looking' techniques

Ofcom also reports estimates based on 'forward-looking' techniques. Ofcom's conclusion is that this type of evidence points to a range of 2.0% to 4.5%, based on estimates implied from market values and surveys of practitioners. It also reports surveys of academics, but does not give them much weight.

The range reported by Ogier et al for this type of information is 2% to 6%. The difference between this range and Ofcom's largely lies in the sources relied on and the way that the evidence is interpreted. For instance, Ogier et al report that Value Line estimates have generally ranged between 2% and 6%, whereas Ofcom does not report Value Line estimates. Ofcom reports that Merrill Lynch estimates are 4%, whereas Ogier et al report Merrill Lynch estimates as '4% to 5%'.

4.3.1 Evidence from the dividend growth model

One type of forward-looking evidence that Ofcom uses is based on the dividend growth model. From the huge number of such studies, Ofcom reports three. The studies reported by Ofcom give low estimates of the market risk premium. Other studies using the same technique give much higher estimates. For instance, Ofcom quotes a study, which gives an estimate of 3% for the US equity market risk premium, whereas an equally important study for the same period using a similar method gives an estimate of 7.3%, which Ofcom does not report. The difference between the estimates arises from a difference in the estimation of the long-run growth rate of dividends. It illustrates the sensitivity of this method to the estimate of long-run dividend growth, which is largely a matter of opinion.

4.3.2 Evidence from surveys

The other type of forward-looking evidence that Ofcom discusses is surveys of expected returns. There are many difficulties in interpreting estimates that results from surveys. Some of the problems are those of any survey, including the nature of the questions asked, the sample, the weighting of responses, and the calculation converting responses into an estimate of the market risk premium.

Another problem is more systematic and relates to the identity of the respondent and the context within which the forecast is made. Ogier et al conclude that 'the answer you get from such a survey depends on the person you ask'. It also depends on the question that is asked and the context. An illustration of this is the estimate of 3% for use by the FSA as a 'central rate for financial projections'. PwC produced this estimate at approximately the same time that it was publicly advocating an estimate of 5% for use in the cost of capital.

A simple explanation for the difference between these two estimates could be that the former is an estimate of the geometric mean, which

should be used for central projections, and the latter is an estimate of the arithmetic mean, which should be used for cost of capital calculations. If this is the case, then the estimate produced for the FSA should not be given any weight in the context of cost of capital estimation by Ofcom.

4.4 Evidence from regulators

Ofcom relies on regulatory benchmarks. Its presentation of these is reproduced in Table 1. Ofcom interprets these estimates as ‘consistent with a range of about 2.5% to 5%’.

Table 1: Ofcom regulatory benchmarks

Source/Year	Equity market risk premium	Context
Ofcom, 2004	5.0%	Various, e.g. Partial Private Circuits charge control, TV licence renewal, mobile termination charges
Ofwat, 2004	4.0%-5.0%	Future water and sewerage charges
Ofgem, 2004	3.5%, based on range of 3.0%-4.0%	Electricity Distribution Charge control review
CAA, 2003	2.5%-4.5%	Economic Regulation of BAA London Airports (Heathrow, Gatwick and Stanstead) 2003-2008, decided to use the then-recent Competition Commission range
FSA, 2003	3.0%	Rates of return for prescribed projections
CC, 2002	2.6%-4.6%	Calls to Mobiles. Noted that the extent of uncertainty concerning the downward trend in recent years made a degree of caution appropriate when implementing this decline, in part to help prevent volatility in the short term. It felt that this factor was most appropriately taken account of not by modifying their judgement of the range for the equity risk premium but by increasing the overall level of the WACC by 0.25% in real terms. This adjustment would be consistent with, for example, increasing the upper bound of its range for the [equity market risk premium] from 4.6% to 4.8%, and the midpoint of its range from 3.6% to 3.7% (or alternatively increasing the lower bound of its range from 2.6% to 2.9%).

Ofcom goes on to use this range as part of the evidence about the equity market risk premium it should use for BT. It fails to point out two other important pieces of evidence that should significantly affect its interpretation of other regulators’ estimates. These are:

- In some cases the regulators use an estimate at the upper end of the stated range.
- In some cases the regulators use the stated risk premium in conjunction with an interest rate that is much higher than the market interest rate, as opposed to Ofcom, which uses it with the market interest rate.

The first point is clearly directly relevant to any interpretation of this evidence. The second point is relevant to the use that Ofcom proposes to make of the risk premium estimate, which is to add it to a market interest rate, rather than the non-market rate that is used by some of these regulators. A risk premium used in the former way cannot be considered to be in any way equivalent to a risk premium used in the latter way. To make its interpretation relevant to the other method, it must be adjusted for the difference in the interest rates used. Ofcom clearly accepts that such issues of application are relevant because it provides analysis of the different way that the Competition Commission applied its estimate in the mobile review.

What is important in regulatory consistency is that the risk premia actually used result in consistent rates of return. If one risk premium is added to an ‘equilibrium’ interest rate and another is added to the market interest rate, the resulting rates of return will be different. Therefore, simply examining the headline range for the risk premium announced by other regulators, as Ofcom does, says nothing about regulatory consistency unless it also examines the way that these rates have been applied.

Table 2 presents the Ofcom estimates of the risk premia alongside my estimate of the risk premium that each implies for Ofcom, if it uses them in its standard approach where it adds them to the market interest rate. I have omitted the FSA from the table, because its estimate was produced for an entirely different purpose, discussed in Appendix 2. Appendix 2 also discusses the adjustments I make to each regulator’s estimate to make it appropriate for the use intended by Ofcom.

Table 2: Ofcom regulatory benchmarks restated for use by Ofcom

Source/Year	Ofcom Estimate	Restated Estimate	Adjustments to Ofcom estimate
Ofcom, 2004	5.0%	5.0%	None
Ofwat, 2004	4.0%-5.0%	5.8%	Ofwat used the top of the range. Interest rate 1.0% greater than the market.
Ofgem, 2004	3.5%, based on range of 3.0%-4.0%	5.6%	Actual range 2.5%-4.5%. Ofgem used the top of the range. Interest rate 1.1% greater than the market.
CAA, 2003	2.5%-4.5%	4.2%	Interest rate 0.4% greater than the market. CC makes a final adjustment equivalent to 0.2%.
CC, 2002	2.6%-4.6%	4.2%	Interest rate 0.4% greater than the market. CC makes a final adjustment equivalent to 0.2%.

The range of estimates actually used, converted to be appropriate to the way Ofcom uses the market risk premium, is 4.2%-5.8%. The more

recent estimates are higher than the earlier estimates, and higher than Ofcom's previous estimate of 5.0%. Thus there is nothing in the estimates used by other regulators that should cause Ofcom to lower its estimate of the equity market risk premium, given the way that it uses it. If anything, to come into line with other regulators, who add their risk premium to a non-market interest rate, Ofcom should raise its estimate.

4.5 Ofcom's use of evidence: Conclusions

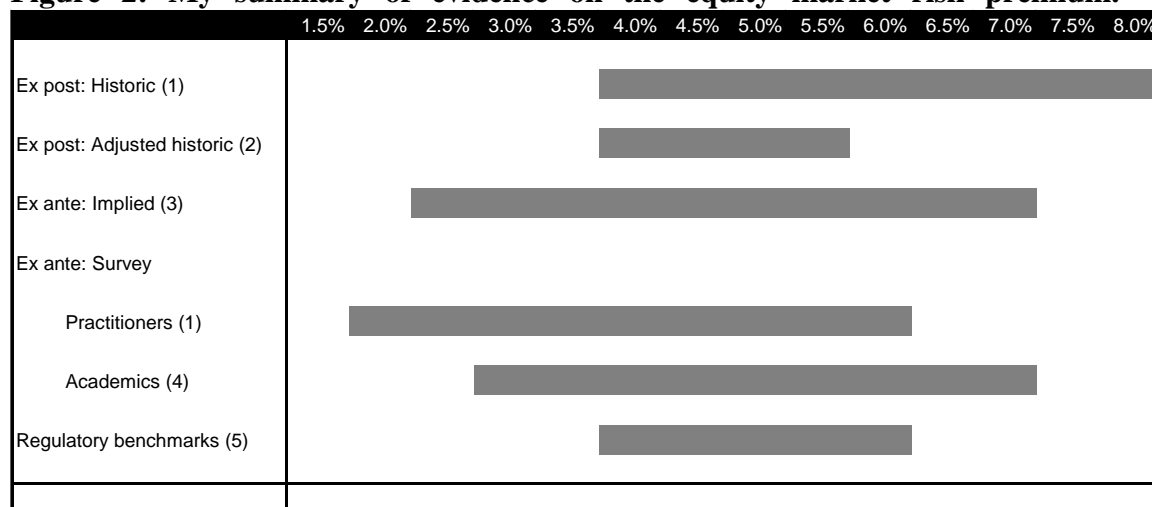
Within each category, Ofcom selects particular evidence and omits other evidence. It is not clear what criteria Ofcom uses to select its evidence, but the omitted evidence appears to systematically point to a higher risk premium than that given by Ofcom. Furthermore, the interpretation by Ofcom of the evidence it actually uses is taken at the low end of the possible range in several cases. In addition, some of the evidence used by Ofcom, such as unadjusted geometric means and the outdated estimates of the Dimson et al adjustments, is not appropriate for current use in cost of capital estimation. Also, the risk premia cited by Ofcom are often measured relative to interest rates more than one percent higher than market interest rates.

Figure 2 shows my summary of the evidence, in the same form as Ofcom's. I have tried to base this as transparently as possible on the review of the evidence given in Appendices 1 and 2. The main differences from Ofcom's ranges are:

- I use the ranges for historical estimates and survey evidence from Ogier et al.
- I use the later estimates of the Dimson et al adjustments.
- I include more studies in the implied estimates.
- I use the actual risk premium used by regulators rather than their headline ranges.

The choice of a particular estimate will always remain a matter of opinion. However, even apart from the details on which it is based, this summary of the evidence can reconcile some of the apparent anomalies regarding Ofcom's conclusions. The central estimates of the experts discussed in section 3 no longer look unreasonable. The area of overlap between the various estimates is the range 4%-6% given as their conclusion by Ogier et al. The centre of this range is 5%, similar to the central estimates given by various experts, and the same as Ofcom's previous estimate. The estimate based on the historical averages reported by Dimson et al is no longer outside the range.

Figure 2: My summary of evidence on the equity market risk premium.



Sources: (1) Ogier et al, (2) Dimson et al estimates, my calculation, (3) Ofcom range adjusted to include other studies, (4) Ofcom, (5) My calculation of implications of regulatory rulings adjusted to current interest rate.

My own view is that 5% is a reasonable estimate. It is consistent with the overall evidence shown in Figure 2. In my opinion, the statistic that is most relevant is the historical average UK risk premium of 5.3%. This is the same as the current forward-looking estimate given by Bloomberg. The adjustments for possible biases that one could make to both these numbers could go either way, and are hard to estimate.

5. Has the risk premium decreased?

Regardless of the evidence concerning the absolute level of the risk premium, it might be correct to revise downwards Ofcom's estimate if there is evidence that the risk premium has fallen recently. In fact, the evidence indicates the opposite.

The measures that best capture the change over time in the risk premium are forward-looking measures that incorporate current market conditions. Even if the level of these is biased, their change over time may still indicate the direction of change in the market's assessment of the risk premium. To assess this trend, we need a measure that has been calculated on a consistent basis from the UK market. The most easily accessible is the Bloomberg estimate.

Between April 2004, just prior to Ofcom's estimate of 5%, and the present time, the Bloomberg estimate of the UK equity market risk

premium rose from 4.5% to 5.3%. The causes were a fall in interest rates and a rise in growth expectations. The details are shown in Table 3.

Table 3: Recent changes in the Bloomberg estimate of the UK equity market risk premium

	23/04/04	11/02/05
Bloomberg UK equity market risk premium	4.46	5.26
Bloomberg expected market return	9.40	9.80
Interest rate	4.94	4.54

This rise in the market risk premium as interest rates have fallen is supported by empirical evidence¹⁵, and by the conclusions of those who favour estimating the risk premium relative to an ‘equilibrium’ interest rate, such as Wright et al and Ofwat.

One effect that might go the other way and suggest that the risk premium has fallen in the recent past is market volatility. Risk premia tend to rise when volatility falls. Recent estimates place market volatility below its long-run average.¹⁶ However, it has not fallen significantly since Ofcom estimated the market risk premium at 5%. In addition, market volatility tends to revert quite quickly to its long-run average, so one must be cautious about adjusting risk premium estimates for short-run volatility changes.

On balance, there is no evidence that the market risk premium has fallen since Ofcom estimated it as 5%. If anything, the evidence points the other way.

6. The equity market risk premium: Conclusions

According to Ofcom, the evidence indicates that a reasonable range for the equity market risk premium is 2.0% -5.0%, that the risk premium is lower than its previous estimate of 5.0%, and that a central estimate of 4.0% - 4.5% is unlikely to be ‘too low’.

¹⁵ See, for instance, Brennan (1997).

¹⁶ The London Business School Risk Measurement Service, January-March 2005 gives the volatility of the FTSE All Share Index as 15%, which is below its historical average.

My review of the evidence suggests that a reasonable range for the risk premium is 4%-6%, with a central estimate around 5%. This is the same as the conclusion reached by Ogier et al in their recent independent study. It is consistent with the central estimates implied by the views of a number of experts cited by Ofcom.

The range does include the estimates of 4.0%-4.5% proposed by Ofcom. However, it does not support the view that 2%-5% is a 'reasonable range'. In my opinion, Ofcom derives the low end of this range from evidence that should not receive much weight. Nor does the evidence support the view that 4.0%-4.5% is towards the top end of the reasonable range, as Ofcom suggests. Rather, the evidence suggests that it lies at the bottom end of such a range.

7. The use of the equity market risk premium in cost of capital calculations

Ofcom says that it may revise its estimate of the market risk premium independently of other inputs to the cost of capital, such as the interest rate. While it is sensible to limit the debate to those elements that are most controversial, there are pitfalls in separating the interest rate from the market risk premium.

First, as discussed in section 3 above, some estimates of the market risk premium are relative to 'equilibrium' interest rates that differ from current market rates. When they are adjusted to be suitable for addition to current market rates, they are higher. Second, there is evidence, discussed in section 5 above, that the market risk premium rises as interest rates fall. This should affect the interpretation and use of evidence. For instance, the Competition Commission estimate for the mobile review was at a time when interest rates were significantly higher than now.

Therefore, it is important to be clear about how the risk premium is to be applied. A risk premium that is reasonable when added to an 'equilibrium' real interest rate of 2.5%, as proposed by Wright et al, may be much less reasonable when added to the current market rate of 1.7%.

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APPENDIX 1: DISCUSSION OF OFCOM'S EVIDENCE ABOUT THE EQUITY MARKET RISK PREMIUM

A1.1 Introduction

Ofcom uses five types of evidence:

- Historical average returns,
- Adjusted historical returns,
- Estimates based on the dividend growth model,
- Estimates based on survey evidence,
- The opinions of regulators.

This appendix discusses the details of the evidence in the first four categories. The next appendix discusses the evidence on regulatory opinions.

A1.2 Ofcom's use of historical averages

A1.2.1 Introduction

Ofcom reports that historical evidence leads to a possible range for the risk premium of 4.0%-5.0%. Apart from any specific arguments about how to interpret historical data, its conclusion contrasts markedly with that reached by Ogier et al. They report a range of 4%-8% based on historical evidence.

The major differences are

- Ofcom relies exclusively on a subset of the evidence provided by one set of authors (Dimson et al), whereas Ogier et al report a wider range of evidence.
- Ofcom gives weight to unadjusted geometric means, whereas Ogier et al give these little weight.
- Ofcom produces its own very low estimates based on an adjustment proposed by Dimson et al.

Ofcom uses only the evidence provided by Dimson et al, which generally gives lower averages than the other sources discussed by Ogier et al. Within the Dimson et al evidence, Ofcom gives weight to geometric averages and to adjusted historical averages, both of which give lower estimates than unadjusted arithmetic averages, which are favoured by many experts.

The vast majority of experts argue that geometric averages are not the correct ones to use in setting the cost of capital for the application envisaged by Ofcom.¹⁷ Many also argue that the use of adjusted averages introduces the possibility of arbitrary judgements about the nature and amount of the adjustments. Therefore, the single statistic from the historical evidence that is favoured by many authorities is the unadjusted arithmetic mean average. In this case, since Ofcom intends to use it in conjunction with a bond market interest rate, the measure that would commonly be used is that calculated relative to bond returns.

In Dimson et al (2004) this is reported as 5.3% for the UK and 5.1% for the world. The Ofcom range based on historical evidence does not contain these numbers. Thus, even if discussion is limited to the Dimson et al evidence, the Ofcom *range* does not include the statistic that would be used as the *central* estimate by many experts.

A1.2.2 Geometric means

Ofcom gives weight to geometric means, on the grounds that Wright et al ‘express a “weak” preference for using the arithmetic mean’. The conclusion of Wright et al is:

‘While arithmetic mean returns should be used to proxy for expected returns, these are best built up from a more data-consistent framework in which returns are lognormally distributed..’

In other words, they have a **strong** preference for the arithmetic mean and give no weight at all to the unadjusted geometric mean. The only relevance of the geometric mean is that it may form the starting point for making an estimate of the arithmetic mean, once an adjustment is added to it. Dimson et al reach a similar conclusion, and the vast majority of experts argue that unadjusted geometric averages are not the correct ones to use in setting the cost of capital for the application envisaged by Ofcom. Even the few experts who argue for the geometric mean usually do so in the context of setting rates of return for very long horizons, which is not relevant to UK regulation.

¹⁷ For instance, even the most prestigious former advocates of the geometric mean (Copeland et al (1990) page 196) now state that ‘The arithmetic average is the best estimate of future *expected* returns’ (Copeland et al (2000) page 219). They now advocate the use of an estimate that attempts to take account of a possible bias in the historical arithmetic mean return. Their adjustment is one of a number of possible adjustments to historical averages that are discussed in section A1.2.3.

A1.2.3 Adjusted historical averages

Ofcom also presents ‘adjusted historic risk premia’ based on ‘DMS downwards adjustments for out-performance of expectations and the re-rating of equities’ given in Dimson et al (2002). According to Ofcom, these adjustments are 2% downwards and result in adjusted risk premia between 2.4% and 4.0%.

The adjustments are, in the words of Dimson et al themselves ‘simplistic’ and ‘should not be taken too seriously’. There are also other possible adjustments that are likely to go the other way, such as tax effects and the effects of share repurchases. In addition, there are other possible adjustments that go the same way as the Dimson et al adjustments, such as survivorship biases and adjustments for serial correlation of the market. Finally, some possible adjustments can go either way, such as adjustments for the bond term premium and volatility of the equity market.

Because of the speculative nature of such adjustments, the difficulty of estimating their size, and the omission of other possible adjustments, many experts believe that such calculations should not be included when using historical capital market data. Indeed, Dimson et al themselves largely discount the size of the adjustments when they reach their own conclusion, which is that the arithmetic mean risk premium, allowing for all adjustments, would be ‘around 5%’.¹⁸

Furthermore, contrary to Ofcom’s claim that ‘DMS have not .. updated their adjustments’ since 2002, Dimson et al *have* reported more recent estimates of the adjustments in a later paper referred to by Ofcom.¹⁹ These later estimates of the adjustments are 0.3% for the UK and 0.8% for the world. They contrast with the 2% adjustment made by Ofcom. Ofcom does not say why it uses the earlier rather than the later estimates.

The large revision of the estimates within a short period of time shows the somewhat arbitrary nature of their estimation. In particular, much of the adjustment for the world comes from an estimate that the adjustment for the US should be 1.0%. This is based on the decline in US dividend yields since 1900. The calculation omits share repurchases, which are now larger than dividends in the US, and should be included in any

¹⁸ This estimate is relative to treasury bill rates, rather than bond rates. I discuss the impact of this difference later in this section.

¹⁹ Dimson et al (2003) page 17.

analysis of aggregate equity market valuation.²⁰ Without including share repurchases in the analysis the estimate of the adjustment for the US, and consequently the world, is at best speculative.

The averages that Ofcom adjusts are measured relative to bond returns and, therefore, are lowered by the term premium in bond returns relative to bills. There are two reasons why the adjustment for the historical term premium may be too large. First, there is evidence that the term premium varies with the level and variability of inflation.²¹ With low current levels of inflation and inflation risk, the current term premium will be lower than the historical average, so the historical downward adjustment will be too large.²² Second, the UK bonds used in the Dimson et al statistics have a maturity of 20 years. UK regulation operates with an horizon of 5 years. The term premium for 5 years is lower than that for 20 years, so the historical downward adjustment will be too large.

Table A1.1 shows adjusted historical estimates for the UK and the world based on the most recent estimate of each component provided by Dimson et al.

Table A1.1: Adjusted historical estimates of the equity market risk premium

	UK	World
Method A:		
Historical geometric mean premium vs bills ¹	4.3	4.6
Adjustment (market re-rating) ²	0.3	0.8
Adjusted geometric mean premium vs bills	4.0	3.8
Adjustment (geometric to arithmetic) ²	2.0	1.3
Forecast relative to bills	6.0	5.1
Bond minus bill premium ¹	0.7	0.9
Forecast relative to bonds (A)	5.3	4.2
Method B:		
Arithmetic premium relative to bonds ¹	5.3	5.1
Adjustment (market re-rating) ²	0.3	0.8
Forecast relative to bonds (B)	5.0	4.3

Sources: 1. Dimson et al (2004). 2. Dimson et al (2003).

²⁰ Julio and Ikenberry (2004) page 91.

²¹ Buraschi and Jiltsov (2005) is the most recent study.

²² Dimson et al (2004) give the historical average UK inflation rate as 4.2% and its standard deviation as 6.8%. Current levels of both are clearly lower.

The resulting estimates are between 4.2% and 5.3%, rather than the range of 2% to 3% reported by Ofcom. There are three reasons for the difference:

- I use the later Dimson et al estimates of the adjustments, which are considerably smaller than those used by Ofcom.
- These estimates use the geometric mean only as an interim step in a calculation of a forecast arithmetic mean, as advocated by Dimson et al.
- These estimates are based on adjusting actual historical data, rather than adjusting a range that has already been adjusted once by Ofcom.

Even these later estimates may now be out of date. The adjustments were calculated on data that ended in 2001. The adjustments largely depend on the behaviour of dividends and dividend yields, and yields have risen since then. They exclude repurchases, which would reduce the adjustment for the world. Also, they include an adjustment for the premium of bond returns versus bill returns, which was 0.9% for this period. Evidence suggests that this may currently be lower than the historical average. These would all reduce the size of the adjustments.

A1.2.4 Historical averages: Summary

Ofcom reports that historical evidence leads to a possible range for the risk premium of 4.0%-5.0%. Apart from any specific arguments about how to interpret historical data, its conclusion contrasts markedly with that reached by Ogier et al. They report a range of 4%-8% based on historical evidence. The major difference is that Ofcom relies exclusively on a subset of the evidence provided by one set of authors (Dimson et al), whereas Ogier et al report a wider range of evidence.

The single statistic from the historical evidence that is favoured by most authorities is the arithmetic mean average. In Dimson et al (2004) this is reported as 5.3% for the UK and 5.1% for the world. The Ofcom range based on historical evidence does not contain these numbers. Thus, even if discussion is limited to the Dimson et al evidence, the Ofcom *range* does not include the statistic that would be used as the *central* estimate by many experts.

Ofcom places weight on the geometric mean of historical returns, which is much lower. For its reliance on this number, it depends on Wright et al. Yet these authors favour the use of the geometric mean only as an interim step in the calculation of the arithmetic mean, not as an estimate in its own right as used by Ofcom.

Ofcom also forms an estimate based on adjusted historical averages, which are lower than the raw averages. The large adjustment it uses has since been re-estimated by its authors as much smaller. These authors also say that the adjustment is ‘simplistic’ and ‘should not be taken too seriously’. Other adjustments that might be made to historical averages would have the opposite effect.

A1.3 Ofcom’s use of the dividend growth model and surveys

A1.3.1 Introduction

The other general type of evidence used by Ofcom is sometimes called ‘forward-looking’. Ofcom’s conclusion is that this type of evidence points to a range of 2.0% to 4.5%, based on estimates implied from market values and surveys of practitioners. It also reports surveys of academics, but does not give them much weight.

The range reported by Ogier et al for this type of information is 2% to 6%. The difference between this range and Ofcom’s largely lies in the sources relied on and the way that the evidence is interpreted. For instance, Ogier et al report that Value Line estimates have ranged between 2% and 6%, whereas Ofcom does not report Value Line estimates. Ofcom reports that Merrill Lynch estimates are 4%, whereas Ogier et al report Merrill Lynch estimates as ‘4% to 5%’.

There are many problems with such evidence, but its benefit can be that it reflects current market conditions. To do this, it must be current and from the market that is under consideration. Some of the forward-looking evidence used by Ofcom is from the US, which limits its relevance to the UK. Other parts of it are old, which largely negates its value in capturing current market conditions. There is, however, one forward-looking estimate that is UK specific, up-to-date, and widely used. This is the Bloomberg estimate based on current surveys of investor expectations. According to Bloomberg, the UK equity market risk premium is currently 5.3%. This estimate falls well outside the range proposed by Ofcom.

A1.3.2 Implied risk premia based on market values and forecasts

One type of forward-looking evidence that Ofcom uses is based on the dividend growth model. From the huge number of such studies, Ofcom reports three.

The studies reported by Ofcom give low estimates of the market risk premium, but other studies based on the same technique give much higher estimates. For instance, Ofcom quotes a study by Claus and Thomas. This gives an estimate of 3% for the US equity market risk premium, based the period 1995-1998.²³ The estimate is derived from a new procedure that involves making a particular assumption about the long-run growth of future dividends. The leading academic authorities on the type of approach used by Claus and Thomas have produced a study covering approximately the same period.²⁴ Their study gives an estimate of 7.3% for the US equity market risk premium, which Ofcom does not report.

The difference between these estimates for the same period is caused by different assumptions about long-run dividend growth. There is no consensus about what forecast to use, so the assumption is largely a matter of opinion. Ofcom does not make it clear why it gives weight to the opinions of some authors and none to others.

Apart from the question of whether the examples Ofcom has chosen are representative, there is the general issue of whether estimates based on this approach should be given significant weight at all. As illustrated above, they depend crucially on untested assumptions about future dividend growth. This is one of the reasons that Wright et al conclude regarding this type of evidence:²⁵

‘We are very sceptical of “forward-looking” (and low) estimates of the equity premium and stock returns derived, usually at the height of the boom, from the dividend discount model.’

A1.3.3 Survey evidence

The other type of forward-looking evidence that Ofcom discusses is surveys of expected returns. There are many difficulties in interpreting estimates that results from surveys. Some of the problems are those of

²³ Claus and Thomas (2001).

²⁴ Harris et al (2003).

²⁵ Wright et al (2003) page 49.

any survey, including the nature of the questions asked, the sample, the weighting of responses, and the calculation converting responses into an estimate of the market risk premium. All these make it difficult to interpret the implications of such surveys for an estimate of the market risk premium that will be used in estimating a corporate cost of capital. One illustration of this is that the survey estimates produced by Welch that Ofcom reports, had to be completely revised because of an ambiguity in interpreting the questions.

Another problem is more systematic and relates to the identity of the respondent and the context within which the forecast is made. On this it is worth quoting the conclusions of Ogier et al at some length:²⁶

‘So what are we to make of this? Probably the key conclusion is that the answer you get from such a survey depends on the person you ask. Pension fund managers tend to suggest low values for the [equity market risk premium]. One can speculate that this is because their performance will be judged on the basis of the return they actually secure for their pensioners, and that they want to manage expectations down. Personal financial advisor, however, tend to quote higher figures. Are we being too cynical if we suggest that this is because they want to attract clients to invest?’

Academics seem to respond with a wide range of different figures – probably because they hold different views on the various theories for calculating the [equity market risk premium], and do not necessarily need to justify their views, or take financial decisions dependent on them. Which leaves corporate organizations somewhere in the middle. Their main vested interest in the [equity market risk premium] seems to be to get it right, so perhaps their views should be given the most weight.’

By this criterion, the survey evidence that Ofcom cites that should be given the most weight is the survey of FTSE 100 companies by OXERA, for which Ofcom reports an estimate of 4.8% in 1999. This estimate falls outside Ofcom’s range.

The importance of context in influencing risk premium estimates can be seen from the way that the same experts produce different estimates when asked different questions. Ofcom cites several times an estimate of 3% by PwC contained in its report to the FSA in 2003. This contrasts with the

²⁶ Ogier et al (2004) page 76.

estimate of 5% by PwC for use in cost of capital estimation.²⁷ The estimate of 3% for the FSA calculations is endorsed by Professor David Miles. Professor Miles is also one of the authors of the Wright et al report that implies a risk premium of at least five percent at the current time for use in cost of capital estimation.

There are various possible explanations for this difference in estimates produced by the same experts in different contexts, but one is simple. The estimate for the FSA is a ‘central rate for financial projections’.²⁸ This may reasonably be interpreted as a geometric mean. If so, it should be adjusted to give an arithmetic mean before use in the cost of capital by Ofcom. Dimson et al estimate this adjustment as adding 2%. The FSA estimate would then correspond to an estimate of a risk premium of 5% for use in setting a corporate cost of capital, the application envisaged by Ofcom. Ofcom does not make it clear why it reports the views of PwC and Professor Miles produced in a context entirely different from setting the cost of capital, while ignoring those produced in a context directly relevant to setting the cost of capital.

A1.3.4 Ofcom’s use of the dividend growth model and surveys: Conclusions

Ofcom also reports estimates based on ‘forward-looking’ techniques. Ofcom’s conclusion is that this type of evidence points to a range of 2.0% to 4.5%, based on estimates implied from market values and surveys of practitioners. It also reports surveys of academics, but does not give them much weight.

The range reported by Ogier et al for this type of information is 2% to 6%. The difference between this range and Ofcom’s largely lies in the sources relied on and the way that the evidence is interpreted. For instance, Ogier et al report that Value Line estimates have generally ranged between 2% and 6%, whereas Ofcom does not report Value Line estimates. Ofcom reports that Merrill Lynch estimates are 4%, whereas Ogier et al report Merrill Lynch estimates as ‘4% to 5%’.

One type of forward-looking evidence that Ofcom uses is based on the dividend growth model. From the huge number of such studies, Ofcom reports three. The studies reported by Ofcom give low estimates of the market risk premium. Other studies using the same technique give much higher estimates. For instance, Ofcom quotes a study by which gives an

²⁷ Ogier et al (2004), PwC/Franks (2002).

²⁸ PwC/FSA (2003) paragraph 118.

estimate of 3% for the US equity market risk premium, whereas an equally important study for the same period using a similar method gives an estimate of 7.3%, which Ofcom does not report. The difference between the estimates arises from a difference in the estimation of the long-run growth rate of dividends. It illustrates the sensitivity of this method to views of long-run dividend growth, which are largely a matter of opinion.

The other type of forward-looking evidence that Ofcom discusses is surveys of expected returns. There are many difficulties in interpreting estimates that results from surveys. Some of the problems are those of any survey, including the nature of the questions asked, the sample, the weighting of responses, and the calculation converting responses into an estimate of the market risk premium.

Another problem is more systematic and relates to the identity of the respondent and the context within which the forecast is made. Ogier et al conclude that ‘the answer you get from such a survey depends on the person you ask’. It also depends on the question that is asked and the context. An illustration is the estimate of 3% for use by the FSA as a ‘central rate for financial projections’. This estimate was produced by PwC at approximately the same time that it was publicly advocating an estimate of 5% for use in the cost of capital.

A simple explanation for the difference could be that the former is an estimate of the geometric mean, which should be used for central projections, and the latter is an estimate of the arithmetic mean, which should be used for cost of capital calculations. Whatever the explanation, however, the difference is an illustration of the difficulty of interpreting estimates based on surveys.

A1.4 Discussion of Ofcom’s evidence about the equity market risk premium: Conclusions

Ofcom uses five types of evidence:

- Historical average returns,
- Adjusted historical returns,
- Estimates based on the dividend growth model,
- Estimates based on survey evidence,
- The opinions of regulators.

Within each category, Ofcom selects particular evidence and omits other evidence. It is not clear what criteria Ofcom uses to select its evidence, but the omitted evidence appears to systematically point to a higher risk premium than that given by Ofcom. Furthermore, the interpretation by Ofcom of the evidence it uses is taken at the low end of the possible range in several cases, and some of the evidence used by Ofcom is not directly relevant to cost of capital estimation.

Ofcom reports that historical evidence leads to a possible range for the risk premium of 4.0%-5.0%. Apart from any specific arguments about how to interpret historical data, its conclusion contrasts markedly with that reached by Ogier et al. They report a range of 4%-8% based on historical evidence. The major difference is that Ofcom relies exclusively on a subset of the evidence provided by one set of authors (Dimson et al), whereas Ogier et al report a wider range of evidence.

The single statistic from the historical evidence that is favoured by most authorities is the arithmetic mean average. In Dimson et al (2004) this is reported as 5.3% for the UK and 5.1% for the world. The Ofcom range based on historical evidence does not contain these numbers. Thus, even if discussion is limited to the Dimson et al evidence, the Ofcom *range* does not include the statistic that would be used as the *central* estimate by many experts.

Ofcom places weight on the geometric mean of historical returns, which is much lower. For its reliance on this number, it depends on Wright et al. Yet these authors favour the use of the geometric mean only as an interim step in the calculation of the arithmetic mean, not as an estimate in its own right as used by Ofcom. Dimson et al reach a similar conclusion, and the vast majority of experts argue that unadjusted geometric averages are not the correct ones to use in setting the cost of capital for the application envisaged by Ofcom.

Ofcom also forms an estimate based on adjusted historical averages, which are lower than the raw averages. The large adjustment it uses has since been re-estimated by its authors as much smaller. These authors also say that the adjustment is 'simplistic' and 'should not be taken too seriously'. Other adjustments that might be made to historical averages would have the opposite effect.

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One type of forward-looking evidence that Ofcom uses is based on the dividend growth model. From the huge number of such studies, Ofcom reports three. The studies reported by Ofcom give low estimates of the market risk premium. Other studies using the same technique give much higher estimates. For instance, Ofcom quotes a study by which gives an estimate of 3% for the US equity market risk premium, whereas an equally important study for the same period using a similar method gives an estimate of 7.3%, which Ofcom does not report. The difference between the estimates arises from a difference in the estimation of the long-run growth rate of dividends. It illustrates the sensitivity of this method to views of long-run dividend growth, which are largely a matter of opinion.

The other type of forward-looking evidence that Ofcom discusses is surveys of expected returns. There are many difficulties in interpreting estimates that results from surveys. Some of the problems are those of any survey, including the nature of the questions asked, the sample, the weighting of responses, and the calculation converting responses into an estimate of the market risk premium.

Another problem is more systematic and relates to the identity of the respondent and the context within which the forecast is made. Ogier et al conclude that 'the answer you get from such a survey depends on the person you ask'. It also depends on the question that is asked and the context. An illustration is the estimate of 3% for use by the FSA as a 'central rate for financial projections'. This estimate was produced by PwC at approximately the same time that it was publicly advocating an estimate of 5% for use in the cost of capital.

A simple explanation for the difference could be that the former is an estimate of the geometric mean, which should be used for central projections, and the latter is an estimate of the arithmetic mean, which

should be used for cost of capital calculations. Whatever the explanation, however, the difference is an illustration of the difficulty of interpreting estimates based on surveys.

APPENDIX 2: DISCUSSION OF OFCOM'S EVIDENCE ABOUT REGULATORY ESTIMATES OF THE EQUITY MARKET RISK PREMIUM

Ofcom reports that Ofwat used a risk premium of 4.0%-5.0%.²⁹ This is the headline range from which Ofwat chose its estimate of the cost of capital. However, the range is misleading for two reasons. First, Ofwat's final estimate is close to the top of the range.³⁰ Second the premium is added to an 'equilibrium' interest rate approximately one percent greater than the market interest rate.³¹ Thus, relative to the current market interest rate at the time, Ofwat's estimate was equivalent to about 5.8%.

Ofcom reports that Ofgem used a risk premium of 3.5% from a range of 3.0%-4.0% in the Electricity Distribution Charge Control Review. In fact, in the initial proposals in Ofgem (2004a) it used ranges of 2.25%-3.0% for the real riskless rate, 0.6-1.0 for the equity beta, and 2.5%-4.5% for the equity market risk premium.³² In the final proposals in Ofgem (2004b) it decided on a return on equity of 7.5%, which is the 'top end of the range published in March 2004'.³³ The only sensible interpretation of this is that it corresponds to a real riskless interest rate of 3.0%, a beta of 1.0 and an equity market risk premium of 4.5%. Only if all the ingredients are at the top ends of their ranges can the equity return be 7.5%. In addition to using a risk premium estimate from the top end of its range, Ofgem also used an interest rate that is above the market. The highest real interest rate in either March 2004, when the consultation was issued, or November 2004, when the final proposals were published, was 1.9%.³⁴ Thus the interest rate of 3.0% used by Ofgem was at least 1.1% greater than the market interest rate at the time. Relative to the market interest rate, its equity return of 7.5% represents a risk premium of 5.6%. This risk premium is for a share with a beta of one, and so is the equity market risk premium it was effectively using.

In December 2002, the Competition Commission estimated the pre-tax nominal cost of capital of the mobile telecommunications industry as 11.25% in pre-tax real terms. Its headline range for the equity market risk premium was 2.6%-4.6%, as shown by Ofcom.³⁵ However, this may not

²⁹ Ofwat (2004) Table 45.

³⁰ The range for the real post-tax WACC is 4.2%-5.3%. Ofwat's decision is a post-tax WACC of 5.1%. It does not say what equity market risk premium this corresponds to, but it must be at least 4.8%.

³¹ Ofwat (2004) page 222. It uses a real riskless rate of close to 3.0%. It says the market rate is less than 2%.

³² Ofgem (2004a) paragraph 6.3.

³³ Ofgem (2004b) paragraph 8.45.

³⁴ Financial Times March 1 2004, April 1 2004, November 1 2004, December 1 2004.

³⁵ Competition Commission (2002b) paragraph 2.242.

be used as an estimate that is appropriate to Ofcom, for two reasons. First, the Competition Commission used an interest rate 0.425% above the current market rate.³⁶ Second, it made an adjustment of 0.25% to its final estimate to allow for the fact that its equity risk premium estimates might be too low. It described the logic of this as:³⁷

‘We consider that a degree of smoothing of the downward trend in the equity risk premium would be appropriate, In our view, the most appropriate way of recognizing this factor is not by modifying our judgement of the range for the equity risk premium, but by an increase of 0.25 percent in the overall level of the WACC.’

Despite the way that the Competition Commission chose to describe this adjustment, it is caused by a view about the market risk premium and amounts to using a higher market risk premium. Its implications for regulatory consistency can be appreciated only if the headline market risk premium is adjusted. The adjustment of 0.25% to the pre-tax WACC is equivalent to adding 0.15% to the equity market risk premium.³⁸ The centre of the Competition Commission headline range for the equity market risk premium was 3.6%. To be equivalent to the way that Ofcom applies the risk premium, this should be increased by 0.425% for the difference between the interest rate used and the market rate, and by 0.15% for the final adjustment to the rate. This gives an estimate that would be appropriate to the way that Ofcom uses it of 4.2%.

Ofcom reports that the CAA used a risk premium of 2.5%-4.5% in the regulation of the London airports in 2003. This was based on the Competition Commission range. The Competition Commission analysis was based on an interest rate 0.425% higher than the market.³⁹ In addition, the Competition Commission added two upwards adjustments to its final cost of capital. The first, for the equity market risk premium, was 0.25% as in the mobile telecommunications review. In addition it added a further 0.25% to allow for the risk of the Terminal 5 project.⁴⁰ An adjustment of 0.25% in the pre-tax cost of capital is equivalent to the same adjustment in the equity market risk premium, given the other

³⁶ Competition Commission (2002b) paragraph 2.226. It says that the market interest rate is 2.2% and it uses a central estimate of 2.625%.

³⁷ Competition Commission (2002b) paragraph 2.243.

³⁸ If the increase in the equity market risk premium is X, then, given the other assumptions that the Competition Commission makes, the increase in the pre-tax WACC is $X \cdot 1.3 \cdot 0.9 / 0.7$.

³⁹ Competition Commission (2002a) paragraph 4.49 says that the market interest rate was 2.2% and the mid-point of the interest rate used was 2.625%.

⁴⁰ Competition Commission (2002a) paragraph 4.72.

assumptions made by the Competition Commission.⁴¹ The centre of the Competition Commission headline range for the equity market risk premium was 3.5%. To be equivalent to the way that Ofcom applies the risk premium, this should be increased by 0.425% for the difference between the interest rate used and the market rate, and by 0.25% for the final adjustment to the rate. This gives an estimate that would be appropriate to the way that Ofcom uses it of 4.2%.

Ofcom cites an estimate of 3% by PwC contained in its report to the FSA in 2003.⁴² This contrasts with an estimate of 5% by PwC for use in cost of capital estimation made at the same time.⁴³ The estimate of 3% for the FSA is endorsed by Professor David Miles. Professor Miles is one of the authors of a report at roughly the same time that implies a risk premium of at least five percent for use in cost of capital estimation.⁴⁴ The fact that the same experts produce different estimates in the FSA context than they do when estimating the cost of capital means that the FSA number is not relevant to Ofcom's intended use of the risk premium.

There are various possible explanations for the difference in estimates produced by the same experts in different contexts, but one is simple. The estimate for the FSA is a 'central rate for financial projections'.⁴⁵ This may reasonably be interpreted as a geometric mean. If so, it should be adjusted to give an arithmetic mean before use in the cost of capital by Ofcom. Dimson et al (2002) estimate this adjustment as adding 2%. The FSA estimate would then correspond to an estimate of a risk premium of 5% for use in setting a corporate cost of capital, the application envisaged by Ofcom.

⁴¹ If the increase in the equity market risk premium is X, then, given the other assumptions that the Competition Commission makes, the increase in the pre-tax WACC is $X \cdot 0.9 \cdot 0.75 / 0.7$.

⁴² FSA (2003).

⁴³ Ogier et al (2004), PwC/Franks (2002).

⁴⁴ Wright et al (2003).

⁴⁵ FSA (2003) paragraph 118.