EPT: Weighted Average Cost Of Capital (WACC)

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1 Introduction

This document provides an estimate of EPT's weighted average cost of capital (WACC). To ensure a consistent and transparent approach in the regulation in Luxembourg, each component of the WACC formula will be analysed in this paper. Potential special conditions relevant for Luxembourg will be considered to enable us to estimate an appropriate WACC for EPT.

1.1 Return on investments

According to the Access Directive’s Article 13 (1), regulated companies are entitled to have a reasonable return on their investments included in the prices paid by third parties.

Significant investments have been and will have to be undertaken to ensure access to telecommunication services. The estimation of a reasonable rate of return can therefore have significant financial implications for the regulated company as well as for third parties buying access to infrastructure.

Internationally, a reasonable return is considered to be coverage of the company’s WACC. WACC has been used in a range of European countries for the purpose of calculating cost oriented tariffs, including Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Spain, Sweden and the UK.

The estimation of the WACC is part of a broader context where regulation in its entirety should promote a climate conducive to efficient investments, innovation, and competition on price as well as functionality. When evaluating the appropriateness of a WACC, the regulatory authority should therefore consider its impact on investment incentives for the incumbent as well as entrants and the scope for network competition.
2 Definition of WACC

The WACC can be estimated in nominal or real terms (ie, corrected for inflation). This paper will estimate a nominal WACC. Another distinction is between pre and post tax estimation of WACC. The international standard of comparison is pre-tax WACC. In this document, both measures will be estimated.

The standard formula used to derive WACC is accepted by the investment community and telecommunications regulators worldwide:

\[ WACC = \frac{R_d(1-T_c)}{V} \frac{D}{V} + \frac{E}{V} \]

Where:

- \( R_d \) is pre-tax cost of debt, assumed to be equal to the return on a risk-free investment plus EPT’s corporate debt premium, i.e. \( R_d = R_f + D_p \). EPT currently has no long-term debt. The cost of debt will therefore have to be estimated for various capital structures.
- \( T_c \) is corporate tax rate. \( R_d(1-T_c) \) is therefore the cost of debt after the corporate tax.
- \( D \) and \( E \) are the values of EPT’s debt and equity respectively and \( V \) is the sum of \( D \) and \( E \). As such, \( D/V \) and \( E/V \) represent the relative weighting of debt and equity used to fund EPT’s operations. EPT’s current capital structure (all equity) hence implies \( E/V = 1 \). An optimal capital structure will be estimated. The final WACC estimate will hence be based on an assumption of \( E/V < 1 \).
- \( R_e \) is the cost of equity capital and is derived from the Capital Asset Pricing Model (CAPM), which is discussed in greater detail below.

Each of the components of the WACC formula will be derived for EPT.

2.1 Divisional versus corporate WACC

Different business units face different levels of business risk. This should in theory be reflected in different WACC estimations for each business unit or division. The ERG recognises this and in ERG’s Common position on Accounting Separation & Cost Accounting Systems the following is stated:

“…NRAs may take into account the fact that different risks may apply to different activities, which could be reflected in different costs of equity ‘\( R_e \)’, even if the undertaking’s financial structure is the same. If so, there could be a different WACC for each market or disaggregated activity derived from electronic communication services (also referred as divisional WACC).”

In Europe, Ofcom, the UK regulator, has estimated separate WACCs for BT’s wholesale access business, and the rest of BT. In contrast the ART in France has abandoned a divisional approach to setting WACC in favour of a single corporate WACC.

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There are several arguments against the adoptions of a divisional WACC. First, the estimation of a divisional WACC is made difficult by practical issues, as recognised by the IRG\(^2\):

> "IRG recognizes that in theory the adoption of a differentiated WACC is reasonable from a regulatory point of view. However, the lack of capital market information at divisional level makes the theoretically correct determination of beta in some cases difficult."\(^3\)

One major obstacle to estimating a divisional WACC is hence lack of appropriate data to support the estimation. There is no stock market information at divisional level. This applies not only for individual companies but for the market in general as no European company has separated its wholesale unit into a separately traded company. Benchmarking with directly comparable companies is therefore not possible.

Another problem when estimating of a divisional WACC is the fact that the incumbent operator is vertically integrated. The company’s ability to service debt and remunerate shareholders ultimately depends on both the network and the retail divisions of the company. The cost of capital for the network part of the company will therefore always to a certain extent be related to the cost of capital of the company’s retail business.

Finally, a divisional WACC may not fully take into account the risk that an independent network operator would face compared to a vertically integrated operator. EPT’s wholesale network business, as part of a vertically integrated operator, has a guaranteed source of income through selling wholesale access to the retail business. However, if the wholesale business is to be considered independent from the retail business (which is what the calculation of a divisional WACC implies), then this source of income would no longer be guaranteed. Indeed the independent retail business would then have the incentive to invest in its own infrastructure, particularly in profitable areas, and directly compete with the wholesale business. This would imply a significant business risk for the wholesale business of EPT. Therefore, if EPT’s wholesale and retail businesses are treated as separate entities for the purpose of calculating WACC, this additional business risk would have to be included in the estimation of the divisional WACC.

EPT currently estimates a WACC for its Telecoms department as opposed to a WACC for the business as a whole. This can easily be compared with the company WACCs estimated for other European telecoms companies which have now largely been separated from postal businesses.

However, other than the UK, there are no examples in the European Union (EU) of separate WACCs being estimated for divisions within a telecoms business. Therefore, given the difficulties in estimating WACC for individual businesses within a company expressed above, and the limited availability of benchmark information to enable such an estimation, we

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\(^2\) The Independent Regulators Group (IRG) was established in 1997 as a group of 29 European National Telecommunications Regulatory Authorities (NRAs) to share experiences and points of views. The group hence also includes countries outside the EU.

\(^3\) IRG, "Regulatory Accounting – Principles of Implementation and Best Practice for WACC calculation", February 2007
recommend that EPT continues to estimate a WACC for the entire Telecoms department.

2.2 Historical estimation of WACC in Luxembourg

Since EPT is all-equity financed, EPT has in the past focused exclusively on the cost of equity in the WACC estimation. The return on equity has been estimated using the Capital Asset Pricing Model (CAPM) with the equity risk premium based on data from Bloomberg for the Luxembourg equity market and on benchmarks to estimate beta.

In previous years, EPT has estimated WACC on a post-tax, as opposed to pre-tax, basis. This reflects that WACC was estimated on the basis of EPT’s all-equity capital structure and that international investors base stock valuations on stocks’ capacity to generate cash flows through dividends (present or future) that are paid out after corporate taxes. The WACC estimation for EPT in 2006 is set out below, showing the actual rate used (post-tax) and the implied pre-tax level.

**EPT’s historic WACC estimation 2006**

<table>
<thead>
<tr>
<th>Input factor</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>3.37%</td>
</tr>
<tr>
<td>Equity risk premium</td>
<td>6.78%</td>
</tr>
<tr>
<td>Levered beta</td>
<td>1.05</td>
</tr>
<tr>
<td>Cost of Equity (post tax)</td>
<td>10.49%</td>
</tr>
<tr>
<td>Debt premium</td>
<td></td>
</tr>
<tr>
<td>Cost of debt (pre tax)</td>
<td></td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td></td>
</tr>
<tr>
<td>Cost of debt (post tax)</td>
<td></td>
</tr>
<tr>
<td>Gearing</td>
<td>0%</td>
</tr>
<tr>
<td>WACC (post tax)</td>
<td>10.49%</td>
</tr>
<tr>
<td>WACC (pre tax)</td>
<td>14.91%</td>
</tr>
</tbody>
</table>

In order to be able to calculate the effects of an optimal gearing approach, the pre-tax WACC has to be calculated though to appropriately take into account the tax benefits of debt financing. We will therefore analyse each component in the WACC formula even though EPT remains all-equity financed.

2.3 Cost of equity

2.3.1 Capital Asset Pricing Model (CAPM)

CAPM has been accepted by regulators for use in estimates of cost of equity in the calculation of interconnection rates. It is based on the premise that investors require increased levels of
return for increased levels of investment risk.

In CAPM, the return on equity capital is defined as:

\[ R_e = R_f + \beta_e (R_m - R_f) \]

Where:
- \( R_f \) = the risk-free rate of return
- \( \beta_e \) = company beta. The beta measures the degree of correlation between an individual company’s returns and the returns expected of the general market
- \( R_m \) = the broad market average return (expected return on market index)

\( R_m - R_f \) is also known as the Equity Risk Premium (ERP). The ERP measures the return an investor with a well diversified portfolio expects to get in excess of the risk free rate.

Beta and ERP estimates should be forward looking to reflect the risk and reward trade-off investors currently face. Quantitative estimates of beta and ERP will therefore be supplemented with qualitative observations and analyses. To achieve a nuanced estimate of each value, the elements of the CAPM formula will therefore be analysed separately even though beta and ERPs could be analysed on the same data set.

2.3.2 Risk-free rate of return

The term “risk-free return” in this context refers to the return an investor could achieve on an asset that bears no risk at all (e.g. risk of default). Since there are theoretically no truly “risk-free” assets, it is necessary to use a proxy. The institutions least likely to default on their payments are considered to be governments in large, economically, and politically stable countries. Government paper therefore represents the closest approximation of a risk-free asset.

Since EPT is located in the Euro zone, the appropriate risk-free rate is that of the Euro zone. A number of approaches can be applied to determine the appropriate maturity of the reference bond:
- The time horizon of the investor;
- The time horizon for the underlying network investment; and
- The time horizon of any charge control which may be considered or imposed.

The different returns for different time horizons are summarised in the yield curve plotting yield against time to maturity. Under normal circumstances, the yield curve is upward sloping (i.e., higher yields for longer maturities, with the curvature of the yield curve reflecting expectations for future interest rate levels and interest rate risk). In order to determine the appropriate time horizon, one can consider the reasons for the shape of the yield curve. The interest rate risk inherent in the price regulation depends on how frequent the regulation is updated. If the prices are updated every year, the regulated company only incurs interest rate risk during this year.
This argument supports a time horizon equal to that of the regulatory pricing updates. In the case of Luxembourg this implies a time horizon of one year.

On the other hand, an operator undertakes investments with a far longer time horizon than the next regulatory pricing review. If the interest rate risk for the relevant investment period is not included in the WACC estimation, prices will not reflect the financing cost an operator will face when investing under competitive circumstances (i.e., a situation where competition prevents the operator from increasing future access prices in response to higher costs of capital). Failing to include the interest rate risk in the WACC can therefore have the effect of deterring entrants from investing.

In a report commissioned by OPTA\(^4\), a time horizon of regulatory review of 3 years is chosen. Ofcom sought to strike a balance between the charge control and investment argument by implementing a five year time horizon\(^5\).

The average yields of Euro zone government bonds are compared in the following table:

<table>
<thead>
<tr>
<th></th>
<th>2 years</th>
<th>3 years</th>
<th>5 years</th>
<th>7 years</th>
<th>10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>2.47</td>
<td>2.77</td>
<td>3.29</td>
<td>3.7</td>
<td>4.14</td>
</tr>
<tr>
<td>2005</td>
<td>2.38</td>
<td>2.55</td>
<td>2.85</td>
<td>3.14</td>
<td>3.44</td>
</tr>
<tr>
<td>2006</td>
<td>3.44</td>
<td>3.51</td>
<td>3.64</td>
<td>3.72</td>
<td>3.86</td>
</tr>
<tr>
<td>05/2007</td>
<td>4.26</td>
<td>4.28</td>
<td>4.31</td>
<td>4.34</td>
<td>4.37</td>
</tr>
</tbody>
</table>

The almost flat yield curve with only 11 basis points separating the yield on a two year bond from that of a ten year bond as of May 2007 reflects expectations of a stable interest rate level. The flat yield curve makes the choice of time horizon immaterial for the current WACC estimation. We propose to set the risk free rate based on a five year time horizon. This time horizon strikes a balance between reflecting the risk faced by entrants and EPT. Therefore, the WACC estimation for EPT will be based on the assumption of 4.31% for the risk free rate reflecting May 2007 interest rate levels.

### 2.3.3 Estimating beta

The degree of correlation between an individual company’s returns and the returns expected of the general market is called the company’s beta. Beta is hence not an absolute measure of risk but a measure of how much extra risk an investor with a diversified portfolio incurs by adding a company to this portfolio. As EPT is not listed, it will be necessary to estimate a beta for EPT on

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\(^5\) Ofcom (18 August 2005) “Ofcom’s approach to risk in the assessment of the cost of capital”. In support of Ofcom’s choice to use 5-year government bond yields as risk free rate, Ofcom wrote: “BT suggested that one line that might be taken by Ofcom was that, “rate(s) should be reviewed only every four or five years, in order to give certainty and avoid unnecessarily intrusive regulation”. Ofcom agrees with the view that, other things being equal, very frequent re-estimation of BT’s WACC is not desirable and would not wish to revisit estimating BT’s WACC unless it was demonstrated that there had been a material change in the circumstance of inputs. Ofcom would be likely to consider that the materiality of a change should be set against the length of time since the last review i.e. the shorter the time since the last review the higher the threshold for reviewing estimates.”
The benchmark portfolio against which the beta is measured can be national, European or international. At national level, the market portfolio is usually identified as the most liquid national stock index (FTSE100 in the UK, CAC40 in France, LuxX in Luxembourg). At European level, a range of indices calculated by providers of financial services (e.g., Morgan Stanley) or information providers (e.g., Dow Jones or Bloomberg) can be used as market portfolio. The same applies at international level.

The choice of benchmark portfolio can impact the level of beta as the correlations between the returns on an individual stock and different portfolios are likely to differ. The choice between measuring against an international portfolio rather than a local or regional portfolio reflects how international the company considered is: the more local the company is in terms of geographical footprint, the less it can be expected to be correlated with international indices and vice versa.

In this context, a national benchmark portfolio can either imply that benchmark companies are all measured against the Luxembourg market portfolio or that each company is measured against a portfolio traded in its home market. Beta values for foreign companies in relation to the Luxembourg market may not reflect a comparable situation to that of investing in EPT. The reason is that financial performance of EPT is likely to be more closely related to Luxembourg’s LuxX index than that of foreign companies because of EPT’s dependence on the Luxembourg economy. A more appropriate estimate would therefore be to estimate beta values in relation to the companies’ local stock indices. That gives rise to another problem however: the betas will be estimated on the basis of different market portfolios as e.g., France Telecom is measured against CAC40, British Telecom against FTSE100 etc. The betas will therefore reflect the risk faced by different investors with different portfolios held in different markets rather than the risk faced by one single investor.

Compared to beta values based on national indices, beta values based on a European index has the advantage of measuring all operators against just one portfolio, thereby making the betas comparable. Moreover, the market portfolio would be better diversified as e.g. some industries are international in scope and investors therefore cannot diversify away company specific risk by investing only in a national index.

An international benchmark would provide an even better diversified portfolio and a common base of comparison. However, in an international portfolio, currency fluctuations can add to the volatility of short term returns. The currency risk can be reduced but not eliminated as uncertainty about the future value of the portfolio held in a foreign currency cannot be predicted.

The advantages and disadvantages of the different scopes of base portfolios are summarised in the following table:
Different approaches to benchmarking Beta

<table>
<thead>
<tr>
<th>National</th>
<th>European</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
<td><strong>Advantages</strong></td>
</tr>
<tr>
<td>• Reflects the choices of a national investor</td>
<td>• All betas are estimated on the basis of the same portfolio</td>
<td>• All betas are estimated on the basis of the same portfolio</td>
</tr>
<tr>
<td></td>
<td>• Well diversified portfolio</td>
<td>• Best possible portfolio diversification</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td><strong>Disadvantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Not an optimally diversified portfolio</td>
<td>• Not an optimally diversified portfolio</td>
<td>• Currency risk adds to volatility</td>
</tr>
<tr>
<td>• Comparing a company to a foreign national index likely to lead to underestimated beta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Betas are not directly comparable if based on national indices</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

According to the IRG, the most common benchmark portfolio is national in scope. Using a national portfolio is therefore in line with European best practice. By benchmarking with betas applied in other IRG countries, an estimate for how returns on investments in local fixed line network operators typically fluctuate vis-à-vis their national markets is obtained. This reflects more closely the risk faced by a Luxembourg investor hypothetically holding shares in EPT than a measure of European incumbents’ betas measured against the Luxembourg market would.

A company’s beta depends in part on the amount of leverage the company employs as more leverage leads to more volatile returns to shareholders. The beta values therefore have to be adjusted for leverage to be comparable. The IRG considers two formulas for delivering of betas:

Miller Formula:

$$\beta_{asset} = \frac{\beta_{equity}}{1 + \frac{D}{E}}$$

Modigliani - Miller Formula:

$$\beta_{asset} = \frac{\beta_{equity}}{\left(1 + (1 + t)\frac{D}{E}\right)}$$

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6 IRG, “Regulatory Accounting – Principles of Implementation and Best Practice for WACC calculation”, February 2007
Where beta asset is the un-levered beta and beta equity is the levered beta. The graph below shows un-levered betas used in the context of price regulation in the IRG countries.

**Asset Beta in IRG countries – fixed networks**

The IRG average for de-levered (asset) beta is 0.75 using the Miller approach\(^7\). Given EPT’s small and predominantly national customer base, EPT does not provide an inherent hedging against market risk. This indicates that investors would attribute a relatively high risk to EPT than to internationally diversified companies like TeliaSonera in Finland and TDC in Denmark. There are hence clear indications that EPT’s beta should be at or above the European average. We therefore find a beta in line with the IRG average of 0.75 appropriate.

### 2.3.4 Equity Risk Premium

The equity risk premium (ERP) is the premium of a broad market portfolio over the risk-free return. It reflects the increased earnings needed to make investing in a risk-bearing asset as attractive as investing in a risk-free asset.

The IRG has published equity risk premiums as applied in different IRG countries. Most countries in the comparison are EU countries and hence subject to exactly the same regulatory framework as EPT. The result is shown below:

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\(^7\) The impact of using either the Miller formula or the Modigliani-Miller formula is small. However, the Miller formula is simpler because it does not require estimation of forward looking effective tax rates for telecommunications companies, and therefore removes an element of uncertainty when benchmarking.
Equity risk premiums in the IRG fluctuate between 3.75% in Denmark and 7.2% in Romania with an average of about 5.25%. These significant fluctuations reflect the effects of using national market portfolios and that some countries have more mature and liquid stock markets than others. 14 of the 19 countries in the survey have reported values between 4.5% and 5.6%.

The IRG data includes risk premiums estimated by Ofcom\(^8\) for BT (4.5%) and rates based on research commissioned by OPTA (6\%)\(^9\).

Considering that Luxembourg is well integrated into the European economy we will consider an equity risk premium close to the European average appropriate. We will consider a range of risk premiums from 4.75% to 5.25%, with 5.00% as our central estimate. This is 25 basis points below the ERG average and at the level of four other ERG countries. The relevant gearing ratio due to the potentially significant differences between the cost of equity and the cost of debt, it is important to consider the appropriate mix of capital when estimating the WACC. The IRG\(^10\) considers three ways to calculate the gearing of the company:

- Based on book values
- Based on market values
- Based on efficient gearing

Each methodology is explained below:

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\(^8\) Ofcom’s approach to risk in the assessment of the cost of capital
\(^10\) IRG-WG RA (07) WACC
2.3.5 Book values

Under this approach, the accounting values of the company's debt and equity are used to calculate their contribution to the capital structure of the company. The advantage of this methodology is that the input values are known and subject to audit. A drawback of this methodology is that book values often do not reflect the actual investment that investors would have to make, and get a return on, to provide the current financing of the company.

2.3.6 Market values

The market value of equity often exceeds its book value as the future cash flows reflected in share prices most often exceed the historical investments necessary to generate the earnings. The return on the book value of equity therefore does not represent the return shareholders receive on their investments. This can be remedied by calculating the equity in the WACC formula as the total number of shares in the company multiplied by the current share price.

The market value of fixed interest rate debt will differ from the book value if interest rates change. Increases in the interest rate will in such cases have two partially offsetting effects: the value of existing debt decreases while the marginal price of debt increases. Using book values rather than market values will therefore overstate the cost of debt in case of interest rate increases (because the reduction in the debt's market value is not included) and vice versa for interest rate reductions.

Only a fraction of corporate debt is publicly traded and it requires detailed knowledge of maturity and seniority of a company's debt to estimate the effects of interest rate changes on the market value of the debt. Such data is seldom available. This is only a problem though for fixed interest rate debt or when a company's credit rating changes after the spread on variable interest debt has been determined. As these loan types only constitute a limited share of the total debt outstanding, book values most often provide a good estimate of market values of debt.

2.3.7 Efficient gearing

Equity holders are residual claimants to a company's earnings and will therefore always demand a higher rate of return than debt holders. As debt levels increase so does a company's risk of default. The required rates of return for debt holders as well as equity holders therefore increase when debt exceeds a level that implies a material risk of default. The WACC as a function of the percentage of capital raised through debt can therefore be depicted with a U-shaped curve where the bottom of the U indicates the lowest possible WACC, ie, the efficient capital structure.

It can be argued that building the WACC estimation on the efficient gearing rather than the actual gearing would provide the regulated company with an incentive to optimise its capital structure and shield third parties from paying too high prices because of an inefficient capital
structure. It is difficult however to determine the efficient capital structure as eg, interest rates and expected return on equity change to reflect different risk levels for different levels of leverage.

2.3.8 EPT perspective

EPT is fully owned by the government and currently does not have any long-term debt. Based on its present capital structure, therefore, EPT’s WACC is equal to its cost of equity, \( R_e \).

In the past, EPT has estimated its WACC on the basis of actual gearing. This is consistent with the approaches followed in other countries. OPTA based the WACC of KPN on current rather than theoretical gearing\(^\text{11}\) (debt 38% of the capital). Ofcom\(^\text{12}\) considered an average of two scenarios for gearing where the highest considered level of gearing was BT’s actual (debt 35% of the capital). The scenario with lower gearing (debt 30% of the capital) resulted in a higher WACC.

However, in EPT’s benchmark countries, the regulated operators are not fully equity financed. It is therefore more likely that actual gearing is closer to the efficient gearing in those cases than in the case of EPT. In order to be certain that the final WACC estimate is appropriate we therefore estimate the efficient gearing.

2.4 Cost of debt

Debt is generally a cheaper source of finance than equity. A company can therefore, within certain limits, reduce the WACC by shifting from equity to debt finance. This is due to:

- Lower risk in debt financing – debt holders are entitled to a predetermined remuneration in predetermined intervals. The company will be in default if it fails to meet this obligation. This reduces the risk of debt holders compared to shareholders that may or may not receive dividends. In the case of financial distress of a company debtors are moreover more senior than shareholders. Shareholders will in such events only be paid after debtors have been paid in full;

- Tax shield - interest payments are tax deductible whereas dividends to shareholders are not. This corporate tax shield reduces by the corporate tax rate the cost of debt borne by the company. The corporate tax rate in Luxembourg was reduced to 29.67% in 2006.

As EPT has no current long term borrowing we cannot assess the level of debt premium using standard approaches such as reference/benchmarking to other companies with similar level of gearing and credit rating, or use regression analysis to derive the relationship between EPT’s cost of debt and a number of documented variables that influence the cost of debt. Instead, we have used the standard formula to estimate the pre-tax cost of debt capital:

\[^{11}\text{Op. cit.}\]
\[^{12}\text{Ofcom (18 August 2005) “Ofcom’s approach to risk in the assessment of the cost of capital”}\]
\[ R_d = R_f + P_d \]

Where:

- \( R_f \) = Risk free rate (as determined previously, 4.31%)
- \( P_d \) = Corporate debt premium (dependant on default risk)

### 2.4.1 Debt premium

The debt premium reflects a company’s risk of default. Credit rating agencies assign companies with ratings which communicate the level of risk. The graph below shows the average debt premium for the rating agency Standard & Poor’s (S&P) ratings.

**Relation between S&P rating and bank premiums on loans (2006)**

There is a clear difference in the premiums for investment grade rated bonds (ie, BBB or above) and bonds below investment grade. Even with significant debt on their balance sheets, all the major European telecommunication companies had investment grade ratings, as summarised below.

**Standard & Poor’s rating (May 2007)**

<table>
<thead>
<tr>
<th>Rating</th>
<th>France Telecom</th>
<th>Deutsche Telekom</th>
<th>Telefonica Italia</th>
<th>Telia-Sonera</th>
<th>BT</th>
<th>KPN</th>
<th>Belgacom</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-</td>
<td>A-</td>
<td>BBB+</td>
<td>BBB</td>
<td>A-</td>
<td>BBB+</td>
<td>BBB+</td>
<td>A</td>
</tr>
</tbody>
</table>

As EPT currently is all-equity financed, there is scope for a shift towards debt finance while maintaining investment grade status (a rating of BBB or above). Companies rated below BBB pay significantly higher risk premiums than investment grade companies. It is therefore unlikely

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13 Ernst & Young extracts from Bloomberg
that optimal gearing would imply use of debt to such a degree that the company would no longer be able to obtain a BBB rating as a minimum. We associate a 50% gearing with a BBB rating\textsuperscript{14}.

In our WACC estimation we have estimated the debt premium to apply for EPT, based on the rating that different levels of gearing would imply. The values we have used are shown in the table below:

\textbf{Debt premium as a function of rating and gearing}

<table>
<thead>
<tr>
<th>Debt as % of capital</th>
<th>Rating</th>
<th>Premium</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.00%</td>
<td>D</td>
<td>14.00%</td>
</tr>
<tr>
<td>93.75%</td>
<td>C</td>
<td>12.70%</td>
</tr>
<tr>
<td>87.50%</td>
<td>CC</td>
<td>11.50%</td>
</tr>
<tr>
<td>81.25%</td>
<td>CCC</td>
<td>10.00%</td>
</tr>
<tr>
<td>75.00%</td>
<td>B-</td>
<td>8.00%</td>
</tr>
<tr>
<td>68.75%</td>
<td>B</td>
<td>6.50%</td>
</tr>
<tr>
<td>62.50%</td>
<td>B+</td>
<td>4.75%</td>
</tr>
<tr>
<td>56.25%</td>
<td>BB</td>
<td>3.50%</td>
</tr>
<tr>
<td>50.00%</td>
<td>BBB</td>
<td>2.25%</td>
</tr>
<tr>
<td>40.00%</td>
<td>A-</td>
<td>2.00%</td>
</tr>
<tr>
<td>30.00%</td>
<td>A</td>
<td>1.80%</td>
</tr>
<tr>
<td>25.00%</td>
<td>A+</td>
<td>1.50%</td>
</tr>
<tr>
<td>20.00%</td>
<td>AA</td>
<td>1.00%</td>
</tr>
<tr>
<td>10.00%</td>
<td>AAA</td>
<td>0.75%</td>
</tr>
</tbody>
</table>

Source: WIK consult, Ernst & Young analysis

\textsuperscript{14} This is in line with the assumption applied e.g. in WIK (2006) “Determination of the optimal WACC”
3 Estimating WACC

In the estimation of WACC, the following scenarios will be tested. The central value for each variable is marked in bold.

Parameter scenarios

<table>
<thead>
<tr>
<th>Input factor</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity risk premium</td>
<td>4.75%</td>
<td>5.00%</td>
<td>5.25%</td>
</tr>
<tr>
<td>Gearing</td>
<td>0%</td>
<td>20%</td>
<td>50%</td>
</tr>
</tbody>
</table>

First, the optimal gearing is determined. The graph below summarises the EPT WACC estimated for different debt levels (5% increments) and for different Equity Risk Premiums. The lowest WACC (hence implying the optimal gearing for EPT) is obtained when debt constitutes 20% of the total capital. We associate this debt level with an AA rating.

Pre-tax WACC as a function of ERP and debts as % of capital

As argued above, EPT considers the Medium ERP scenario the most appropriate as it reflects beta and ERP values at or below European estimates. We estimate the optimal gearing as a 20% debt to equity ratio.

In the table below, the effect of gearing is illustrated for this level of Equity Risk Premium. The table shows the effects of increasing debt as part of the capital structure and thereby how the efficient level of gearing is estimated:
### WACC estimation at different levels of gearing

<table>
<thead>
<tr>
<th>Input factor</th>
<th>Actual gearing</th>
<th>Optimal gearing</th>
<th>High gearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk free rate</td>
<td>4.31%</td>
<td>4.31%</td>
<td>4.31%</td>
</tr>
<tr>
<td>Equity risk premium</td>
<td>5.00%</td>
<td>5.00%</td>
<td>5.00%</td>
</tr>
<tr>
<td>Levered beta</td>
<td>0.75</td>
<td>0.94</td>
<td>1.50</td>
</tr>
<tr>
<td>Cost of Equity (post tax)</td>
<td>8.06%</td>
<td>9.00%</td>
<td>11.81%</td>
</tr>
<tr>
<td>Debt premium</td>
<td>0.75%</td>
<td>1.00%</td>
<td>2.25%</td>
</tr>
<tr>
<td>Cost of debt (pre tax)</td>
<td>5.06%</td>
<td>5.31%</td>
<td>6.56%</td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td>29.67%</td>
<td>29.67%</td>
<td>29.67%</td>
</tr>
<tr>
<td>Cost of debt (post tax)</td>
<td>3.56%</td>
<td>3.73%</td>
<td>4.61%</td>
</tr>
<tr>
<td>Gearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WACC (post tax)</td>
<td>8.06%</td>
<td>7.94%</td>
<td>8.21%</td>
</tr>
<tr>
<td>WACC (pre tax)</td>
<td>11.46%</td>
<td>11.30%</td>
<td>11.68%</td>
</tr>
</tbody>
</table>

The prices of debt as well as equity increase reflecting increased risk when the proportion of debt increases. However, the change in mix from relatively expensive equity to relatively cheap debt will bring down the WACC until the point where more debt will increase risk so much that the higher prices for debt and equity outweigh the effect of a change in capital mix.

On this basis, we recommend that a pre-tax WACC of 11.30% is used for the purpose of regulatory pricing.

### 3.1 Benchmarking

The estimated WACC for EPT is in the mid-range of the WACCs applied in Europe. The table below summarises nominal pre-tax WACCs used for regulation of fixed-line wholesale products in Europe.

#### Comparison of WACC across Europe

Source: Cullen international
NB – the figure applied for KPN in the Netherlands of 7.6% is actually a pre-tax real (ie excluding inflation). We have calculated the implied nominal rate.

Most countries operate with a WACC between 10% - 11%, but there are three clear outliers; Portugal and Norway who operate with WACCs above 13%, and Denmark which has a WACC below 9%.

The WACC estimations for the UK, Belgium, Luxembourg and the Netherlands are decomposed in the table to illustrate how the different components in the WACC estimation influence Luxembourg’s WACC in an international context:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of calculation</td>
<td>2007</td>
<td>2005</td>
<td>2006</td>
<td>2005</td>
</tr>
<tr>
<td>Risk free rate</td>
<td>4.31%</td>
<td>4.60%</td>
<td>4.30%</td>
<td>3.3%</td>
</tr>
<tr>
<td>Equity risk premium</td>
<td>5.00%</td>
<td>4.50%</td>
<td>4.96%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Levered beta</td>
<td>0.94</td>
<td>1.20</td>
<td>1.351</td>
<td>1.0</td>
</tr>
<tr>
<td>Cost of Equity (post tax)</td>
<td>9.00%</td>
<td>9.98%</td>
<td>11.00%</td>
<td>9.2%</td>
</tr>
<tr>
<td>Debt premium</td>
<td>1.00%</td>
<td>1.00%</td>
<td>0.84%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Cost of debt (pre tax)</td>
<td>5.31%</td>
<td>5.60%</td>
<td>5.14%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td>29.67%</td>
<td>30%</td>
<td>30.36%</td>
<td>30.2%</td>
</tr>
<tr>
<td>Cost of debt (post tax)</td>
<td>3.73%</td>
<td>3.92%</td>
<td>3.58%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Gearing</td>
<td>20%</td>
<td>33%</td>
<td>35%</td>
<td>38%</td>
</tr>
<tr>
<td>WACC (pre tax)</td>
<td>11.30%</td>
<td>11.40%</td>
<td>12.08%</td>
<td>10.1%</td>
</tr>
<tr>
<td>WACC (post tax)</td>
<td>7.94%</td>
<td>7.98%</td>
<td>8.40%</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

Source: Regulator websites

NB – Data for the Netherlands is only available to 1 decimal place. The rate applied in Belgium is 11.52% - the regulator makes a deduction to the calculated rate of 12.08% reflecting differences between the official tax rate and the effective tax rate paid by Belgacom.

The WACC values estimated in this paper for the parameters used to estimate the WACC for EPT are broadly in line with those in the UK and Belgium, and above the Netherlands, though on the basis of different input parameters. A comparison with Belgium reveals that the primary source of a higher WACC in Belgium than in Luxembourg is a relatively high levered beta. Higher leverage accounts for part of this difference. The rest is attributable to market conditions. In the case of Belgium where a significant number of network companies have each a high network coverage, the presence of extensive cable networks implies more competition. This increase business risk and thereby potential volatility compared to the European average.

There are a number of reasons why the WACC in the case of Luxembourg may be higher than the EU average:
The Luxembourg economy is not as diversified as other European countries (Luxembourg relies e.g. to a relatively high extent on financial services) and is as a result more vulnerable to internal as well as external shocks;

EPT’s relatively small size compared to other telecommunication providers in Europe would make it difficult to secure sufficient volumes in trading and ability for institutional investors to trade larger blocks of shares. It is therefore appropriate to include a liquidity premium to compensate for the greater difficulty an investor would have in reducing exposure to, or completely exiting, an investment in EPT. As EPT is privately held and there therefore are no liquid markets for EPT shares, the actual liquidity premium is likely to be much greater than what is observed for small companies that are actually traded. Not considering a liquidity premium, even though it is not directly observable, would therefore implicitly punish EPT for being privately held and may moreover make it difficult for listed network operators, for whom the premium will be directly observable, to compete as their WACC will be higher than the regulated WACC; and

The country’s small size makes it easier and cheaper to roll out new infrastructure. A high percentage of potential clients can be reached from a limited number of exchanges. This makes it easier to achieve critical scale for equipment installed at the last mile – otherwise a typical barrier to entry. The market’s small size reduces scale economies on international transit and billing systems. However, operators already present in neighbouring countries are likely to enjoy economies of scope in these areas and thereby reduce this barrier. All in all, this implies that EPT faces relatively high business risk. The increasing DSL penetration implies that this risk is likely to materialise as DSL services can be used to increase competition on PSTN services from an IP platform.

These three arguments support an above average WACC as they can push up beta as well as ERP compared to bigger countries. In this context, the estimated WACC seems appropriate.
4 Future model updates

This section discusses issues related to how often the WACC estimate should be updated. The appropriate update frequency for each parameter will be considered in the context of the incentives that the resulting access pricing should promote.

4.1 Update frequency

In theory the WACC should be reviewed and updated as frequently as the period of the charge control for which it applies. This will ensure that it reflects as closely as possible the relevant market conditions. In the context of setting interconnection and access prices in Luxembourg, this would imply a yearly update.

However, yearly updates may add volatility to the WACC and hence regulatory prices. This can create a more uncertain investment environment, particularly for entrants that risk undertaking investments only to see regulatory intervention resulting in margin reductions afterwards as a result of a lower WACC.

Different countries have opted for different time horizons ranging from one year e.g. Belgium, two years e.g. in France and up to four years in the UK. However, in the UK, Ofcom does retain the right to revise the WACC if it can be “demonstrated that there had been a material change in the circumstance of inputs”.

The present WACC estimation is based on benchmarking for each parameter except for the risk free rate and interest rate risk premiums, which are set on the basis of current market data. The benchmarked parameters are not directly related to a specific time horizon as a range of different time horizons are underlying the parameters we have benchmarked against.

Updating the WACC for the risk free rate and interest rate risk premiums is straightforward as public updated statistics are readily available from ECB, the financial markets, and rating agencies. However, a five year rate for the risk free rate was chosen to include the interest rate risk premium to shield investors in new infrastructure against short term volatility in the regulated prices as a result of interest rate changes. Since the risk of volatility is included in the interest rate there is therefore no inherent need to update the data every year in response to such potential changes.

Beta values and equity risk premiums can be more difficult to estimate and are likely to be more volatile over time compared to the risk free rate or debt premium. This short term volatility reflects the dynamics of financial markets where funds can be reallocated between assets continuously to benefit from changes in expected returns. The use of a broad group of countries in the benchmark to estimate mitigates the risk that short term volatility is reflected in the estimate of beta and ERP. The IRG benchmark will therefore provide a reliable benchmark that

15 Ofcom (2005), Ofcom’s approach to risk in the assessment of the cost of capital
can be updated when appropriate, as subsequent IRG studies become available, or, if necessary, can be obtained directly from national regulatory authorities.

Telecommunication companies investing in infrastructure do not have the same ability to dynamically scale their investments to reflect changing returns for different assets, as a material part of infrastructure investments will be sunk. Thus a change in expected market returns does not mean that telecommunication companies pursuing a rational investment strategy in a competitive environment can and/or should respond by changing their prices or considering a different cut-off level for the Internal Rate of Return (IRR) for investments.

The nature of the parameters supports a regime of updates with time intervals of more than one year, and there is international precedent for a WACC being applied for up to four years. This suggests that it would be reasonable, assuming reasonable stability in the underlying parameters, for the WACC proposed in this paper to apply for up to 4 years.