



Decision and Further Consultation on Estimating the cost of capital

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Malta Communications Authority

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1 Background

1.1 Introduction

In December 2006, the Malta Communications Authority (hereafter “the Authority” or “MCA”) published a Consultation and Proposed Decision on Estimating the cost of capital (hereafter “the Proposed Decision”). This Proposed Decision addressed the theoretical background for estimating the cost of capital and asked for the views of respondents on a number of specific aspects related to the MCA’s proposed methodology and approach in estimating the cost of capital (hereafter “WACC”).

The consultation period for the aforementioned Proposed Decision ended on 9 February 2007. Two operators submitted their formal feedback and the Authority would like to take the opportunity to thank them for their contributions.

This Decision and Further Consultation contains a summary of the feedback received from respondents, the Authority’s position in relation to these comments, and subsequently, the Authority’s decisions on the proposed methodology and approach in estimating the cost of capital. In this Document, the MCA also proposes to further consult on the Beta values to be used for the calculation of the WACC.

2 Theory of risk and return

This section provides a brief overview of the models commonly used to estimate the rate of return required by an investor in exchange for bearing different levels of risk associated with different investments.

Investors have the opportunity to invest their money and for doing so will want to obtain compensation for the risk in the form of added wealth. The company attains a reward to its providers of finance by investing in projects that generate wealth, thereby allowing it to service debt finance and maximise share value.

In order to assess whether an investment is wealth-creating, it is important to have a clear understanding of cash flow and the time-value of money. Shareholders are made better off only if the benefits associated with an investment exceed the costs. However, costs and benefits may occur at different time periods, thereby introducing the factor of the timeliness of receipts and payments.

Cash flows today are valued higher than cash flows at a future date because:

- Future cash flows are subject to greater uncertainty than cash flows now;
- Inflation erodes the purchasing power of money;
- As a matter of personal consumption preference, it is generally preferable to consume now rather than later;
- Cash flows now can be invested at a given interest rate and generate even more wealth. Future cash flows, therefore, carry an element of opportunity cost in terms of foregone earnings.

In assessing investment decisions, investors therefore need to discount future cash flows at a rate that encompasses the risks involved. Where a project results in a positive net present value (NPV), then it can be said that the benefits exceed the costs, and the investment adds to shareholder wealth. The net present value (NPV) of an investment is therefore the sum of future discounted cash flows and is represented as:

$$NPV = I_0 + \sum_{t=1}^T \frac{I_t}{(1+i)^t}$$

Where:

- I_0 represents the cost of initial investment now;
- I_t represents the certain cash flow at the end of year t ; and
- i represents the discount rate which is determined by the time value of money, that is the safe or risk free rate of return.

However, in reality future outcomes are not certain, and are subject to varying degrees of uncertainty. Economic theory has developed a number of different approaches to modelling risk.

The sources of risk are commonly categorised as specific risk and systematic risk. Specific risk is associated with factors directly attributed to an individual company or product. Holding a well-diversified portfolio can mitigate this type of risk. It is generally assumed that a rational risk averse investor can and will want to eliminate this element of risk through diversification.

Systematic risk, on the other hand, refers to those factors that are common to the whole market and will have some impact on nearly all the companies within an economy. The main examples of systematic risk are factors that have an impact on demand, such as fluctuations in the GDP growth (such as a boom or a recession), oil prices and interest rates. This element of risk cannot be diversified away.

In the light of this, the NPV formula is modified in order to allow for uncertainty in the cash flows, as well as the different types of systematic risk. The income in the second period will represent what the investor expects to receive, $E(I_{t+1})$, and the discount rate r reflects both the risk free rate of interest, and the additional premium required for incurring systematic risk. Additionally, the required return demanded by investors increases as the investment becomes more risky. Therefore:

$$NPV = I_0 + \sum_{t=1}^T \frac{E(I_t)}{(1+i)^t}$$

One of the fundamental principles of finance theory is that the rate of return required by investors increases as the risk of the investment increases. This principle is based on the assumption that investors are risk averse and therefore require compensation for any risk they choose to bear as opposed to investing in risk free assets. This theory is supported by historical data on the world's major stock markets, which shows that the returns on different classes of assets do vary, with riskier assets earning, on average, a higher return.

The table below summarises the historic returns for the equity market and government bonds over the period 1900 to 2005.

Index	Bonds	Equities
UK	6.0%	11.6%
USA	5.3%	11.6%
World	5.0%	10.2%

Source: Dimson, Marsh and Stauton, *Global Investment Returns Yearbook 2006*

The level of compensation required by investors for investing in securities is commonly referred to as the company's cost of equity, or cost of debt, depending on the class of securities held. A company's weighted average cost of capital (WACC) is simply the weighted average (based on proportions of equity and debt to total capital) of the cost of equity and cost of debt. The company's cost of capital is equal to the expected return that could be gained from an alternative investment opportunity of equivalent risk that is available in the capital market, that is the opportunity cost.

A company's cost of capital reflects the expected return from the company as a whole, and does not necessarily reflect the risk associated with a particular investment. Investments with different risk profiles need to be evaluated separately, taking into account the risk profile of that particular investment. Companies might therefore use a higher discount rate than the cost of capital for internal investment appraisal purposes of initiatives where the outcome is subject to higher levels of uncertainty.

In the context of this Decision and Further Consultation, the MCA is concerned with the approach to be used in determining the cost of capital of undertakings with SMP. A company-wide measure of cost of capital is useful as a relative measure of risk, taking into account the company's overall portfolio of assets. The remainder of this document discusses the main components of the cost of capital, including the cost of equity, cost of debt and the gearing structure.

The MCA is aware that a company's cost of capital is a reflection of the results of both the regulated and unregulated business. In practice there may be arguments to suggest that the cost of capital of the regulated business may be higher or lower than the average of the company business as a whole. This argument has been debated at length by Ofcom, the UK regulator. In its 2001 conclusions on the "Proposals for Network Charge and Retail Price Control" Oftel (now Ofcom) argued that "there is no longer an obvious basis for adjusting the equity beta of BT to allow for different betas of component activities such as mobile telephony." However in a more recent consultation on risk and cost of capital issued in January 2005 Ofcom debated "whether it should apply different cost of capital figures to different parts of the BT Group. In particular, it proposed that the equity beta, which is an important determinant of the cost of equity within the capital asset pricing model framework, should be lower for BT's copper access business than for the BT Group as a whole". In its final statement issued in August 2005 Ofcom established a separate WACC rate for BT's copper access and the rest of BT. This matter is discussed in greater detail in section 7.1.4 of this document.

3 The Weighted Average Cost of Capital

The Weighted Average Cost of Capital (“WACC”) measures a company’s average cost of debt and equity financing weighted by the percentage of debt and percentage of equity in a company’s capital structure. Arithmetically the formula for calculating the after-tax WACC is:

$$WACC = r_D(1 - T_c) \frac{D}{V} + r_E \frac{E}{V}$$

Where:

- r_D = cost of debt financing;
- r_E = cost of equity financing;
- D = estimated value of debt;
- E = estimated value of equity;
- V = total company value, that is D + E;
- T_c = assumed tax rate.

3.1 A single WACC estimate or a range of estimates

3.1.1 Background

The WACC calculation is dependant on a number of assumptions made for the key variables forming the cost of equity and the cost of debt. Very often it is not possible to award these key variables a single value, but a range of values dependant on the different assumptions made. Therefore, in practice it is very difficult to identify a single WACC estimate.

The MCA sought respondents’ views on the estimation of WACC using a range of pre-defined parameters. The range of parameters which result in a range of WACC estimates reflect the uncertainty surrounding the key parameters. The WACC for regulatory purposes could then be established as an average of the possible outcomes.

Proposed Decision 1: Do respondents agree that the WACC should be estimated on a range of parameters? Do respondents agree that the WACC used for regulatory purposes should be established as an average of the possible outcomes or the mid-point between the high and low WACC estimates?

3.1.2 Summary of responses

In general respondents were in agreement with the MCA's proposition that WACC should be estimated on a range of parameters to reflect the subjectivity surrounding the estimation of the key parameters.

However, one of the respondents expressed concern on the establishment of pre-defined parameters for estimating WACC arguing that calculating WACC on the basis of a defined range of parameters may lead to a situation where the variables which best define an operator's WACC do not fall within the defined ranges. Each operator should determine its own WACC supported by reasonable argumentation justifying each parameter. This particular respondent noted that the impact of political, economical, technological and other environmental factors is different on each operator and at the micro level each operator is subject to different forces which are specific to the circumstances of the company.

Both respondents agreed that due to uncertainty surrounding the estimation of the key parameters, the WACC for regulatory purposes should be established as an average of the possible outcomes (or the mid-point) between high and low WACC estimates.

3.1.3 MCA approach and decision

The cost of capital for regulatory purposes should reflect the operations of an efficient operator which will always seek to minimise its cost of capital. The Authority recognises the difficulty and subjectivity of estimating the various variables making up the cost of capital. However it can be argued that estimating WACC on a range of pre-defined parameters should provide regulated entities with an incentive to optimise their WACC and shield third parties from paying too high prices because of inefficient capital structures and / or financing. The use of pre-defined parameters should also result in a certain level of consistency amongst players.

Based on the above, the MCA is of the opinion that the WACC used for regulatory purposes should be based on a defined range of parameters for the key variables. The range of estimates is a reflection of the uncertainty surrounding the estimation of the key parameters, which are going to be discussed in greater detail in the rest of this document. The WACC used for regulatory purposes would be established as an average of the possible outcomes.

Decision 1:

The Authority directs that the WACC should be estimated on a range of parameters and that the WACC used for regulatory purposes should be established as an average of the possible outcomes.

The estimates should be based on the range of parameters established in this decision notice, and should be computed in a similar manner as detailed in the Illustrative Results included in Appendix I to this decision notice.

3.2 Price base (nominal versus real WACC)

A common consideration in WACC estimates is whether the rate of return should be expressed in real or nominal terms. A nominal WACC is one which does not take into account movements in inflation rates and is calculated in current terms, whereas a real WACC is expressed in constant terms.

So far the MCA has mandated that the WACC be expressed in nominal terms but may review this approach in future consultations.

3.3 Taxation

3.3.1 Background

WACC may be estimated on either a pre- or post-tax basis. When applied to the capital base the pre-tax WACC indicates the pre-tax operating profit required to finance tax and interest payments, while providing shareholders with their required return.

The typical approach would be to compute the WACC on a pre-tax basis. The logic behind this is that tax liabilities are highly dependent on factors outside of normal operations, such as fixed asset base and tax planning skills. However, in practice, market information may only be available post-tax, meaning that WACC would be estimated on a post-tax basis and then converted into the pre-tax using the following formula:

$$\text{Pre-tax WACC} = \text{Post-tax WACC} / (1-T)$$

where T is the effective tax rate.

To estimate a pre-tax WACC rate a single tax rate must be estimated. In practice it is difficult to estimate a single effective tax rate, reflecting a company's taxation liability, as the taxation charge will inevitably vary from year to year. Furthermore, forward looking costs do not depend on the tax rate for previous years, but on the corporate tax rate that can be expected in a forward-looking perspective.

Given the uncertainty and difficulty of making such a projection, the MCA proposed the pragmatic solution of using the current corporate tax rate in Malta of 35% as a proxy for the effective tax rate. Although the MCA is aware that this may not be conceptually perfect, the use of the corporate tax rate eliminates any uncertainty that would otherwise be introduced by attempting to estimate the effective rate. Furthermore, the use of the corporate tax rate is in line with generally accepted

practice, and is adopted by a number of other regulators including Ofcom¹ and Post & Telestyrelsen (“PTS”), the Swedish regulator².

Question 2 of the consultation and proposed decision sought respondents’ views on the use of a corporate tax rate of 35% as a proxy for the effective tax rate.

Proposed decision 2: Do respondents agree with the MCA’s pragmatic approach of using the corporate tax rate of 35% as a proxy for the effective company tax rate?

3.3.2 Summary of responses

One of the respondents agreed with the MCA’s pragmatic approach of using the current corporate tax rate of 35% as a proxy for the effective tax rate.

However the second respondent argued that although in most circumstances and in the context of the present tax legislation, an operator’s effective tax rate should normally approach the corporate tax rate, there are circumstances which may deviate an operator’s effective tax rate from the standard rate (such as disallowed expenses or tax incentives available under the Business Promotion Act). Therefore, the respondent argued that each operator should be granted flexibility to apply its own effective tax rate, providing reasonable explanations and reconciliations in the case of material deviations from the standard rate.

3.3.3 MCA approach and decision

The MCA understands that there may be circumstances that deviate an operator’s tax rate from the standard corporate tax rate on a year by year basis, making it difficult to estimate a single effective tax rate going forward.

Forward looking costs do not depend on the tax rate of previous years, but on the tax rate that can be expected in a forward looking perspective. The corporate tax rates are not expected to change in the near future, and the tax circumstances of the operators are not significantly different from one another.

Having considered the responses of both respondents, MCA remains of the view that given that operators are operating in the same business environment, and the difficulty and uncertainty of projecting a forward looking effective tax rate, the corporate tax rate of 35% is the most appropriate rate to be used as the effective company tax rate when calculating WACC. Should the corporate tax rate change in the future, then the MCA shall direct operators to reflect the revised rate when calculating WACC. This approach should ensure consistency in treatment amongst the operators, and is in line with the approach used by a number of other regulators.

¹ Oftel Review of the Mobile Market, 2004.

² Estimating the cost of Capital for fixed and mobile: SMP operators in Sweden, July 2003, Andersen Management International A/S.

Decision 2:

The Authority directs that the corporate tax rate of 35% should be used as a proxy for the effective company tax rate.

3.4 Capital structure

The assumed proportion of debt and equity financing (i.e. the level of gearing) is an important component of the WACC calculation. Theoretically, a company can potentially lower its overall cost of capital by increasing its gearing up to a certain point. This is because debt is cheaper than equity as a result of tax advantages and the lower risk premium associated with debt.

This does not imply that a company should continue to increase its debt indefinitely in an attempt to reduce its overall cost of capital. Increasing the level of gearing beyond an optimal level will give rise to sharp increases in financial risk which are likely to result in an increase in both the cost of debt and the cost of equity, thus resulting in an increase in the WACC. This situation suggests that an optimal gearing ratio exists which maximises benefit to the company and minimises WACC.

The key issues to consider in estimating a company's capital structure are:

- The values of debt and equity to be used in the calculation; and
- Use of existing gearing versus optimal / target gearing structure.

3.4.1 Market versus book values of debt and equity

3.4.1.1 Background

A number of arguments exist on whether it is more appropriate to use book cost or market value of debt and equity when calculating a company's gearing for the purposes of estimating WACC.

Finance theory suggests that market values should be used in estimating gearing. Damodaran argues that *"the weights assigned to equity and debt in calculating the weighted average cost of capital have to be based upon market value, not book value. The rationale rests on the fact that the cost of capital measures the cost of issuing securities, stocks as well as bonds, to finance projects, and these securities are issued at market value, not book value"*.³

In practice it may be difficult to estimate the market value of stocks and shares where these are not publicly traded. In the local context, only GO plc (previously Maltacom plc) has shares publicly traded on the Malta Stock Exchange. In the absence of market information, a company's gearing structure has to be computed on the basis of book values of equity (capital and reserves) and outstanding debt.

In the case of GO, the market value of its equity can be determined by reference to the market price of its shares, which are listed on the Malta Stock Exchange and the London Stock Exchange (as Global Depository Receipts). In computing the market value one needs to determine whether to use the latest market price or an average price over a defined period of time. Technically, in a strongly efficient market the market price should reflect the best available estimate of the market value of the equity and is superior to using book values or averages of past market prices. However, if share prices are subject to significant fluctuations due to certain conditions, such as thin or speculative trading and other market anomalies, then it may make more sense to use an average market price over a pre-determined number of months.

Due to the above considerations the MCA is of the view that, where market prices are available, a company's current gearing structure should be computed on the basis of average market prices over a one-year period.

In the consultation and proposed decision, the MCA sought respondents' views on whether a company's existing gearing structure should be computed on the basis of average market prices over a one-year period. Furthermore, the MCA considered the fact that GO's equity is quoted on the Malta Stock Exchange and the London Stock Exchange and sought respondents' views on whether in such cases the computation of the market price should take into consideration the share price on both exchanges.

³ Investment Valuation, Tools and techniques for determining the value of any asset, Aswath Damodaran

Proposed decision 3.1: Do respondents agree that where market prices are available, a company's existing gearing structure should be computed on the basis of average market prices over a one-year period?

Proposed decision 3.2: Where equities are traded on more than one stock exchange, should the market price be computed on the basis of the weighted average price taking into account share prices on the different markets, or should it be restricted to the market price on the local stock exchange?

3.4.1.2 Summary of responses

Both respondents agreed with the MCA's proposed decision that where market prices are available, a company's existing gearing structure should be computed on the basis of average market prices over a one-year period.

One of the respondents noted that, should a company have dual listing, one would not normally expect any significant differences between the prices quoted on different stock exchanges, as otherwise arbitrage would come into play to even out the differences. Any variations between the two quoted prices would normally be attributable to very short term fluctuations and transaction costs.

The second respondent noted that given that GO's listing on the London Stock Exchange is relatively small in proportion to the total share capital, any attempt to average out market data arising from GDR transactions with market data from the trading activity on the local stock exchange would not provide any additional benefits. Furthermore, the same respondent noted that in situations where a company's equity is not listed on a recognised stock exchange, the market value of equity could still be estimated through the use of valuation techniques. Although the respondent recognises that there is a degree of subjectivity involved in such an exercise, it believes that the estimation of the fair market value of equity of an unlisted entity would provide a more realistic measure of the equity component of gearing.

3.4.1.3 MCA approach and decision

Considering that both respondents accepted the MCA's views with respect to the computation of a company's existing gearing structure on the basis of average market prices over a one-year period, the MCA retains its position in this regard.

The MCA acknowledges the second respondent's arguments on the computation of market prices where shares are traded on more than one stock exchange. Although theoretically market prices should be established by reference to the weighted average of share prices on the different exchanges, in view of the relatively low volume of equity traded on the second exchange, in this case only the market price on the MSE should be considered for calculating the existing gearing. However, the MCA retains the right to change its position should the number of shares quoted on the second stock exchange increase.

The MCA also acknowledges the arguments put forward by the second respondent with respect to the estimation of market value of equity where shares are not quoted on a recognised stock exchange. However, given the subjectivity involved in such an estimation exercise, coupled with the fact that regulatory WACC is based on optimal rather than existing gearing, the MCA will retain its position that market values will only be used when shares are publicly quoted.

Decision 3:

The Authority instructs that where market prices are available, a company's existing gearing structure should be computed on the basis of average market prices over a one-year period.

The Authority directs that where equities are traded on more than one stock exchange, the market price should be computed on the basis of the market prices of the predominant stock exchange. Provided that where a significant portion of the equity is traded on more than one exchange, the market price should be computed on the basis of the weighted average price taking into account share prices on the different markets.

3.4.2 Existing versus optimal gearing structure

3.4.2.1 Background

Theoretically, a forward-looking WACC should be based on the estimated optimal capital structure over the period of the regulation, as opposed to the existing capital structure of a company. An optimal gearing ratio makes full use of the tax advantages of debt while keeping default risk at levels acceptable to shareholders.

The argument for using an optimal capital structure is further strengthened by the fact that:

- a company's financial structure at a point in time may not necessarily reflect the capital structure that is expected to prevail over the life of the business; and
- the regulatory WACC is used to provide the operator with a reasonable rate of return on regulated basis, assuming an efficient gearing structure.

To develop an optimal capital structure for a company one should consider the following:

- a) Current market-value based capital structure of the company;
- b) Capital structure of comparable companies;
- c) Company's business plans and investment projections over the period of the regulation and the likely borrowing constraints of the market.

In practice the MCA does not have information on the company's business plans and investment projections. Therefore, the optimal gearing structure is developed by reference to (a) and (b) above and by making reference to optimal gearing structures used by other regulators.

The views expressed by other regulators in connection with optimal gearing ratios are set out below.

- Ofcom: In its December 2003 consultation on wholesale mobile call termination Ofcom stated that “it is still appropriate to consider the wider range of 10% to 30% for the optimal gearing of UK mobile operators to allow a potential for different capital cost structures. This range is broadly consistent with the actual gearing ratios of the UK MNOs in recent years.”⁴
- PTS: In their report to PTS on estimating the cost of capital for fixed and mobile SMP operators in Sweden, Andersen Management International (“AMI”) noted that: *“Evidence suggests that the gearing levels for mobile operators are significantly lower than that of their integrated counterparts. This may be explained by the fact that incumbents with a combination of mobile and fixed assets have a greater capacity for debt financing provided by the more cash generative fixed investments albeit of lower growth potential. If the optimal gearing of TeliaSonera were 25%, the optimal gearing of its mobile operations would be lower...We therefore propose using a lower gearing level for a Swedish mobile operator than for integrated operators. We estimate that an interval of 10% - 20% is reasonable and consistent with long term grade A/A credit rating”*⁵.
- New Zealand Commission: In their Draft Determination on the Application for Pricing Review for Designated Interconnection Service the Commission noted that *“in his report to the Commerce Commission on the cost of capital for electricity companies, Lally stated that it would be consistent to use optimal rather than actual levels of leverage in conjunction with the use of efficient cost and actual levels of gearing with actual costs... In the 2001-02 Final TSO Determination the Commission concluded that an optimal leverage ratio should be used, and is best based on observations of the average leverage amongst relevant firms. Taking into account of evidence of Telecom’s current and past gearing, gearing of other telecommunications firms and the gearing of regulated firms, the Commission adopted a leverage ratio of 30%. The same ratio was used in the 2002-03 TSO determination”*.⁶

The above positions reflect that other national regulatory authorities tend to favour the use of optimal gearing structures. This is in line with the principle that cost-oriented prices should be consistently based on an “efficient operator” basis. The MCA is of the view that gearing ratios should be based on optimal gearing structures by taking into account of the following:

- A range of gearing structures should be considered – this in view of the difficulties encountered in establishing a single optimal gearing ratio;
- Gearing structures used by other regulators;

⁴ ‘Wholesale mobile call termination’, Ofcom consultation December 2003

⁵ ‘Estimating the cost of capital for fixed and mobile SMP operators in Sweden’, Andersen Management International 9 July 2003

⁶ Draft Determination on the application for Pricing Review for Designated Interconnection Services, New Zealand Commission, 11 April 2005

- Gearing structures of comparable companies - in this case one should consider both the existing gearing structures as well as the average gearing structures over the previous 5 years in order to take into account recent changes which have occurred in the electronic communications sector;
- Existing gearing structures - where possible these should be estimated on the basis of market values.

In a recent study on the WACC rate for fixed telecoms in Sweden, the authors reviewed the gearing estimates used by other European authorities in the regulation of fixed telecommunication network operators. Copenhagen Economics noted that the lowest gearing used is of 30% (Finland) and the highest gearing used is 52% (Portugal)⁷.

Based on an evaluation of all the above factors the MCA expressed the view that, at the current moment, the optimal gearing structure (on a debt to debt plus equity basis) should lie in the range of 10% to 30% for mobile operators and in the range of 20% to 40% for fixed operators.

In the proposed decision, MCA asked respondents for their views on the use of optimal versus existing gearing structures, the use of a range of gearing ratios and different gearing ratios for mobile and fixed and cable operators.

Proposed Decision 4.1: Do respondents agree that the WACC used for regulatory purposes should be based on optimal gearing structures as opposed to the existing gearing structures?

Proposed Decision 4.2: Do respondents agree that a range of gearing ratios should be used in estimating the WACC rate?

Proposed Decision 4.3: Do respondents agree with the use of an optimal gearing ratio ranging between 10% to 30% for mobile operators, and 20% to 40% for fixed and cable operators?

3.4.2.2 Summary of responses

Both respondents were in agreement with the MCA's view that an optimal gearing, as opposed to the existing gearing structure should be used to estimate WACC for regulatory purposes.

However both respondents expressed concern on the proposed range of gearing ratios.

One of the respondents noted that a company's optimal gearing structure is specific to a company's own case and may differ from operator to operator depending on

⁷ WACC for the fixed telecommunications net in Sweden, Copenhagen Economics for PTS, 26 October 2007

the type of technology implemented. The respondent believes that each operator should have the flexibility to apply its own optimal target capital structure rather than the MCA stipulating a specific range of values

The second respondent concurred with MCA's view that a range of gearing ratios should be used in estimating the WACC rate. However, it did not agree with the ranges proposed by the MCA, arguing that the proposed range of 20% to 40% for fixed operators is on the high side. In conclusion the said respondent noted that a feasible optimal gearing ratio range is of between 15% to 25% and that this range should be applied to both fixed and mobile operators.

3.4.2.3 MCA approach and decision

Both respondents agreed that the WACC used for regulatory purposes should be based on an optimal gearing structure. An optimal gearing structure is one which minimises a company's WACC.

There is a trade-off between the cost of equity and the cost of debt, which tends to be cheaper than equity. As noted in section 6 of this report, there is also a trade-off between the level of gearing and the cost of debt, with the cost of debt increasing as gearing levels increase.

The MCA considers that its original estimates of the gearing are appropriate, and should provide the regulated entities with an incentive to optimize their capital structures and shield third parties from paying too high prices because of non-optimal capital structures.

Decision 4:

The Authority directs that WACC used for regulatory purposes should be based on optimal gearing structures as opposed to existing gearing structures.

The Authority directs that a range of optimal gearing ratios, ranging between 10% to 30% for mobile operators and 20% to 40% for fixed and cable operators, should be used to estimate WACC.

4 Estimating the cost of equity

4.1 The CAPM model

4.1.1 Background

As highlighted earlier most assets have some exposure to risk, and the riskier the investment the higher the return required to compensate for the increased risk. The cost of equity represents the rate of return required by investors for investing in a risky asset as opposed to earning the risk free rate.

There are a number of models that can be used to estimate the cost of equity. In practice the most commonly used asset pricing models are the Capital Asset Pricing Model (CAPM), the Arbitrage Pricing Theory (APT) and the Fama and French Three Factor Model. Each of these models share the common views that all investors hold a well diversified portfolio and that an investment is risk free only when there is certainty that the actual return will be equal to the expected return. Despite these common views, a number of differences exist.

The following section present a brief description of each model in order to highlight the principle theoretical and empirical differences, and assess which model best suits the calculation of cost of capital for local regulatory purposes.

The Capital Asset Pricing Model

The CAPM is built on the premise that the variance in returns is an appropriate measure of risk, however only that portion of the variance that cannot be diversified is rewarded by a risk premium. The model measures the non-diversifiable variance using a “beta estimate” and links up the expected return to this beta estimate.

Under the CAPM methodology the cost of capital is derived from three main factors, namely:

1. The risk free rate;
2. The market equity risk premium; and
3. The beta value for the company in question, which is measured by reference to the volatility of returns of the company relative to the volatility of the overall market portfolio.

Arithmetically, the equation for the cost of equity is expressed as follows:

$$r_E = r_f + \beta(r_m)$$

Where:

- r_E is the required return on equity,

- r_f is the risk free rate of return,
- r_m the market equity risk premium, and
- β is the measure of systematic risk which cannot be diversified away by investors.

Under the CAPM the rate of return of a risky asset is a linear combination of the risk free rate and the equity risk premium, with the weights given by the asset's beta. The simplicity of the model is attractive and largely explains the popularity of the CAPM amongst practitioners. However, this simplicity has a price as it implies a number of strong underlying assumptions.

A number of assumptions related to investor's risk aversion and competitive equilibrium are common to all asset pricing models. These assumptions include that:

1. All investors are rational and risk averse; and
2. Markets for risky assets are in perfectly competitive equilibrium, that is:
 - there are no transaction costs, taxes, constraints on short selling, or other market frictions;
 - assets are infinitely divisible;
 - there is perfect competition, and no one individual investor can affect asset returns;
 - All investors can lend or borrow unlimited amounts at a common interest rate;
 - Investors have identical beliefs about asset returns.

However the CAPM is also based on a strong assumption that given any portfolio of assets, there exists a portfolio of two mutual funds that investors prefer at least as much as the original portfolio. This gives the characteristic form of the CAPM equation as a linear combination of returns on two portfolios.⁸

Despite these strong assumptions and various criticisms thereto, the CAPM remains the most widely used model amongst practitioners and by regulatory authorities.

The Arbitrage Pricing Model

The Arbitrage Pricing Model (APM) can be seen as a multi-factor version of the CAPM. Whilst the CAPM explains asset returns as a function of the market index,

⁸ A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Stephen Wright, Robin Mason, David Miles February 2003

the APM measures returns as a function of a number of different systematic risk factors. In fact, under the APM cost of equity is defined as:

$$ER_j - R_f = \beta_1(ER_{factor1} - R_f) + \beta_2(ER_{factor2} - R_f) + \dots + u_j$$

Where:

- ER_j is the expected rate of return on security j ,
- $ER_{factor1}$ is the expected return on macroeconomic factor 1,
- β_1 is the sensitivity of security j to factor 1, and
- u_j is the random deviation based on unique events impacting on the security's return.

Each different beta measures the sensitivity of a company's stock return to a separate set of underlying factors in the economy. These typically include pervasive macro-economic influences such as volatility of oil prices, interest rates, exchange rates, inflation rates etc.

The main problem with using the APT is that the model does not identify which factors need to be taken into account in the estimate of asset returns. Consequently, there are serious issues in determining the number of factors to use, and whether the appropriate factors have in actual fact been considered. Additionally, there is no test to justify the appropriateness of the factors used in the model, as their selection is purely subjective.

The Fama and French Multifactor Model

Fama and French (FF) developed another multifactor model that is similar to the APT in concept, and which attempts to resolve two of the key anomalies of the CAPM. The model is developed around the notion that, from an empirical point of view, stocks of small firms and those with a high book-to-market ratio have provided above average returns. It is therefore hypothesised that certain crucial factors are omitted from the CAPM, which only considers beta as a factor affecting asset prices.

The FF model starts with the observation that small-cap stocks, and stocks with a high book-value-to-price have tended to outperform the market as a whole. Consequently, three factors are deemed relevant when estimating the required rate of return, only one of which is considered in the traditional CAPM:

- Market factor: being the difference between the market rate of return and the risk free rate (also used in the CAPM).
- Size factor: being the difference between the return on small-firm stocks, and large-firm stocks.
- Book-to-market factor: being the difference between the return of high book-to-market-ratio stocks and low book-to-market-ratio stocks.

Similar to the APT, the cost of equity under FF model is defined as:

$$ER_j - R_f = \beta_{market} (ER_{market_factor}) + \beta_{size} (ER_{size_factor}) + \beta_{book} (ER_{book-to-market_factor})$$

Similar to the other models, high returns are considered as a reward for higher risk. This means that if returns increase with the book to market ratio, then stocks with a high book to market ratio must be more risky than average. The model does not provide a strong basis why the book-to-market ratio should be included, and over the years the inclusion of this factor has been widely disputed⁹. In their study on the Cost of Capital for Regulated Utilities in the UK, the authors note that “FF themselves acknowledge that the theoretical basis for their factors is, at best, patchy. While they can, to a limited extent, be rationalised ex post, there is no clear theory that posits a positive premium on the factor portfolios...even within their own sample, the empirical evidence of significantly positive premia is not very strong”.¹⁰

The MCA's preferred approach

In line with the preferred approach of other regulators including Ofcom, the MCA's initial preferred approach is to estimate the cost of equity using the CAPM. Although the model suffers from certain theoretical shortcomings it is widely used by practitioners, has a clear theoretical foundation, is simple to implement and is well established when compared to other asset pricing models.

In fact, in their Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, the authors state “*it is now well-known that the CAPM has failed to account for several observations about the average stock returns (for example, that they are related to firm size, book-to-market equity and a number of other factors).*”¹¹ Despite these shortcomings, the authors conclude that the CAPM still retains the status of the model of choice for estimating the cost of equity. “*Almost all regulators of utilities companies estimate acceptable rates of profit by reference to CAPM. Use of the CAPM to estimate the required rate of return on the equity of a company is the usual procedure in large investment banks and securities houses. For example, Merrill Lynch, one of the world's largest investment houses, in its recent publication “The Cost of Capital Guide” uses the CAPM to estimate the required rate of return on the equity of companies throughout Europe. The London Business School share price service has for many years provided the inputs needed to use the CAPM to estimate the cost of equity...*”¹²

⁹ Refer to Malin M, & Veeraraghavan, ‘On the robustness of the Fama and French Multifactor Model: Evidence from France, Germany, and the United Kingdom’ International Journal of Business and Economics, 2004 Vol 3 (2)

¹⁰ A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Stephen Wright, Robin Mason, David Miles February 2003.

¹¹ A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Stephen Wright, Robin Mason, David Miles February 2003

¹² *ibid*

Furthermore, in its recent consultation on the approach to risk in cost of capital, Ofcom states that *"the CAPM has a clear theoretical foundation and its implementation is simple and well established relative to that of other asset pricing models... The empirical shortcomings of the CAPM are known. Alternative models to address this issue have their own shortcomings – weak theoretical foundations and empirical challenges. In our view, there is at present no one clear successor to the CAPM for practical cost of capital estimation¹³.*

Similar conclusions are made by a number of other regulators and practitioners. The MCA shares the view that notwithstanding its shortcomings the CAPM represents the most practical cost of equity estimation. The specific issues relating to the inputs required by the CAPM and other practical issues surrounding the implementation of the model are examined in the remaining part of this document.

In its consultation and proposed decision, the MCA sought respondents' views as to whether they agree with the view that the CAPM represents the most practical financial model to estimate the cost of equity.

Proposed decision 5: Do respondents agree with the MCA's view that the CAPM represents the most practical financial model to estimate the cost of equity?

4.1.2 Summary of responses

Both respondents concurred with the MCA's view that the CAPM is the most practical financial model to estimate the cost of equity.

However one of the respondents further argued that the CAPM model alone does not capture all the risks inherent in the case of the company the respondent represents. The CAPM model does not measure the specific (unsystematic) risk of an entity and it only takes into consideration the systematic risk through the market equity risk premium. This respondent claims that given the environment and state of the market in which it operates, unsystematic risk is very relevant and forms an important element of the company's cost of equity. The respondent therefore proposed that the CAPM as adjusted to take into account unsystematic risk (alpha risk) is the most appropriate method to be used for the calculation of the company's cost of equity.

4.1.3 MCA approach and decision

As highlighted in the consultation document, use of the CAPM is widespread among regulators including Ofcom. The MCA retains the view that despite its shortcomings the CAPM remains the most appropriate model to estimate the cost of equity. This view is supported by an independent study carried out on behalf of Oftel (now Ofcom) and the UK economic regulators "A study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK". The report's conclusion regarding the appropriateness of the various models is reproduced below:

¹³ Ofcom's approach to risk in the assessment of the cost of capital, Ofcom August 2005

"In summary: the empirical shortcomings of the CAPM are known. Alternative models to address this issue have their own shortcomings – weak theoretical foundations and empirical challenges. In our view there is at present no one clear successor to the CAPM for practical cost of capital estimation. We do however feel that alternative models provide helpful insights into the points of vulnerability of the CAPM, and may also provide information on the robustness of the CAPM beta."¹⁴

This view is also supported by the Independent Regulators' Group (IRG) which "observes that there are empirical shortcomings in the CAPM methodology. On the other hand, alternative models also have their own problems such as weak empirical foundations and empirical challenges. Therefore, at the moment CAPM is widely used for the purpose of calculating cost of capital."¹⁵

In the light of the above and the continued widespread use of the CAPM by other regulators and competition authorities, particularly in the UK, the MCA remains of the view that the CAPM is the most appropriate asset pricing model. The MCA is not aware of instances where Ofcom or other telecom regulators have adjusted the CAPM to take into account unsystematic risk, and would need to be convinced of the validity of such an adjustment before departing from the standard CAPM approach.

Decision 5:

The Authority directs that the CAPM model should be used when estimating the cost of equity.

¹⁴ A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK, Stephen Wright, Robin Mason, David Miles February 2003.

¹⁵ Principles of Implementation and Best Practice for WACC calculation, IRG – Regulatory Accounting, February 2007

5 Arriving at an Estimate of Cost of Equity Using the CAPM

This section will consider the various issues involved in estimating the cost of capital using the CAPM methodology. Each of the components of the cost of capital – namely the risk free rate, the beta coefficient and the equity risk premium are discussed separately.

5.1 Estimating the risk free rate

5.1.1 Background

The risk free rate is the expected return on an asset which bears no risk at all. For an investment to be truly risk free the risk of default needs to be zero and there must be no reinvestment risk (the actual return and the expected return are equal at maturity).

In practice it is difficult to find an investment that is entirely risk-free, since some form of reinvestment risk tends to exist. However, freely traded government bonds can generally be regarded as having close to zero risk of default and liquidity. In nominal terms the yield to maturity on such bonds, which takes into account future expectations of inflation and any differences between the coupon rate of interest and the prevailing market rates, is typically regarded as a proxy for the risk free rate.

In order to estimate an appropriate risk free rate of return the following factors need to be considered:

- Maturity period of the government bonds;
- Use of nominal versus real returns on government bonds;
- Historic versus current yields.

Maturity period

In practice there is a range of maturities which could be used as a basis to estimate the risk free rate. Maturities of Malta Government Stocks range from less than one year up to seventeen years.

Theoretically, the maturity period should be determined by reference to the investment horizon of a project, that is, the average life of the group of assets making up the investment project. Therefore for projects whose assets lives range between 9 to 10 years, it may be justified to discount future cash flows using a risk free rate derived by reference to bonds with a maturity period of 10 years. However, from a regulatory context, WACC is not used to discount expected cash flows of a particular investment over the investment horizon, but rather to provide

investors with a reasonable rate of return over the regulatory period. This suggests that the maturity period should be linked to the regulatory review period.

There are arguments in favour of both short and long term maturities as the best estimate of the risk free rate for regulatory purposes. *"For the purposes of calls to mobile market review, a maturity of three years may be appropriate, as the review is concerned with charge controls to be applied over a three-year period. However, it is relevant to consider that mobile operators are required to make longer term investments, for example regarding network infrastructure, hence long-term gilts may better represent the risk free alternative to the investment made by mobile operators. Oftel (now Ofcom) has previously taken a position between these extremes, and used a period of between 4 and 5 years. Oftel considers the use of 5-year gilts as reasonable."*¹⁶

In its March 2005 consultation on the approach to risk in the assessment of the cost of capital, Ofcom also concluded that the use of 5-year gilts strikes a reasonable balance between the use of short and long term gilts as the best estimate of the risk free rate for the proposed charge control.¹⁷

The issue of the appropriate maturity period is also discussed in a number of other papers. Andersen Management International¹⁸ argue that the risk free rate should be linked to the period used to determine the equity risk premium, to ensure a level of consistency in the calculation.

For pragmatic reasons the MCA suggests using a maturity period ranging between 5 and 10 years to estimate the risk free rate for local investments.

Nominal versus real returns on government bonds

Government bonds are generally risk free in nominal terms but not in real terms due to the volatility of inflation. This implies that where there are conditions of high and unstable inflation, it is generally more appropriate to use real as opposed to nominal risk free rates of return.

However, as highlighted in section 3.2 the WACC rate will be estimated in nominal terms. Therefore, a nominal government bond will be used to estimate the risk free rate. If the WACC were to be estimated in real terms, the yield on an inflation bond would be used as a proxy for the risk free rate.

¹⁶ Review of mobile wholesale voice call termination markets, EU Market Review Oftel, 15 May 2003

¹⁷ Ofcom's approach to risk in the assessment of cost of capital, Final assessment, 18 March 2005

¹⁸ Andersen Management International, Estimating the cost of capital for fixed and mobile SMP operators in Sweden, July 2003: "the equity risk premium is normally determined by reference to a 10-year government bond. If one were to use a different time to maturity for the risk free rate, one should therefore also adjust the estimated equity risk premium in order to ensure consistency in the calculation".

The nominal risk free rate is usually proxied by the yield to maturity on government bonds.

Historic versus current yields

If capital markets were perfectly efficient, current yield would reflect all expectations of future earnings and the appropriate measure of the risk free rate would be the current yield.

Current yields show the ratio of the annual interest payments to the asset's current price. This ratio refers to the yield of the asset for the current year and may change over the life of the investment. Historic yields, on the other hand, represent the same ratio calculated as an average (of interest payments on current prices) for a selected time horizon.

In their report to TelstraClear on the cost of capital for mobile operators, the authors state that *"theory predicts that current yields will reflect (all) expectations of future earnings (if capital markets are efficient). However, current yields can be significantly affected by market influences in the short term (e.g. thin trading) and be prone to significant cyclical variations. It is therefore worthwhile to review the historical yields as these may be better predictors of future yields than current yields."*¹⁹

Despite the above, the MCA is of the view that the risk free rate should be based on current yields since these tend to reflect the best available information relating to future yields. The MCA will however be amenable to take into account other factors if it considers that at any point in time the current rate is not a reliable proxy for future rates.

The MCA's preferred approach to estimating the risk free rate

In the consultation and proposed decision the MCA sought respondents' views on the establishment of the risk free rate for the purpose of calculating the regulatory WACC. The Authority also proposed a range of risk free rates and asked the respondents' views on whether the proposed range is appropriate.

Proposed decision 6.1: Do respondents agree with the MCA's view that the risk free rate should be established by reference to the current yield to maturity on Malta Government bonds with maturity ranging between 5 and 10 years?

Proposed decision 6.2: Do respondents agree that a nominal risk free rate ranging between 3.9% and 4.2% is appropriate for calculating the WACC?

The initial view expressed by the MCA was that the risk free rate should be established by reference to current yields on Malta Government Bonds with maturity ranging between 5 and 10 years. At the time of consultation the average yield to maturity on five year Malta Government Stocks ("MGS") maturing in 2011 ranged between 3.96% and 3.99% with a simple average of 3.975%. The average

¹⁹ The cost of capital for mobile operators: Investigation into regulation of mobile termination', Marsden Jacob Associates, 19 July 2004

yield to maturity on 10 year MGSs maturing in 2016 ranged between 4.21% and 4.24% with a simple average of 4.225%. Based on the above, the MCA considered a range of between 3.9% to 4.2% to be an appropriate nominal risk-free rate for calculating the WACC.

5.1.2 Summary of responses

Both respondents were in agreement with the use of the yield to maturity on Malta Government bonds as a proxy for the risk-free rate.

One of the respondents noted that although setting the yield to redemption on a 5 to 10 year gilt as a proxy for the risk free rate is the usual industry practice, an operator should have the flexibility to select a maturity period that best suits the investment constraints and appraisal criteria, thus ensuring consistency in the WACC calculation.

Both respondents noted that yields to maturity are not static and influenced by the country's monetary policy and by movements in the market interest rates. Therefore it may be more appropriate to establish the methodology on which such a rate can be estimated rather than setting a pre-defined range.

5.1.3 MCA approach and decision

The MCA accepts the respondents' views that the yields are not static and has therefore decided to propose the approach to be used by the operators in estimating the risk free rate, rather than setting a pre-defined range.

However, the MCA retains its view that a range of maturities between 5 and 10 years for Malta Government Bonds is the appropriate period to be used in estimating the risk free rate for calculating the regulatory WACC.

Decision 6:

The Authority directs that the risk free rate should be established by reference to the current yield to maturity on Malta Government bonds with maturity ranging between 5 and 10 years, with a mid-point of these estimates as a proxy for the risk free rate for Malta.

5.2 Estimating Beta

5.2.1 Background

Beta measures the market or systematic risk that applies to a particular stream of cash flows. This should be reflected by the volatility of a company's stock price relative to the overall market, and is usually measured by the covariance between the market returns and those of the company.

Theoretically, a company's beta is determined by three key variables:

- The type of business the company operates in;
- The degree of operating leverage (fixed costs to total costs); and
- The degree of financial leverage or gearing.

Since betas measure the risk of a company relative to the market, the more sensitive a business is to market conditions the higher is its beta value. Where a company provides returns which follow closely the market returns, its beta is equal to 1. A Beta above 1 implies that the company's returns are more volatile than the market while a Beta between 0 and 1 implies that the company's returns are less volatile. A security that provides stable returns irrespective of market movements has a beta of 0. Based on the standard CAPM, an investment in a company with a beta value of 0 will only pay out the risk free rate of return to its investors.

It is important to note that, since a firm's equity beta is determined by its equity returns (dividends and share price changes), expectations of future generated cash flows may play a more significant role in determining a company's equity beta than its current cash flows. Expectations of future cash flows may even relate to services that are not currently offered by the company.

Equity beta calculation usually involves an estimation of what the relationship between a company's returns and those of the market will be on a forward looking basis. Expectations of this sort are difficult to measure. As a result, equity betas are typically calculated by using historical data.

In appraising the usefulness of equity betas estimated on the basis of historic data, one needs to consider a number of issues, including:

- The statistical properties, such as:
 - ✓ Reliability of estimates (e.g. standards of error);
 - ✓ Parameter stability (if beta estimates change over time, then it may not be appropriate to use estimation methods that rely on a long run historical data window);

- ✓ Other technical issues, such as heteroscedasticity, autocorrelation and asynchronous trading basis²⁰.
- Need to measure risk relative to an appropriate index (domestic versus international);
- Other issues which are relevant to policy makers such as stability of the estimates and reliance on well known published data sources.

Taken together, the above imply that there are a number of estimation issues that need to be considered in selecting an appropriate basis for estimating a company's beta. The key practical issues in the estimation of betas include:

- Frequency of observation;
- Choice of estimation period;
- Choice of market index;
- The use of a Bayesian adjustment.

Before discussing the above estimation issues in greater detail, it is important to bear in mind that in the local context only one of the undertakings with SMP is publicly traded. GO is currently traded on the Malta Stock Exchange and the London Stock Exchange (in the form of GDRs). The local capital market is relatively young with a limited listing. GO's shares constitute a relatively large part of the share index, with the potential result that beta estimates may be over or under estimated due to feedback effect, whereby a large change in the stock price of GO could result in a significant change in the market index as well, even though the price change is completely unrelated to changes in other assets. Additionally thin trading and market anomalies may also result in volatile prices on the market.

This implies that beta estimates derived on the basis of market trading need to be applied with some care. The MCA, cognisant of this issue, is of the opinion that betas of local undertakings with SMP should be estimated after having considered a number of alternative approaches. In estimating betas of private companies, or companies with a limited stock market data, one may need to consider alternative approaches to estimating beta, including:

- Betas of comparable companies operating in a similar business adjusted for the effect of financial leverage;

²⁰ vide Issues in Beta Estimation for UK Mobile Operators, The Brattle Group, July 2002 for more detail. Heteroscedasticity refers to the absence of homogeneity of variables, such as weekend heteroscedasticity; the potential higher variance of returns on a Monday compared to other days of the week due to the increased amount of information (and time) available across the weekend.

- Betas used by other regulatory authorities which would provide an indication of the risk associated with a particular type of industry.

Betas from stock market information

Frequency of observation

In general, increasing the frequency of observations will result in larger sample size, and improve statistical confidence. In practice the most common data frequencies used are daily, weekly and monthly readings.

The choice of frequency needs to be made in conjunction with the time period to be used in estimating beta. The longer the time period, the lower the frequency required for obtaining a reasonable number of observations.

The use of monthly readings is fairly standard practice amongst practitioners, and helps to overcome the issue of serial correlation in returns.²¹ However, monthly data over a reasonable period of time (five years being the standard) provides too small a data set, resulting in a large potential for estimation errors. Increasing the estimation period over the 5-year standard time-period tends to result in an increase in the probability that beta estimates will be based on factors which are no longer relevant. This is further compounded with the belief that beta changes over-time, and that monthly data is sensitive to the day of the month from which returns are calculated.

On the other hand, daily readings tend to entail a larger sample size for a given estimation period when compared to monthly data, and hence improve statistical confidence. Furthermore, relying on daily data means that more focus is placed on recent information, thereby mitigating the problem of beta variation over time. However, in practice the use of daily data may also present challenges, due to certain market characteristics, such as asynchronous trading and bid-ask spreads, which may significantly bias beta estimates.²²

²¹ "There is evidence that at high frequencies returns may be correlated. In the US there is evidence of positive correlation of daily returns from one day to the next...Serial correlation in weekly and monthly returns tend to be somewhat less significant, though not absent. " – Source: A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the UK - Stephen Wright, Robin Mason and David Miles, February 2003

²² "Stock return data measured very frequently(e.g. daily) reflects not only the risk-return trade-off, but also the "noise" created by the institutional infrastructures of stock trading, such as non-synchronous trading and bid-ask spreads. Empirical studies show that in some cases daily stock return data strongly violates the assumptions underlying Ordinary Least Square regression and the CAPM. In particular, the standard estimation process tends to underestimate the beta of thinly traded shares, and over-estimate that of "thickly traded" ones." Source: Issues in Beta Estimation of UK Mobile Operators, the Brattle Group, July 2002

Asynchronous trading distinguishes between frequently traded and non-frequently traded assets²³. This characteristic tends to cause a problem when trying to calculate the daily returns for assets which have not been traded, since one would technically need to calculate the price that would have been obtained had a trade taken place, and this is inherently impossible to calculate. This issue is unlikely to occur when using monthly data.

The issue of asynchronous trading may be particularly relevant in the local stock market, where one may observe securities which are not be traded for a number of days. Theoretically, if any reliance is to be made on the local stock exchange indicators, adjustments may need to be made for leads and lags to try and capture market forces which could not be observed in non-trade days.

In their report on the cost of capital for regulated utilities in the UK, the authors conclude that *"in general we would expect gains in precision from having more observations, or the advantages in being able to rely upon more recent data, would outweigh the disadvantages of inefficiencies due to induced serial correlation, heteroskedasticity and other timing issues."*²⁴

Furthermore, empirical evidence suggests that *"the standard errors for the daily estimates are very much lower than with weekly, monthly or quarterly data. Standard errors from daily estimates are around one third the standard errors from estimates based on monthly data."*²⁵ In fact, evidence suggests that with monthly data *"unless one uses data from well over 5 years ago the standard errors will generally be large."*²⁶

Nonetheless, the choice between daily and monthly data remains purely judgmental. A safer approach is to weight estimates using both daily and monthly information subject to statistical robustness, with greater importance being placed on daily returns when using a shorter time window and vice versa.

Estimation Period

There is a great deal of evidence which suggests that beta changes over time. This may reflect movements in a company's gearing or changes in the underlying correlations between the company and the aggregate returns.

²³ Share prices of infrequently traded stocks may take some time to reflect new market information, whereas highly liquid investments may reflect market information on the same day or even ahead of the information being made publicly available as a result of speculation.

²⁴ 'A study into certain aspects of the cost of capital for regulated utilities in the UK', Smithers & Co Ltd, 13 February 2003

²⁵ A study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K. – Stephen Wright, Robin Mason and David Miles on behalf of Smithers & Co. Limited, February 13, 2003

²⁶ Ibid

Therefore care should be taken not to employ too long an estimation period since it may not necessarily reflect current values and shareholder expectations. This may be particularly true in the electronic communications sector which has gone through a number of changes in recent years. This is particularly applicable in the local scenario which has seen a number of changes such as increased regulatory intervention, liberalisation of the market, as well as privatisation of the GO group.

The above implies that the length of the estimation period involves a trade-off between greater statistical accuracy by using more data points, and the risk of errors in estimation due to alterations in the underlying economic environment.

One way of providing for changing betas is to use a short estimation period, thereby assuming that beta is closer to the current value of the company. The corollary is that more observations shall be required if greater statistical confidence is to be achieved. The implication is that theoretically it would be better to use daily readings in this case.

In their study into certain aspects of the cost of capital of regulated utilities in the UK, the authors recommend estimating beta using between one year and two year periods with daily data since this tends to give low standard errors. Furthermore, the authors state that *"in the absence of an explicit method for handling time varying covariances and variances, the best one can do in handling changing betas is to use as recent an estimation window as is consistent with estimates having low standard errors. The trade-off between using a large estimation window which gives low standard errors (which means having a large number of observations) and one which comes from a period where beta is likely to be close to its current value (which requires a short estimation window if there is time-variation) is much more favourable with daily data than with weekly or monthly data."*²⁷

The approach of using between one and two years of daily data is also recommended by The Brattle Group.

In practice, the beta during a given period may vary due to specific changes in a company's circumstances. Therefore, one needs to consider whether specific periods (such as during a merger, privatisation, market crash etc) should be eliminated from the data sample. The main principle to use when considering the removal of outliers should be an assessment of whether the unusual behaviour is caused by economic fundamentals, and whether these factors are expected to keep affecting the future distribution of returns. However, caution should be used when subjectively eliminating data from a given sample range. As noted by The Brattle Group *"Automatically excluding outliers...involves a misunderstanding of the fundamental statistical assumptions behind the CAPM model. CAPM in its most commonly used version assumes that asset returns (relative to the market portfolio) are normally distributed. Since the normal distribution has "tails", one should therefore expect to see occasionally very low or very high returns."*²⁸ If the

²⁷ A study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K. – Stephen Wright, Robin Mason and David Miles on behalf of Smithers & Co. Limited, February 13, 2003

²⁸ Issues in Beta Estimation for UK Mobile Operators', The Brattle Group Ltd, July 2002

probability that a particular event or economic condition recurs in the future is highly unlikely, then it is probably more logical to eliminate or disregard the outliers since a forward looking estimate based on such circumstances may be unrealistic.

Choice of market index

An asset's beta is a measure of its riskiness relative to the overall market portfolio. However a definition of the overall market portfolio is not always clear. With greater access to foreign markets, there are strong grounds to suggest that investors tend to hold a mix of investments, comprising both domestic and international portfolios.

Therefore a key issue in beta estimation is the choice of market index, that is whether to restrict attention to the local market or to consider a broader international portfolio. The argument of adopting an international market index implies that all these classes of assets from all markets around the world make up the market portfolio.

Traditionally the cost of capital estimation has focused on the risk relative to the domestic market. Moreover consideration of overseas investments presents some difficulties. In practice it is not clear whether domestic investors hold investments that are proportional in terms of domestic and foreign capitalisation value. This is known as the "home bias" anomaly and arises from a number of factors such as inflation risk, informational disadvantages, tax regulations and differential access to markets.

In principle, beta should be estimated "on the basis of the same portfolio of assets used in estimating the market risk premium. And in theory, this market portfolio should consist of all risky assets, including stocks, bonds, property and commodities in various international markets ... In practice, however, most analysts and regulators simply use the national stock market as a proxy for the market portfolio."²⁹

Bayesian Adjustment

Theoretically, the average beta across all stocks will be close to or equal to unity, whilst the beta on individual stocks will include a certain estimation error. Betas significantly in excess of unity are likely to be overestimated, while betas well below unity are potentially underestimated.

The Bayesian adjustment is a response to the estimation error. Therefore its size varies with the size of the error in the best estimation process. In practice, the impact of the Bayesian adjustment tends to be smaller using daily data for say two

²⁹ Estimating the cost of capital for fixed and mobile SMP operators in Sweden, Andersen Management International A/S – 9 July 2003

to three years compared to using five years of monthly data, since the increase in the number of data points reduces the estimated standard deviations significantly.

From a practical point of view, calculating the Bayesian adjustment would involve estimating the betas of all firms in the market. This may require significant time and effort to prepare. Therefore, it may be more practical to use daily data and do away with the need to calculate the Bayesian adjustment.

In their conclusion on issues in beta estimation for U.K. mobile operators, the Brattle Group concluded that they "*suspect that in this particular instance the value of using daily data may be greater than the potential downside arising from the failure to implement the Bayesian adjustment, given that the adjustment is relatively small for daily data.*"³⁰

The MCA does not have a strong preference for the use or otherwise of a Bayesian adjustment. However for pragmatic reasons, it would appear to be more practical to use daily data over a period of say two years, and do away with the need to calculate the Bayesian adjustment.

In the proposed decision, the authority sought the respondents' views on the estimation of beta from stock market information.

Proposed decision 7: Do respondents agree with the MCA's pragmatic approach that beta from stock market information is estimated using daily data over a period of two years, and do away with the need to use of the Bayesian adjustment?

Alternative methods to estimating Beta

Young stock markets are more susceptible to thin trades, volatile prices and feedback effects (especially when the market capitalisation of one company constitutes a significant proportion of the entire market's capitalisation). Furthermore, since in the local context only GO plc (previously Maltacom plc) is publicly listed, in practice the betas of the other undertakings with SMP cannot be estimated on the basis of market information and an alternative approach to estimating beta will need to be used.

There are a number of alternative approaches that can be used in estimating beta, including the estimation of the fundamental beta, which involves a regression model that relates the market risk of publicly traded companies to specific accounting ratios (such as debt/equity, interest cover and liquidity), and then applies this relationship to the accounting ratios of the non-traded company. In practice this approach may be difficult to use as it requires a large sample of accounting ratios across a large number of companies. This information may not always be publicly available.

Another approach is to use the betas of comparable companies (as adjusted for financial leverage), as an indication of the beta of the target company. Ideally the

³⁰ Issues in Beta Estimation for UK Mobile Operators', The Brattle Group Ltd, July 2002

comparable company should have similar or identical characteristics that affect risk, such as type of industry, services offered, growth rate, market share, and operating and financial leverage. The comparator company could be selected from either the local or foreign market, with the former being more suitable since the business environment and regulations are harmonised. However, the use of local comparables is not always possible. Therefore in the absence of such information comparables are selected from foreign markets.

Betas of companies operating in the electronic communications sector are widely available. However, the difficulty arises in identifying companies with similar risk characteristics to local undertakings with SMP, particularly in terms of customer base and market size. Despite these difficulties, the MCA is of the opinion that an indication of the betas of local electronic communications companies can be deduced by reference to betas of companies operating in foreign markets, particularly those operating in a market with a similar regulatory regime.

When comparing the beta values of different companies, one needs to take into account differences in financial gearing and tax rates. Therefore, beta values of comparable companies need to be “unlevered”, based on the comparable’s average debt-to-equity ratio over the period used for estimating beta and re-levered to reflect the appropriate level of financial gearing (i.e. the optimal gearing structure).

The MCA is aware and points out that betas derived by reference to foreign companies have a number of different characteristics, including but not limited to:

- the considerable size difference (including size of market) between local and foreign companies;
- market fluctuations of companies forming part of large market players are generally influenced by the perceived operations of the group as a whole, and are not restricted solely to the operations of a particular subsidiary.
- betas of foreign companies may be affected by the overseas operations of the parent / group, and may therefore not be necessarily comparable to local companies.

Therefore, betas derived by reference to comparable companies need to be adopted with caution.

In its consultation and proposed decision, the MCA asked for the respondents’ views on the following questions on Beta estimation:

Proposed decision 8.1: Do respondents agree with the MCA’s view that the beta of undertakings with SMP should be estimated using the range of techniques highlighted in this section?

Proposed decision 8.2: In particular, where reliable market information is available, do respondents agree that beta should be initially estimated using daily and weekly data over a 2 year period, using the domestic market as the market index, and compare the results with betas of comparable companies and used by other NRAs?

Proposed decision 8.3: Do respondents agree that where companies are not publicly traded, their betas should be estimated by reference to the betas of

comparable companies operating in the electronic communications sector, as adjusted to take into account the effect of financial leverage and tax rates?

Given the fact that the local capital market is relatively young with a limited listing, and only one of the undertakings with SMP is publicly listed, the MCA's initial view was that it is worthwhile to consider a number of different sources in estimating the beta of local undertakings with SMP.

As discussed above, the techniques that can be used include:

- Market information: where market information is available, beta should be estimated during daily and weekly data of a 2 year period, using the Malta Stock Exchange as market index.
- Betas of comparable companies, as adjusted for the effect of financial leverage;
- Betas used by other regulatory authorities (electronic communications).

The table below summarises the range of ungeared betas for mobile operators used in the UK and Sweden.

Asset betas	Low	High
UK (2004) ⁽¹⁾	0.90	1.49
Sweden (2003) ⁽²⁾	1.00	1.10

⁽¹⁾ Source: Ofcom, *Wholesale mobile voice call termination, June 2004*

⁽²⁾ Source: Andersen Management International, *Estimating the cost of capital for fixed and mobile SMP operators in Sweden, July 2003, Draft report for Post & Telestyrelsen*

The table below summarises the range of asset betas for fixed telecom operators used by other regulators.

Asset betas	Low	Average	High
Australia (2004) ⁽¹⁾	0.40	0.50	0.80
New Zealand (2005) ⁽²⁾	0.50	0.65	0.80
UK (2005) ⁽³⁾		0.88 to 0.90	
Sweden (2003) ⁽⁴⁾	0.85 to 0.95		0.90 to 1.0

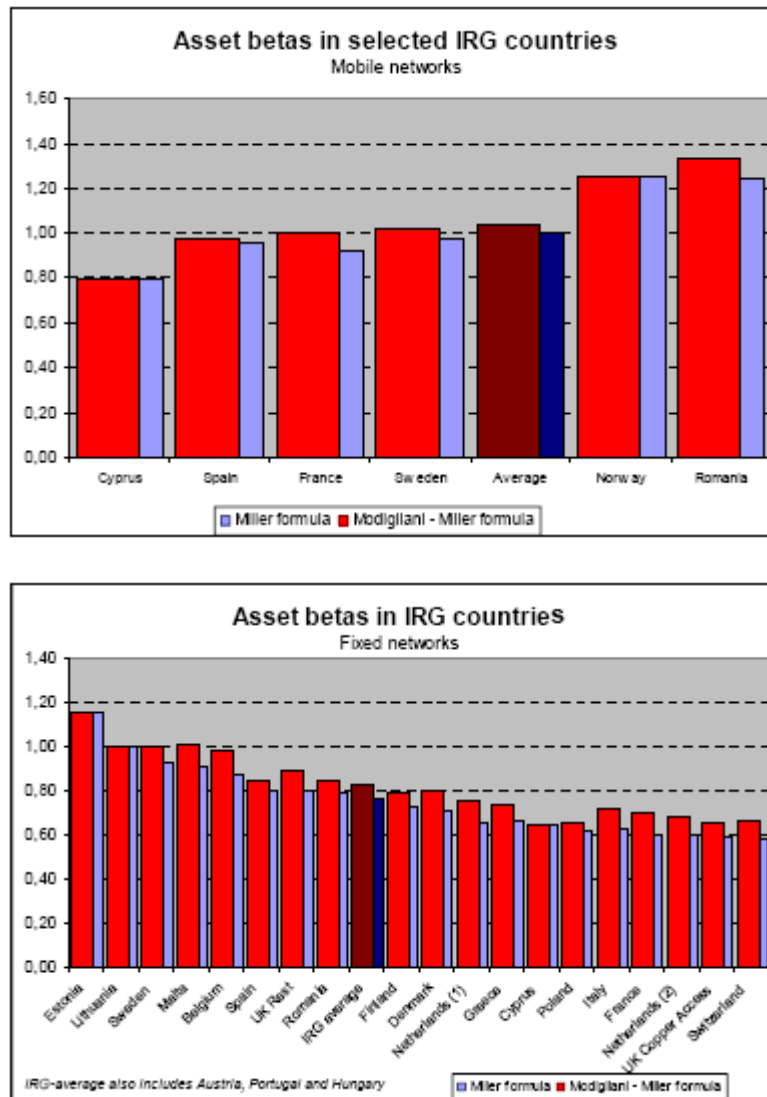
⁽¹⁾ Source: *The New Zealand Commission: Draft Determination on the Application for Pricing Review for Designated Interconnection Service, 11 April 2005*

⁽²⁾ *Ibid*

⁽³⁾ Source: *Ofcom's approach to risk in the assessment of the cost of capital, Final statement August 2005*

⁽⁴⁾ Source: Andersen Management International, *Estimating the cost of capital for fixed and mobile SMP operators in Sweden, July 2003, Draft report for Post & Telestyrelsen*

In a report issued in February 2007, IRG published the following asset betas which are used in the different IRG countries.



Source: IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007

The betas of mobile networks range from 0.8 in Cyprus to 1.3 in Romania, whilst those of the fixed network range from just above 0.6 in Cyprus to just below 1.2 in Estonia, with a simple average in the region of 0.8.

5.2.2 Summary of responses

Respondents were generally in agreement with the views expressed by the MCA and in the use of different techniques to estimate the beta of companies. In particular both respondents noted that the use of comparables and estimates used

by other operators need to be adopted with caution due to the different profiles and size of the market.

As regards proposed decision 7 on the use of Bayesian adjustment, one of the respondents noted that estimating beta on the basis of stock market information is normally the accepted approach. However, the inherent limitations and weak-form efficiency of the local market should also be considered. The respondent further noted that calculating the Bayesian adjustment would involve significant time and effort and which may not be justifiable in the context of the local stock exchange.

The second respondent also highlighted the limitations of estimating beta on the basis of local stock exchange data and noted that by estimating betas through the use of benchmarks from betas of comparable companies, standard errors created by regression betas is eliminated. The respondent is of the opinion that in establishing a beta value, comparison with other companies across Europe should be made (adjusted for financial leverage) with the resulting analysis adjusted to take into account local realities, including considerable size differences between local and foreign companies, and customer base / geographical operational spread.

5.2.3 MCA approach and decision

Following consensus from both respondents on the estimation of Beta and the different techniques to be used in estimating it, the MCA retains the approach detailed in the consultation paper and proposed decision, namely that there is no need to make use of the Bayesian adjustment and that beta should be estimated using the different techniques mentioned in the consultation paper and proposed decision notice and reiterated in this decision notice.

The MCA would like to stress that, given the limitations of the local stock exchange, the beta of publicly traded companies should be estimated using the range of techniques highlighted in this document. The local stock exchange is relatively young, with a limited listing comprising four banks which collectively account for more than 60% of the market capitalization at December 2007. Over the last two years, the market prices of the banks were highly volatile and had a large impact on the MSE index. As a result, beta estimates using the last two years' data may not provide a suitable estimate of the systematic risk of a particular company. This reinforces the argument that beta should be estimated using a range of techniques to ensure that estimates are reasonable.

Decisions 7 and 8:

The Authority directs that the beta of undertakings with SMP should be estimated using the range of techniques highlighted in this decision notice, namely:

- *should be estimated using daily and weekly data of a 2 year period, using the Malta Stock Exchange as market index and do away with the use of the Bayesian adjustment.*
- *financial leverage;*
- *communications).*

The Authority directs that:

- *Where market information is available, beta should be initially estimated using daily and weekly data over a 2 year period, using the domestic market as the market index. Results should be compared with betas of comparable companies and those used by other NRAs (as adjusted to take into account the effect of financial leverage and tax rates) to assess the reasonableness of the estimates, and to adjust estimates where necessary.*
- *Where companies are not publicly traded, their betas should be estimated by reference to the betas of comparable companies operating in the electronic communications sector, as adjusted to take into account the effect of financial leverage and tax rates.*

5.3 Further Consultation on Beta values

As highlighted in section 5.2 the betas for SMPs can be established using a range of techniques including:

- Market information (for publicly traded companies); and
- Betas of comparable companies; and
- Betas used by other regulators

The MCA has observed that beta estimates using local stock exchange market information for the last two years does not necessarily provide a suitable estimate of the systematic risk of a particular company. As a result the beta estimates for both publicly traded and private companies will need to be estimated by reference to benchmark data from comparable companies and used by other regulators.

Data published by the IRG in February 2007, and which is included in section 5.2.1 provides an indication of the betas used in different IRG countries. The asset betas range significantly between countries reflecting the difficulties in estimating betas. The asset betas for mobile companies range from 0.8 in Cyprus to 1.3 in Romania

with a simple average in the region of 1.0. In the case of fixed networks the betas range from just above 0.6 in Cyprus to just below 1.2 in Estonia, with a simple average in the region of 0.8.

The MCA is cognisant that systematic risk is influenced by various factors which may not necessarily be comparable between companies, and this together with other factors such as the availability of data and estimation techniques used, gives rise to the wide range of beta estimates in the IRG countries. Despite this, the MCA is of the view that an indication of the beta estimate for Maltese telecom companies can be obtained from this data.

Therefore, taking into account the local scenario the MCA is proposing the use of a range of ungeared beta estimates in calculating the cost of capital of telecom companies in Malta, and would like to seek respondents' views in this regard.

Proposed Decision:

Do respondents agree with the following range of asset betas in estimating their cost of equity:

- ***Fixed and Cable companies: 0.8 for the low estimate and 1.0 for the high estimate***
- ***Mobile companies: 1.0 for the low estimate and 1.05 for the high estimate.***

The above estimates are to be maintained under review in line with Decisions 7 & 8.

5.4 Estimating the Market Equity Risk Premium

5.4.1 Background

The Equity Risk Premium ("ERP") represents the additional rate of return that investors will require for investing in investments which are more risky (in a diversified manner to mitigate company specific risks).

This principle is based on the assumption that investors are risk averse and require compensation for any risk that they choose to bear rather than investing in a risk free investment. This argument has been borne out by historical data from major stock markets, which shows that returns on different classes of assets vary in practice, with riskier assets earning higher returns on average.

The table below summarises the historic returns for the equity market and government bonds. The higher average return to equity over the long term reflects the higher perceived risk associated with this type of asset.

Index	Bonds	Equities
UK	6.0%	11.6%
USA	5.3%	11.6%
World	5.0%	10.2%

Source: Dimson, Marsh and Staunton, *Global Investment Returns Yearbook 2004*, Tables 70 (p.149), 74 (p. 155), and 78 (p. 161)

The ERP is an expected return whose value depends on the perceived risk associated with the equity market and the level of investors' risk aversion. There is considerable debate over the size of this premium and the appropriate method of calculating the ERP.

In practice there are a number of different approaches which can be used to estimate the ERP and there is limited consensus on the most appropriate approach to adopt. The key issues related to the ERP estimation include:

- Whether to use a historic or prospective approach,
- Whether to use the arithmetic or geometric mean, and
- Time period to use to compute the estimate.

This section considers the different issues related to estimating the ERP.

Historic versus prospective approach

Investors care about expected returns and not historic returns. Therefore, in theory the ERP should be estimated on a forward looking basis. However, in practice it is difficult to estimate a forward looking ERP and any such estimate will always be subject to debate as it is impossible to estimate expected returns without relying on subjective forecasts.³¹

As a result, in practice historic returns are used as a proxy for the expected forward-looking return. Historic risk premia are calculated as the difference between returns from the equity market and those earned from risk free assets over a period of time. This approach prompts a number of methodological issues that need to be considered, including:

- *Definition of a safe or risk free rate of return.* Typically, government bonds are considered as risk free investments. However as highlighted in section 5.1 government bonds have different maturity dates. Long term bonds especially

³¹ A forward looking risk premium may be calculated on the basis of a so-called implied risk premium. The approach assumes that the market is generally correctly priced. The implied risk premium is then estimated as the expected return, consistent with the current market price, expected dividends for the next period and the expected growth rate in earnings. For a further discussion on this method see Damodaran "Estimating equity risk premiums"

carry an element of reinvestment risk, meaning that the long term government bonds are not risk free.

A standard approach to deal with this matter is to match the maturity date of the risk free asset with the time over which the rate of return is to be applied, or alternatively one that reflects the economic life of the relevant assets.

- *Use of arithmetic (simple) or geometric (compounded) mean.* The arithmetic mean has a tendency to result in higher premia when compared to the geometric mean whenever returns vary over time. This implies that arithmetic averages are highly influenced by past levels of market volatility. However, the recurrence of certain historical events is highly unlikely and therefore the past must be used with care as a guide to the future. Irrespective of this, there is as yet no consensus on the most appropriate approach. Brealey and Myers³², and Dimson, Marsh and Staunton, and Ofcom all show an inclination towards the use of arithmetic mean.
- *Local or international market index.* Global indices carry a high informative value especially since capital markets are becoming highly integrated. On the other hand, the relevance of a global index depends on the proportion of outward investment or international diversification of local investors. If there is a strong 'home bias' effect, domestic market indices may be more representative of the expectations of local investors.

The historic approach is not without its problems, and empirical studies challenge the use of historical returns as a proxy for expected returns on the basis that:

- past market behaviour is unlikely to have reflected investors' expectations at the time, and therefore does not provide an indication of the expected ERP; and
- the future may not be like the past. The overall economic environment has changed significantly when compared to past decades, with a resultant change in the underlying equity risk. This change in the equity risk may be a combination of increased potential for diversification (increase in number of publicly traded industries and easier access to foreign markets), pace of technological improvements, and more economic and political stability in the latter half of the century implying that investment risk is now lower.

In its review of the mobile wholesale call termination market, Oftel (now Ofcom) notes that *"in particular, methods based on an analysis of current market expectations tend to give lower values than those based on analysis of historical estimates from stock market data."*³³ Therefore, ERPs derived using the historic returns need to be applied with caution as they may result in an over-estimation of the cost of capital with the possibility that consumers end up paying prices that are above the competitive level.

³² Brealey A. R and Myers C. S, 'Principles of corporate finance', McGraw-Hill, 7th Ed.

³³ Review of mobile wholesale voice call termination markets, EU Market Review Oftel 15 May 2003

This is further corroborated by Dimson Marsh and Stauton. In fact in their study on historic risk premia, the authors *"conjectured that the historic risk premia are likely to over-estimate the future ERP, due to the market having outperformed the expectations of investors over the last century i.e. investors could not reasonably have expected to experience such prolonged periods of growth and economic stability, particularly in the US economy. DMS adjust for this apparent out performance of expectations by making a downward adjustment to historical premia."*³⁴

The table below summarises historic and prospective estimates of the ERP relative to treasury bills of the period 1900 to 2000 using both the geometric and arithmetic mean.

	Historic premia		Prospective (adjusted) premia	
	Geometric mean	Arithmetic mean	Geometric mean	Arithmetic mean
UK	4.8	6.5	2.4	3.7
World	4.9	6.2	3.0	4.0

Source: Dimson, Marsh and Staunton, 2002

Based on the above, it would appear that there has been a downward adjustment in historic premia ranging between 1.9% and 2.8%. In fact, in its 2005 consultation on the cost of capital, Ofcom applied a downward adjustment of 2% to the range of historic ERP of 4% to 5% that were set in previous consultations.

In its decision Ofcom noted the risks associated with setting too low a level for the ERP³⁵ and opted to give more weight to the higher figure calculated using the arithmetic mean.

Forward Looking ERP Without Using Historic Data

The ERP can also be estimated without resorting to the use of historic data. The first alternative method is the estimation of a forward looking ERP using the Dividend Growth Model (DGM), which values a company on the basis of estimated growth rate in dividend distribution. Under this model, dividend growth is assumed to result from earnings growth originating entirely from new investment financed

³⁴ Ofcom's approach to risk in the assessment of the cost of capital, consultation document – Consultation document, Ofcom 26 January 2005

³⁵ "While setting rewards too low will lead to consumers benefiting from lower prices in the short run, it may also lead to discretionary investment being discouraged, meaning that the levels of infrastructure-based competition and innovation are at a sub-optimal level. Given the duties and objectives outlined above, Ofcom believes that the costs associated with setting too low a cost of capital are greater than those associated with setting it too high." Source: Ofcom's approach to risk in the assessment of the cost of capital, Ofcom, 26 January 2005

through retained earnings. Such investments are only made if the cost of equity is met or exceeded. Therefore any retained earnings used to finance new investment will generate additional returns that will eventually be distributed back to shareholders. Consequently, the prospects of higher future dividends are assumed to play an important role in assessing the market value of a firm³⁶.

The DGM in its original form is:

$$P_0 = \frac{D_1}{r_f + ERP - g}$$

Where:

- P_0 is the present market value of a firm,
- D_1 the dividend in the next period,
- r_f is the risk free rate of return and
- g is the estimated growth rate of dividends.

A rearrangement of this formula can be used to indicate the factors used to measure the ERP. The arranged formula is thus:

$$ERP = \frac{D_1}{P_0} - r_f + g$$

The use of the DGM has a number of practical limitations. For example if a company opts for a series of retentions (either to accumulate earnings for future investments that add value, to compensate for a drop in past earnings, etc), the DGM assigns a nil value to the firm. In practice it is common to find firms that pay no dividends at all.

Secondly, this model assumes that companies will constantly face wealth-creating investment opportunities. This is clearly not always the case, and depends heavily on the life cycle stage of the firm and its products. Nonetheless, *"for much of the period from 1872 to 2000...the dividend growth model and the average stock return produce similar estimates of the expected return."*³⁷

An alternative approach to the DGC is the *ex ante* estimation of ERP on the basis of surveys carried out amongst academics and practitioners, in which participants are directly asked to quantify the returns that they expect from the equity market over a period of time. These surveys are widely available overseas, and in fact in its

³⁶ Modigliani and Miller have strongly debated that dividends are actually irrelevant for the purposes of company valuation. For more information refer to: Miller M. H and Modigliani F (1961), 'Dividend policy, growth, and the valuation of shares', *The Journal of Business*, 34(4)

³⁷ Fama E. F & French R. K, 'The equity premium', *The journal of finance*, 57(2)

consultation on the cost of capital Ofcom notes that "*the view of practitioners (fund managers and financial professionals) appear to be clustered in the range 2% to 4%. The views of academics appear to produce higher estimates, with a range from 3% to 7%.*"³⁸ Even though this method is inherently subjective it is possible to identify a trend, and its usefulness is even more pronounced if seen in conjunction with other estimation methods.

However, from a local perspective, limited if any information is available on the expected returns used by practitioners.

Implications for Local Regulatory Purposes

The foregoing paragraphs discussed the theoretical background and related issues in estimating the ERP. The ERP for Malta reflects the general risk of investing in equities in Malta. The above issues are even more pronounced in the local perspective since the local Stock Exchange has a short trading history and a limited portfolio of investments, thus making it difficult to estimate the local market risk premium over a reasonable time period.

Internationally a number of reports and studies (such as those published by Ibbotson Associates, Damodaran and Dimson, Marsh and Staunton) which estimate the market equity risk premium for a particular country are available. These are used by different regulatory authorities (such as Ofcom and Post & Telestyrelsen), which tend to rely on the results of independent studies of historic market premium as well as surveys of current expectations of market participants. However, studies and data on equity risk premium is not widely available for Malta, and therefore in estimating a local ERP reliance may need to be placed on different sources of information.

It is the MCA's understanding that generally, local valuation practitioners have in the past established the market risk on a "best judgement" basis, by reference to international valuation practices and knowledge of the market. In the absence of alternative sources, in establishing an ERP for local regulatory purposes, the MCA has made reference to ERPs used by other regulators, particularly in the UK, where regulators have issued a number of relevant papers and proposals. UK regulators have adopted a range of measures of the risk premium, such as:

- OFGEM, in its Review of Transco's Price Control from 2002 (September 2001) suggests a risk premium of 3.5% based primarily on survey forecast evidence;
- OFWAT, in Final Determinations: Future water and sewerage charges 2000-2005 (25 November 1999), assumes an ERP of 3% - 4.0%. Again, this estimate was based primarily on survey forecast evidence;
- The CAA in Economic Regulation of BAA London Airports (Heathrow, Gatwick and Stanstead) 2003-2008 (February 2003) decided to use the CC's most recent range of 2.5% to 4.5%;

³⁸ Ofcom's approach to risk in the assessment of cost of capital – Ofcom 26 January 2005

- In its recent consultation Ofcom noted that “having reviewed its approach in this area and on review of the available evidence and responses on this issue Ofcom believes that values in the range 4.0% to 5.0% are reasonable. Within this range Ofcom takes the view that 4.5% is the appropriate value for it to use in estimating a company’s cost of capital. This represents a reduction of 0.5% from Ofcom’s previously applied value of 5.0%.”

Based on the above, it would appear that UK regulators have used an ERP ranging between 2.5% and 4.5%. In line with Ofcom’s arguments the downside risk associated with taking too low a value for the ERP is more detrimental to the interests of the consumers than taking too high a value, and therefore one would tend to go for the higher end of the range.

From a local perspective some arguments do exist for increasing the local ERP above the 4.5% level due to additional risks associated with a small market economy such as Malta. This is evidenced by the fact that at least one study indicates that a UK investor investing in Malta would require a higher return than if the same investor was investing in the UK³⁹. This indicates that a higher return may be expected from a smaller economy.

The quantum of this additional premium is debatable, and there is limited information as to the appropriate level of this adjustment. In its proposed decision, the MCA expressed the view that a post-tax ERP ranging between 4.5% and 5.5% is appropriate for this regulatory period. This took into account the upper range adopted by Ofcom and included an additional premium of 1% pre-tax.

In the proposed decision, MCA asked respondents whether the ERP for Malta should be estimated by reference to ERPs used by other regulators and whether they agree with a post-tax ERP ranging from 4.5% to 5.5% with a central estimate of 5%.

Proposed decision 9.1: Do respondents agree that given the difficulty in estimating an ERP on the basis of available data, the ERP for Malta should be estimated by reference to ERPs used by other regulators?

Proposed decision 9.2: Do respondents agree with a post-tax ERP ranging from 4.5% to 5.5%, with a central estimate of 5%, in estimating the cost of equity for the Maltese market?

5.4.2 Summary of responses

Both respondents noted that each country has its own specific risk factors. Therefore the ERP for the Maltese market cannot be based on that used by other regulators without adjusting it for limitations and additional risk factors inherent in the local market.

The respondents were not in agreement with the proposed range of ERP.

³⁹ International cost of capital perspectives report (2001), Ibbotson Associates

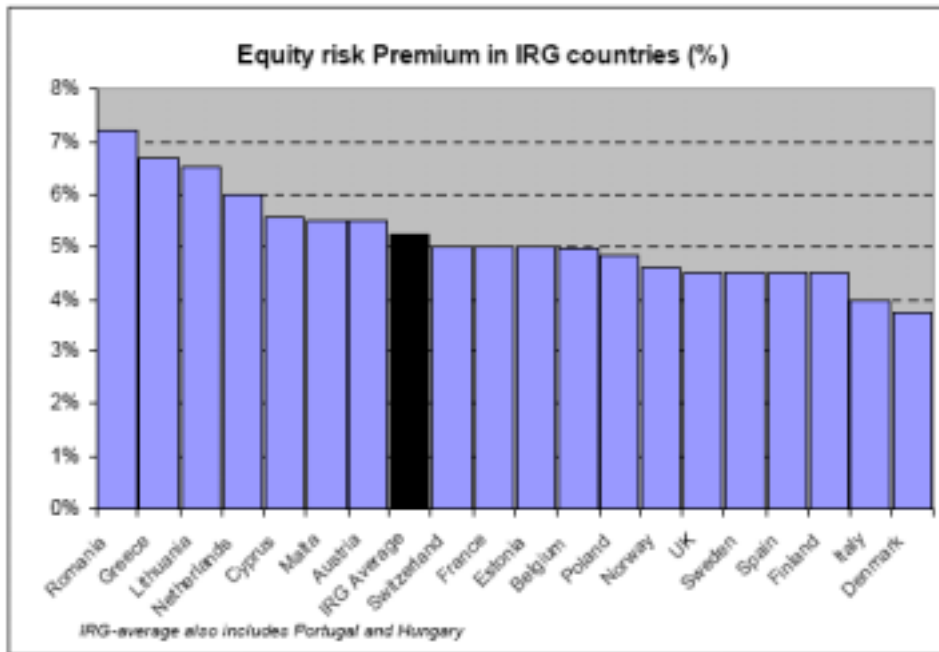
One of the respondents noted that a 5% post-tax ERP is a widely accepted premium in developed economies, where the stock markets are relatively efficient thus enabling shareholders to diversify away specific risk, thus expecting compensation for market risk only. This is not the case in Malta, which is characterized by limited population (market) size and geographic limitations (eg operators cannot leverage on their existing network infrastructure to offer their services in other countries). The respondent argued that in these types of economies, it is an accepted practice that a specific risk premium adjustment is made to compensate for specific company risk, industry risk and in specific circumstances country risk. The respondent further argued that it is exposed to specific risks including advances in wireless technology reducing investment required by potential entrants, alternative technology and, market size limitations. In its conclusion this particular respondent stated that an ERP range should not be predefined but each operator should estimate its own range of ERP supporting judgements with reasonable justifications.

The second respondent quoted a recent study (January 2007) by Damodaran which estimated the risk premia for a number of countries, based on their credit rating. From the study it transpires that Malta had a credit rating of A3, which is four levels below the credit rating of the UK (AAA). The study estimated Malta's and the UK's risk premia at 6.19% and 4.91% respectively as at January 2007. The respondent argued that the risk premia of 4.91% is within the 4% and 5% range arrived at by Ofcom, whereas the range proposed by the MCA between 4.5% and 5.5% is well below the 6.19% estimated by Damodaran. In its conclusion the respondent noted that the proposed ERP range of 4.5% to 5.5% with an average of 5% does not fully take into account the local market circumstances and a rate of about 6% would reflect better the ERP for Malta.

5.4.3 MCA approach and decision

ERP measures the difference between the overall return on equities and the nominal risk free rate. Its value in Malta reflects the risk of investing in Malta equities generally. It is a measure of the market risk in Malta and not individual company risk which is captured in the company's Beta estimate. As a result the MCA is of the opinion that a pre-defined range of ERP estimates are applicable.

As noted in the consultation paper, one of the alternatives to estimate the risk premium is through benchmarking. The consultation paper made reference to ERPs used by UK regulators, which ranged between 2.5% and 4.5%. In a recent study (February 2007), the IRG published the range of ERPs used in some of its member states. The level of ERP ranges between just below 4% (Denmark) to slightly above the 7% range (Romania), with an average value of 5.3%. There are significant differences amongst IRG countries which may be caused by different calculation methods, as well as country specific reasons, such as maturity of stock market, differences in country risk etc.



Source: IRG – Regulatory Accounting, Principles of Implementation and Best Practice for WACC calculation, February 2007

As noted in the consultation paper, there is an argument for a higher ERP, compared to the UK and other large countries, on the grounds of a small country risk premium. The debate arises on the quantum of this additional premium. The MCA has examined the arguments put forward by one of the respondents in this respect and noted Ofcom’s observations that *“the costs associated with setting too low a cost of capital are greater than those associated with setting it too high”*⁴⁰ and is proposing an increase in the range of ERP estimates. Based on the study published by Damodaran in January 2007 the risk premium of Malta, based on a credit rating of A3 was of 6.19%. In January 2008, following Malta’s entry into the Eurozone, Malta’s credit rating was increased to A1. According to the same study by Damodaran, countries with a credit rating of A1 have an ERP estimate of 5.96%.

Based on this the MCA has decided to increase the previous ERP estimate from the range of 4.5% to 5.5% to a range of 5% to 6%, with a mid-point of 5.5%, which is more or less equal to the IRG average.

⁴⁰ Ofcom’s approach to risk in the assessment of the cost of capital, Ofcom, 26 January 2005

Decision 9:

The Authority directs that a post-tax ERP ranging from 5% to 6%, with a central estimate of 5.5%, is used in estimating the cost of equity for the Maltese market.

6 Estimating the cost of debt

6.1 Background

A company's cost of debt is normally identified by reference to the average cost of borrowing based on market values. However, where market information is not available or where it is unlikely that a company continues to borrow at the current cost of borrowing, estimates may need to be made.

Corporate debt behaves in essentially the same manner as government debt however companies are more risky than government, implying that a higher interest rate has to be offered to investors. In practice this debt premium is driven by credit ratings based on financial characteristics such as market capitalisation, earnings volatility, leverage and business risks specific to the company and/or sector.

The most common approach taken by regulatory authorities in estimating the cost of debt is to base the estimate on the risk free rate plus a premium determined by reference to the specific company under consideration or other similarly rated companies in the market. In Malta, none of the undertakings with SMP or similar companies have a publicly available credit rating, therefore it is difficult to use this approach in estimating the cost of debt.

In the absence of such information, the MCA expressed the view that reference should be made to the debt premiums used by other regulatory authorities in estimating the cost of debt. The table below summarises the debt premiums used by foreign regulatory authorities:

	Debt Premium
PWC: TSO Determination process – June 2002	1.7%
Commission Draft TSO Determination – 2002/03	1.2% - 1.8%
Swedish Competition Commission	2.5% - 2.9%
UK Competition Commission	1.0% - 4.0%
Swedish telecom regulator:	
Fixed operator	1.0% - 1.4%
Mobile operator	2.5% - 2.9%
Ofcom:	
BT's debt premium	1.0%
Mobile companies	1.0% - 3.5% for gearing 10% to 30%
Marsden Jacobs Associates: TelstraClear (mobile operator)	1.5% - 2.5%

Source: The Cost of Capital for Mobile Operators, Investigation into Regulation of Mobile Termination, Report prepared by Marsden Jacob Associates for TelstraClear, 19 July 2004; Ofcom's consultation papers

A range of debt premiums between 1.0% and 3.5%, depending on the gearing ratio, are used by foreign electronic communications regulatory authorities. In the consultation and proposed decision, the MCA expressed the view that a debt premium ranging between 1.0% and 3.5%, over the current risk free rate would be appropriate for Malta, with the higher debt premium allocated to the higher gearing ratio.

In the proposed decision, MCA sought respondents' views on the use of a premium ranging between 1.0% and 3.5% over the risk free rate.

Proposed decision 10: Do respondents agree with the use of a post-tax debt premium ranging between 1.0% and 3.5% over the risk free rate in estimating the cost of debt for Maltese telecom companies?

6.1.1 Summary of responses

Both respondents disagreed with the range of debt premiums proposed by the MCA.

One of the respondents argued that given that in Malta most operators' debt consists of bank financing rather than bonds, it is more practical to measure the cost of debt as a premium on the Central Bank intervention rate rather than on the risk free rate. The respondent acknowledged that a premium ranging from 1% to 3.5% is reasonable in most circumstances however it stated that there should be no predefined range and that each operator should be provided with sufficient flexibility to apply the premium applicable in its own circumstances provided that it is supported by reasonable justifications.

The second respondent noted that the additional risks faced by the industry could contribute to an increase in the cost of debt required by banks and therefore argued that the debt premium should be nearer to 3.5% over the risk free rate.

6.1.2 MCA approach and decision

Similar to the premium on equity, the debt premium represents the additional return required by lenders to compensate for the additional risk of lending to a particular entity. For an investment to be truly risk free, the risk of default needs to be zero, and this is normally proxied by the yield on Government bonds. As a result the MCA remains of the view that the cost of debt should be measured as a premium over the risk free rate.

The debt premium is a function of a company's credit rating and gearing. In their study on the determination of the optimal WACC (2006) WIK consult draw a relationship between Standard & Poor Ratings and bank premiums on loans, with a premium ranging between 0.75% for an AAA rating and 14% for a D rating.

In Malta none of the companies with SMP have a publicly available credit rating. However in their report on WACC (2007) P&T Luxembourg make reference to the

study by WIK Consult and "associate a 50% gearing with a BBB rating".⁴¹ Furthermore in their report P&T Luxembourg set out the following table, which shows debt premium as a function of rating and gearing:

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

Source: EPT Weighted average cost of capital, October 2007, P&T Luxembourg

The debt premium increases as the level of gearing increases. Benchmark data from IRG indicates that the debt premium used by different countries ranges between 0.5% and 3.5% for gearing between 0% and 50%, with an average debt premium of circa 1.8% at 50% gearing levels.

Based on the conclusions reached in section 3.4.2, whereby the target gearing structure ranges between 10% to 30% for mobile companies and 20% to 40% for fixed and cable operators, the MCA believes that the proposed debt premium is in fact generous, and the Authority has therefore for the time being decided to retain the range of debt premiums proposed in the consultation paper, however it reserves the right to revise its position in this regard.

Decision 10:

The Authority directs that for the time being a debt premium ranging between 1.0% and 3.5% over the risk free rate should be used in estimating the cost of debt for Maltese telecom companies, with the higher premium used for higher gearing structures.

⁴¹ EPT: Weighted Average Cost of Capital (WACC) October 2007, P&T Luxembourg

7 Methodological issues

In the foregoing sections we have considered a number of issues related to the measurement of the components of WACC. This section considers certain methodological issues related to the WACC estimate.

7.1 The use of a single WACC rate for mobile operators

7.1.1 Background

Currently in Malta there are two mobile operators with SMP status. Both companies have a substantial market share, operate in similar market conditions and, although there may be certain differences in the product range, the overall products and services offered are similar. However in practice certain differences exist, such as:

- Gearing structure, with Vodafone being fully equity financed;
- Customer mix (pre-paid versus post-paid)
- Vodafone forms part of a large group operating in the mobile industry and may therefore have greater access to market information, technological advancement etc.

In practice there may be arguments in favour of both the use of a single or separate estimates of the cost of capital of operators in a single market. In their paper on the cost of capital for mobile operators, Marsden Jacob Associates considered this point in detail, and stated that:

“If the Commission decides to apply a method of cost orientation that requires a cost model, a cost of capital rate will be necessary to calculate the annual service costs. In this context, the size of the operator in terms of number of subscribers, minutes, the economies of scale they are able to achieve (at each point in time) and technology deployed will ultimately determine the unit cost of mobile termination. In addition, each operator may also have different cost of capital rates, due to differences in service mix, capital structure, ownership, technology etc.

In Australia, for example, CDMA (as opposed to GSM) was originally marketed as a supplementary technology best suited for rural and remote customers. If the two technologies serviced different terminations markets, i.e. GSM serving major cities and urban areas and CDMA serving rural and remote areas, income and price elasticities for each technology would arguably differ and hence there would be an argument for estimating two different cost of capital rates. Our understanding of the New Zealand market is that such a distinction does not apply.

However, in the context of costing termination services, the decision on what costing measure to use and how to apply the termination charge may ultimately make the issue of estimating different cost of capital rate for each operator of less importance.

First, if the Commission were to apply a forward-looking cost measure, capital costs should reflect the cost of an optimal capital structure and not the actual capital structure of the mobile operator. This is because forward-looking cost measures are concerned with the cost of an efficient operator. Although such a capital structure may differ between efficient operators, the current similarities in scope and size of Vodafone and Telecom Mobile are likely to lead to the same optimal capital structures.

Second, if the same call termination charge is applied to both operators, it would make little sense to use different cost of capital rates. Input parameters, and the implied cost of capital rates, could of course be estimated for the individual operators, but the Commission should apply the same rate, when calculating the capital costs used for the price setting.

For the purpose of simplicity in the current context, the WACC estimates we provide are not specifically related to any one of the operators. Rather our estimate may be regarded as that of a notional New Zealand mobile operator with a similar scope and size of Telecom Mobile and Vodafone".⁴²

In its consultation and proposed decision, the Authority expressed its view that locally there is no real distinction in the technologies used by Go Mobile and Vodafone on a forward looking basis, and that, thus, a single estimate of the cost of capital of the mobile operators in Malta should be estimated for regulatory purposes. The MCA sought respondents' views on whether they agree with its approach.

Proposed decision 11: Do respondents agree that a single cost of capital estimate should be estimated for mobile operators in Malta?

7.1.2 Summary of responses

In their response, one of the respondents stated that it agrees with the MCA's view that a single cost of capital for the mobile operators in Malta should be estimated for regulatory purposes by noting that the MCA's view supports the decision regarding the glide path for mobile termination rates issued in December 2005, leading to a common Reference Interconnection Offer ("RIO") by the two mobile operators.

On the other hand the second respondent expressed the view that parameters such as the ERP and the cost of debt remain very specific to the operator and that each operator should have sufficient latitude to estimate its own cost of capital, supporting it with reasonable justifications.

⁴² The Cost of Capital for Mobile Operators, Investigation into Regulation of Mobile Termination, A report prepared by Marsden Jacob Associates for TelstraClear, 19 July 2004

7.1.3 MCA approach and decision

Taking into account the views expressed by the respondents, the MCA retains its view that the two mobile operators have similar risk profiles and therefore their regulatory cost of capital is expected to be the same. This is in line with other MCA pronouncements, particularly with respect to the RIO.

Decision 11:

The Authority directs that a single cost of capital estimate should be estimated for mobile operators in Malta.

7.1.4 The Use of Different Cost of Capital Estimates for the Different Business Segments

7.1.5 Background

A company's cost of capital is a reflection of the risks associated with the company's portfolio of investments and services offered. In a study on the cost of capital of regulated utilities in the UK, the authors state that a real issue for regulators is finding an estimate of the beta of the assets used in the regulated part of the business. Arguments may exist to indicate that the beta for regulated business is lower than the overall beta of the company, which may include other business such as data services etc.

In a consultation on risk and the cost of capital⁴³ issued in January 2005, Ofcom debated "whether it should apply different cost of capital figures to different parts of the BT Group. In particular, it proposed *that the equity beta, which is an important determinant of the cost of equity within the capital asset pricing model framework, should be lower for BT's copper access business than for the BT group as a whole*". Ofcom sets out the reasons why it proposes to apply different cost of capital to different parts of BT's business.

Ofcom argues that:

- *"In its views there is a reason to believe that different parts of BT's business do indeed have different risk characteristics – "BT provides a wide range of retail and wholesale activities, including well established products such as voice call origination and termination, new products such as broadband services, and as yet undeveloped services...."*

⁴³ Disaggregating BT's Beta, June 2005 – A report prepared for Ofcom by PWC

- *The implication of the above is that if, in fact, the risks faced across BT's product line do differ materially, then the use of a single return would have an adverse impact on Ofcom's ability simultaneously both to encourage efficient investment and to protect customers from excessive pricing. Ofcom notes that if "the company WACC and expected cash-flows are used as a basis for investment appraisal or regulated charge setting (rather than the allowed return reflecting the systematic risk of the particular project), then there is the possibility of suboptimal market decisions being made."*⁴⁴

There may be arguments to suggest that the above may also be applicable to GO. In fact, GO Group provides a wide range of retail and wholesale activities, including well-established products such as voice call origination and termination and new products such as broadband services.

Ofcom argues that it would be impractical to disaggregate the group beta into all the separate components, but rather, based on practicality and materiality, Ofcom's view is to isolate the special case of wholesale regulatory products that give retail operators access to the company's copper access network as this may involve significantly less systematic risk than the risk of the group as a whole. In fact in its final statement on the approach to risk in the assessment of cost of capital (18 August 2005) Ofcom calculated the following pre-tax nominal WACC estimates for BT's different activities:

- Copper access – 10%;
- Rest of BT – 11.4%

In its recent consultation paper on Eircom's cost of capital, ComReg debated this issue and noted that a disaggregated WACC approach "*should only be adopted if there is clear evidence of risk differentials and confidence that robust and accurate estimates of the precise extent of those risk differences can be obtained.*"⁴⁵ ComReg went on to conclude that for the time being an overall fixed-line WACC rate was to be used, however the matter of disaggregation would be explored further in the future if a fundamental change in market circumstances was to occur.

In its paper on principles of implementation and best practice for WACC calculation, IRG noted that "*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.*"⁴⁶

The MCA regards the issue of cost of capital disaggregation with great interest. However the MCA is aware that the issue is still being debated in some detail

⁴⁴ Disaggregating BT's Beta, June 2005 – A report prepared for Ofcom by PWC

⁴⁵ Review of Eircom's Cost of Capital, Consultation Paper, Comreg 1 November 2007

⁴⁶ Principles of Implementation and Best Practice for WACC calculation, IRG – Regulatory Accounting, February 2007

overseas, and it may therefore be too early to consider introducing such a concept in the local market.

The MCA expressed the view that a decision on the disaggregation of a company's cost of capital should be deferred to a later stage. However, it requested respondents' views on this matter.

Proposed decision 12.1: Do respondents agree with deferring a decision on the disaggregation of a company's cost of capital on the basis of risk associated with the different business?

Proposed decision 12.1: Should the MCA consider disaggregating GO's cost of capital on the basis of 3 main business activities – the copper access network, other regulated activities and the rest of the business?

7.1.6 Summary of responses

Both respondents agreed with the MCA's view that a decision on the disaggregation of a company's cost of capital on the basis of risk associated with the different business should be deferred.

7.1.7 MCA approach and decision

Decision 12:

The Authority directs that a decision on the disaggregation of a company's cost of capital on the basis of risk associated with the different business should be deferred to a later stage.

8 Conclusion

This Decision and Further Consultation Document and the preceding consultation process have sought to establish a methodology for estimating the cost of capital. In its decision, the MCA has endeavoured to maintain regulatory consistency with the objective of establishing an appropriate cost of capital aimed at promoting a favourable climate for efficient and timely investment whilst at the same time safeguarding public interest.

To this effect, this decision notice also establishes a range of parameters for the different variables making up the cost of capital, namely:

- Target gearing structure;
- Risk free rate;
- Equity risk premium; and
- Debt premium

With respect to beta values, the MCA is cognisant that systematic risk is influenced by various factors which may not necessarily be comparable between companies, and this, together with other factors such as the availability of data and estimation techniques used, gives rise to the wide range of beta estimates. Therefore, taking into account the local scenario the MCA is consulting further on a range of ungeared beta estimates to be used in calculating the cost of capital.

In conclusion the MCA would like to invite all operators with SMP status to submit their comments, if any, on the proposed decision on the beta estimates.

It is the intention of the MCA to have the resulting WACC rates applied retrospectively for Regulatory Accounting periods ending on or after 31 December 2007.

Going forward, the MCA will request operators with SMP status to submit revised WACC rates on an annual basis following the approach outlined in this Decision.

All submission should be made by no later than noon of Wednesday 9 May 2008, and should be sent to:

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8.1 Other Provisions

The variables established in this decision notice are likely to change over time as a result of changes in circumstances relating to Malta's overall risk rating and the general economic environment. Furthermore, future developments may also give rise to the need for a revision of the methodology and / or the parameters established in this decision notice.

Therefore the MCA reserves the right to review and modify the methodology and / or the parameters established in this decision notice, when the need arises in accordance with the normal consultation process.

Appendix I – Illustrative Results of WACC estimation stemming from the Ranges established in this Decision Notice

The tables hereunder illustrate the resulting calculations of the WACC rates for the fixed, cable and mobile markets arising from the range of pre-defined parameters established (or as proposed in the case of Beta values) in this decision.

	Low Gearing		Medium Gearing		High Gearing	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Risk free rate	4.42	4.67	4.42	4.67	4.42	4.67
Equity Risk Premium	5.00	6.00	5.00	6.00	5.00	6.00
Equity beta	0.93	1.16	1.02	1.28	1.15	1.43
Cost of Equity (post-tax)	9.07	11.65	9.53	12.34	10.15	13.27
Cost of Equity (pre-tax)	13.95	17.92	14.67	18.99	15.62	20.42
Debt Premium	1.00	1.00	2.25	2.25	3.50	3.50
Cost of debt (post-tax)	3.52	3.69	4.34	4.50	5.15	5.31
Cost of debt (pre-tax)	5.42	5.67	6.67	6.92	7.92	8.17
Optimal Gearing	20%	20%	30%	30%	40%	40%
Tax Rate	35%	35%	35%	35%	35%	35%
WACC (pre tax nominal)	12.25	15.47	12.27	15.37	12.54	15.52

Table I – WACC calculation for the Fixed and Cable markets

The above is based on the following assumptions:

- Risk free rate based on yield to maturity on Government bonds as at 10 January 2008;
- Ungearred beta of 0.8 for the low estimate and 1.0 for the high estimate.

Based on the above, the WACC estimate ranges between 12.25% and 15.52% with an average pre-tax WACC rate of 13.9%

	Low Gearing		Medium Gearing		High Gearing	
	Low estimate	High estimate	Low estimate	High estimate	Low estimate	High estimate
Risk free rate	4.42	4.67	4.42	4.67	4.42	4.67
Equity Risk Premium	5.00	6.00	5.00	6.00	5.00	6.00
Equity beta	1.07	1.13	1.16	1.22	1.28	1.34
Cost of Equity (post-tax)	9.78	11.43	10.23	11.99	10.81	12.73
Cost of Equity (pre-tax)	15.05	17.58	15.74	18.45	16.64	19.58
Debt Premium	1.00	1.00	2.25	2.25	3.50	3.50
Cost of debt (post-tax)	3.52	3.69	4.34	4.50	5.15	5.31
Cost of debt (pre-tax)	5.42	5.67	6.67	6.92	7.92	8.17
Optimal Gearing	10%	10%	20%	20%	30%	30%
Tax Rate	35%	35%	35%	35%	35%	35%
WACC (pre tax nominal)	14.09	16.39	13.93	16.15	14.02	16.15

Table II – WACC calculation for the Mobile market

The above is based on the following assumptions:

- Risk free rate based on yield to maturity on Government bonds as at 10 January 2008;

- Ungearred beta of 1.0 for the low estimate and 1.05 for the high estimate.

Based on the above, the WACC estimate ranges between 13.93% and 16.39% with an average pre-tax WACC rate of 15.1%.

Appendix II – WACC rates used by other telecom regulators

The table below summarises the WACC rates used by other western telecom regulators as published by Cullen International SA. The WACC rates for both fixed and mobile vary widely with:

- fixed rates ranging from 9.47% in Germany to 18.5% in Hungary;
- mobile rates range from 10.85% in Spain to 17.5% in Hungary and Romania.

In comparing rates various country and company specific issues need to be considered, including but not limited to:

- Nature and size of the companies,
- Market size and level of competition;
- Differences in taxation
- Differences in country risk and rating.

Country	Nominal pre-tax WACC	
	Fixed	Mobile
Austria	10.48%	Rate calculated separately for each operator
Belgium	11.44%	12.24%
Bulgaria	Not public	-
Cyprus	12.86%	13.91%
Czech Republic	11.18%	13.26%
Denmark	8.6% (for 2007), 8.85% (for 2008)	Not applicable
Estonia	11.00%	-
Finland	8.73%- 10.90%	11.45%- 14.31%
France	9.80%	12.40%
Germany	9.47%	details not published
Greece	10.40%	14.81%
Croatia	Not applied	-
Hungary	16.5% (Magyar Telekom), 18.5% (Emitel, Invitel, Hunarotel and Monortel)	17.50%
Ireland	11.50%	No decision
Italy	10.20%	12.40%
Latvia	Not public	Not public
Lithuania	12.27%	Not yet set
Luxembourg	No decision	No decision
Macedonia	15.5% (proposed)	Not yet set
Malta	14.50%	17.00%
Netherlands	7.6% (real)	13.80%
Norway	12.50%	12.5% (for Telenor), 14% (for NetCom)
Poland	11.29%	Information not available
Portugal	13.32%	Not yet approved
Romania	15.24%	17.52% Vodafone, 16.88% Orange
Slovakia	11.00%	-
Slovenia	13.18%	Not public
Spain	9.86%	10.85% (Telefonica Moviles); 11.22% (Vodafone); 11.06% (France Telecom Espana)
Sweden	10.80%	12.60%
Switzerland	7.6% (real)	Not applicable
Turkey	Information not available	Information not available
United Kingdom	10% for BT's copper access network; 11.4% for rest of BT	11.2% (real)

Source: Cullen International SA