Estimating the cost of capital

Consultation and Proposed Decision

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Executive Summary

This consultation and proposed decision addresses the theoretical background for estimating the cost of capital and asks for the views of respondents on a number of specific aspects related to the MCA's proposed methodology and approach in estimating the weighted average cost of capital ("WACC"). The MCA recognises that the WACC is a key input in the analysis of a number of key regulatory issues, including amongst others:

- Wholesale and retail price control;
- The preparation of regulatory accounts;
- Competition analysis, such as margin squeeze issues.

The MCA has to make decisions relating to charges in a way that prevents excessive pricing in markets by mobile, fixed and cable undertakings having SMP in relevant markets, but which at the same time allows a reasonable rate of return which is sufficient to reward investors and incentivise investment, but does not include monopoly or SMP profits.

This document discusses a number of key issues including:

- The approach to estimating a single WACC rate or a range of estimates;
- The use of optimal as opposed to actual gearing structures as the basis for estimating the WACC rate;
- An appropriate methodology to estimate the cost of equity;
- Approaches to estimating the risk free rate, beta, equity risk premium and the debt premium;
- The methodology to be used in estimating the cost of debt; and
- The use of a single WACC rate for companies operating a similar electronic communications business.

1 Introduction

1.1 Background

As part of its remit in the regulation of the electronic communications sector the Malta Communications Authority (MCA) makes decisions over the appropriate level of charges for services subject to price regulation as a result of remedies imposed on undertakings having Significant Market Power (SMP).

The MCA has to make decisions relating to charges in a way that prevents excessive pricing in markets by undertakings having SMP, but which at the same time allows such undertakings to earn a reasonable rate of return on their investment.

The Weighted Average Cost of Capital ("WACC") represents one of the determining parameters used for calculating charges that permit a reasonable rate of return to investors. A reasonable rate of return is one which is sufficient to reward investors and incentivise investment but does not include monopoly or SMP profits.

1.2 Objectives

This document is intended to consult on a methodology and elicit feedback on the estimation of the cost of capital of mobile, fixed and cable undertakings having SMP in electronic communications where cost accounting remedies are imposed.

This consultation document and proposed decision provides the theoretical background for estimating the cost of capital and asks for the views of respondents on a number of specific aspects related to the MCA's proposed methodology and approach in estimating the weighted average cost of capital ("WACC"), including:

- The general approach to estimating WACC, including the estimate of a single WACC rate or a range of estimates based on a range of parameters for each of the variables making up the cost of capital;
- The use of optimal gearing structures, as opposed to actual gearing structures, as the basis for estimating the WACC rate;
- The most appropriate methodology used to estimate the cost of equity
- The approach to be used in estimating the risk free rate, beta, equity risk premium and the debt premium;
- The methodology to be used in estimating the cost of debt; and
- The use of a single WACC rate for companies operating a similar electronic communications business (e.g. mobile operators) in Malta.

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 consultation and proposed decision, 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*". This matter is discussed in greater detail in section 7.2 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

The WACC calculation is dependant on a number of assumptions made for the above 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.

As a result, 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 or the mid-point between the high and low WACC estimates.

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?

3.2 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 that does not take into account movements in inflation rates and is calculated in current terms, whereas a real WACC is expressed in constant terms.

The choice of price base should be consistent with the regulatory pricing regime. If access and interconnection prices are regulated in real terms then the cost of capital should be expressed in real terms, whereas it should be expressed in nominal terms if prices are regulated in nominal terms.

To date prices in Malta have been regulated in nominal terms, and there is no indication that this is expected to change in the near future. Therefore, the regulatory cost of capital should be expressed in nominal terms. By permitting a nominal return on assets, investors are compensated for both their opportunity cost of capital and expected inflation.

3.3 Taxation

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 is proposing 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 Ofcom[1] and Post & Telestyrelsen ("PTS"), the Swedish regulator[2].

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?

3.4 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;
- Use of existing gearing versus optimal / target gearing structure

Market versus book values of debt and equity

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*

[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.

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 Maltacom 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 Maltacom, 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.

Proposed Decision 3
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?

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?

Existing versus optimal gearing structure

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.

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

The argument for using a 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*

[4] 'Wholesale mobile call termination', Ofcom consultation December 2003

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;
- 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.

[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

Based on an evaluation of all the above factors the MCA is of 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.

Proposed Decision 4

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

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

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?

4 Estimating the Cost of Equity – the alternative models

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 sections 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:

- The risk free rate;
- The market equity risk premium; and
- 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:

- All investors are rational and risk averse; and
- 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.[7]

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

[7] 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 Arbitrage Pricing Model

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

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

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 disputed[8]. 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 there own sample, the empirical evidence of significantly positive premia is not very strong".*[9]

The MCA's preferred approach

In line with that of other regulators including Ofcom, the MCA's 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*

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

of other factors)."[10] 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 services has for many years provided the inputs need to use the CAPM to estimate the cost of equity…"*[11]

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 estimation*[12].

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 consultation document.

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?

[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] ibid
[12] Ofcom's approach to risk in the assessment of the cost of capital, Ofcom August 2005

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

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*."[13]

In its recent 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 [14]

The issue of the appropriate maturity period is also discussed in a number of other papers. Andersen Management International[15] 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 3.1 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.

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

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[13] Review of mobile wholesale voice call termination markets, EU Market Review Oftel, 15 May 2003

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

[15] 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*".

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."*[16]

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

Based on the above, the MCA is of the view 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. The current average yield to maturity on five year Malta Government Stocks ("MGS") maturing in 2011 ranges between 3.96% and 3.99% with a simple average of 3.975%. The average yield to maturity on 10 year MGSs maturing in 2016 ranges between 4.21% and 4.24% with a simple average of 4.225%.

Based on the above, the MCA considers a range of between 3.9% to 4.2% to be an appropriate nominal risk-free rate for calculating the WACC.

Proposed Decision 6

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?

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

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

5.2 Estimating Beta

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 basis[17].

- 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. Maltacom 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. Maltacom'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 Maltacom 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;

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[17] *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 heterscedasticity; 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.

5.2.1 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.[18] 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.[19]

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[18] "*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

[19] "*Stock return data measured very frequently(eg 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 assets[20]. 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.*[21]'

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*."[22] 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*."[23]

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.

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

[20] 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.
[21] 'A study into certain aspects of the cost of capital for regulated utilities in the UK', Smithers & Co Ltd, 13 February 2003
[22] 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
[23] Ibid

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 Maltacom 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. "*[24].

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."*[25] If the probability that a particular event or economic condition recurs in the future

[24] Ibid
[25] Issues in Beta Estimation for UK Mobile Operators', The Brattle Group Ltd, July 2002

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.*"[26]

However, using the national market as the market index may not be the most appropriate choice for companies which have significant overseas investments, or whose securities are traded internationally.

One pragmatic approach is to use a portfolio which reflects the composition of assets held by the dominant owners of the stock in question. From a local context, an equal amount of Maltacom's shares are traded on the Malta Stock Exchange and the London Stock Exchange (in the form of GDRs). Therefore, in computing Maltacom's beta, reference would be made to both listings, with the beta estimated on a weighted average based on the total value of Maltacom's shares on each exchange.

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

Despite the above it is interesting to note that in practice "*when estimating betas it is more common to use the returns on an all equity portfolio and to use a domestic stock price index*."[27]

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 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.*"[28]

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.

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?

[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

5.2.2 Alternative methods to estimate 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 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 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.

5.2.3 The MCA's preferred approach beta estimation

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 is of the opinion that 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 electronic communications 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

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

The use of different techniques to estimate the beta represents a more prudent approach and it is believed that a better beta estimate can be made by weighing the different results obtained by applying the above techniques.

Proposed Decision 8
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?

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?

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?

5.3 Estimating the Market Equity Risk Premium

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 over the period 1900-2005. 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 2006, Tables 80, 84, and 88.

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.[29]

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 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 Myers[30], 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.

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[29] 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 Domadoran "Estimating equity risk premiums"

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

The historic approach is not without 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 underlying equity risk. This change in 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."*[31] 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

This is further corroborated by Dimson Marsh and Staunton. In fact in their study on historic risk premia, the authors "*conjectured that the historic risk premia are likely to be 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*."[32]

The table below summarises historic and prospective estimates of the ERP relative to 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

[31] Review of mobile wholesale voice call termination markets, EU Market Review Oftel 15 May 2003
[32] Ofcom's approach to risk in the assessment of the cost of capital, consultation document – Consultation document, Ofcom 26 January 2005

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 latest 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 ERP[33] 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 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 firm[34].

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.

[33] "*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 innovated 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

[34] 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)

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.

This model also 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.*"[35]

An alternative approach to the DGM 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 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%.*"[36] 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 have 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, Damodoran 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 &

[35] Fama E. F & French R. K, 'The equity premium', The journal of finance, 57(2)
[36] Ofcom's approach to risk in the assessment of cost of capital – Ofcom 26 January 2005

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.

Generally, local valuation practitioners have 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%;

- 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 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 UK[37]. 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. However, the MCA is of the view that a post-tax ERP ranging between 4.5% and 5.5% is appropriate for this regulatory period. This takes into account the upper range adopted by Ofcom and includes an additional premium of 1% pre-tax.

Proposed Decision 9

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?

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?

[37] International cost of capital perspectives report (2001), Ibbotson Associates

6 Estimating the Cost of Debt

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 is of 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 electronic communications regulator: Fixed operator Mobile operator	 1.0% - 1.4% 2.5% - 2.9%
Ofcom:	
BT's debt premium Mobile companies	1.0% 1.0% - 3.5% for gearing 10% - 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 Jul 04; Ofcom 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. The MCA is of 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.

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?

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

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.[38]*"*

Most of the points discussed by Marsden Jacob Associates in their paper are applicable for the local scenario. In fact, locally there is no real distinction in the technologies used by Go Mobile and Vodafone on a forward looking basis, and the cost of capital is required for the estimation of call termination rates.

On the basis of the above, the MCA is of the opinion that a single estimate of the cost of capital of the mobile operators in Malta should be estimated for regulatory purposes.

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

[38] 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

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

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 more recent consultation on risk and the cost of capital[39] 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…..*

- *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."*[40]

There may be arguments to suggest that the above may also be applicable to Maltacom. In fact, Maltacom 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.

[39] Disaggregating BT's Beta, June 2005 – A report prepared for Ofcom by PWC
[40] Ibid

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 initial 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.

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

The MCA is of the view that a decision on the disaggregation of a company's cost of capital should be deferred to a later stage. However, the MCA is interested to hear the views of the operators on this point.

Proposed Decision 12
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?

Should the MCA consider disaggregating Maltacom'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?

8 Consultation framework

8.1 Consultation period

The consultation period will run until noon on Friday, 9th February 2007. Comments should be sent to:

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Pinto Wharf.

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Written comments may be made publicly available at the MCA unless confidential. Respondents are therefore asked to separate out any confidential material into a clearly marked annex. Respondents are also kindly requested to refer their comments to the specific sections of this document.

8.2 Finalisation of the MCA's Position

The MCA will consider comments received in response to this consultative document and proposed decision, before publishing the final decision on the estimation of the WACC. It may however offer the proposed methodology and approach for further consultation as and when considered appropriate.