MALAYSIAN COMMUNICATIONS AND MULTIMEDIA COMMISSION

A CONSULTATION PAPER ON COST OF CAPITAL

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Preface

On 11 March 2001, the Malaysian Communications and Multimedia Commission (MCMC) published a final report entitled "Access List Determination and Statement on Access Pricing Principles". MCMC's draft statement set out the principles for the application of cost based access prices and outlined a methodology for determining cost based interconnection charges.

The methodology outlined in the draft statement specified that cost-based interconnection charges should be set at a level that covers the long run incremental cost (LRIC), including cost of capital, economic depreciation and operating and maintenance costs.

MCMC and National Economic Research Associates (NERA) have conducted a study into the LRIC of both Public Switched Telephony Network (PSTN) and mobile interconnection charges. As part of this study, the cost of capital for licensees providing PSTN and public cellular services in Malaysia has been calculated, using the methodology outlined in this consultation paper.

The Commission invites submissions from interested parties on the approach adopted, as set out in this consultation paper. Written submissions should be provided to the Commission by **12 noon, 1 July 2002**. Submissions should be provided in hard copy as well as electronic form and addressed to:

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Any confidential material should be provided under a separate cover clearly marked 'Confidential'.

The Commission thanks interested parties for their participation in this consultative process.

TABLE OF CONTENTS

ABBREVIATIONS

CAPM	Capital Asset Pricing Mechanism
EPS	Earnings per share
ERP	Equity Risk Premium
KLCI	Kuala Lumpur Composite Index
KLEMAS	Kuala Lumpur Exchange Main Board All Share Index
KLSE	Kuala Lumpur Stock Exchange
MCMC	Malaysian Communications and Multimedia Commission
NERA	National Economic Research Associates
TMB	Telekom Malaysia Berhad
WACC	Weighted Average Cost of Capital

SECTION 1: INTRODUCTION

On 11 March 2001, the Malaysian Communications and Multimedia Commission (MCMC) published a final report entitled "Access List Determination and Statement on Access Pricing Principles". MCMC's draft statement set out the principles for the application of cost based access prices and outlined a methodology for determining cost based interconnection charges.

The methodology outlined in the draft statement specified that cost-based interconnection charges should be set at a level that covers the long run incremental cost (LRIC), including the cost of capital, economic depreciation and operating and maintenance costs.

As part of a wider study on interconnection charges, MCMC has estimated the cost of capital for licensees who provide PSTN and public cellular services in Malaysia. The approach taken is set out in this consultation paper and MCMC would welcome comments from interested parties on the approach adopted.

Participants are encouraged to support their comments with reasons and where appropriate provide or refer to evidence or other relevant information in support of their comments.

This report is structured in the following manner:

Section 2 introduces the approach taken in general and highlights the factors taken into account when deciding on the reference market and the calculation of the cost of equity (in particular of beta);

Section 3 explains in more detail the approach taken to calculate the cost of equity;

Section 4 outlines the approach taken to determine the cost of debt and the level of gearing;

Section 5 examines the issue of taxation and how a pre tax cost of capital should be derived;

Section 6 presents the estimates of the cost of capital for Malaysian licensees who provide PSTN and public cellular services.

SECTION 2: METHODOLOGY

MCMC has applied best practice methodology to estimate the cost of capital for the Malaysian licensees who provide PSTN and public cellular services, using the weighted average cost of capital (WACC). The cost of equity is calculated using the Capital Asset Pricing Model (CAPM) given that, despite its limitations, it is the most widely used model for the calculation of the cost of equity in regulated industries both by regulators and practitioners.

In this section, the principles underlying the cost of capital calculation are set out and the main choices that need to be made in order to reach an agreement at the level of principles are set out. First, the issues relating to the general methodology are reviewed, before turning to methodological issues that affect specific components.

2.1 General Methodology

The WACC methodology, as defined below, is now widely accepted as a suitable method for calculating the cost of capital. It is understood by both the finance community and industry, and is consistent with the methodology used by many regulators.

2.1.1 The Post Tax "Vanilla" WACC

The "Vanilla" post tax weighted average cost of capital (otherwise referred to as the post tax gross of debt tax shield WACC), is defined as:

(2.1) "Vanilla" Post Tax WACC = $r_e*(E/V)+r_d*(D/V)$

where: r_e is the declared/regulatory cost of equity;

r_d is the declared/regulatory cost of debt;

D is a firm's debt;

E is a firm's equity; and

V is the total assets of the firm, that is, V =D+E[1].

The WACC formula reflects the fact that companies can raise capital either through debt or equity and that the returns required by the market for each of these two elements are likely to be different. The true cost of capital for a company is a weighted average of the two. The cost of equity and the cost of debt are defined as follows:

(2.2) r_e = (risk free rate) + (equity beta)*(equity risk premium)

(2.3) r_d = (risk free rate) + (debt premium)

The Vanilla post tax is the return to capital after both corporate tax and any imputation credits have been accounted for elsewhere in a business's cash flows.

2.1.2 The Pre Tax WACC

The pre-tax approach focuses on "scaling-up" the post-tax rate of return to a pre-tax rate of return. The pre-tax WACC is usually defined as:

(2.4) Pre tax WACC = $r_e * (E/V) * t_{adj} + r_d *(D/V)$

Where t_{adj} is tax adjustment factor (usually calculated as $(1-t_i)/(1-t_c)$, where t_i is the dividend imputation tax credit rate and t_c is the corporate tax rate, see section 7 of this report). When taking account of the fact that interest on debt is tax deductible, and thereby offers a debt

[1] In the following we will refer to D/(D+E)=D/V as the "gearing" ratio of the company

"tax shield", the "scaling-up" of the tax adjustment factor cancels with the tax shield on debt. When an imputation tax system is in place, the appropriate tax adjustment factor reflects the corporation tax rate and the dividend imputation tax rate.

2.2 Reference Market

The cost of capital reflects the return that investors require in order to invest. The cost of capital required on any investment is influenced by the whole portfolio of stocks (and other assets) to which an investor can gain access, and thus, from investors' point of view, the cost of capital should be estimated with reference to the financial market that best represents their investment opportunity set. The most common starting point would be to look at the domestic market and, if applicable, the reference market would be extended to cover a greater economic region. However, this will depend upon matters such as exchange rate risk, transaction costs of transferring capital between markets and capital controls.

In September 1998, Malaysia became the first Asian country affected by the economic crisis in the region to announce selective exchange and capital controls in an attempt to restrict the country's exposure to financial speculators and the global financial turmoil. The restrictions included:

- currency peg to the US dollar;
- prohibition of international trade in its currency, the ringgit;
- restrictions on domestic investments abroad; and
- a one-year minimum investment period for foreign portfolio funds, later converted into an exit tax.

Along with the restrictions placed on foreign ownership of Malaysian companies, these measures have, to some extent, segmented the Malaysian stock market from the rest of the Asian region and the world. The government has since lifted or reduced some of these measures to attract foreign investment once again. In this report, the cost of capital estimates are calculated with reference to the domestic Malaysian market.

Question 1

Do you agree that Malaysia is the relevant reference market when calculating the cost of capital?

2.3 Principles for Estimating the Cost of Equity

The post tax cost of equity is the return on equities (through dividends and through an increase in the value of shares) that is required to attract investors. In this report the Capital Asset Pricing Model (CAPM) is used to estimate the cost of equity.

2.3.1 Capital Asset Pricing Model (CAPM)

The CAPM approach is generally the accepted methodology by finance practitioners and regulators for determining the cost of equity for input to the calculation of the weighted average cost of capital. CAPM is based on the portfolio theory of finance, and estimates the required post (corporate) tax returns on the equity of a company in the following way:

(2.5) $$E[r_e]=E[r_f]+\beta(E[r_m]-E[r_f])$$

where,

$E[r_e]$ is the expected return on equity

$E[r_f]$ is the expected return on a risk free asset

$E[r_m]$ is the expected rate of return for the market (and thus $E[r_m]-E[r_f]$ is the expected risk premium); and,

β is a measure of the systematic riskiness of the equity, the equity beta.

2.3.2 Beta

An important aspect of the CAPM model is the underlying assumption that people can diversify their investment portfolio through purchasing other assets. The risk associated with a specific equity in the CAPM model (captured through the value of beta, β) reflects the non-diversifiable risk of that equity. An asset's return is therefore related only to the asset's *covariant* risk with the market portfolio, that is, the degree of co-movement between the company's returns and the market returns. Thus, the beta is a measure of the strength of the relationship between the expected returns on an asset and the expected returns on a broad portfolio of assets. If the assumptions of the OLS[2] technique are met by the data, the slope coefficient is a "best-fit" unbiased estimate of the so-called equity beta.

In theory, a full range of assets is available to investors and returns to all assets should be included in the model. However, in practice, the returns to the stock market are used in the calculation as a proxy for the returns to all assets.

Formally, the equity beta is defined in the following way:

(2.6)
$$\beta = \frac{\mathrm{cov}(r_e, r_m)}{\mathrm{var}(r_m)}$$

where r_e is the return on a specific stock and r_m is the return on the market as a whole.

2.3.2.1 Estimation period

In practice, forward looking estimates of returns on particular stocks and on the market as a whole are not readily available, therefore historic returns are used as a proxy for expectations about the future.

However, using historic returns to estimate future values of beta raises the question of what is the correct period to use in the sample. It can be argued that, since historical data is being used as a proxy for forward-looking expectations, the most recent period possible should be chosen, since this will embody market expectations about future returns. This would suggest that, for example, daily data over the past one or two years is considered.

On the other hand, it can also be argued that the values of beta fluctuate systematically over the business cycle. Therefore taking only a recent period (i.e. less than one complete business cycle) risks missing information and biasing the results. According to this argument, betas should be calculated over as long a period as possible to smooth out the effects of long-run cycles.

In order to generate a statistically significant estimate of the value of beta, it is important to have a data set of a reasonable size. If the estimate of beta is based on recent historical data, then daily or weekly data is required in order to provide a sufficiently large sample size. However, if the value of beta is to be estimated over a longer period, then monthly data is sufficient. The disadvantage of daily data is that it can introduce a variety of biases associated with thin trading, serial correlation of market returns and asynchronous price

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[2] Ordinary Least Squares (OLS) is a statistical methodology for estimating the best linear relationship between a dependent variable and presumed factors that explain this by minimising the differences between the fitted and actual values.

adjustment processes. Studies have shown that infrequently traded securities are likely to be biased downwards for these reasons.

2.3.2.2 Levered and unlevered beta

The equity or 'levered' betas are calculated on the basis of the relationship between the stock price of the companies and the local stock market as a whole, and thus the value of the equity beta reflects two types of risks:

- Business risk: As the level of business risk increases, profit streams become more sensitive to changes in general economic conditions and hence company returns become more highly correlated with market returns.
- Financial risk: As the gearing ratio (debt/(debt+equity)) rises and the company issues more debt, the fixed interest costs on debt increases, which means that profit streams also become more volatile and leads to a rise in the beta estimate.

In order to be able to compare levels of business risk across companies with different levels of gearing on an uniform basis, it is necessary to calculate the value of beta for the company on the assumption that the company holds *no* debt, the so-called asset or 'unlevered' beta. In the CAPM framework, the traditional way to account for the impact of a change in gearing on the cost of equity is to adjust the beta coefficient in a linear manner, reflecting the fact that the variability of equity returns is directly proportional to the amount of profits paid out as interest payments. To go from unlevered (or asset) betas to levered (or equity) betas, the following formula is used:

(2.7) $$\beta_{equity} = \beta_{unlevered} \, (1+(1-t)*(\text{Debt}/\text{Equity}))$$

where t is the effective tax rate.

Because debt represents a fixed prior claim on a company's operating cashflows, as a company's gearing increases, the greater the variability of equity returns will be. For this reason, increased gearing leads to a higher cost of equity, reflected in a company's beta value.

In the event that a company is expected to increase its level of gearing in the future, it is necessary to adjust the observed equity beta for the higher level of financial risk that will result from the higher gearing. In practice this is done by first calculating an unlevered beta based on the current (and historic) gearing levels and then lever the beta for the higher (or expected) future gearing levels. It is important to emphasise that the value of beta needs to be consistent with the assumed level of gearing, in order that equity holders are rewarded for the levels of financial risk to which they are exposed.

2.3.2.3 Public Cellular Services and PSTN Betas

When companies are not quoted, one cannot obtain the beta directly from market data. One method to overcome this problem is to use a "pure-play" beta. This method attempts to identify publicly traded companies whose operations match those of the unquoted company in question. Having identified a sample of "comparator" companies, the sample's average beta serves as a substitute for the non-traded company's beta. In employing this approach, regulators may attempt to account for differences between the comparators and the company in question by making subjective adjustments to beta. The outcome is typically a relatively broad range of values for beta. To account for differences in financial risk, unlevered betas are used to compare proxy companies.

If a company operates in more than one sector, its beta will reflect the relative riskiness of these different businesses. Thus one can expect the beta of a company that operates purely in, say, public cellular services to be different to one that operates in PSTN or internet businesses to be different, due to the inherent differences in the riskiness of these businesses. For that reason MCMC believes that it may be appropriate to estimate an two

separate betas for the Malaysian licensees who provide public cellular services and PSTN : a separate beta estimate for Telekom Malaysia Berhad (TMB), which has the largest market share in the Malaysian PSTN market but only an intermediate position in the public cellular sector ("integrated" beta); and a separate beta for the other main licensees in Malaysia who mainly operate in the public cellular sector ("cellular" beta).

Question 2

Do you support the calculation of a separate beta for TMB ("integrated" beta) and a separate beta for other licensees ("cellular" beta)? Please explain your answer.

For the purpose of setting interconnection prices in the Malaysian PSTN and public cellular markets, it is clear that the most appropriate set of comparators first to be considered is the licensees who provide PSTN and public cellular services in Malaysia. There are five main players in Malaysia, namely TMB, DigiCom (Digi), Time dotCom (Time), Maxis, and Celcom. The betas of TMB, Digi and Time, which are all publicly quoted companies, can be directly observed from market data and used to derive a market based estimate of the equity beta to apply to "generic" integrated and "generic" public cellular service providers in Malaysia.

However, whereas TMB is a well-established company, there is limited data available for Digi and Time (quoted on the Kuala Lumpur Stock Exchange Composite Index (KLCI) in December 1997 and March 2001, respectively). In addition, whereas Celcom and Maxis each control 36% and 24% of the public cellular service market,[3] Time and Digi have smaller market shares (5% and 19%, respectively), and are thus likely not to be representative of the larger operators.

Thus, as a robustness check, MCMC investigated whether it was possible to distinguish a discernible difference in beta risk between integrated and cellular licensees in other countries (a "public cellular beta premium"). Should this be the case, the "public cellular beta premium" could be added to TMB's asset beta so as to derive a separate asset beta for public cellular services. To get an indication of the existence of such a difference in beta risk between integrated and cellular licensees in other countries, betas for Asian and European "comparator" companies were examined.

2.3.2.4 Comparator companies

The full set of companies considered is presented in Appendix A.

In order to select relevant comparators for integrated and public cellular services, a number of major publicly traded Asian and European telecoms companies were identified, categorized by the primarily activities that they are involved in. The chosen comparators will often have peripheral activities of different risk exposures, and there will, therefore, be some degree of measurement error attached to the observed 'integrated' or 'cellular' betas.

Thus, it is important to consider the breakdown of revenue or income by activity for each of the companies in order to assess whether their betas accurately reflect PSTN or public cellular business. However, it is important to note that these revenue splits have been derived from data obtained from company accounts. As a consequence, given differences in accounting procedures and classifications, both across companies and across countries, the data on revenue proportions is necessarily subject to measurement error. Comparators have been classified as either "integrated" (i.e. integrated operators that gain the majority of

[3] CIT Publications (1999) "The Yearbook of Asia-Pacific Telecommunications 2000)

their revenue from PSTN activities)[4] or "cellular" (i.e. operators that derive the majority of their income from public cellular activities). Comparator companies all have a domestic market share (in terms of subscribers) in excess of 20% in either PSTN or public cellular services.

For each country an integrated operator and a cellular operator have been chosen, in an attempt to "extract" a public cellular "beta premium".

[4] Former monopoly operators (the "incumbents") in PSTN have also been classified as "integrated" even if they obtain the majority of their revenue from public cellular services.

SECTION 3: ESTIMATING THE COST OF EQUITY

3.1 The Risk Free Rate

The risk free rate is a measure of expectations about future returns on a risk free asset. In theory this is captured by the current yields (to maturity) on benchmark government bonds, as expectations about future returns would best be captured by current rates. In countries where index-linked (i.e. inflation-adjusted) bonds exist, these can be used as estimators of the real risk free rate.

When estimating the risk free rate, there are several issues that should be taken into consideration, most notably the appropriate maturity; the reference market; and the use of historic vs. current rates. These issues are discussed in turn below.

3.1.1 Choice of reference market

As described in Section 3, for the purpose of estimating the cost of capital for the Malaysian licensees who provide PSTN and public cellular services, the risk free rate will be estimated with reference to the Malaysian market.

3.1.2 Maturity

For a regulated company there is good reason to use the regulatory review period as the appropriate maturity. Since the WACC is used primarily to value projected cash flows arising in the regulatory period, the use of a risk free rate with a maturity consistent with the regulatory review period will bring the cost of capital to be consistent with the cash flows to which it is being applied. The regulatory review process therefore offers the opportunity to readjust the ex ante return on the asset basis as cash flows forecasts are adjusted.[5]

3.1.3 Historic vs. current yield

An important consideration for regulation is whether the risk free rate of return for regulatory purposes should be estimated using current or historical yields. If capital market markets are efficient, current yields will reflect all expectations of future earnings. If, on the other hand, capital markets are mean reverting, as current yield are affected by general market influences in the short term (e.g. thin trading) and are prone to significant cyclical variations, historic yields would be better predictors of future yields than current yields.

In MCMC's view there is stronger evidence to support the proposition that markets are generally efficient (rather than mean reverting) and thus that current risk free rates provide a better estimate of the future than a long-run historical average. However, since risk free rates can be affected by institutional factors and be extremely volatile in the short run, MCMC considers it appropriate to calculate a risk free rate based on a short term average (say, 3 months) of recent bond market yields. This method minimizes very short-term fluctuations in rates while capturing the most up to date information and inflation expectations incorporated in the current yields.

3.1.4 Review of the available evidence

A benchmark bond in a country is typically the bond that is most actively traded and most liquid, and thus is the yield on these bonds is the best proxy of a risk free rate. However, the Malaysian Benchmark Bonds have too long maturities for our purpose (see Table 3.1). In Table 3.1 evidence on the yield to maturity of Malaysian Government Bonds with 1-2 years to maturity is presented. The risk free rate should only reflect the time value of money and

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[5] In other circumstances, it may be appropriate to use the investment horizon i.e. the average life of the assets. However, the use of a long-term maturity would overcompensate investors for interest rate risk that they do not bear if: (i) the investor horizon is likely to be shorter than the asset life horizon; and (ii) (for a regulated company) returns are re-set at the next regulatory review.

not the sovereign risk attached to government default. Table 3.1 shows that the return on Malaysian bonds exhibits an upward sloping yield curve.

Table 3.1
Risk free rates

Bond option	Issue date	Maturity	Coupon	Current yield	3-month average[1]
Malaysian Government Bonds					
	01/06/1982	31/03/2002	8.5	2.65	2.86
	30/04/1991	30/04/2002	8.35	2.68	2.87
	18/09/1995	**18/09/2002**	**6.72**	**2.78**	**2.93**
	18/11/1997	**18/11/2002**	**8.157**	**2.81**	**2.95**
	25/02/1983	01/03/2003	8.5	2.83	2.97
	15/03/1990	15/03/2003	6.75	2.84	2.98
Malaysian Government Benchmark Bonds					
	15/03/1989	15/03/2004	6.75	2.89	3.06
	16/08/1999	16/08/2006	6.697	2.98	3.38
	28/09/2001	28/09/2011	3.833	3.39	3.42

Source: NERA analysis of Bloomberg data. (1): The three-month average is taken as the daily average over the period from 12/07/01-12/10/01.

Based on the two bonds that are closest to 1 year to maturity, the evidence suggests a nominal risk free rate of 2.95%.

3.1.5 Conclusion on the value of the risk-free rate

In summary MCMC proposes to calculate the risk free rate with the following parameters:

- The Malaysian market as the relevant "reference" market;
- A bond with a 1-year maturity; and
- The risk free rate should be calculated using a 3-month (arithmetic) average of (daily) yields to maturity.

Question 3

Do you agree that the above parameters are reasonable when calculating the risk free rate for licensees in PSTN and public cellular services in Malaysia? Please explain your answer.

On this basis, MCMC proposes to use a nominal risk-free rate of 2.95%, based on a 3-month average of daily yields to maturity of 1 year (to maturity) Malaysian Government Bonds.

3.2 The Equity Risk Premium

The equity risk premium (ERP) is the difference between the expected return on the market portfolio and the expected return on a risk free asset.

Consistent with prevailing views amongst both academics and finance practitioners, the approach adopted for estimating the ERP relies primarily on the results obtained from the analysis of the average difference over the long term between realized returns on the market portfolio, and those on a risk free asset (the so-called ex post approach). However, evidence on results obtained from the difference between current expected returns and current expected yields on a risk free asset (the ex-ante approach) are also presented.

The arithmetic mean approach is consistent with the hypothesis that financial markets are efficient, with equity returns serially independent. This is consistent with the majority academic viewpoint and current evidence regarding the efficiency of equity markets.

3.2.1 Ex post Approach

The ex post approach calculates the average differences between realized (i.e. historical) returns on (a proxy for) the market portfolio and realized returns on (a proxy for) the risk free asset. This presumes that the expected ERP is constant over time and that realized premiums converge towards this expectation when averaged over sufficiently long periods (i.e. there is no systematic bias between expectations and outturns).

There is no right time period to use when analysing historic data to estimate the ERP. Using long-term historic averages is most likely to overcome the possibility of systematic bias between expectations and outturns. Long-term averages of returns are most appropriate if it is assumed that the equity risk premium is constant over the measurement period and will remain constant in the future.

Long-term estimates do not exist for the Malaysian economy (the KLSE was established in 1973), and for that reason evidence of the equity risk premium over the long run on for USA and the world, estimated by LBS / ABN AMRO[6] is presented, based on the difference between returns on equity markets and returns on treasury bills and bonds around the world over the last 101 years. Table 3.2 indicates that world average equity risk premium over the very long term is 7.5% or 6.7% depending on whether one uses bills or bonds.

Table 3.2
LBS/ABN AMRO estimates of the equity risk premium

	ERP relative to Bills		ERP relative to Bonds	
	Arithmetic	**Std. dev.**	**Arithmetic**	**Std. dev.**
USA	7.5%	19.8%	6.9%	19.9%
World average[1]	7.5%	N/a	6.7%	N/a

Source: LBS / ABN AMRO (2001)"Millennium Book II, 101 years of investment returns". The estimates are based on 100 years of data, with 1922/3 excluded for Germany where hyperinflation had a major impact on the risk premia and bills returned. (1) The countries included in this average are: Australia, Belgium, Canada, Denmark (from 1915), France, Germany, Ireland, Italy, Japan, Netherlands, Spain, Sweden, Switzerland (from 1911), UK and USA.

3.2.2 Ex ante approach

The "full ex ante approach" calculates the ERP as the difference between the current observable *expected* returns on a proxy for the market portfolio (e.g. taken from a survey of investors' expectations) and observable current (or recent) *expected* yields on a proxy (or proxies) for the risk free asset.[7]

The dividend growth model derives an *ex ante* estimate of the ERP by using market data on actual share prices and earnings per share, in conjunction with forecasts of the growth in earnings, to derive an implied cost of equity. One advantage of this approach is that it is market-driven, does not require historical data, and does not necessitate correction for differences in country risk.

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6 E. Dimson, P. Marsh, M. Staunton, "Millennium Book II, 101 years of investment returns", 2001

7 At times, averages of expectations over some historical period are used, modified for changes in economic circumstances.

Table 3.3 shows the implied equity premiums in the Malaysian market based on the current P/E[8] ratios of the index, a real risk free rate for Malaysia of 1.08% and a real earnings growth rate to infinity of 3%.[9] For informational purposes, Table 3.3 also presents evidence on some of the main stock indices in the Asian region.

In this case, where the P/E ratio refers to a market capitalization-weighted index, the equity weight refers to the outstanding shares. Therefore, the index P/E ratio reflects the most current market perception of the earning powers of the index members.

Table 3.3
Implied equity risk premium based on current P/E ratios

Index	Country	Current P/E	Implied ERP[1]
Kuala Lumpur Composite Stock Index	Malaysia	20.84	6.72%
Kuala Lumpur EMAS Index	Malaysia	36.98	4.62%
Topix Index	Japan	79.91	3.17%
Taiwan Weighted Index	Taiwan	12.46	9.95%
Hang Seng Stock Index	Hong Kong	13.75	9.19%

Source: NERA analysis of Bloomberg data. 1: Based on a long-term real risk free rate of 1.08% and an annual earnings growth rate to perpetuity of 3%. The real interest based on an assumption that the nominal interest rate is 2.95% and the inflation rate 1.85%, and calculated (using the Fischer equation) as [(1+2.95%) / (1+1.85%) - 1].

Using this methodology, the implied ERP is 4.6% - 6.7% for the selection of Malaysian indices, with an average of 5.7%. Needless to say, these results are highly dependent upon the assumption of a future (infinite) real earnings growth rate for all countries of 3%. This figure is consistent with data on forecasted GDP growth for the coming decade, academic estimates of output growth in major economies, and observed historical long run earnings per share (EPS) growth in major economies (e.g. US average ESP growth since World War II has been 3%).

3.2.3 Conclusions on the ERP

The data shows that depending on the estimation approach, there is a wide range for the estimated equity risk premium that is hard to reconcile. From the historical figures, the world equity market risk premium lies in the range of 6.7% to 7.5%, and deriving the ERP using current P/E ratios, the corresponding *Malaysian* figure lies in the range from 4.6% to 6.7%. On this basis, the equity risk premium for Malaysian market is taken to be around 6%. MCMC believes that this estimate of the ERP is consistent with world estimates of the equity risk premium and the methodology used to derive these estimates consistent with best international regulatory practice, such as that observed in USA and Australia.

Question 4

Do you support the approach taken to estimate the ERP? Please explain your answer.

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8 Bloomberg calculates the P/E ratios using the following formula:

P/E = index value / sum of each equity EPS, where

*EPS = (equity weight * tailing 12 month EPS) / index divisor*.

9 For the purpose of estimating *a forward-looking* ERP, the relevant growth rate to be applied should be the *infinite* real earnings growth rate.

3.3. Beta

In order to select relevant comparators for the Malaysian licensees who provide PSTN and public cellular services, a number of sources of evidence have been examined:

- Malaysian licensees who provide PSTN and public cellular services;
- Asian telecoms companies, categorized by activity; and
- European telecoms operators, categorized by activity.

The full set of companies considered is presented in Appendix A.

3.3.1 The appropriate time frame

Given the relevant comparator set, there are two key issues that are relevant to the estimation period prior to the estimation of the betas,

- the "economic relevance" of the estimation period to the expected operating environment over the next control period; and
- the need for a sufficiently long time period to ensure the regression results are robust.

The interconnection charges are to be set for the calendar year 2002. Beta estimates based on the most recent market data are often preferred as the most "economically relevant" estimates of the companies' beta going forward. However, in order to generate a statistically significant estimate of the value of beta, it is important to have a data set of a reasonable size. A beta estimate over the past two years reflects the most recent operating conditions of Malaysian companies who are licensed to provide PSTN and public cellular services and comparator operators, while providing sufficient data points to ensure a robust estimate and smoothing out any short-term fluctuations in the data that do not reflect fundamental changes in the market environment. Under these circumstances betas for comparator companies have been estimated using time periods of:

- 2 years to reflect the short term; and
- 5 years to reflect the medium term.

Question 5

Do you consider these time frames to be reasonable?

3.3.2 Relevant market index

To ensure that the estimates are robust weekly company share and market returns are used in the regression equation. Each company's return is regressed against a common index consistent with MCMC's overall approach of calculating beta in the context of a Malaysian market. The Kuala Lumpur Stock Exchange Main Board All Share (KLEMAS) Index is preferable compared with the Kuala Lumpur Composite Index (KLCI). The former is a significantly broader index than the latter, covering as it does all companies quoted and listed on the Kuala Lumpur Stock Exchange (KLSE) (515), against the 100 covered by the latter. TMB makes up 7.3% and 10.7% of these two indices, respectively.

3.3.3 Empirical results - Malaysia

Table 3.4 below presents the estimated 2 and 5-year betas for the Malaysian companies that are licensed to provide PSTN and public cellular services, calculated against the KLEMAS Index. However, as Time was first quoted in the KLSE in March 2001, its beta is calculated

since then. Individual and composite equity and asset betas are presented for the different time periods.

Table 3.4
Betas for Malaysian telecoms operators[10]

Company	Type of Operator	Gearing	Effective tax rate	7 months (daily)		2 year (weekly)		5 year (weekly)	
				Equity beta	Asset beta	Equity beta	Asset beta	Equity beta	Asset beta
Telekom Malaysia (TMB)	Integrated	0.19	44.21%	-	-	1.14	1.01	0.97	0.84
Digi.Com	Mobile	0.15	0%	-	-	1.13	1.03	0.69	0.58
Time dotCom	Mobile	0	28%[1]	1.43	1.43	N/a	N/a	N/a	N/a
Average					**1.13**		**1.02**		**0.71**

Source: NERA analysis of Bloomberg data. Betas have been estimated against the KLEMAS Index and calculated over the following periods 03/01-10/01 (for Time only); 10/99-10/01; and 10/96-10/01. (1): The effective tax rate is not available; therefore the corporate tax rate has been used.

If estimated over the 2-year period, the asset (or ungeared) beta of TMB is around 1. Time's 7-month beta is significantly higher than the 2-year beta of TMB. This would seem to confirm the preconceived belief that, all other things equal, public cellular service is relatively more risky than PSTN, although it should be noted that the estimate may not be robust, given that Time's beta has been estimated over a 7 month period. The data suggests a cellular beta premium of around 0.4.

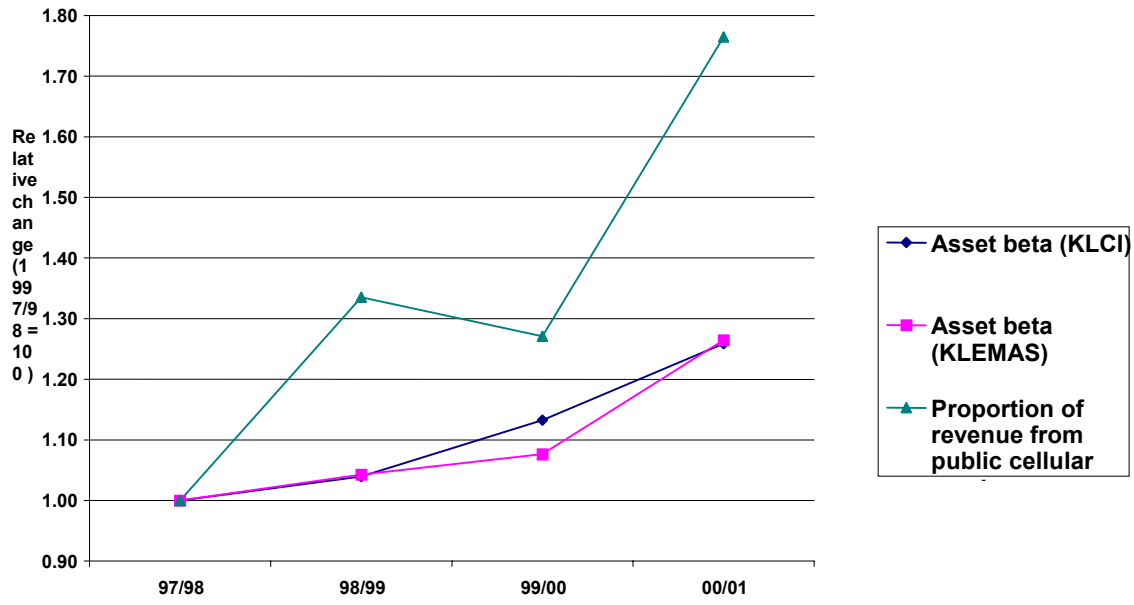
However, this observation is not mirrored in the difference between the betas of Digi and TMB. Digi's five-year beta is somewhat lower than the beta of TMB, and the two-year estimate is only marginally higher. The limited number of beta estimates for Malaysian PSTN and mobile service providers emphasizes the need to look at pairs of integrated and mobile operators in other jurisdictions, so as to perform a robustness check on the estimated mobile betas.

Figure 3.1 presents evidence on the change in TMB's beta over time, as the proportion of revenue deriving from mobile phone services increase.[11]

[10] In order provide a comparable beta estimate, it is necessary to abstract from the tax liabilities and the gearing levels of each of the companies. Thus equity betas (i.e. the betas obtained from OLS regressions of equity returns on market returns) have been unlevered. The gearing and effective rates used are the averages over the time period in question. It is a widely observed empirical finding that a security's true beta move towards the market average (of one) over time. To improve the forecast of betas, prior to unlevering, raw equity betas (or historical betas, i.e. those betas obtained from the regression of the company's stocks against the market index) are adjusted according to a simple deterministic formula: $\beta_{adjusted} = (0.67)*\beta_{raw} + (0.33)*1.0$. These adjusted betas are reported in the table. The reported gearing level is the most recent figure as are the reported effective tax rates. Debt is calculated as: (short term debt + long term debt) - where short-term debt includes bank overdrafts, short-term debts and borrowings, repurchase agreements (repos) and reverse repos. Equity is defined as market capitalization. These figures are end-of –financial year figures.

[11] The figures presented have been re-based to 1996/97 figures, and thus should not be mistaken for actual figures.

Figure 3.1
The relationship between TMB's ungeared beta measured against the KLCI and KLEMAS indices and the proportion of revenue deriving from public cellular services over time (1997/98=100)



3.3.4 Betas for comparator companies

In this section, a group of Asian and European comparator companies are examined in order to determine whether it is possible to extract a cellular "beta premium" that can be added to the beta of TMB. There are number of key characteristics that influence the covariance of a company's returns with the market, and thus must be considered when selecting comparator companies. These include the nature of the regulatory and competitive environment; the relative importance of PSTN and Public cellular business to the company's capital base; and the diversification of its earnings base, between national and international markets, and between different areas of business.

Thus, to get an indication of whether there exists a difference in beta risk between integrated and cellular operators in other countries (a cellular "beta premium"), it is important to minimize the influence of these characteristics to the furthest degree possible. Furthermore, as the differences in the betas between integrated/incumbent operators and public cellular operators is of interest rather than the magnitude of the betas, they have been calculated with reference to the main stock exchange index in the country in question. By comparing companies within the same country, and against the domestic index, the influence that differences in operating, regulatory, and competitive environment may have on companies' betas can be circumvented.

As Table 3.5 shows, there is a general trend for mobile operator betas in the countries surveyed to be significantly higher than those of their integrated counterparts. For the reasons stated above, a longer time period is preferred. In general, there is a wide spread of differences between integrated and cellular betas, ranging from 0.05 to 0.72. On average, betas estimated over the 2 and 5-year period indicate that, on average, within the countries surveyed, cellular betas are around 0.25 to 0.3 higher than those of their integrated counterparts. On average, these differences are comparable between Asian and European companies. Nippon Telegraph & Telephone (NTT) and NTT DoCoMo may present the best

evidence of a "cellular beta premium" as the latter is majority owned by the former and, therefore, company specific risks that may have an influence on the differences in the betas are, at least to a certain extent, eliminated. As a conservative estimate, it is proposed that a "cellular beta premium" of 0.25-0.40 be added to TMB's beta of 1.

Table 3.5
Comparator company betas[12]

Company	Type of Operator	Index used	2 year (weekly)		5 year (weekly)	
			Equity beta	Asset beta	Equity beta	Asset beta
Asian Telecoms Operators						
Japan						
Nippon Telegraph & Telephone	Integrated	TPX	0.98	0.89	1.08	0.99
NTT DoCoMo	Mobile	TPX	1.64	1.61	N/a	N/a
Philippines						
PLDT	Integrated	PCOMP	0.85	0.44	0.80	0.44
Globe Telecom	Mobile	PCOMP	0.75	0.57	0.80	0.50
South Korea						
Korea Telecom	Integrated	KOSPI	0.45	0.36	N/a	N/a
SK Telecom	Mobile	KOSPI	0.45	0.41	0.92	0.77
Thailand						
Telecomasia	Integrated	SET	1.52	0.57	1.46	0.52
Advanced Info Service	Mobile	SET	0.84	0.77	1.08	0.98
Average difference				***0.27***		***0.26***
European Telecoms Operators						
UK						
BT	Integrated	UKX	1.10	0.80	1.02	0.86
Vodafone	Mobile	UKX	1.26	1.19	1.26	1.20
Finland						
Elisa Communications	Integrated	HEXP	1.38	1.27	N/a	N/a
Sonera Oyj	Mobile	HEXP	1.90	1.43	N/a	N/a
The Netherlands						
Royal KPN	Integrated	AEX	1.36	0.56	1.08	0.67
Libertel	Mobile	AEX	0.99	0.85	N/a	N/a
Portugal						
Portugal Telecom	Integrated	PSI20	1.41	1.14	1.13	0.92
Telecel	Mobile	PSI20	1.38	1.37	1.21	1.19
Average difference				***0.27***		***0.31***

Source: NERA analysis of Bloomberg data. These betas are calculated over the following periods: 10/99-10/01 and 10/96-10/01.

[12] See Footnote 10

SECTION 4 ESTIMATING THE COST OF DEBT AND THE LEVEL OF GEARING

The cost of debt can be expressed as the sum of the risk free rate and the company specific debt premium. The company specific debt premium is driven by several factors, most notably actual (or implied) credit ratings based on financial characteristics such as market capitalisation, earnings, volatility and business risk (specific to the company and/or the industry). As a company's gearing increases, the debt premium will tend to increase as a reflection of the increased financial riskiness of the company, i.e. that more cash flow needs to be generated from operations/investments in order to meet interest payments.

Besides the financial position and the term structure of the debt issued, it is important to note that the state of the economy also affects the premiums (above the risk free rate) that companies have to pay. Both absolute yields and yield 'spreads' can change over time according to prevailing economic conditions. For example, due to the continuing difficulties of the Japanese and Asian economies, there is evidence that the number of lenders in the syndicated bank market and the size of the commitments are decreasing. This places upward pressure on debt margins. A slightly higher margin will increase the WACC, although not materially.

The beta estimates demonstrated that there is a difference in the level of riskiness between integrated and public cellular service providers. Thus, in developing estimates of the cost of debt for the Malaysian PSTN and public cellular service providers, market based evidence of the cost of debt of TMB (currently, the only licensee to issue public quoted debt) and a selection of Asian and European comparator companies have been taken into consideration, and specifically, the actual observed costs of debt of the comparators and the relationship between the cost of debt finance and a company's capital structure.

4.1 Market Based Evidence on the Gearing Level

Gearing is a measure of the ratio of debt to company value (the latter being equivalent to the sum of debt and equity). Since market returns on debt and equity vary, as do the tax implications of each, the gearing ratio has a significant impact on the final WACC.

Equity is usually measured using market values, i.e. the market capitalisation of the company. However, in certain instances the book value of debt may be necessary as an approximation of the market value of debt for a company.

4.1.1 Empirical evidence

Table 4.1 presents actual market gearing ratios for the Malaysian PSTN and public cellular service providers and a set of comparator companies. However, it should be noted that the tax advantages of debt finance in these countries may differ according to differences in corporate tax rates and dividend tax credits.

Our analysis shows a wide range of different gearing levels, ranging from 0% to 63% (with an average of 24%). More than half of the surveyed companies (11 out of 19) have a gearing ratio between 10% and 30%.

Table 4.1
Market gearing for Malaysian PSTN and public cellular service providers and comparator companies

Company Name	Moody Rating	S&P Rating	Debt to Market Cap	Market Gearing D/(D+E)
Integrated Operators				
Telekom Malaysia	-	-	0.24	0.19
Nippon Telegraph & Telephone	Aa1	AA	0.21	0.17
Philippine Long Distance Telephone	-	-	1.35	0.57
Korea Telecom	-	-	0.4	0.29
Telecomasia Corp	-	-	1.64	0.62
British Telecommunications	Baa1	A-	0.92	0.48
Elisa Communications	A3	A-	0.24	0.19
Royal KPN	-	BBB-	1.69	0.63
Portugal Telecom	A3	A	0.36	0.26
Average			***0.78***	***0.38***
Cellular Operators				
Digi.Com	-	-	0.18	0.15
Time dotCom	-	-	0	0
NTT DoCoMo Inc	-	AA	0.05	0.05
Globe Telecom	-	BB-	0.52	0.34
SK Telecom	-	-	0.13	0.12
Advanced Info Service	-	BBB	0.14	0.12
Vodafone Group	-	A	0.11	0.10
Sonera	-	BBB	0.4	0.29
Libertel	-	-	0.4	0.29
Telecel	-	-	0.02	0.02
Average			***0.20***	***0.15***
Overall average			***0.43***	***0.24***

Source: Bloomberg.

The data shows that TMB's gearing ratio of 19%, although lying towards the lower end of the range of observed gearing levels and being somewhat lower than the average of observed gearing levels for (integrated) comparators, is nevertheless in line with gearing levels observed for other integrated operators, such as Nippon Telegraph & Telephone and Portugal Telecom. On this basis, there does not appear to be any evidence to suggest that TMB's actual gearing structure is sub-optimal and propose to use TMB's actual gearing in estimating the cost of capital for the "integrated" operator. The gearing ratio used is 20%.

The average gearing levels for the set of integrated comparators is somewhat higher than the average observed for mobile comparators. Time's gearing level of 0% appears to be somewhat low, although is it not significantly lower than those levels observed for Telecel and NTT DoCoMo. However, the observed gearing level of TMB is not significantly different from that observed for Digi (15%) or for the average observed for public cellular service providers in general (15%). Thus, MCMC has not found any discernible evidence that the gearing levels of the Malaysian public cellular service providers are significantly lower than that of TMB. A gearing level of 20% is proposed for public cellular service providers. This figure is close to the actual gearing of Digi and to the average of the observed gearing levels.

It is not possible to obtain information on the market gearing levels of Maxis and Celcom (as they are not publicly listed companies). One possibility would be to use the book gearing of these companies as a proxy for their market gearing. For example, the book gearing (defined as total debt to debt plus common equity) of TMB for 2000 is 39%, whereas the market gearing is 19%. Likewise, the book gearing of Digi was 34%, whereas the market gearing was 7%.

As a sensitivity test, in Section 6, to illustrate the effect of a significantly higher gearing level (than the assumed 20%), an estimation of the WACC for mobile companies based on an assumption of a (market) gearing figure of 50% is included.

Question 6

Do you agree that gearing levels of 20% are reasonable for this exercise? Please explain your answer.

4.2 Market Based Evidence on the Cost of Debt

Table 4.2 shows the corporate bonds issued by TMB and comparator companies for a variety of maturities, with the spreads over the government securities as well as their gearing ratios and corporate tax rates. The gearing is needed in order to estimate a debt premium that is consistent with this figure. Finally, the table also provides information on the companies' credit ratings, from which one can make inferences regarding the impact of optimal financial management on the risk premium for loan capital.

Table 4.2 presents evidence on comparator companies' bonds, all of which are rated in a range from A to BB- (all bonds rated BB+ or lower are non-investment-grade bonds, or "junk bonds"). According to this data, the spread on relevant government benchmarks for outstanding telecom companies' bond issues are in a range of 108 to 989 basis points. Although this range is very broad, the data can be used to draw some general conclusions concerning the differences in the level of gearing, credit ratings and differences in debt spreads between integrated and public cellular service providers.

Table 4.2
Credit ratings of debt issued by comparator companies

Company	Gearing[1]	Coupon	Issue date	Maturity date	Currency	Spread vs. benchmark[2]	Current YTM	Moody's/ S&P rating
Telekom Malaysia	0.19	4	03/10/1994	03/10/2004	USD	191.852	4.630	Baa2/BBB
		7.125	10/08/1995	01/08/2005	USD	219.619	5.272	Baa2/BBB
		7.875	10/08/1995	01/08/2025	USD	398.256	8.636	Baa2/BBB
Philippine Long Distance Telephone	0.57	9.125	31/07/1995	01/08/2002	USD	834.857	10.219	Ba2/BB+
		10.625	02/06/1994	02/06/2004	USD	576.459	8.330	Ba2/BB+
		9.875	31/07/1995	01/08/2005	USD	989.089	13.362	Ba2/BB+
		10.5	13/04/1999	15/04/2009	USD	722.231	11.105	Ba2/BB+
Globe Telecom	0.34	13	06/08/1999	01/08/2009	USD	676.969	10.699	Ba3/BB-
British Telecommunications	0.48	7.125	15/09/1993	15/09/2003	GBP	110.91	5.059	Baa1/A-
		7.125	15/02/2001	07/12/2006	GBP	124.795	5.702	Baa1/A-
		8.375	12/12/2000	15/12/2010	USD	212.092	6.246	Baa1/A-
		8.875	12/12/2000	15/12/2030	USD	235.246	7.163	Baa1/A-
Vodafone Group	0.10	7.5	20/03/1997	19/03/2004	GBP	108.427	5.151	A2/A
		7.75	10/02/2000	15/02/2010	USD	185.153	5.873	A2/A
		7.875	10/02/2000	15/02/2030	USD	198.207	6.77	A2/A
Orange Plc	0.17	8.75	29/10/1999	01/06/2006	USD	234.446	6.746	Baa1/BBB+
		8	24/07/1998	01/08/2008	USD	273.653	7.039	Baa1/BBB+
		8.875	11/06/1999	01/06/2009	GBP	255.574	6.877	Baa1/BBB+
Elisa Communications	0.19	6	06/09/2000	06/09/2004	EUR	119.325	4.405	A3/ N/a

Company	Gearing[1]	Coupon	Issue date	Maturity date	Currency	Spread vs. benchmark[2]	Current YTM	Moody's/ S&P rating
		6.375	31/01/2001	31/01/2006	EUR	166.51	5.638	A3/A-
Sonera	0.29	5.125	16/08/2001	17/02/2003	EUR	200.935	-	Baa2/BBB
		5.625	14/03/2000	14/03/2005	EUR	379.547	7.079	Baa2/BBB
		4.625	16/04/1999	16/04/2009	EUR	301.171	7.101	Baa2/BBB
Malayan Banking Berhad	0.54	7.125	27/09/1995	15/09/2005	USD	271.351	5.834	Baa2/ BB+
YTL Power	0.26	2.5	11/07/2001	11/07/2006	USD	278.317	-	N/A / BBB-

Source: NERA analysis of Bloomberg data. 1: Gearing is measured as total debt to (debt plus market capitalisation). 2:Spreads are measured in basis points (0.01%)

Companies do not reissue their debt at the start of a new periodic review period, and do not only issue debt with a maturity matching the regulatory review, but instead issue debt with different maturities, from the very short term to the very long term. MCMC considers that bonds with around 10 years to maturity are used, on the grounds that, in general, this would tend to reflect the average maturity of debt issued.

Vodafone's single A rated bond with a 9 year maturity exhibits a spread over the risk free rate of around 185 basis points. In comparison, British Telecom's bond of the same maturity but a single credit grade lower (A-) exhibits slightly higher debt spreads, at around 215 basis points. This difference between the credit grades is mirrored when examining the bonds of Orange Plc and Sonera, which both have similar gearings. Orange's BBB+ bonds have a debt spread which is around 50 basis points lower than Sonera's BBB bonds at 8 year to maturity. For the junk bonds of PLDT and Globe Telekom, if appears that the significantly higher gearing of PLDT has offset the lower credit rating of Globe's bonds, thus leading to Globe's bonds having a debt spread which is around 50 basis points lower than PLDT's bond with 8 years to maturity. However, it should be noted that bond spreads are dependent upon other factors than credit ratings, such as the coupon, the maturity, the yield and the presence (and type) of embedded covenants. Table 4.2 also demonstrates that longer maturities tend to have wider spreads, ie the cost of debt appears to be influenced by the maturity one chooses.

Despite TMB being (indirectly) majority government owned, there does not appear to be any discernible sovereign guarantee which enables it to borrow below what would normally be paid by the market. This can be illustrated by comparing the current spread of TMB's outstanding issues with those of Sonera (which has a similar credit rating, but a slightly higher gearing). The debt spreads are similar, when taking into consideration that Sonera is a mobile operator. Other examples are Malayan Banking and YTL Power, two privately owned Malaysian companies listed on the KLCI and KLEMAS indices, which have debt spreads that are in line with those of TMB, when one considers their different credit ratings and gearing structures.

In general, TMBs bonds display debt spreads of around 200-400 basis points depending on the maturity. The spreads presented in Table 4.2 suggests that a bond with around 10 years to maturity would be likely to have a spread over the risk free rate of around 300 basis points. This is the figure MCMC proposes to use for the debt spread over the risk free rate for TMB.

BT's bonds are one credit rating level higher than those of Orange. Over the medium to long term, BT's bonds have around 40-60 basis points lower debt spreads than those of Orange, despite its relatively higher gearing. Sonera's bonds are rated two credit rating levels lower than those of Elisa (BBB compared to A-), both of which have gearing levels comparable to TMB's. Sonera's bond exhibit debt spreads that are around 150-200 basis points greater than those of Elisa. On this basis, for the Malaysian mobile operators MCMC proposes debt spreads of around 50-100 basis points in excess of that experienced by TMB, namely 350-400 basis points. This is based on the assumption that public cellular service providers are able to maintain investment grade credit ratings on their issued debt, i.e. credit ratings that are no more than one rating level below that of TMB (that is, BBB-).

4.3 Initial Conclusions on the Cost of Debt and Gearing

In general, the surveyed companies illustrate that within countries there is a tendency for public cellular service providers to have lower gearing, lower credit ratings and larger debt spreads than integrated service providers.

The comparator group experienced a broad range of capital structures, with the majority of gearing levels lying around 10-30%. Of the Malaysian service providers, market-gearing data is only available for TMB, Digi and Time, making it difficult to make a judgement on the optimal gearing for Maxis and Celcom. For that reason, a gearing level of 20% as a proxy for the level of gearing for both integrated and public cellular service providers in Malaysia is used, as this is close to the actual gearing of both TMB and Digi and to the average of the range experienced by comparator companies.

Given this level of gearing, the evidence shows that the debt premium for TMB is around 300 basis points, while public cellular service providers are likely to experience debt spreads of around 50-100 basis points in excess of that experienced by their integrated counterparts. For that reason a range for the debt premium for public cellular service providers is used, namely 350-400 basis points. This is based on the assumption that mobile operators are able to maintain investment grade credit ratings on their issued debt.

Question 7

Do you have any comments on the debt spread adopted for use in MCMC's WACC calculations?

SECTION 5 TAXATION

5.1 The Tax Wedge

To calculate a pre-tax cost of capital, a "tax wedge" needs to be calculated. The pre-tax cost of capital will take account of the levels of both corporate and personal taxation, and so provide investors with required after tax returns.

Under an imputation tax system, the tax wedge must also take account of dividend tax credits received by personal investors, which can be offset against personal tax liabilities. Ceteris paribus, an imputation tax system reduces the effective tax wedge relative to a classical tax system.

The tax wedge is in principle a function of the tax position of the particular company. In practice, a simplistic tax adjustment formula is often based purely on the relative values of corporation tax and the tax credit allowed on dividends:

(5.1) $$\textbf{Tax adjustment} = (1 - t_i) / (1 - t_c)$$

where t_i is the dividend tax credit rate and t_c is the corporate tax rate.

This formula assumes a dividend cover of one and ignores capital allowances and inflation. Although it is a simplification, this formula has been used by regulators around the world to take account of taxation.

5.2 The Malaysian Tax System

5.2.1 Corporate income tax

Resident companies (except unit trusts, and companies engaged in banking, insurance, air transport and shipping) are subject to income tax on all income arising in or derived from Malaysia. The income tax rate for both resident and non-resident companies is 28%.

5.2.2 Tax imputation system

Malaysia operates a full imputation tax system. Under this system, when paying out dividends, the company pays tax at the corporate income tax rate (28%). Dividend payments are deemed to be received net of company tax. Therefore, domestic shareholders can credit the tax (i.e. 28% of the grossed-up dividend) against their personal tax liability (the same process applies to a corporation). Should the marginal tax rate of the domestic shareholder be lower than the company tax rate, the resulting excess tax credit can be used against other income liable to tax or result in a tax rebate if there is no other tax liability.

5.2.3 The Pre Tax WACC Under a Tax Imputation System

As explained in Section 2.1.2, the pre-tax WACC is usually defined as:

(5.2) $$\textbf{Pre tax WACC} = r_e * (E/V) * t_{adj} + r_d * (D/V)$$

where t_{adj} is tax adjustment factor.

Under a full tax imputation system, one has to adjust for the impact of the tax imputation as illustrated in Equation (5.1). The absence of dividend tax credits for non-domestic investors, implies that the required returns of non-domestic investors will be higher than domestic investors. Thus the WACC formula should be adjusted to ensure that telecom companies are able to earn returns that provide appropriate remuneration to existing

domestic and non-domestic investors. The WACC must also enable companies to attract new finance for future investments. However, as non-resident investors can be assumed to have no income additional to dividend within Malaysia against which to offset any imputation credit, only the dividend imputation tax credit extended to domestic investors should be adjusted for. Thus, the tax adjustment factor becomes:

(5.3) $$t_{adj} = \frac{(1 - t_i * \delta)}{(1 - t_c)}$$

where t_i is average dividend tax credit rate tax rate, δ is the proportion of domestic investors (based on number of shares) and t_c is the rate of corporation tax.

For the purpose of deriving a pre tax WACC, a taxation adjustment has been applied to the nominal post tax cost of equity to convert to a nominal pre tax cost of equity (taking the tax imputation system into account), assuming an effective corporation tax liability of 28% and a dividend imputation tax credit rate of 28%.

When the dividend tax credit rate and the corporation income tax rate are identical (i.e. there is full imputation), and all shareholders are domestic the "Vanilla" WACC is equal to the pre tax WACC.

The greater the proportion of foreign ownership, the greater is the resulting pre tax cost of equity, as the required returns of non-domestic investors will be higher than domestic investors to reflect the absence of the dividend tax credits.

Thus, the appropriate cost of capital will be company specific, depending on the proportion of foreign investors. The general restriction on foreign ownership of PSTN and public cellular service providers in Malaysia is 30% (however, since 1999, foreign ownership can be allowed up to 61% for a period of five years, on a *case-by-case* basis). In general, the Malaysian PSTN and public cellular service providers exhibit a wide range of ownership structures, ranging from fully nationally owned (e.g. Time dotCom) to majority foreign owned (e.g. Digi).

Given the practical difficulties with identification of marginal providers of new finance, the right value to assume for δ is ambiguous.

MCMC proposes to err on the side of caution and calculate the cost of capital on the assumption that the general foreign ownership restrictions are binding, and thus assume that the proportion of non-domestic investors is equal to 30%.

Nevertheless, for informational purposes, in Section 6 a cost of capital estimate based on an assumption of 30% non-domestic investors, as well as an estimate based on no foreign ownership and an estimate based on the maximum foreign involvement allowed under Malaysian law (i.e. 61% foreign shareholders) are all provided. In addition, for TMB an estimation of the cost of capital based on an assumption of 8.54% foreign shareholders is provided.[13]

[13] Statistic taken from Telekom Malaysia Berhad's Annual Report 2000. The figure reflects the distribution of shareholders as at 9 March 2001.

Question 8

Do you agree with MCMC's approach in erring on the side of caution and taking the 30% restriction on foreign ownership as binding?

SECTION 6: WACC

The cost of capital for the Malaysian PSTN and public cellular service providers was calculated using the approach outlined in thus document and the results are presented in Table 6.1. This table provides calculations of the WACC for integrated telephony (i.e. for TMB) on four different assumptions concerning the proportion of domestic shareholders, namely 100%, 91.46%, 70% and 39%. On the basis of the estimated parameters, the nominal post tax "Vanilla" WACC (which is unaffected by taxation and dividend imputation) is 9.2%. The resulting pre-tax WACC lies in a range of 9.2%-11.1% depending upon the proportion of domestic shareholders. Assuming an inflation rate for 2002 of 1.85%, the real pre-tax WACC is lies in a range of 7.2%-9.1%.

Table 6.1
WACC estimates for integrated telephony (TMB)

Proportion of foreign ownership	**0%**	**8.54%**	**30%**	**61%**
Nominal risk free rate	2.95%	2.95%	2.95%	2.95%
Real risk free rate	1.08%	1.08%	1.08%	1.08%
Equity risk premium	6.00%	6.00%	6.00%	6.00%
Asset beta	1.00	1.00	1.00	1.00
Tax rate	28.00%	28.00%	28.00%	28.00%
Equity beta	1.18	1.18	1.18	1.18
Gearing	20%	20%	20%	20%
Debt premium	3%	3%	3%	3%
Inflation[14]	1.85%	1.85%	1.85%	1.85%
Proportion of domestic investors	100%	91.46%	70%	39%
Nominal cost of debt (gross of debt tax shield)	5.95%	5.95%	5.95%	5.95%
Nominal post tax cost of equity	10.03%	10.03%	10.03%	10.03%
Nominal pre tax cost of equity	10.03%	10.36%	11.20%	12.41%
Nominal post-tax "Vanilla" WACC	**9.21%**	**9.21%**	**9.21%**	**9.21%**
Nominal Pre-Tax WACC	**9.21%**	**9.48%**	**10.15%**	**11.12%**
Real Pre-Tax WACC[1]	**7.23%**	**7.49%**	**8.15%**	**9.10%**

(1) The real pre-tax WACC is estimated by adjusting the nominal pre-tax WACC for inflation using the Fischer equation.

Table 6.2 presents the estimated WACC for public cellular service providers for three different assumptions regarding the proportion of domestic shareholders (and based on a gearing level assumption of 20%). On the basis of the estimated parameters, the "Vanilla" WACC for the public cellular service providers lies between 10.7% and 11.7%. The nominal pre-tax WACC lies in a range of 10.7%-14.1% depending on the proportion

[14] On the basis of data from *Consensus Economics (October 2001) "Consensus Forecasts Global Outlook 2001 – 2011"* and IMF (October 2001) *"World Economic Outlook Database" (of 1.7% and 2.0%, respectively)*, NERA has used an estimated inflation rate for the Malaysian economy for 2002 of 1.85%.

of domestic shareholders. Assuming an inflation rate for 2002 of 1.85%, the real pre-tax WACC lies between 8.7% and 12.1%.

As described in Section 4.1.1, as a robustness test on the assumed gearing level of 20% for public cellular service providers, WACC calculations based on a significantly higher gearing level are also presented. Table 6.3 presents the WACC for public cellular service providers based on a gearing level of 50%. The cost of debt finance is assumed to stay constant, although in practice it might increase due to increased credit risk. Assuming a higher gearing level of 50%, the "Vanilla" WACC lies between 11.2% and 12.2%. The nominal pre-tax WACC lies in a range of 11.2%-14.2%, and the real pre tax WACC lies between 9.1% and 12.2%.

The WACC estimates based on an assumption of a 50% gearing level for mobile operators are slightly higher than those based on a 20% gearing assumption. This is a result of the increase in the cost of equity more than offsetting the increased weight of the cost of debt finance.

Table 6.2
WACC estimates for public cellular service providers assuming a 20% gearing

Proportion of foreign ownership	**0%**	**30%**	**61%**
Nominal risk free rate	2.95%	2.95%	2.95%
Real risk free rate	1.08%	1.08%	1.08%
Equity risk premium	6.00%	6.00%	6.00%
Asset beta	1.25-1.40	1.25-1.40	1.25-1.40
Tax rate	28.00%	28.00%	28.00%
Equity beta	1.48-1.65	1.48-1.65	1.48-1.65
Gearing	**20%**	**20%**	**20%**
Debt premium	3.5%-4.0%	3.5%-4.0%	3.5%-4.0%
Inflation[15]	1.85%	1.85%	1.85%
Proportion of domestic investors	100%	70%	39%
Nominal cost of debt (gross of debt tax shield)	6.45%-6.95%	6.45%-6.95%	6.45%-6.95%
Nominal post tax cost of equity	11.80%-12.86%	11.80%-12.86%	11.80%-12.86%
Nominal pre tax cost of equity	11.80%-12.86%	13.18%-14.36%	14.60%-15.91%
Nominal post-tax "Vanilla" WACC	**10.73%-11.68% (11.21%)**	**10.73%-11.68% (11.21%)**	**10.73%-11.68% (11.21%)**
Nominal Pre-Tax WACC	**10.73%-11.68% (11.21%)**	**11.83%-12.88% (12.36%)**	**12.97%-14.12% (13.55%)**
Real Pre-Tax WACC[1]	**8.72%-9.65% (9.19%)**	**9.80%-10.83% (10.32%)**	**10.92%-12.05% (11.49%)**

Note: midpoint figures shown in brackets. (1):The real pre-tax WACC is estimated by adjusting the nominal pre-tax WACC for inflation using the Fischer equation.

15 See Footnote 14

Table 6.3
WACC estimates for public cellular service providers assuming a 50% gearing

Proportion of foreign ownership	**0%**	**30%**	**61%**
Nominal risk free rate	2.95%	2.95%	2.95%
Real risk free rate	1.08%	1.08%	1.08%
Equity risk premium	6.00%	6.00%	6.00%
Asset beta	1.25-1.40	1.25-1.40	1.25-1.40
Tax rate	28.00%	28.00%	28.00%
Equity beta	2.15-2.41	2.15-2.41	2.15-2.41
Gearing	**50%**	**50%**	**50%**
Debt premium	3.5%-4.0%	3.5%-4.0%	3.5%-4.0%
Inflation[16]	1.85%	1.85%	1.85%
Proportion of domestic investors	100%	70%	39%
Nominal cost of debt (gross of debt tax shield)	6.45%-6.95%	6.45%-6.95%	6.45%-6.95%
Nominal post tax cost of equity	15.85%-17.40%	15.85%-17.40%	15.85%-17.40%
Nominal pre tax cost of equity	15.85%-17.40%	17.70%-19.43%	19.61%-21.53%
Nominal post-tax "Vanilla" WACC	**11.15%-12.17% (11.66%)**	**11.15%-12.17% (11.66%)**	**11.15%-12.17% (11.66%)**
Nominal Pre-Tax WACC	**11.15%-12.17% (11.66%)**	**12.07%-13.19% (12.63%)**	**13.03%-14.24% (13.66%)**
Real Pre-Tax WACC	**9.13%-10.14% (9.66%)**	**10.04%-11.13% (10.59%)**	**10.98%-12.16% (11.57%)**

Note: midpoint figures shown in brackets. (1):The real pre-tax WACC is estimated by adjusting the nominal pre-tax WACC for inflation using the Fischer equation.

[16] See Footnote 14

6.1 Conclusions on the WACC

As described in Section 4.1.1, a gearing level for the mobile operators of 20% is preferred. This figure is similar to the actual gearing of Digi and to the average of the range experienced by comparator companies.

The appropriate cost of capital will depend on the proportion of foreign investors, and thus be company specific. The WACC has been calculated based on a broad range for the assumed proportion. The WACC, to the extent that it is used to set allowed revenues, must be sufficient to provide appropriate remuneration to existing investors and allow companies to finance new investment. However, as the marginal investor cannot be observed, the correct figure for the proportion of domestic shareholders within the ranges cannot be identified. Given this, it seems appropriate to err on the side of caution and use a WACC that is consistent with existing constraints on foreign ownership (the general restriction on foreign ownership of 30%). For companies with foreign ownership which is lower than this level, the use of this figure implies that the marginal provider of new finance will be foreign.

Based on these recommendations, Table 6.4 sets out the resulting WACC. The nominal post tax "Vanilla" WACC is estimated to be 9.2% for TMB and 10.7%-11.7% for mobile operators. The nominal pre tax WACC estimate is 10.2% for TMB and 11.8%-12.9% for mobile operators. This translates into a real pre tax WACC of 8.2% for TMB and 9.8%-10.8% for mobile operators.

Thus, overall the preferred rates are a real pre-tax WACC of 8.2% for integrated telephony (TMB) and 10.2% for mobile telephony operators.

Question 9

Do you believe that MCMC should determine the WACC for Malaysian licensees who provide PSTN and public cellular services for use in a regulatory context? Please explain your answer.

Table 6.4
Proposed WACCs

	Integrated	Cellular
Nominal risk free rate	2.95%	2.95%
Real risk free rate	1.08%	1.08%
Equity risk premium	6.00%	6.00%
Asset beta	1.00	1.25-1.40
Tax rate	28.00%	28.00%
Equity beta	1.18	1.48-1.65
Gearing	20%	20%
Debt premium	3%	3.5%-4.0%
Inflation	1.85%	1.85%
Proportion of domestic investors	70%	70%
Nominal cost of debt (gross of debt tax shield)	5.95%	6.45%-6.95%
Nominal post tax cost of equity	10.03%	11.80%-12.86%
Nominal pre tax cost of equity	11.20%	13.18%-14.36%
Nominal post-tax "Vanilla" WACC	**9.21%**	**10.73%-11.68% (11.21%)**
Nominal Pre-Tax WACC	**10.15%**	**11.83%-12.88% (12.36%)**
Real Pre-Tax WACC	**8.15%**	**9.80%-10.83% (10.32%)**

Note: midpoint figures shown in brackets. (1):The real pre-tax WACC is estimated by adjusting the nominal pre-tax WACC for inflation using the Fischer equation.

APPPENDIX A: COMPARATOR COMPANIES

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
Malaysia						
Telekom Malaysia Bhd (TMB)	TMB establishes, provides, and maintains telecommunication and related services. Through its subsidiaries, the Company provides payphone network, public cellular service, PSTN, and leasing of optical fibre telecommunication system services. TMB also manages and operates Kuala Lumpur Tower and provides intelligent security services.	0.19	69%	98%	16%	16%
DigiCom BHD	DigiCom Berhad is an investment holding company. Through its subsidiaries, the Company establishes, maintains, and provides wireless telecommunication services through the global system for mobile telecommunications (GSM) network in Malaysia. Digi.com also has operation in property holding and other related services.	0.15	N/a	0%	N/a	19%
Time dotCom Bhd	TIME dotCom Berhad is an investment holding company. The Company, through its subsidiaries, provides voice, data, video, image communication, and payphone services. Time dotCom also provides and markets Internet services to consumers including world wide web, organization and aggregation of content, on-line call centre, on-line services, on-net advertising, and virtual data storage.	0.0	N/a	1%	N/a	6%
Japan						
Nippon Telegraph & Telephone Corp	Nippon Telegraph and Telephone Corporation (NTT) provides a variety of telecommunication services, including telephone,	0.17	55 %	97%	36%	(53% - through NTT

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
	telegraph, leased circuits, data communication, terminal equipment sales, and related services. The company provides both local and long distance telephone services in Japan.					DoCoMo – see below)
NTT DoCoMo Inc	NTT DoCoMo Inc provides various types of telecommunication services including cellular phones, personal handyphone systems (PHS), paging, satellite mobile communication and wireless Private Branch Exchange system services. The Company also sells cellular phones, PHS, car phones, and pagers.	0.05	1%	0.00%	99 %	53%
Philippines						
PLDT	Philippine Long Distance Telephone Company provides domestic and international long distance and cellular telephone services. The Company has a network of central office exchanges serving the Metro Manila area, other cities and municipalities throughout the country.	0.57	68%	80%	25%	50%
Globe	Globe Telecom, Inc. provides wireless application protocol and mobile banking services. The Company also offers service which allows users access to a wide range of information and services via a user-friendly menu. In addition, Globe provides wireline voice and data services.	0.34	10%	n/a	78%	27%
Korea						
Korea Telecom	Korea Telecom Corporation provides telecommunication services including local, long distance, and international calling, satellite communication, data transmission, and wireless telephone services in South Korea. The Company also offers	0.29	74%	99.95%	23%	18%

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
	network portal and high-speed Internet access services using asymmetric digital subscriber lines (ADSLs).					
SK Telecom	SK Telecom Co., Ltd., an affiliate of SK Group, offers telecommunications services and products in South Korea. The Company provides mobile phone services under the brand names Speed 011 and Speed 012. In addition, SK Telecom and its subsidiaries offer other wireless services including data, paging, and Internet services.	0.12	0%	0%	94%	41%
Thailand						
TelecomAsia	TelecomAsia Corporation Public Company Limited develops and operates telephone project in Bangkok and suburbs. The Company has been granted by the Telephone Organization of Thailand (TOT) a 25-year concession starting 1991 to build 2.6 million telephone lines which would be transferred to TOT upon completion, while it would earn 84 percent of revenues from operations over concession period.	0.62	88%	27%	6%	N/a
Advanced Information Services	Advanced Info Service Public Company Limited is granted a 25-year concession expiring the year 2010 by the Telephone Organization of Thailand to provide cellular phone services. The Company provides analog mobile phone services through the Nordic Mobile Telephone (NMT900) network, and digital phone services through the Global Systems for Mobile Communication (GSM) network.	0.12	0%	0%	64%	48%
UK						
British Telecommunications	British Telecommunications plc provides telecommunications	0.48	45%	83%	9%	25%

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
Plc	services. The Company provides local and long-distance telephone call products and services in the UK, telephone exchange lines to homes and businesses, international telephone calls to and from the UK, telecommunications equipment for customers' premises, and mobile, Internet and data services. BT has operations in over 50 countries.					
Vodafone	Vodafone Group Plc provides mobile telecommunications services. The Company supplies customers with digital and analogue cellular telephone, paging and mobile data and Internet services. The Group, via a 50% joint venture with VivendiNet, operates the 'Vizzavi' brand Internet portal company in Europe. Vodafone also has a 45% interest in Verizon Wireless Inc.	0.10	0%	0%	94%	30%
Orange Plc	Orange Plc operates the Orange digital PCN telecommunications network in the United Kingdom and sells and markets Orange services. The group offers a broad range of mobile voice and data communications services under the "Orange" brand name. Orange has approximately 2.2m subscribers within England, Scotland and Wales.	0.17	0%	0%	83%	24%
Finland						
Elisa Communications Oyj	Elisa Communications Oyj is an integrated telecommunications provider. The Company provides local, long distance, mobile telephone, and data transmission services. Elisa also leases networks and sells terminals. The Company sells to private	0.19	45%	26%	48%	34%

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
	individuals and businesses in Finland.					
Sonera	Sonera Oyj offers telecommunications services and support. The Company offers mobile communications and mobile-based services and applications, data transmission, and fixed network voice service in Finland and surrounding countries. Sonera also retails telephones, computers, fax machines, printers, and terminals.	0.29	14%	27%	43%	62%
Netherlands						
Royal KPN NV	Koninklijke (Royal) KPN NV provides telecommunications services throughout the Netherlands. The Company provides local, long distance, international, and mobile telecommunication services, voice-mail, call forwarding, ISDN Internet lines, faxing, and communications services for businesses.	0.63	36%	99%	40%	47%
Libertel NV	Libertel NV offers mobile telephone services. The Company operates a GSM 900 network and offers per second billing, dialing by voice recognition, short message service, prepaid services, stock market prices, and traffic and weather reports. Libertel operates in the Netherlands.	0.29	0%	0%	93%	30%
Portugal						
Portugal Telecom SGPS SA	Portugal Telecom, SGPS, S.A. offers telecommunications services in Portugal. The Company offers domestic, long distance, and international telephone, mobile telephone, paging, Internet access, and data communications services. Portugal Telecom also distributes cable television	0.26	41%	100%	51%	45%

Company	Description[1]	Gearing (D/D+E)[2]	Proportion of revenue from PSTN[3]	Proportion of national PSTN (number of subscribers)[4]	Proportion of revenue from public cellular service[3]	Proportion of national public cellular service (number of subscribers)[4]
	programming. In Brazil and Morocco, the Company offers mobile telephone services.					
Telecel	Telecel Conunicacoes Pessoais S.A. operates and provides mobile and fixed line telecommunications, Internet access, paging services and other related activities under a 15 year license granted on 18-Oct-1991 by the Portuguese Institute of Communications (ICP). The business activities of the Company are subject to the terms of this license.	0.02	0%	0%	90%	35%