
The Cost of Capital for Mobile Operators

Investigation into Regulation of Mobile Termination

*A report prepared by Marsden Jacob Associates
for TelstraClear*

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1. Introduction

1. Marsden Jacob Associates (MJA) has been requested by TelstraClear to provide comments on the indicative cost of capital for mobile operators in New Zealand.
2. The comments and opinions expressed in this paper are those of Marsden Jacob Associates and do not necessarily reflect those of TelstraClear. No part of this submission is confidential and Marsden Jacob has no objection to it being made publicly available.
3. Our comments are made in context of the “Schedule 3 Investigation into Regulation of Mobile Termination - Issues Paper” (18 June 2004), which is the first stage of the investigation into whether or not mobile termination should become a designated or specified service. In particular this note specifically addresses question 6.1 (g) in the Commerce Commission’s (hereafter ‘Commission’) Issues Paper: *What is considered to be a reasonable WACC for a mobile network?*
4. In the Issues Paper the Commission clearly sets out the market (service) for consideration¹:

“The service which the Commission has decided to investigate is mobile termination. This relates to the termination of voice calls to mobile customers....Mobile termination is a component used in the supply of various downstream end-to-end services such as fixed-to-mobile and mobile-to-mobile calling services. For example, for a fixed-to-mobile call, the call originates on the fixed network to which the calling party (the A-party) is connected. The call will at some stage be handed over to the mobile network on which the called party (B-party) is located, and will be ‘terminated’ on that network.”

5. Further, the investigation has been initiated due to²:

“...complaints that a potential lack of competition in the market for mobile termination may be resulting in unreasonably high charges for fixed-to-mobile calls.”

¹ Commerce Commission, *Telecommunication Act 2001: Schedule 3 Investigation into Regulation of Mobile Termination*, Issues Paper, June 2004, p 21

² Commerce Commission, *ibid*, p 5

6. As such the Commission follows similar investigations in other jurisdictions. In particular, we note that that the ACCC recently, published a mobile services review on the issue of the mobile terminating access service (MTAS) and European regulators, within the framework of the Electronic Communications Directive, will or have reviewed this issue.
7. In contrast to the TSO and determinations by the Commission in other sectors (such as electricity, gas and airports), the cost of capital for mobile operators and in particular that of mobile termination has not previously been considered in New Zealand³. We therefore need to work from first principles and publicly available evidence to form a judgement on the cost of capital.
8. The framework used by MJA to assess the WACC of a mobile operator is based on that used by the Commission in previous determinations in the sector. In particular, MJA has used insights and parameter values from the TSO determination process. Although MJA does not agree with the Commission's sole reliance on the domestic CAPM model used, it is a useful and well understood starting point for a discussion of the size of the cost of capital for any service offered in New Zealand.
9. Before considering the specific WACC parameters, it is necessary to consider the nature and characteristics of the investment in and the market for mobile services and mobile termination in particular. This entails an understanding of the essential nature of the services provided, that is, their fundamental economic nature. As a first step we therefore need to answer the following questions:
 - What are the key characteristics of a mobile operator and the services they provide, including mobile termination?
 - What implications do these characteristics have for the nature and magnitude of risks faced in the provision of mobile termination?
 - Which of these risks are diversifiable and which are not and what does this imply for the asset beta?
 - What is the risk to lenders and how does this affect the debt premium and leverage?

³ The Commission has requested Telecom to use a WACC of 10.5% for Telecom Mobile in the 2002-03 TSO Determination, cf. letter to Douglas Webb, 23 September 2003. We understand that TelstraClear has requested details of how the Commission calculated the WACC of 10.5%, and that the Commission has been unwilling to provide this information. In the absence of such detail we are unable to comment specifically on the calculation beyond noting that the calculation differs from our calculation of a New Zealand mobile operator WACC.

10. Once these questions have been addressed we can then clarify whether there are potential areas of difference between the two mobile operators which affect their cost of capital and, finally, discuss the issue of calculating different estimates of WACC.
11. Our approach seeks to address these issues systematically. In the next section we therefore set out the nature of the mobile business. In particular, we compare it with the business of providing fixed line service and discuss the issue of different WACC estimates. In order to prepare for the actual calculation of the WACC we briefly set out the framework used to derive the WACC in Section 3. Section 4 uses the framework provided, the insights from Section 2 and that of international experience to provide estimates of the specific parameters used in the calculation of the WACC. Section 5 summarises our estimates.
12. In an appendix to this report we have provided detail on the WACC determinations for mobile operators in the UK and Sweden.

2. Nature of the Business

13. In the following sections we develop our understanding of the key characteristics of providing mobile services, in particular issues of technology risk, the degree of income and price elasticity etc. We do this by comparing the mobile business to that of the fixed counterpart. Finally, we discuss the issues related to the estimation of different cost of capital rates for each operator.

2.1. Comparison of Fixed and Mobile Services and Mobile Termination

14. A mobile phone is associated with a person, not a place, and allows the customer to make and receive voice calls or text message anywhere within the coverage area. Until recently mobile phones have not been suitable for sending or receiving large amounts of data or for Internet access. However, with the introduction of GPRS (for GSM) and W-CDMA, growth in data traffic is expected in the mobile market.
15. Fixed-line telephone, by contrast, is associated with a place rather than a person and is well suited for data transmission and Internet access.
16. While the characterisation above summarises the essential operational differences between the mobile and fixed networks, an analysis of the nature and economic fundamentals entails a more thorough comparison, in particular a comparison of the technology, demand characteristics, regulation etc.
17. In the table below (overleaf) we have compared the fixed network market, mobile network market and that of mobile termination based on a number of fundamental features. We note that the category, mobile termination, per definition is a subset of the category mobile business.

TABLE 1: COMPARISON OF FIXED AND MOBILE BUSINESSES IN NEW ZEALAND

Category	Fixed Business	Mobile Business	Mobile Termination
1 Technology	<i>Stable predictable technology.</i>	<i>Different technology platforms that are constantly evolving. Operators use different technologies including CDMA, GSM, W-CDMA.</i>	<i>As for mobile business.</i>
2 Demand characteristics	<i>Established usage patterns, low income elasticity.</i>	<i>More volatile demand patterns, significant growth in subscriber numbers and usage in recent years</i>	<i>As for mobile business.</i>
3 Pricing	<i>Pricing structure lending itself to a relatively high degree of fixed revenue.</i>	<i>A diversity of fixed and variable revenue with a large degree of variable elements</i>	<i>Revenue will depend on the fixed to mobile and mobile to mobile calling pattern.</i>
4 Regulation	<i>Significant.</i>	<i>Limited. Specification of co-location and roaming.</i>	<i>None to date</i>
5 Nature of services	<i>Many mature services</i>	<i>A large range of different services Increasing number of data services.</i>	<i>Degree of variability is likely to be less than other mobile services (on average). More mature than other mobile services.</i>
6 Competition prospects	<i>Service competition (reselling). Limited prospect of infrastructure competition. Duplication of the local loop is not economical.</i>	<i>Infrastructure competition in retail segment. Lack of competition for wholesale termination services.</i>	<i>Doubtful prospect of competition for termination services, no countervailing power.</i>
7 Nature of customer	<i>Traditional mix of residential and business customers. Interconnection agreements with other operators.</i>	<i>Retail revenue contains a relatively larger share from young people compared with that of the fixed network. Interconnection agreements with other operators.</i>	<i>No retail revenue. Wholesale contracts between operators. Reduced credit risk.</i>

18. The comparison shows that the fundamental nature of the mobile business differs considerably from that of the fixed line business. Below we consider the above points in the table starting with 1 to 4.

2.1.1. Technology, Demand, Pricing and Regulation

19. *First*, the fixed line business is a mature business; it uses stable and predictable technology. This is in direct contrast to the nature of the mobile operators that may operate on different technology platforms (i.e. Vodafone employ GSM and Telecom Mobile CDMA) that are constantly evolving. Accordingly the technology risk is much greater for mobile operators.
20. *Second*, the fixed line business has an established usage patterns and a low income elasticity (it is a basic commodity). For example, the TSO business is less sensitive to real GDP shocks than businesses producing products with a high income elasticity. In contrast to this, mobile services are arguably more income elastic than fixed line services (and TSO services) and follow a more volatile demand pattern.
21. However, the question is whether the mobile termination service in itself is very income elastic. Evidence suggests that the mobile termination service is relatively price inelastic⁴. However, the two elasticity components are not directly comparable⁵. Further, it is conceptually difficult to separate out the income elasticity of the basic mobile service from that of termination. However, as stated above we would expect mobile income elasticities to be higher than their fixed network counterparts⁶. Accordingly, this points to a higher beta value for mobile operators than that of the fixed line operator.
22. *Third*, the pricing structure deployed by mobile operators typically encompasses a higher degree of variable revenue than that of the fixed network operator. In particular, a large share of revenue generated by mobile operators is through pre-paid arrangements. It is likely that the revenues from these customers would be more sensitive to the business

⁴ See for example evidence provided to UK Competition Commission in its analysis of “The cost of calls to Mobiles”, 2003 pp 206 - 218

⁵ *Price elasticity* measures how much the quantity of supply of a good/service, or demand for it, changes if its price changes. If the percentage change in quantity is less than the percentage change in price, the good/service is price inelastic; if it is more, the good/service is elastic. *Income elasticity* of demand measures how the quantity demanded changes when income increases.

⁶ In this respect we note a comment provided by COG (a group of fixed network operators) to the UK Competition Commission in “The cost of calls to Mobiles”, 2003, p 192 on the evolution of the income elasticity of mobile services: “...during the high growth phase ... mobile phones adopted the characteristics of a ‘superior good’ where customers viewed the product as a non-essential luxury that they could do without if they needed to cut their spending. As the market approached saturation, the product takes on the form of a ‘normal’ or even ‘inferior’ good with much lower income elasticity.”

cycle than contract customers. For example pre-paid customers have a greater ability to vary their expenditure on a month-by-month basis. This variability in revenue increases sensitivity to real GDP shocks relative the fixed line business where revenue to a much larger degree is fixed.

23. *Fourth*, parts of the fixed line business are subject to tight regulation. For example, the provision of TSO services is subject to annual determination of costs. This should lower the asset beta for those activities compared with the provision of both other fixed line services and mobile services.
24. Together, this group of four factors: evolving technology, relatively high income elasticity, variability of revenue and lack of regulation, imply an a priori expectation that the level of risk is higher for mobile operators than that of fixed network operations (and in particular the TSO business) and thus imply a higher beta value.

2.1.2. Customer, Service and Competition

25. The last three points in the table above comprise competition prospects and nature of customer and service.
26. *First*, in the fixed line business there is limited prospect of real infrastructure competition as it would not be economical to duplicate the local loop. In contrast, mobile operators compete in the retail segment. This apparent difference in market dynamics would therefore suggest the same conclusion as above – a higher risk for mobile operations.
27. However, a special issue arises in the case of mobile termination. Here the following may be observed:
 - the separate market for mobile termination is a monopoly, no one else can provide the caller with the same service; and
 - the price impact for the caller party A is separate from any decision from the caller receiver (party B) on the choice of providing mobile services.
28. As stated above evidence suggests that the price elasticity of mobile termination is relatively small and as such has influence on the possible degree of monopoly power. In particular, we note the Commission's statement⁷:

⁷ Commerce Commission, *Telecommunications Act 2001: Schedule 3 Investigation into Regulation of Mobile Termination - Issues Paper*, June 2004, p 29

“The mobile termination market in New Zealand appears to be characterised by: ...Substantial market power in the hands of mobile network operators, because of the CPP arrangement, the state of current technology, and the lack of countervailing power in the hands of purchasers of termination services”

29. As call termination is initiated, and paid for, by the person calling the mobile phone, there is little competitive incentive for mobile operators to reduce termination charges for calls to their networks. The caller cannot choose another operator to terminate the call if the caller finds the cost is too high. The caller is forced to terminate on the network in question to reach the particular mobile customer.
30. Given the lack of competitive pressures and absence of countervailing power, each mobile operator may therefore be characterised as having market power in the supply of mobile termination to its own network. Given these characteristics it may therefore be argued the specific service, mobile termination, exhibits a lower level of risk. Accepting this argument therefore implies a lower beta value for mobile termination than other services provided by the mobile operator.
31. *Second*, there is the difference in the nature of customer, which refers to their type, i.e. retail (residential and business) or wholesale (operator). Clearly, mobile termination is a wholesale product, hence revenue is from other operators (or through internal transfer) terminating calls. There is no retail revenue. Accordingly, this reduces the credit risk for the mobile termination service market compared with the mobile market as whole and that of fixed line service.
32. *Finally*, the nature of the service mobile termination differs from that of other mobile services. Voice call termination is a relatively mature service compared to mobile data services that are still in a developmental stage. In addition, although the range of mobile products may change over time with new tariff packages and new technologies the service of providing voice termination remains the same.
33. To summarise the evidences suggests that mobile and fixed telephony businesses clearly have fundamentally different characteristics. Importantly, the levels of risk are lower for fixed telephony compared to mobile telephony. When we consider the separate market for mobile termination the evidence suggests that the risks are lower than for mobile services generally.

2.2. Different WACC for Telecom Mobile and Vodafone

34. Having mapped out the key differences between fixed and mobile operators above we now consider the differences between the two operators potentially subject to regulation: Telecom Mobile and Vodafone.
35. We ask the following question: Should separate cost of capital rates be calculated for each of them?
36. 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.
37. 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 rates⁸. Our understanding of the New Zealand market is that such a distinction does not apply.
38. 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.
39. 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.
40. 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

⁸ In addition to calculating the unit costs.

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.

41. 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.

3. The Framework

42. The framework used here is the same as that used by the Commission for the TSO determinations (and the Commission's examinations in respect of airfield operations, electricity lines businesses and gas).

43. In particular the nominal WACC model used is

$$WACC = k_e(1 - L) + k_d(1 - T_c)L,$$

where k_e is the cost of equity capital, k_d the interest rate on debt capital, T_c the corporate tax rate and L the leverage ratio. In addition, k_d is estimated as the sum of the current risk-free rate (R_f) and a premium (p) to reflect marketability and exposure to the possibility of default, i.e.,

$$k_d = R_f + p$$

44. With regard to the cost of equity the Commission uses a Simplified version of the Brennan-Lally CAPM, i.e.,

$$k_e = R_f(1 - T_I) + \varphi\beta_e,$$

where T_I is the average (across equity investors) of their marginal tax rates on ordinary income, φ the market risk premium, and β_e the beta of equity capital.

45. Although in general agreement with this framework model, we also note that this model fails to recognise that New Zealand is now increasingly integrated with world capital markets. The implication being that any assessment based solely on a domestic model will inflate that WACC estimate if no judgements are made of the likely effects of increased integration. This has most recently been acknowledged by the Commission in the Final 2001-02 TSO Determination by the following statements⁹:

“The simplified Brennan-Lally CAPM model assumes that national equity markets are completely closed whilst the international model assumes that they are completely integrated. The truth is clearly between these two extremes...”

⁹ Commerce Commission, *Determination for TSO Instrument for Local Residential Service for period between 20 December 2001 and 30 June 2002*, December 2003, p 43

“...use of an international CAPM, where investors diversify risk across world markets would likely provide a lower cost of capital compared to a domestic CAPM.”

46. However, for the purpose of this paper, we focus on using the Commission’s existing framework to reach an estimate, noting that any estimate using the domestic CAPM framework will err on the high side.

4. WACC Components

47. When setting the cost of capital it is important to consider the time period over which it will be used. The WACC is a forward-looking measure calculated on the basis of future expectations. WACC calculations therefore require market-based data. Further, in determining the cost of capital, adjustments to current market expectations may be necessary to take account of future events that will change current relationships and equilibrium. This is particularly important when using the WACC for price setting purposes over a period of time.
48. However, the estimates provided here do not factor in such considerations and it will be necessary to discuss in more detail the WACC if it is used for pricing decisions by the Commission at a later stage.
49. The main areas of difference in terms of WACC input parameters are those of the asset beta, leverage and debt premium. We therefore initiate our comments on these parameters. However, both risk-free rate and tax adjusted market risk premium (TAMRP) are also briefly discussed, although to some extent, these are more generic in nature.

4.1. Beta

50. The term 'beta' refers to the relative risk of a return producing asset such as a ratio of the covariance of income from the particular asset and a well diversified portfolio and the variance of the income from the diversified portfolio.
51. The equity beta measures the relative risk to shareholders in the particular company or project and this reflects both the underlying risk of the project and the risk to shareholders as a result of the higher claims of debt holders resulting from having leveraged the balance sheet.
52. The debt beta is similarly a measure of the systematic, i.e., non-diversifiable, risks facing debt holders.
53. In other words, the beta value shows whether an operator is more or less risky than the market. A (equity) beta of 1.5 means that the share moves 1.5% for every 1.0% move in the market index, outperforming the index in a bull market and underperforming in a bear market. Conversely, a beta of 0.5 means that the share's return is more stable than the market as a whole. The higher the beta, the riskier the share and the higher the return required to compensate for this higher risk.

54. All three betas are directly linked and any one can be derived from knowledge or assumptions on the other two.

4.1.1. Methodology for Estimating Beta

55. Beta values are not available for the specific service of providing mobile termination. Beta estimates may only be made for the companies as a whole. There are however two additional complicating factors:
- Telecom's Mobiles activities are not listed separately. It is therefore not possible to calculate a beta value for their mobile activities. Any estimates will be for the whole (integrated) company; and
 - Vodafone is not listed on the NZSE.
56. In order to determine an appropriate asset beta for a mobile operator in New Zealand, we have therefore used two basic approaches:
- We reviewed evidence from Telecom on their actual beta value, noting that these values are based on Telecom as an integrated operator and as such should be adjusted; and
 - International surveys. In particular we have considered information from the UK and Sweden in their determination of cost estimates for mobile termination.

4.1.2. Evidence of Telecom's beta value

57. On behalf of Telecom, PriceWaterhouseCoopers (PWC) has estimated the cost of capital for Telecom for the TSO Determination process¹⁰. According to PWC, Telecom's own asset beta for a rolling five year period from July 1996 till August 2002 varies in the range 0.78 to 1.03 with an average of 0.90.
58. In the Commission's 2001-02 Final TSO Determination¹¹ they note that, "*The likely range for the asset beta of Telecom's fixed PSTN business is between 0.50 ... and 0.95...*".
59. As outlined in Section 2, the characteristics and nature of the service or market will have influence on the estimate of beta. Different parts of the company do not face homogeneous risks. Telecom as a company can be

¹⁰ PWC, "Telecom New Zealand Limited, The Weighted Average Cost of Capital to be Applied in calculating the Cost of Telecommunication Service Obligation for the Period 1 July 2002 to 2003", 9 September 2003.

¹¹ Commerce Commission, *Determination for TSO Instrument for Local Residential Service for period between 20 December 2001 and 30 June 2002*, December 2003, p 61

thought of as a portfolio of assets, with each part carrying a different degree of risk. For example, the Telecom beta will reflect the risk of both regulated and non-regulated activities. As we outlined in section 2, regulated activities may have a lower risk. Another example is that demand for mobile services is likely to fluctuate more than demand for basic telephony services with changes in economic conditions. In summary our expectation is that the mobile activities in general exhibit a higher non-diversifiable risk than that of fixed line PSTN. However, the special characteristics of mobile termination will tend to reduce the beta value compared with other mobile services.

60. Based on the revenue distribution of Telecom's activities and an asset beta value for Telecom as a whole, we can try to infer the likely range of a beta value for Telecom Mobile. Based on a review of the revenue split in Telecom's financial accounts we find that the fixed line business constitutes more than 50% of total revenue. Mobile services approx. 15%, internet data etc., 15% and other revenue 20%. Assuming that the asset beta of the fixed line business is 0.7¹², that of other 1.0¹³, and internet and data, 1.4¹⁴. Using the weights outlined above we estimate an asset beta for mobile telephony of 0.9.

4.1.3. International Evidence

61. In the appendix to this report we have compiled international experience from the UK and Sweden. We find this evidence of particular relevance, since it in both cases is related the issue of determining the cost of mobile termination.
62. In terms of asset beta the UK exhibits very broad intervals from 0.93 to 1.54. In contrast, the Swedish regulator only uses one estimate of the asset beta, namely 1.1.
63. In the UK a wide of range of methods were used to estimate a range for beta and numerous submission were made on the subject. Based on an assessment of the evidence the Competition Commission concluded¹⁵:

¹² The approximate mid-point of the range stated by the Commission, cf. paragraph 58.

¹³ Since it is difficult to judge the exact size of the beta for other services, we have simply chosen 1.

¹⁴ Based on our analysis of US data from Bloomberg (available at <http://pages.stern.nyu.edu/~adamodar/>) we estimate an average beta value for internet related companies of approx. 1.5. Since there is considerable uncertainty in this estimate we have chosen an estimate of 1.4 for New Zealand.

¹⁵ Competition Commission, Reports on references under section 13 of the Telecommunications Act 1984 on the charges made by Vodafone, O2, Orange and T-Mobile for terminating calls from fixed and mobile networks, December 2002.

“...We believe a range of 1 to 1.6 [for equity beta] takes into account all of the uncertainties brought about by taking daily as opposed to monthly returns, choosing the appropriate time period, any differences between UK and overseas activities and any differences between the regulated and non-regulated operations of the MNOs. The lower end of this range takes account of monthly data and that which could apply to a regulated operator. The upper end takes account of daily data and that which could apply to overall activities of the MNOs. In order to avoid the difficulties caused by overseas ownership, our upper estimate of beta is based on mmO₂ and not Vodafone.”

64. In Sweden both estimates of the operators' actual beta values and international survey data were used to determine the appropriate value. The asset beta values explicitly calculated for Tele2 and Vodafone¹⁶ were 0.850 and 0.936, respectively. However, based on an international survey it was concluded that these values might be too low and hence a value of 1.1 was chosen.
65. In addition we have surveyed evidence provided by Domodaran¹⁷ on the beta values for US cellular companies¹⁸. This analysis indicates a range of asset beta values from 0.6 – 1.2 although we note that there are outliers at both ends of the range.
66. Based on this surveyed information we believe an asset beta range of 0.7 to 1.1 is reasonable for mobile services in aggregate, noting that an asset beta for mobile termination will lie in the lower end.

4.1.4. Conclusion

67. Based on the available evidence we estimate that a reasonable range for the asset beta for a mobile operator in New Zealand is 0.7 – 1.0. We note that the asset beta for mobile termination will be lower than the mobile business as a whole. In the absence of sufficient data to make an explicit adjustment to the asset beta, we propose to use a beta value for mobile termination of 0.7 (i.e. the minimum)¹⁹.

¹⁶ Vodafone solely provide mobile services, while Tele2 in addition to mobile telephony also provides fixed line services through reselling and wholesale arrangements with TeliaSonera.

¹⁷ <http://pages.stern.nyu.edu/~adamodar/>

¹⁸ In particular we have looked at AT&T Wireless, Nextel Communications, Sprint PCS Group, U.S. Cellular, Verizon Communications and Western Wireless.

¹⁹ We note that our choice of the lower range estimate is not a reflection of our view that the domestic CAPM likely overstates the cost of capital. It is a solely a pragmatic solution to a potentially complex adjustment for which we currently do not have sufficient data.

4.2. Debt Premium

68. The debt premium a company is able to achieve in the market 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 the sector. In particular, Credit rating agencies consider a wide range of financial indicators²⁰ that inform on different but related aspects of a business' debt service capacity.
69. The most common approach taken by regulatory bodies is to base the estimate of the cost of debt on the risk-free rate plus a premium, determined with reference to the specific company under consideration or other and similar rated companies in the market (where consistency is ensured between the estimated debt premium and the underlying risk-free rate).
70. This approach reflects to considerations:
- First, the WACC calculation should be forward-looking in nature. Any foreseeable events that suggest the cost of debt may change should be taken into account. As such a company debt profile may at any point in time not be representative of the future. In particular, recent restructuring or change in maturity profile may make estimates of the actual cost of debt unrepresentative.
 - Second, the cost of debt should be consistent with the calculation of the cost of equity and hence the beta value used.
71. Our approach to estimating the debt premium is to review the submission by Telecom on their actual debt premium and evidence from overseas companies. In particular, we refer to the experience in the UK and Sweden as was the case for beta.
72. For the purpose the TSO Determination process PWC estimated Telecom's overall weighted average debt premium (including all facility fees) over a ten year government bond. As of June 2002, the premium was estimated at 167 points over the government bond. They therefore conclude that a debt premium of 1.7% is reasonable²¹. Although this must be regarded as a good estimate of the prospective debt premium, we note that this estimate is based on Telecom as a whole and the debt premium of Telecom Mobile may differ.

²⁰ E.g. *interest coverage* defined as the number of times a company can meet its interest payments out of its earnings

²¹ PricewaterhouseCoopers, "Telecom New Zealand Limited, The Weighted Average Cost of Capital to be Applied in calculating the Cost of Telecommunication Service Obligation for the Period 1 July 2002 to 2003", 9 September 2003

73. In the Commission's 2002-03 Draft TSO Determination a debt premium of 1.5% is adopted with a range between 1.2% and 1.8%. We note that this point estimate is taken to reflect that of the TSO business.
74. In terms of debt premium the UK exhibits very broad intervals from 1.0% to 4.0%, reflecting the very wide range of estimates received by the Competition Commission. In contrast, the Swedish regulator uses a much smaller range, namely 2.5% to 2.9%.
75. In Sweden a benchmarking approach was used. Their analysis concluded that a debt premium of 1.0% - 1.4% was appropriate for an integrated fixed network operator (consistent with the leverage and credit rating used) and an interval of 150 points above that of the integrated operator for a mobile operator (equivalent to 2.5% - 2.9% as stated above).
76. We note that the point spread of 150 points reflects a maturity consistent with the maturity period of the government bond used to estimate the proxy for the risk free rate (which was 10 years). If a shorter maturity is chosen the spread may be narrowed by as much as 100 points.
77. Based on this surveyed information we believe a debt premium range of 1.5% - 2.5% (with a midpoint of 2.0%) is reasonable for a New Zealand mobile operator. The point estimate is slightly above that of Telecom as a whole, within the range suggested in the UK (although in the lower part of the interval) and within the range used in Sweden (if account is taken of the more narrow spread between integrated and mobile operator for shorter maturities of the risk-free rate).
78. Based on the evidence we are not able to infer a specific debt premium for mobile termination, but note that it potentially will be lower than the midpoint estimate.

4.3. Leverage

79. In the simple Brennan-Lally model used here the WACC will not change materially by small changes to the leverage. The lowest WACC figure is obtained when the leverage ratio is zero since the advantage of lower cost debt is more than offset by increases in the cost of equity.
80. As noted in Section 2.2 the issue of whether one is assessing the efficient costs or actual costs will influence the choice of leverage ratio. In the following we therefore assume that we are concerned with efficient costs and therefore the optimal leverage. However, such a target is difficult to

estimate in practice. Ideally, such an estimate should be based on best practice estimates within the industry.

81. In the 2001-02 Final TSO Determination the Commission has endorsed a gearing ratio of 30%, a level approximately the same as for Telecom as a whole. In the same Determination the Commission quotes a study by Ernst and Young that reported an average leverage for New Zealand companies of around 20% and an estimate by PWC of the 5 year average for Telecom of 22%.
82. In the UK mobile termination process, all the involved parties estimated leverage ratios for mobile operators at between 10 and 30%. While in the Swedish process a leverage ratio between 10 and 20% was used.
83. Based on this evidence we conclude that an optimal leverage level of 20% is a reasonable, but conservative, estimate for a New Zealand mobile operator.

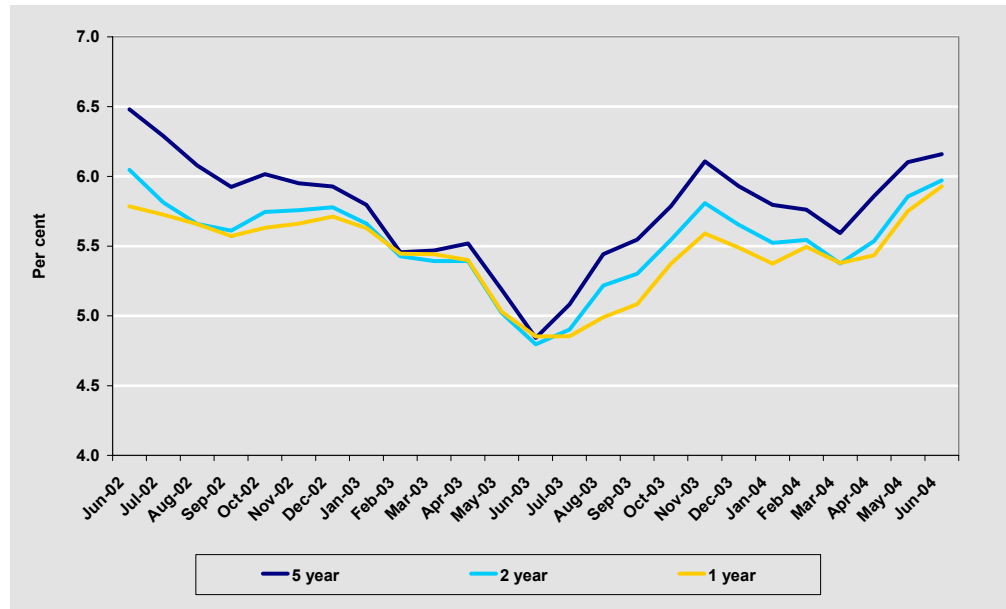
4.4. Risk-free Rate

84. In order to calculate an appropriate risk-free rate for a mobile operator in New Zealand, we need to consider the following factors²²:
 - maturity period for government bonds; and
 - historic vs. current yields as estimates of the prospective risk-free rate.
85. With regard to maturity the Commission determines the risk-free rate is with reference to the one-year government bond rate. This choice is made with reference to the frequency of the regulatory review period which is only one year. In the Commission's Interconnection, Wholesaling and Residential Resale Determinations have been set at 18 months.
86. In our opinion it would therefore be appropriate to select a maturity period between that of a one year and two-year government bond.
87. With regard to yields, 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.

²² In addition there is a choice of a real or nominal government bond. Since we are calculating a nominal WACC, a nominal government bond is used.

88. During the past two years the five-, two- and one-year government bonds have followed a pattern as illustrated in the figure below.

FIGURE 1 DEVELOPMENT IN THE 5-, 2- AND 1-YEAR GOVERNMENT BOND



89. The figure shows that the yields for the one- and two-year bond has roughly fluctuated between 5% and 6% during the past two years and currently lies around 5.9%-6.0%. There are no abnormalities in the daily yields for the time period leading to atypical results.
90. We conclude that 5.9% is reasonable estimate of the risk-free rate for an estimate of the WACC today. Following the methodology adopted by the Commission when setting the cost of capital for past periods in particular for the period 1 July 2002 - 30 June 2003, 1 July 2003-June 2004 we would estimate the risk-free rate to be 5.8% and 4.9%, respectively.

4.5. Tax Adjusted MRP

91. The market risk premium is the additional return required by investors for accepting the systemic risk associated with investing in the market portfolio instead of a risk-free asset²³.

²³ The size of this premium has been highly disputed in the previous determinations by the Commission. This is common and much academic argument has been presented about the merits of alternative methods for deriving a value for such a premium. Different methods produce very different values. The MRP can be calculated on an arithmetic or geometric basis. In addition, the MRP is very sensitive to the time period over which it is calculated.

92. In the 2002-03 TSO Determination the Commission use a TAMRP of 8%. This is based on the preferred range for the Commission and the judgement to choose the high end of the 6% –8% range. The later position was:

“...taken more as a reflection of possible investment incentive risks posed by a WACC that is too low (given the considerable uncertainty attached to this issue), rather than as an indication of the respective merits of the consistency arguments.”

93. We disagree with this judgement which we consider risks heaping caution on caution. We note that the Commission has chosen to rely solely on a domestic CAPM model, despite its acknowledgement that the truth lies somewhere between (see quote in paragraph 45) the domestic model and the international CAPM model. Since the domestic model yields estimates of the cost of capital which are higher than if the international model were applied, it follows that choosing to rely solely on the domestic model will yield estimates of the cost of capital that err on the high side. Accordingly, rather than choose the maximum value for the TAMRP, we believe that one should choose the best estimate.
94. A separate issue is that of range. MJA recommend a forward-looking approach to estimating the MRP, as the historical approach is inconsistent with the theoretical underpinnings of the CAPM theory. Based on evidence from Lally (2004)²⁴ and others we believe a reasonable estimate for the TAMRP lies in the range of 5% –7% with a midpoint estimate of 6%.

4.6. Tax Rates

95. We use an investor tax rate of 33% consistent with the simple Brennan-Lally model and a corporate tax rate of 33% equivalent to the statutory rate. This is consistent with Commission Determinations.

²⁴ Lally M., (2004), “The Weighted Average Cost of Capital for the Gas Pipeline Businesses”, June 2004.

5. Summary and Conclusion

96. Based on our assessment of the different WACC parameters in the previous section, we conclude that the WACC for a mobile operator in New Zealand today lies in the range of 7.7% - 11.3% with a mid-point of 9.3%.
97. As we have argued throughout this report the asset beta for the service mobile termination can be expected to be lower than that for mobile services as a whole. We have not explicitly corrected the beta value for the expected lower level of risk as we do not believe our data currently justifies such a quantitative adjustment. However, as a proxy value for a mobile termination asset beta, we have chosen our low range estimate of the asset beta. Our WACC estimate for mobile termination is 8.4%²⁵.
98. For the period from July 2001 to June 2002 our midpoint estimate is 9.3% and for the period from July 2002 to June 2003 our estimate is 8.7%. Estimates and the specific parameter values are outlined overleaf²⁶.
99. We note that estimation of the WACC must reflect the environment in which the business operates. Mobile operators are not currently subject to regulation of mobile termination and as such it could be argued that the WACC should reflect this. In our view, however, the key issue is not so much whether mobile termination charges are subject to regulation or not, but rather that voice call termination has significantly different characteristics to that of other mobile services and that this should be reflected in a lower risk assessment.

²⁵ The low risk characteristics of mobile termination may also potentially lead to an adjustment in the debt premium. The estimate provided relies on the mid-point estimate of the debt premium.

²⁶ As previously noted, these estimates are outputs of a domestic CAPM framework and as such will err on the high side.

TABLE 2: SUGGESTED WACC VALUES

	1 July 2002 - 30 June 2003			1 July 2003 - 30 June 2004			Today			
	Low	High	Mid-point	Low	High	Mid-point	Low	High	Mid-point	Mobile termination
RFR (R_f)	5.8%	5.8%	5.8%	4.9%	4.9%	4.9%	5.9%	5.9%	5.9%	5.9%
MRP (ϕ)	5%	7%	6%	5%	7%	6%	5%	7%	6%	6%
Equity Beta, $\beta_e = \beta_a * [1+L/(1-L)]$	0.875	1.250	1.063	0.875	1.250	1.063	0.875	1.250	1.063	0.875
Asset beta, β_a	0.7	1.0	0.85	0.7	1.0	0.85	0.7	1.0	0.85	0.7
Cost of Equity, $k_e = R_f * (1-T_I) + \phi * \beta_e$	8.26%	12.64%	10.26%	7.66%	12.03%	9.66%	8.33%	12.70%	10.33%	9.20%
Debt Premium, p	1.5%	2.5%	2.0%	1.5%	2.5%	2.0%	1.5%	2.5%	2.0%	2.0%
Cost of Debt (pre-tax), $k_d = R_f + p$	7.30%	8.30%	7.80%	6.40%	7.40%	6.90%	7.40%	8.40%	7.90%	7.90%
Gearing, L	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Corporate tax rate, T_c	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Investor tax rate, T_I	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%	33.0%
Post-tax Nominal Cost of Capital, $k_e * (1-L) + k_d * (1-T_c) * L$	7.59%	11.22%	9.25%	6.98%	10.62%	8.65%	7.65%	11.29%	9.32%	8.42%

Annex A: International Experience

100. Below we briefly summarise the experiences from the UK and Sweden. Regulators in both countries have undertaken a cost modelling exercise of mobile termination and in this process determined the WACC to use in these calculations. We note that the CAPM framework used in these countries differs from that in New Zealand and as such the results they reach are not directly comparable with results for New Zealand.

United Kingdom

101. Oftel has estimated the cost of capital for mobile operators with significant market power. In September 2001, Oftel published calculations of the long run incremental costs for mobile termination including estimates of the cost of capital. Following complaints from the mobile network operators, the case was referred to the Competition Commission (CC), who published its decision in December 2002 and subsequently updated it in December 2003.

102. The main features of cost of capital discussion in the UK may be summarised as follows:

- A *real* (pre tax) cost of capital is used as prices are regulated in real terms (charges are allowed to increase by the rate of inflation – minus an efficiency factor).
- The risk-free rate is estimated on the basis of current yields on 5-year gilts (government bond).
- The market risk premium is calculated by first calculating historical averages and second using surveys and other evidence of investors' current expectations over the short term.
- A standard corporate tax rate is used as proxy for the effective tax rate.
- Oftel considered that the same WACC should be applied for all mobile operators. CC examined company-specific inputs as well, but did not find the variation in these inputs sufficient to justify using different WACCs for different mobile operators.
- In theory, beta should be estimated for 2G termination. In practice, however, beta values were estimated for the entire 2G network operators, as there was not enough evidence indicating how the beta of the quoted companies should be estimated to exclude non-2G termination services.

- CC considered it appropriate to give more weight to actual gearing rather than estimates and applied a gearing of 10% instead of the range 10-30% proposed by Oftel.

103. The CC calculations are quoted in the table below:

TABLE 3: COST OF CAPITAL FOR MOBILE OPERATORS (UK)

%	Low gearing		High gearing	
	Low case	High case	Low case	High case
Risk-free rate	5	5	5	5
Market risk premium	5	5	5	5
Equity beta	1	1.6	1.3	2
Asset beta*	0.93	1.48	1.00	1.54
Cost of equity (post tax)	10	13	11.43	14.57
Debt premium	1	3.5	1	3.5
Cost of debt (post tax)	6	8.5	6	8.5
Optimal leverage	10%	10%	30%	30%
Corporate tax	30%	30%	30%	30%
WACC (post tax nominal)	9.42	12.3	9.26	11.99
WACC (pre tax nominal)	13.46	17.56	13.23	17.12
WACC (pre tax real)	10.33	14.33	10.11	13.89

Source: Competition Commission, December 2003

*MJA estimate²⁷

104. On this basis, the Competition Commission estimated a pre tax real WACC of 12.25% for the purpose of calculating termination charges. This corresponds to a nominal post-tax WACC of 10.3%²⁸.

Sweden

105. The Swedish regulator Post och Telestyrelsen (PTS) has estimated the cost of capital for mobile operators with significant market power in conjunction with their move to set prices for mobile termination. In October 2003, PTS published WACC parameters for use in the calculation of the long run incremental costs for mobile termination.

²⁷ We have used the following formula: $\beta_U = \frac{\beta_L}{\left[1 + (1-T)\frac{l}{1-l}\right]}$,

where β_L is the levered beta value, β_U the unlevered beta value, T the tax rate and l the leverage. We note that this formula differs from that used in the Brennan-Lally context.

²⁸ MJA estimate.

106. The main features of cost of capital approach adopted in Sweden may be summarised as follows:
- A *nominal* (pre tax) cost of capital is used.
 - The risk-free rate is estimated on the basis of current yields on 10-year government bond.
 - The market risk premium is estimated with reference to surveys, historical averages and forward-looking estimates
 - A standard corporate tax rate is used as proxy for the effective tax rate.
 - PTS considers that the same WACC should be applied for all mobile operators. The unit cost estimate of mobile termination should be that of highest of the three operators subject to regulation.
 - A beta range is estimated with reference to actual beta values of operators and survey of beta values in other countries.
 - Leverage ratios are inferred by examining evidence of actual ratios and those from other countries.
 - The cost of debt is estimated as premium over the risk-free rate, where account is taken leverage ratios and credit ratings. Both domestic and international information is used.
107. PTS calculations (from 15 October 2003) are quoted in the table below:

TABLE 4: COST OF CAPITAL FOR MOBILE OPERATORS (SWEDEN)

%	Low gearing	High gearing
Risk-free rate	4.79	4.79
Market risk premium	4.50	4.50
Unlevered Beta	1.10	1.10
Equity Beta	1.19	1.30
Cost of equity	10.14	10.63
Debt premium	2.50	2.90
Cost of debt	7.29	7.69
Leverage	10.00	20.00
Tax rate	28.00	28.00
Post-tax WACC	9.65	9.61

Source: PTS Konsultationsrapport