هيئة تنظيم الاتصالات
Telecommunications Regulatory Authority
Kingdom of Bahrain - مملكة البحرين

2013 Cost of Capital

Final Determination

20 February 2013

Ref: MCD 02/13/018

Purpose: To set the cost of capital to be used in subsequent calculations for the costs of provision of regulated telecommunications services in the Kingdom of Bahrain.

DETERMINATION

HAVING REGARD TO THE LEGISLATIVE DECREE NO. 48 OF 2002 PROMULGATING THE TELECOMMUNICATIONS LAW, ALL RELEVANT EVIDENCE AND SUBMISSIONS RECEIVED, AND THE ANNEX TO THIS DETERMINATION WHICH SETS THE REASONING FOR THIS DETERMINATION, THE TELECOMMUNICATIONS REGULATORY AUTHORITY HEREBY MAKES THE FOLLOWING DETERMINATION:

1. The value for the nominal cost of capital for the Bahrain Telecommunications Company B.S.C ("Batelco"), MTC-Vodafone Bahrain B.S.C. ("Zain"), and VIVA Bahrain B.S.C ("VIVA")is set at 9.5%.
2. The Annex to this Determination forms an integral part of this Determination.
3. This Determination shall take effect from its date of issue.
4. This Determination shall be reviewed between three to five years from its date of issuance, unless circumstances justify otherwise.

Signed on 20/02/2013

Mohamed Bubashait
General Director
Telecommunications Regulatory Authority
Manama, Kingdom of Bahrain

Reasoning for the Cost of Capital Determination

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List of acronyms

APV	adjusted present value
AMEX	American Stock Exchange
bp	basis points
CAPEX	capital expenditure
CAPM	capital asset pricing model
DMS	Dimson, Marsh and Staunton
EBITDA	earnings before interest, tax, depreciation and amortisation
ERP	equity risk premium
EV	enterprise value
FTSE	Financial Times Stock Exchange
GDP	Gross Domestic Product
IMF	International Monetary Fund
IV	implied volatility
MM	Modigliani–Miller
NGA	next-generation access
NYSE	New York Stock Exchange
PPP	purchasing power parity
S&P	Standard & Poor's
SMP	significant market power
USD	United States dollar
WACC	weighted average cost of capital

1 Executive Summary

1. The objective of this Determination is to set the appropriate level of the allowed rate of return for regulated telecommunications services in the Kingdom of Bahrain. In reviewing the cost of capital, the Authority has followed a similar methodology as was used by the Authority in 2009, albeit the methodology has been refined in a number of places to reflect updated market conditions and data availability. The parameters used to estimate the cost of capital have also been updated.

2. The Authority sets a nominal cost of capital of 9.5% for both fixed and mobile telecommunications services regulated in Bahrain. The Authority intends to review this Determination between three to years from its date of issuance, unless circumstances justify otherwise.

3. The Authority is of the view that it is appropriate to estimate the cost of capital from the perspective of both an international investor which holds a diversified portfolio of investments; and from the perspective of a domestic, potentially less diversified, investor. Under each of these scenarios, the cost of capital is estimated based on a rigorous analysis of economic and capital market data. For each scenario, a range has been determined by the Authority.

4. The overall estimate of 9.5% is determined by placing similar weight on the ranges under the international and the domestic investor scenarios, which reflects a change in approach since the 2009 Determination (when the international scenario was used as the base case). This change in approach reflects the increased availability of market data on Bahraini government bonds, and the possibility that Bahraini companies may find it harder to access international capital markets than in 2009.

5. The 9.5% estimate is also above recent regulatory precedents in other countries. However, considerable care must be taken when comparing the regulatory cost of capital in different countries, as in most cases they relate to companies operating in countries with country risk different from Bahrain. Estimating the cost of capital inevitably also involves an element of judgment.

6. The Authority is of the view that there is insufficient robust evidence to support the introduction at this stage of a differential in the cost of capital estimates between different regulated business activities. In particular, there is no robust evidence available to conclude that the level of systematic risk differs between the relevant fixed and mobile services in Bahrain. Therefore, the Authority proposes to estimate a single cost of capital for all regulated telecommunications services in Bahrain. The Authority recognises the possibility of the roll-out of fibre-to-the-premises networks in future, which may be of higher risk than the current range of regulated activities, and thus reserves the option to consider the inclusion of a differential in future determinations.

7. The estimates are based on a notional, equity-only capital structure, which ensures that the regulated companies retain discretion to choose their optimal capital structures. Since there are limited incentives for companies in Bahrain to increase leverage (i.e., there is no corporate taxation), the Authority sees limited risk of this approach overstating the true, lower cost of capital that companies might be able to achieve by increasing leverage.

8. The Authority's estimate also takes into account the current, Bahrain-specific characteristics, as well as the global market characteristics that might affect the expected rate of return, including recent volatility in capital markets, the relative illiquidity of the domestic stock market, and the country risk for which an international investor might expect compensation. Specific premia for these factors are incorporated into the cost of capital estimates (where relevant), in line with the conservative approach to the cost of capital estimation adopted by the Authority to ensure that investments in the provision of regulated services by the respective operators are financeable[1].

9. The Authority's cost of capital parameters are summarised in Table 1.

Table 1 Summary of the cost of capital parameters—2013 Determination

	International			Domestic		
Parameter	**Low**	**Midpoint**	**High**	**Low**	**Midpoint**	**High**
Nominal risk-free rate (%)	3.5		4.0	4.4		4.9
Country risk premium (%)	1.7		2.0	0.0		0.0
ERP (%)	5.5		6.5	5.5		6.5
Asset beta	0.50		0.60	0.75		0.85
Equity beta	0.50		0.60	0.75		0.85
Cost of equity (%)	8.0		9.9	8.5		10.4
WACC (nominal, %)	**8.0**	**8.9**	**9.9**	**8.5**	**9.5**	**10.4**

Note: Parameters have been presented to two significant figures.
Source: The Authority.

10. The average of the midpoints for the international and domestic investor ranges is 9.2%. The Authority has determined the appropriate cost of capital to be 9.5%, which is above this average, to reflect a cautious approach to the estimation of the cost of capital to ensure that incentives for efficient long-term investment in regulated telecommunications services are maintained in Bahrain. The cost of capital of 9.5% is the same as the cost of capital that was determined in 2009, although the values of the various parameters of the cost of capital have changed. The 2009 cost of capital included an additional 0.5% as a transitional adjustment to take into account the relatively large change in the cost of capital from the previous Determination. The Authority considers that such a transitional adjustment is not appropriate for this Determination.

11. The final cost of capital estimate of this Determination is the same as the proposed cost of capital in the Draft Determination. Having carefully considered the submission received, the Authority is of the view that no change of position was required.

12. Appendix 1 contains a comparison of the 2009 and 2013 cost of capital parameter estimates. For the 2009 Determination, the Authority's point estimate for the cost of capital was 9.0% (excluding the transitional adjustment) relative to the 9.5% point estimate for 2013. For the international scenario the main parameter changes between 2009 and 2013

[1] The Authority's cost of capital estimate excluding these premia is 8.40%. The aggregate effect of including these premia is to add 110 basis points to the cost of capital estimate.

include increases in both the ERP and the country risk premium for Bahrain, whereas for the domestic scenario most parameters have increased.

2 Introduction

13. This Determination sets out the approach taken by the Telecommunications Regulatory Authority ("the Authority") to estimate the cost of capital and the evidence used to estimate both a range and a point estimate.[2] The cost of capital is an essential input to calculate the cost of regulated telecommunications services, and therefore has direct implications for the regulated telecommunications companies, consumers and other stakeholders.

2.1 Consultation process

14. The Authority issued for consultation a Draft Determination on the cost of capital (the "Draft Determination") on 5 November 2012 (Ref MCD/11/12/138).

15. The Authority received responses from Bahrain Telecommunications Company B.S.C. ("Batelco")[3], MTC-Vodafone Bahrain B.S.C. ("Zain")[4], and VIVA Bahrain B.S.C ("Viva")[5].

16. For clarity, this Determination reproduces the text included in the Draft Determination, with minor amendments, before summarising and addressing the comments received on the Draft Determination. The Determination follows the same structure as the Draft Determination.

2.2 Purpose of this Determination

17. The weighted average cost of capital ("WACC") is an important input that is used in the regulatory framework to determine regulated prices in Bahrain. In setting a cost of capital in this Determination, the Authority has given careful consideration to the relevant risks associated with the financing of investments in the provision of regulated telecommunications services in Bahrain. The WACC will ensure that Licensed Operators who have been found to have SMP and/or dominance will be appropriately compensated for the capital costs that they face when making such investments. This in turn will maintain incentives for efficient investment, and will allow the regulated entities to continue to attract the capital required to underpin the development of the telecommunications sector in Bahrain. At the same time this will ensure that access seekers and consumers do not face excessive charges which would lead to distortions of competition and consumption.

18. The objective of the Determination is to estimate the level of the nominal cost of capital and therefore the rate of return applicable for regulated telecommunications services in the

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[2] This document is based on analysis by Oxera Consulting Ltd.

[3] Batelco, "Response to the Telecommunications Regulatory Authority of Bahrain (TRA) Cost of Capital Draft Determination" (Batelco Ref GCL/424/12), 6 December 2012.

[4] Zain, "Zain Bahrain Response to Draft Determination on Cost of Capital" (Zain Ref: R1/1212/054), 6 December 2012.

[5] VIVA, "Submission to the Telecommunications Regulatory Authority by VIVA Bahrain on the draft determination Cost of Capital", 5 December 2012. The Viva submission stated that: "VIVA has no comments on the TRA's "Cost of Capital" draft determination".

Kingdom of Bahrain. It will apply to Batelco, Zain and Viva (in the event that Viva is found to be SMP/dominant in relevant market)[6] for regulatory purposes.

19. The estimated cost of capital will be an input into companies' regulatory accounts and the bottom-up cost models that the Authority has been developing to complement the existing regulatory instruments in Bahrain.[7] Consequently, the allowed rate of return will be used to determine the prices that Batelco, Zain and potentially Viva can charge for services supplied in markets in which they have significant market power ("SMP") and/or are dominant. Given the current environment and the expected use of the bottom-up cost models, the Authority considers that setting the allowed rate of return for a period of three to five years is appropriate. The cost of capital could also be used in different contexts, such as in ex-post competition investigations.

20. For this Determination, the cost of capital is estimated for a notional telecommunications company in Bahrain providing a range of telecommunications services. This is based on an empirical analysis of underlying risk and other parameters of the cost of capital, detailed below.

2.3 Background to this Determination

21. Batelco provides a wide range of fixed-line and mobile telecommunications services to customers in Bahrain. Zain is another provider of mobile services in Bahrain and also offers fixed voice and fixed wireless services. The third player in the industry is Viva, whose mobile network has been deployed following the award of a mobile licence to its parent company, Saudi Telecom Company ("STC"), in March 2009.

22. The Authority has issued a number of determinations on the appropriate cost of capital to be used for telecommunications regulatory purposes in Bahrain.[8] The last cost of capital determination was issued by the Authority on 3 November 2009 (the "2009 Determination") with a cost of capital of 9.5%.

23. The parameters of the cost of capital are not static and may vary over time. Consequently, they need to be updated periodically. For example, interest rates have varied substantially since the 2009 Determination. Risk premiums have also been volatile, and the riskiness of companies and industries relative to the overall equity market may have changed. The new evidence and up-to-date market information need to be reflected in the latest estimates.

24. Furthermore, the Bahraini telecommunications market has seen the entry of Viva. This may be expected to have had an impact on market dynamics and the estimate of the cost of capital for the market.

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6 In a draft dominance determination, the Authority has identified that Viva is dominant in the wholesale market for termination services on its own mobile network. See TRA Bahrain (2012), "Draft Determination: Dominance designation for termination services on VIVA's mobile network", 30 August.

7 TRA Bahrain (2011), "Development, implementation and use of bottom-up fixed and mobile network cost models in the Kingdom of Bahrain", Position Paper, MCD/10/11/144, 19 October 2011. Available at: http://www.tra.org.bh/en/pdf/MCD1011144PositionPaperonBU-LRICcostmodels.pdf.

8 Previous determinations include: TRA Bahrain (2009), "Cost of Capital", Determination, MCD/11/09/090, 3 November; TRA Bahrain (2005), "Batelco's Cost of Capital", Determination, ERU/1105/207, 20 November; TRA Bahrain (2003), "Batelco's Cost of Capital", Determination, ERU/DE/004, 9 August.

25. This Determination follows a similar approach as was taken by the Authority in the 2009 Determination—albeit the methodology has been refined in a number of places to reflect updated market conditions and data availability—and updates parameter values in order to take into account the changed economic environment.

2.4 Scenarios: the international and domestic investor

26. The cost of capital is the weighted average return required on different forms of capital, where different sources of capital are used—in particular, the costs of debt and equity. In the context of Bahrain, the cost of equity is the main driver of the WACC because there are limited tax incentives associated with debt financing, and domestic operators exhibit relatively low levels of gearing.

27. The WACC estimate may be sensitive to assumptions about the degree to which investors are globally diversified. For the purposes of the 2009 Determination, the Authority considered that the appropriate base-case assumption was to consider the required rate of return to an international investor that holds a globally diversified investment portfolio, in line with corporate finance theory. There were a number of reasons for this. Two of the key conceptual ones are listed below:

    a. Portfolio theory suggests that since risks are less than perfectly correlated across countries, investors can reduce the total risk of their portfolios by internationally diversifying their investments;

    b. The Bahraini market is likely to account for only a proportion of large investors' investment portfolios, and hence is unlikely to be considered separately from other Middle Eastern or international markets when these investors make investment and asset allocation decisions.

28. There were also several reasons related to the empirical estimation of parameters of the cost of capital that supported this base-case assumption for the 2009 Determination, including:

    a. Potential problems with the robustness of pricing signals might mean that the domestic Bahraini capital markets do not provide robust estimates of the cost of capital parameters;

    b. The available Bahraini benchmarks for the risk-free rate might not provide accurate estimates given the limited activity in the Bahraini government bond market;

    c. There was insufficient data to provide robust estimates of the equity risk premium ("ERP") for Bahrain.

29. However, given that the regulated activities of Batelco and Zain take place in Bahrain, the 2009 Determination also considered evidence based on domestic market benchmarks. This was used to estimate the cost of capital under an alternative scenario based on an investor that holds a less internationally diversified investment portfolio. For example, taxes on international investments might limit the extent of diversification. This estimate was used as a cross-check on the results under the base case for the 2009 Determination.

30. For the purposes of the current Determination, the Authority considers that it is appropriate to increase the weight placed on the domestic investor scenario. Specifically, the Authority has placed similar weight on the domestic investor and the internationally diversified investor scenarios. This is due to recent market developments, including the following:

a. Relative to the 2009 Determination, there is now more market data for Bahraini government bonds, both in terms of the number of bonds and the amount of historical data available. The Authority is therefore better placed to consider evidence on Bahraini benchmarks for the risk-free rate;

b. Relative to the 2009 Determination it may be more difficult for Bahraini companies to access international capital markets due to uncertainty in the domestic economy.[9] This suggests that it may be appropriate to place greater emphasis on the domestic investor perspective alongside the internationally diversified investor perspective.

31. Had the Authority chosen to place greater weight on the international investor scenario in this Determination, as it did in the 2009 Determination, the point estimate for the cost of capital would have been similar to the 2009 point estimate (9.0%, before the transitional adjustment).

[9] For example, see Standard & Poor's (2012), "S&P Research Update on Bahrain", 20 July, p. 3.

3 Application of the capital asset pricing model to the cost of capital

32. The allowed rate of return is a key value driver for a capital-intensive, regulated business since it sets the allowed return on invested capital. It represents the weighted average return across the components of a company's capital structure.

33. A key parameter of the WACC is the cost of equity. Since this is not directly observable, a number of models and approaches can be used to estimate it. Industry practitioners and regulators commonly use the capital asset pricing model ("CAPM") to estimate the cost of equity for regulated entities.

34. This Determination estimates the cost of capital from the perspective of an investor with an internationally diversified portfolio of assets as well as from the perspective of a domestic investor, who is assumed to hold a less diversified portfolio. The parameters used to determine the cost of capital in these two scenarios are estimated using data from international and Bahraini capital markets.

35. The remainder of the section is structured as follows:

    a. the conceptual issues associated with the assessment of the cost of capital are summarised;

    b. the models and approaches that can be used to estimate the cost of equity are described, and the CAPM is presented.

3.1 Conceptual issues

36. The cost of capital is the expected rate of return on the capital invested in a firm, which compensates the providers of capital for both the time value of money and the underlying risk of the business. It depends on the firm's risk characteristics, the market in which it operates, and the current situation in capital markets.

37. The WACC represents the average return across the different components of a company's capital structure, weighted by the proportion of each component in the overall capital structure of the firm. It represents the cost to a firm of raising funds to finance existing operations and/or to undertake new investment.

38. Investors need to recover efficient investment costs—referred to as the return "of" the capital invested—along with the expected return on investment—the return "on" capital. In a regulatory context, the return of the invested capital is remunerated through the allowed depreciation charge, whereas the return on the invested capital is remunerated by applying the WACC to the company's invested capital.

39. The regulatory WACC is a key value driver for a capital-intensive regulated business. Adjustments to the WACC have a direct impact on the cost base of operators and allowed rates of regulated services. Hence, estimating a WACC commensurate with a firm's underlying business risks is essential if the firm is to be able to finance its functions without making excessive profits, which would be detrimental to consumers.

40. Determination of the WACC requires estimation of each of the components of a company's capital structure. However, for simplicity, these components are typically limited to the cost of debt and the cost of equity (weighted by the market values of debt

and equity respectively), or the cost of equity only, which is equivalent to the overall cost of capital in the absence of debt.

41. The WACC can be expressed on a different basis depending on the treatment of corporate taxation. The vanilla WACC (i.e. post-tax cost of equity, pre-tax cost of debt) represents the allowed rate of return excluding tax allowances. However, since corporate taxes are not applicable to the activities of Batelco, Zain and Viva in Bahrain, the pre-tax WACC that includes tax allowances will be equal to the vanilla (and post-tax) WACC, and can be expressed as:[10]

$$(r_d \times g) + r_e \times (1 - g)$$

where g is gearing, r_d is the cost of debt, and r_e is the cost of equity.

3.2 Models for the cost of equity

The Draft Determination

42. In general, the costs of debt and equity can be measured based on past and/or current data. Although the required return to equity is not directly observable, a number of asset pricing models can be used to estimate the cost of equity, including:

    a. the CAPM;

    b. arbitrage pricing and multi-factor models;

    c. direct proxies.

43. The CAPM relates the cost of equity of a particular firm to its exposure to systematic, or non-diversifiable, equity market risk. Systematic risk relates to the possibility that returns may deviate from expected returns in correlation with the market returns. The CAPM asserts that investors do not need compensation for non-systematic risk because it can be eliminated through portfolio diversification. The level of exposure is expressed as a single beta factor describing the correlation between returns on the firm's equity and the overall equity market. The CAPM is commonly used by industry practitioners and regulators in estimating the cost of capital for regulated entities, indicating that it is widely considered as the model of choice when estimating the cost of equity.[11]

44. Arbitrage pricing and multi-factor models, such as the Fama–French three-factor model or Cahart's four-factor model, represent alternatives to the CAPM.[12] Robust estimates of the cost of capital derived from multi-factor models depend on the availability of a

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[10] The corporate tax rate does not take into account personal taxation. In practice, investors do face personal taxation, but this is not taken into account in the cost of capital of corporations.

[11] See, for example, Ofcom (2011), "WBA Charge Control", Charge control framework for WBA Market 1 services, 20 July; Autorità per le Garanzie nelle Comunicazioni (2010), "Delibera N. 578/10/CONS", 11 November; Ofcom (2008), "A New Pricing Framework for Openreach – second consultation", 5 December; ARCEP (2008), Decision numbers 2008-0162 and 2008-0163; UK Competition Commission (2008), "Stansted Airport Ltd, Q5 Price control review—Presented to the Civil Aviation Authority", 23 October; UK Competition Commission (2007), "Report on the economic regulation of Heathrow and Gatwick Airports", 28 September; Commerce Commission of New Zealand (2005), "Determination on the application for pricing review for designated interconnection services", 11 April; and Commerce Commission of New Zealand (2005), "Draft Guidelines on the Commerce Commission's Approach to Estimating the Cost of Capital", October.

[12] Fama, E. and French, K. (1992), "The Cross-Section of Expected Stock Returns", *Journal of Finance*, **47**:2, June; Cahart, M. (1997), "On Persistence in Mutual Fund Performance", *Journal of Finance*, **52**, pp. 57–82.

considerable amount of data to estimate both the premiums for, and individual companies' exposure to, the specified risk factors. In the case of Bahrain, there appears to be insufficient market data to estimate these risk factors robustly. This suggests that the application of models other than the CAPM is unlikely to offer additional reliable insight into required returns. These empirical models are also often criticised for lacking strong theoretical foundations.

45. Direct proxies, such as observed yields on corporate debt, might also be used in the cost of capital estimation. Given the seniority of debt over equity in a company's capital structure, the additional risk to which equity investors are exposed implies that the upper bound of the yield on corporate debt could be seen as a lower bound to the cost of equity. The rates of return targeted by equity investors might also be used as a proxy for the cost of equity. However, there are typically few directly observable proxies that do not carry biases and can be independently verified.

46. In the absence of adequate data to implement the alternative models, and having regard to the stronger theoretical foundations of the CAPM and its widespread use by regulators and practitioners, the Authority has used the CAPM to estimate the cost of equity in line with international regulatory practice.

Responses to the Draft Determination

47. In their submissions, both Zain and Batelco agreed with the application of the CAPM for the purposes of this Determination.[13]

The Authority's analysis and conclusion

48. The Authority is of the view that, for the reasons set out in the Draft Determination, the CAPM is appropriate for calculating the cost of equity.

3.3 The capital asset pricing model

49. The required return to equity is often estimated using the CAPM, where the required return on a given asset is determined by the relative contribution of that asset's risk to the risk of the overall market portfolio. A central principle of this model is that investors hold a broad portfolio of assets so that the idiosyncratic risk of any single asset is diversified away, leaving only the systematic risk component. Therefore, only the systematic risk component is expected to be remunerated through the return on the market portfolio.

50. The degree to which the expected return to any one specific asset is correlated with the expected return on the market for all assets determines investors' required returns on a forward-looking basis.

51. According to the CAPM, the required return to an asset is estimated as follows:

    risk-free rate + equity beta of the asset $\times$ ERP

    where:

    - equity beta is the risk of the asset relative to the market, estimated as:

[13] Zain submission, page 5, section 3 and Batelco submission, paragraph 16, page 22.

$$\beta = \frac{Cov(R_e, R_m)}{Var(R_m)}$$

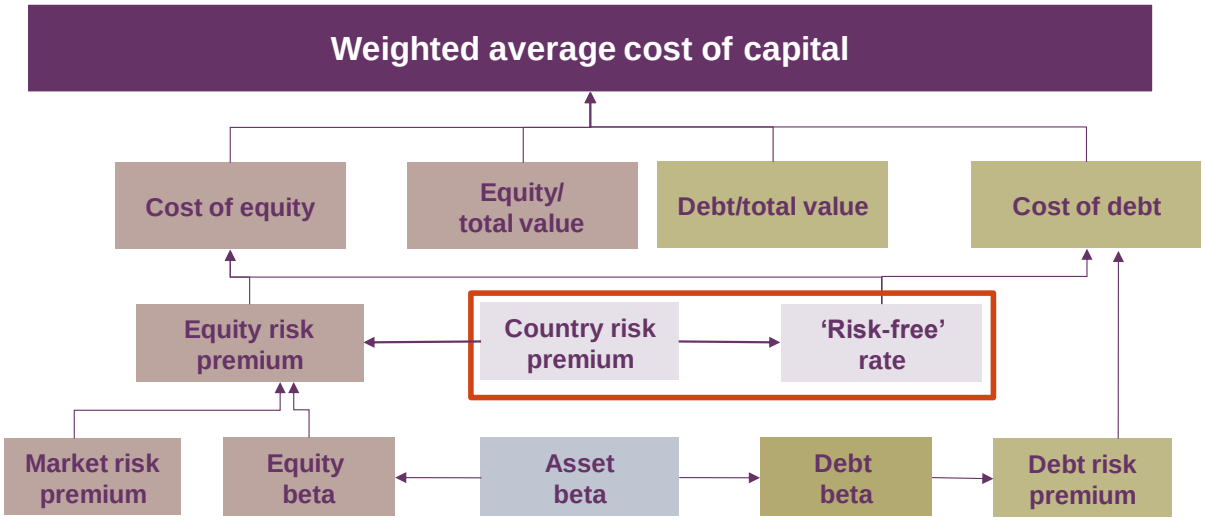
where:

R_e is the return on the asset; R_m is the return on the market portfolio (proxied by a broad equity market index); and $Var(R_m)$ is the variance of the market portfolio.

- ERP is estimated as the excess return on the market portfolio over the risk-free rate ($r_m - r_f$).

52. Figure 1 presents a stylised illustration of the relationship between the individual cost of capital parameters.

Figure 1 Parameters of the weighted average cost of capital



Source: The Authority.

53. Some of the main parameters in the WACC—gearing, the debt risk premium and asset beta—are specific to the activity or company being assessed. The other parameters—the risk-free rate and the ERP—are generic to all applications of the CAPM at any given time. The country risk premium is conceptually specific to the activity being assessed, but in practice is often assumed not to vary between activities in a specific country.

3.4 Scenarios for the cost of capital

The Draft Determination

54. The CAPM suggests that investors can diversify exposure to idiosyncratic risks by investing in a global portfolio of securities. This is optimal because, by diversifying, investors reduce risk. In practice, it is not always the case that all investors hold fully diversified investment portfolios. For example, investors sometimes exhibit a preference for domestic equities (termed the "home-bias puzzle"), whereby investments outside the home country are held in a lower proportion than would be the case in a market value-

weighted portfolio.[14] Furthermore, taxes on international investments might limit the extent of diversification.

55. Although the home-bias puzzle might indicate that investors have preferences for investments that are located geographically near to their home market, international capital markets are closely interlinked and global investors have access to capital markets across the world. Improved information flows and global links across economies facilitate cross-country diversification. Nevertheless, to the extent that variations across markets in expected inflation, country risk and liquidity could be significant for the cost of capital, these factors have been controlled for in the Draft Determination where relevant.

56. In the Draft Determination, the Authority estimated the cost of capital from the perspective of an international, globally diversified investor. This assumes that investors are both rational and diversify their investments (see also paragraph 27).

57. In addition, another scenario is considered in which the cost of capital is estimated from the perspective of a less diversified, "domestic" investor. For the Draft Determination the Authority proposed placing similar weight on the international and domestic investor perspectives, given that changes in the market and in data availability have increased the reliability and relevance of the domestic investor scenario (see also paragraph 30).

Responses to the Draft Determination

58. Batelco agreed with the Draft Determination that, compared with the 2009 Determination, there is now available more robust information relating to Bahraini government bonds. Batelco emphasised the fact that the financial turmoil has made it significantly more difficult for Bahraini companies to seek funding in the international markets. Therefore, Batelco submitted that the primary basis for setting the WACC should be the domestic scenario, due to the home-bias puzzle and the fact that its investor base is predominantly domestic.[15]

59. Zain also took the view that the domestic investor scenario, which has the advantage of capturing Bahrain-specific information, should be given a greater weight.[16] Alternatively, with the objective of setting an estimate less sensitive to assumptions, Zain suggested that the Authority could calculate the actual cost of capital for the three regulated operators along with the "efficient" operator.

The Authority's analysis and conclusion

60. The Authority recognises some of the advantages of domestic estimates and the fact that current market conditions may make it more difficult for Bahraini companies to attract funding from international investors.[17] However, the Authority notes that the financial turmoil is captured in setting the ERP under both the international and domestic approaches.

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[14] French, K. and Poterba, J. (1991), "Investor diversification and international equity markets", *American Economic Review,* **81**, pp. 222–26.

[15] Batelco submission, paragraphs 2–3, pages 15–16.

[16] Zain submission, pages 3 and 5.

[17] Although the Authority notes that on 14 January 2013, Batelco announced that its board had approved the issuance by the company of debt instruments up to a value of USD 1 billion to assist in the acquisition of Cable & Wireless Communications Plc.

61. For the reasons set out in the Draft Determination, the Authority does not consider the domestic approach to be sufficient by itself in the current context.

62. The international approach considered by the Authority has a number of advantages with regard to the key parameters of the risk-free rate and equity beta. The credit risk specific to countries with a similar credit rating to Bahrain is captured by adding the country risk premium on top of the international risk-free estimate. It represents valuable comparator evidence in addition to the pure Bahraini information used in the domestic investor approach. Regarding the betas, domestic evidence may not produce a sufficiently robust estimate in less mature markets, due to potential concerns such as lack of liquidity and relatively large weight of a company's value in the equity market index. Those issues are addressed in the case of international beta estimates and the use of comparators.

63. The nature of the approach proposed by Zain is not clear. The question arises whether the actual operator's cost of capital or the "efficient" cost of capital would be applied for each of the three operators. Furthermore, if the Authority were to estimate each operator's WACC at the group level, it would be not be relevant for regulatory purposes in Bahrain, given that the Bahraini operations are only a part of Zain's and STC's businesses. Finally, the "efficient" operator cost of capital is already reflected in the Authority's approach: a combination of the two scenarios, international and domestic, is used to arrive at the cost of capital that an operator in Bahrain would be likely to incur.

64. Having considered the views of respondents, the Authority remains of the view that it is appropriate to estimate the cost of capital by giving similar weight to the international and domestic investor approaches. Compared with the 2009 Determination, more consideration is given to the domestic investor approach due to increased availability and reliability of the domestic data. That said, the Authority continues to believe that the international approach contains useful information and is consistent with the key CAPM assumptions. The final estimate of 9.5% is consistent with the international approach as well as the domestic approach.

4 Capital structure

65. The capital structure of a company refers to the relative proportions of different types of financial security in the overall financing of a company. In the context of cost of capital analysis, capital structure is usually focused on the relative proportions of debt and equity. Leverage, or gearing, is the ratio of debt to total capital.

66. The optimal capital structure for a company is determined by a number of factors, including corporate taxation rates and the costs of financial distress. In general, companies would be expected to target an optimal capital structure that maximises the value of the company, while minimising the associated cost of capital, although other considerations might cause the actual and optimal capital structures of a company to differ.

67. Instead of using the actual level of gearing, regulators typically adopt a level of gearing that is reflective of a notional, reasonably efficiently financed company. This approach allows the regulated company greater discretion to choose its optimal capital structure. Adopting a notional capital structure also ensures consistent treatment across regulated companies.

68. The remainder of the section is structured as follows:

    a. the drivers of optimal capital structure are summarised;

    b. the actual capital structures of Batelco, Zain and STC are analysed, and the extent to which the current capital structures are likely to represent the efficient forward-looking structures of the entities regulated in Bahrain is assessed;

    c. the concept of a notional capital structure in the regulatory context is discussed;

    d. the approach proposed by the Authority to capital structure is presented.

4.1 Drivers of optimal capital structure

69. The conceptually most transparent approach to estimating the appropriate rate of return is to start by assuming an equity-only capital structure.[18] Indeed, Modigliani and Miller ("MM") argued that a firm's value—and the associated cost of capital—is independent of the underlying capital structure, and hence there is no single, optimal capital structure.[19] Figure 2 below shows that, under the MM framework, an increase in leverage or gearing raises the cost of equity and the cost of debt, as equity and debt become more risky, leaving the overall WACC unchanged since the increased cost of both debt and equity offsets the effect of using debt to replace the relatively more expensive equity.[20]

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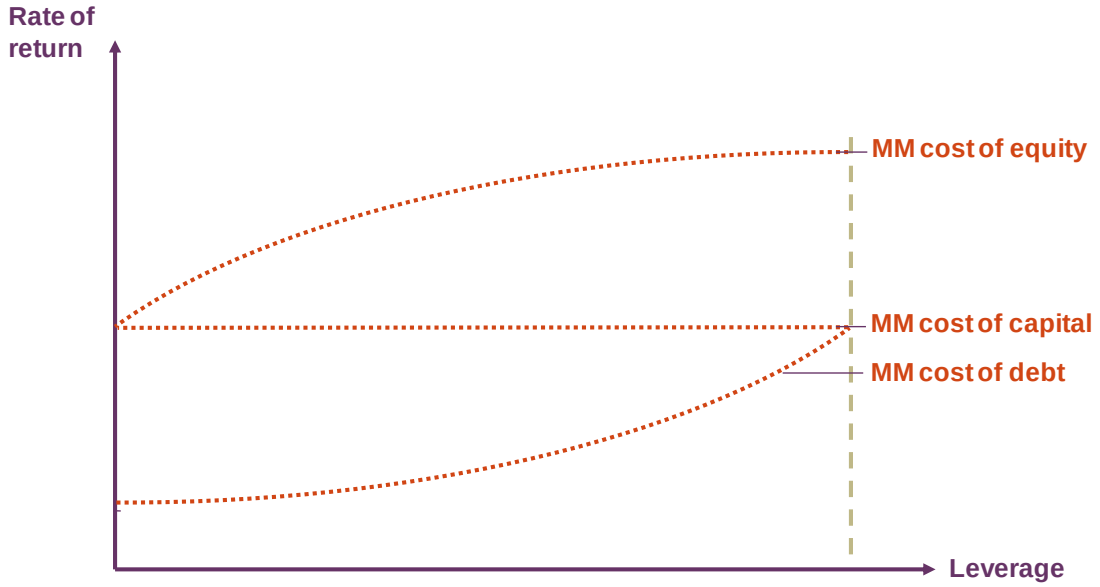
[18] Brealey, R. and Myers, S. (1991), *Principles of Corporate Finance*, 4th edition, chapter 19.

[19] Modigliani, F. and Miller, M. (1958), "The cost of capital, corporation finance and the theory of investment", *American Economic Review,* **48**:3, pp. 261–97.

[20] The figure assumes a positive cost of financial distress—i.e., as gearing increases, the cost of debt increases owing to the higher probability of financial distress.

Figure 2 Cost of capital under changes in leverage



Source: The Authority.

70. MM's invariance proposition relies on a set of assumptions, including no corporate taxes. The strength of the MM analysis is that these assumptions highlight the factors that might affect the sensitivity of the cost of capital to leverage. For example, relaxing the "no taxes" assumption provides incentives (in jurisdictions where debt interest payments are tax-deductible) to issue more debt. If there are limited costs associated with financial distress, the result would be that the cost of capital can be lowered with increases in leverage. In such a situation, the firm might be incentivised to adopt a capital structure with a substantial amount of debt in order to reduce its cost of capital.

71. Since it is unrealistic to assume that the costs of financial distress are negligible, the optimal financing structure in the presence of both a positive corporate tax rate and the costs of financial distress might lie somewhere between equity-only and debt-only financing.

72. The MM analysis suggests that if an optimal capital structure exists, it will depend on the degree to which the MM assumptions do not hold in each particular case. In general, firms would be expected to make decisions about leverage by balancing the expected benefits and costs associated with increased leverage—for example, the benefit of tax-deductibility of interest against the cost associated with increased probability of financial distress.

73. These decisions about leverage can be informed by delineating the cash-flow effects of financing choices, and hence calculating the adjusted present value ("APV") of planned investments. An alternative approach is to incorporate the effects of financing decisions in a single step by adjusting the WACC that is used to discount cash flows.

74. The implication for regulation is that an estimate of the WACC based on an equity-only capital structure can be combined with separate adjustments to the allowed revenue, if required, to pass on to consumers any specific benefits associated with a particular capital structure, if relevant and deemed appropriate. Although an equity-only capital structure used for a cost of capital estimation on a "pre-tax basis" (i.e., including allowance for tax

payments in the WACC) would be likely to overestimate the required rate of return in the presence of corporate taxation, this consideration is not applicable to Bahrain.

75. In the context of companies based in Bahrain, given that there are no corporate taxes, the benefits of a leveraged capital structure might be low, and therefore an equity-only capital structure represents the most transparent and conceptually appropriate basis for estimating the cost of capital.

4.2 Actual capital structures of Batelco, Zain and STC

76. The actual capital structures of the parent companies of the regulated entities may provide an indication of the optimal capital structure for these entities, assuming that financial managers take decisions about capital structure aimed to maximise value.

77. The companies' actual capital structures may differ from what is optimal for reasons other than taxation and the costs of financial distress. For example, a company may choose to increase gearing as a means of reducing free cash flows and enforcing discipline on managers. Alternatively, it may choose to raise debt instead of equity to avoid the risk of sending a negative signal to the market about its earnings prospects—the "pecking-order" theory of financial structure.

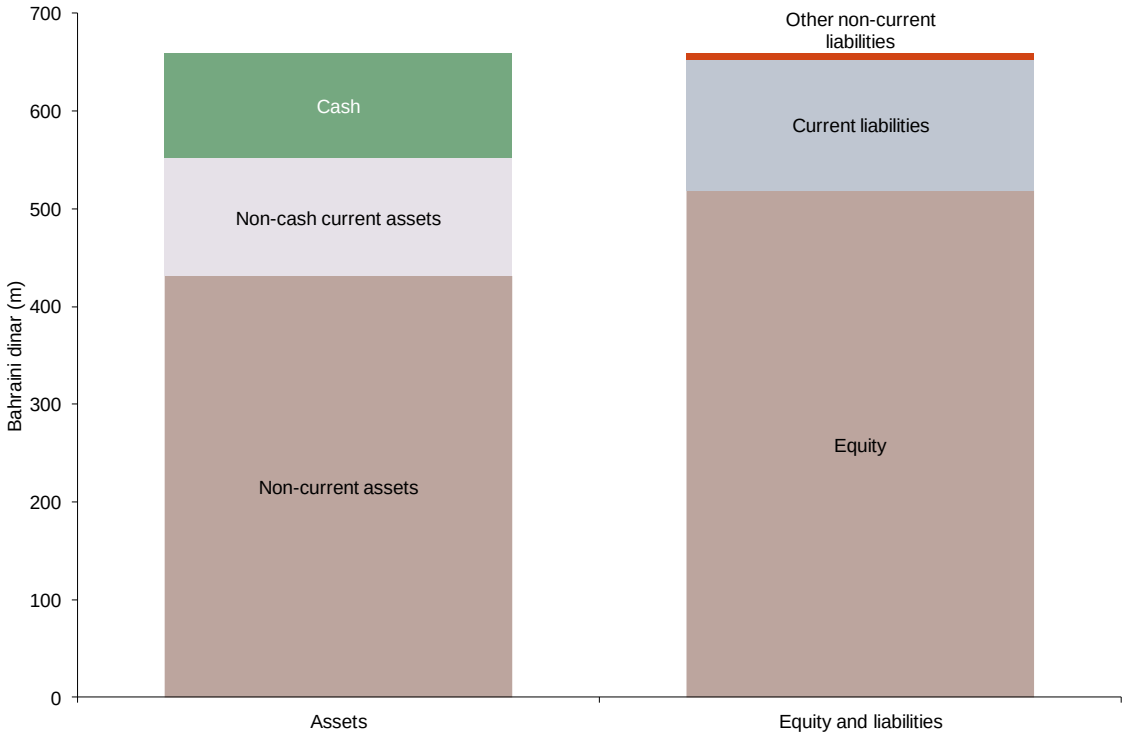
78. Furthermore, the capital structure of the parent company will be set from the perspective of the overall group, which may deviate from the optimal structure for constituent companies within the group, and in particular for the regulated activities in Bahrain.

79. Since the primary location of Batelco's business activities is in Bahrain, its actual capital structure would be expected to be similar to the capital structure of a notional telecommunications company operating in Bahrain. Figure 3 below illustrates Batelco's balance sheet as at 2011, which indicates that gearing was low, or zero if cash is deducted from the value of long-term debt.[21]

[21] Gearing is calculated as debt minus cash and short-term assets, divided by the sum of equity value and net debt.

Figure 3 Composition of Batelco's balance sheet

(Bahraini dinar, million)

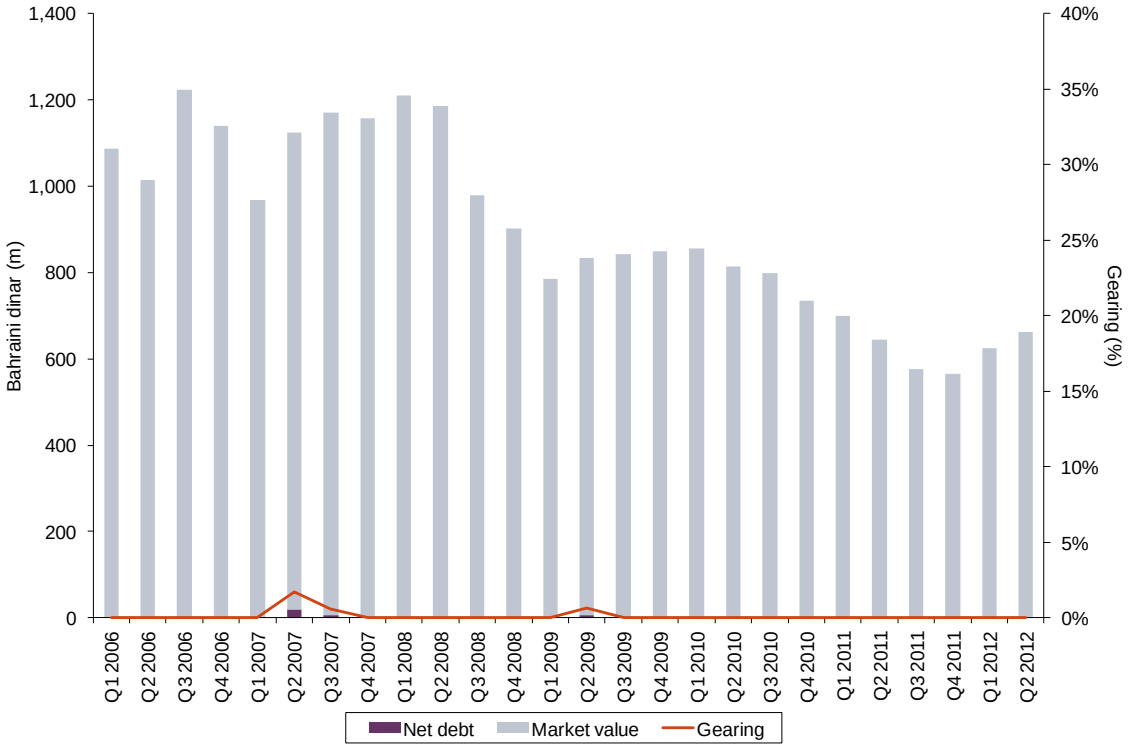


Source: Batelco's 2011 annual report.

80. Figure 4 plots Batelco's market value of equity and gearing over time. Given that net debt has been zero in most periods since 2006, gearing has also been zero in most periods. This level of gearing might be expected in view of the absence of corporate taxes in Bahrain (the primary location of Batelco's regulated business operations), which means that there are no expected tax benefits from issuing debt for firms pre-dominantly operating in Bahrain (or other tax-free zones).[22]

[22] A firm operating under such circumstances might still issue debt as a disciplining tool on management or because of transaction costs and liquidity considerations.

Figure 4 Estimates of market value of equity and gearing for Batelco



Note: Net debt = short-term + long-term borrowings – cash and equivalents – marketable securities – collaterals. Gearing is estimated as the ratio between net debt and the sum of net debt and the market value of equity. Gearing is equal to zero if there is no long-term debt.
Sources: Bloomberg, and the Authority's calculations.

81. Given that Bahrain is the primary location of Batelco's activities, the company's actual capital structure may be a good proxy for the optimal capital structure of a notional telecommunications company operating in Bahrain.

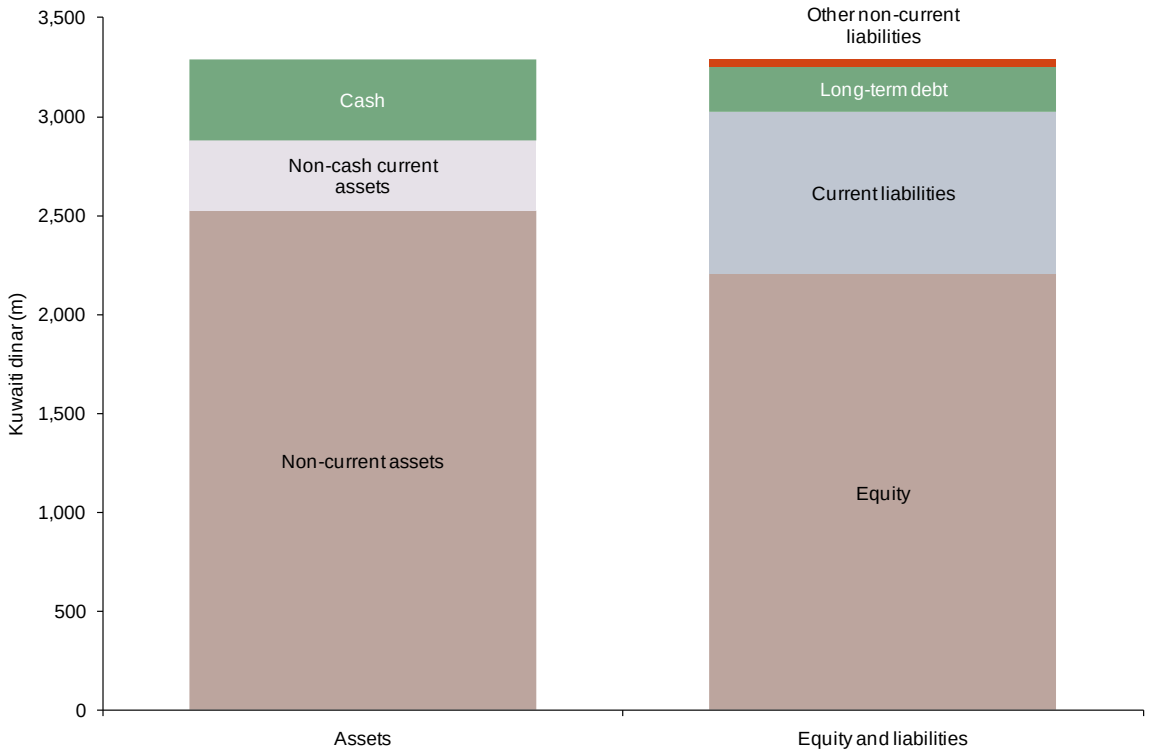
82. In contrast, Bahrain is not the primary location for either Zain's or STC's business activities—Zain derives only 4% of its revenue from Bahrain, while STC derives about 2% of revenues from Viva.[23] Zain's and STC's actual capital structures would therefore not be expected to be a reliable indication of the optimal capital structure for a notional telecommunications company operating in Bahrain.

83. Figure 5 below illustrates Zain's balance sheet as at 2011. Gearing was low, or zero if cash is deducted from the value of long-term debt.

[23] Zain (2012), "H1-2012 Earnings Release", p. 4; STC (2012), "Interim Consolidated Financial Statements for the Three and Six-Month Periods Ended June 30, 2012", page 20.

Figure 5 Composition of Zain's balance sheet

(Kuwaiti dinar, million)



Source: Zain's 2011 annual report.

84. Figure 6 shows the trend in Zain's market value of equity, net debt and gearing over time. In the 2009 Determination, the Authority observed the increase in gearing prior to 2009 and suggested that this may have been a short-term deviation from the optimal long-term capital structure.[24] This might have arisen, for example, if debt finance was perceived to be a more flexible means of funding Zain's acquisitions and international expansion at the time.

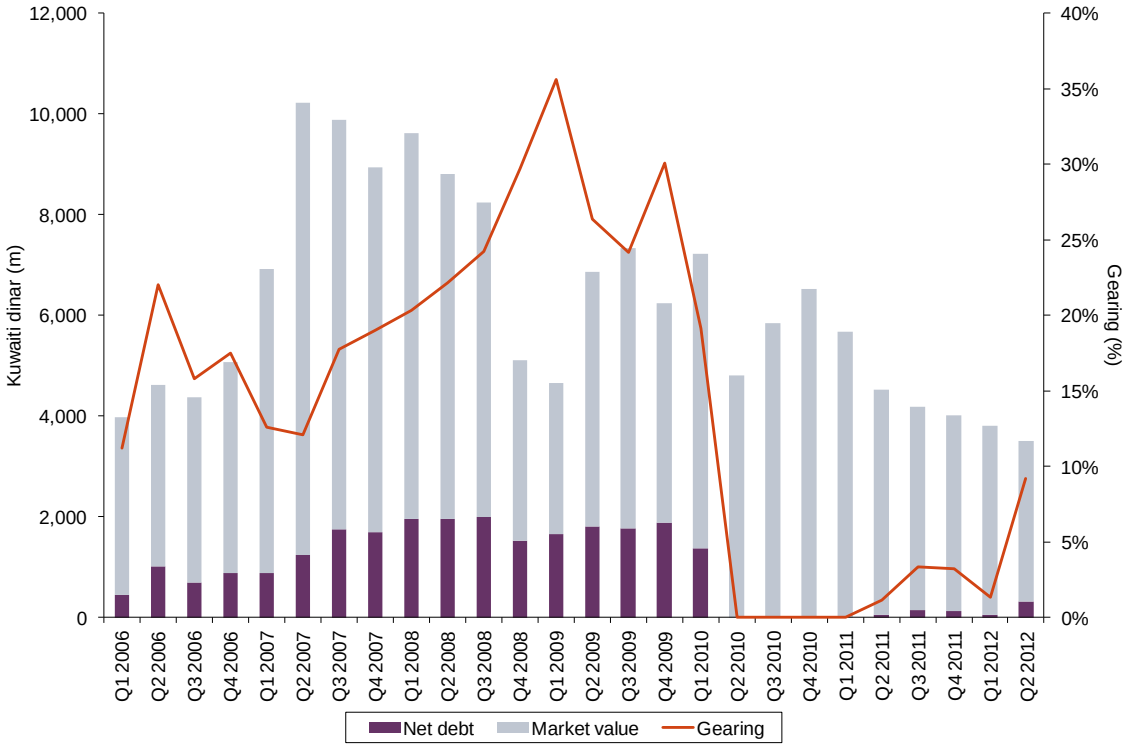
85. In the 2009 Determination, the Authority had suggested that Zain's gearing might be expected to decline once the rate of expansion slowed.[25] Figure 6 shows that Zain's gearing has indeed declined since its peak of around 35% in Q1 2009 to about 9% (as at Q2 2012).

[24] The Authority, "Cost of Capital", Determination, MCD/11/09/090, 3 November 2009, paragraph 72.

[25] ibid., paragraph 73.

Figure 6 Estimates of Zain's market value of equity, net debt and gearing

(Kuwaiti dinar, million)

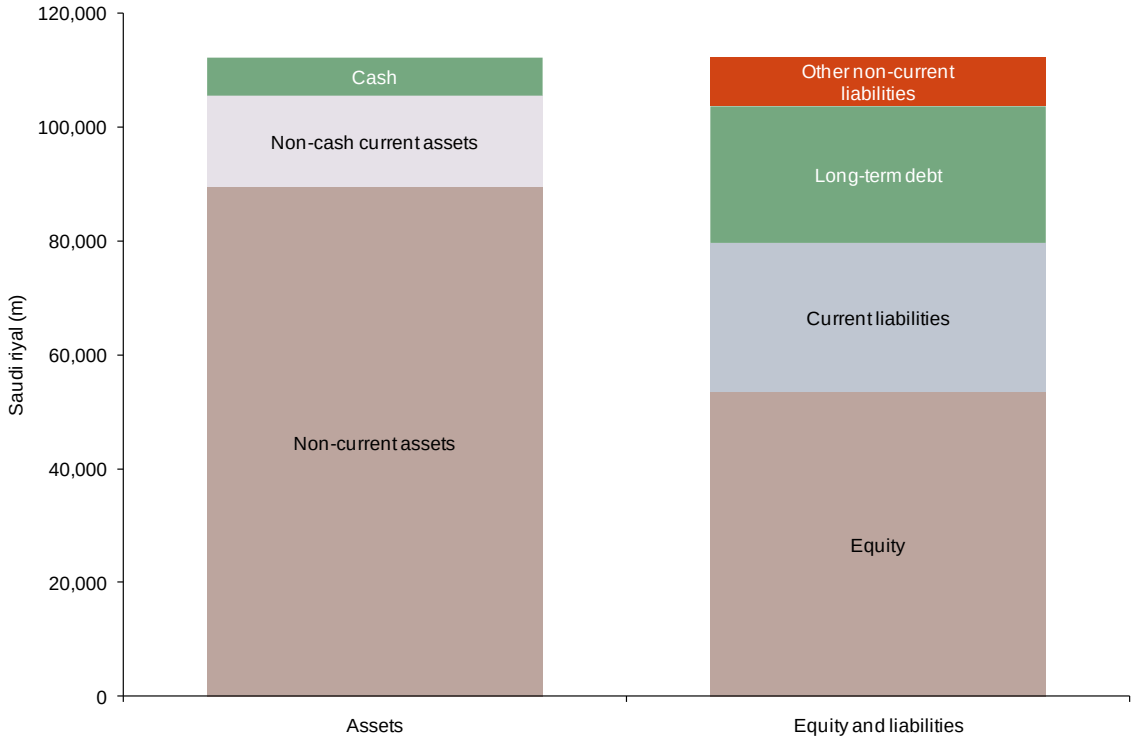


Note: Net debt = short-term + long-term borrowings – cash and equivalents – marketable securities – collaterals. Gearing is estimated as the ratio between net debt and the sum of net debt and the market value of equity. Gearing is equal to zero if there is no long-term debt.
Sources: Bloomberg, and the Authority's calculations.

86. Figure 7 illustrates STC's balance sheet as at 2011. Gearing was positive regardless of whether cash is deducted from the value of long-term debt.

Figure 7 Composition of STC's balance sheet

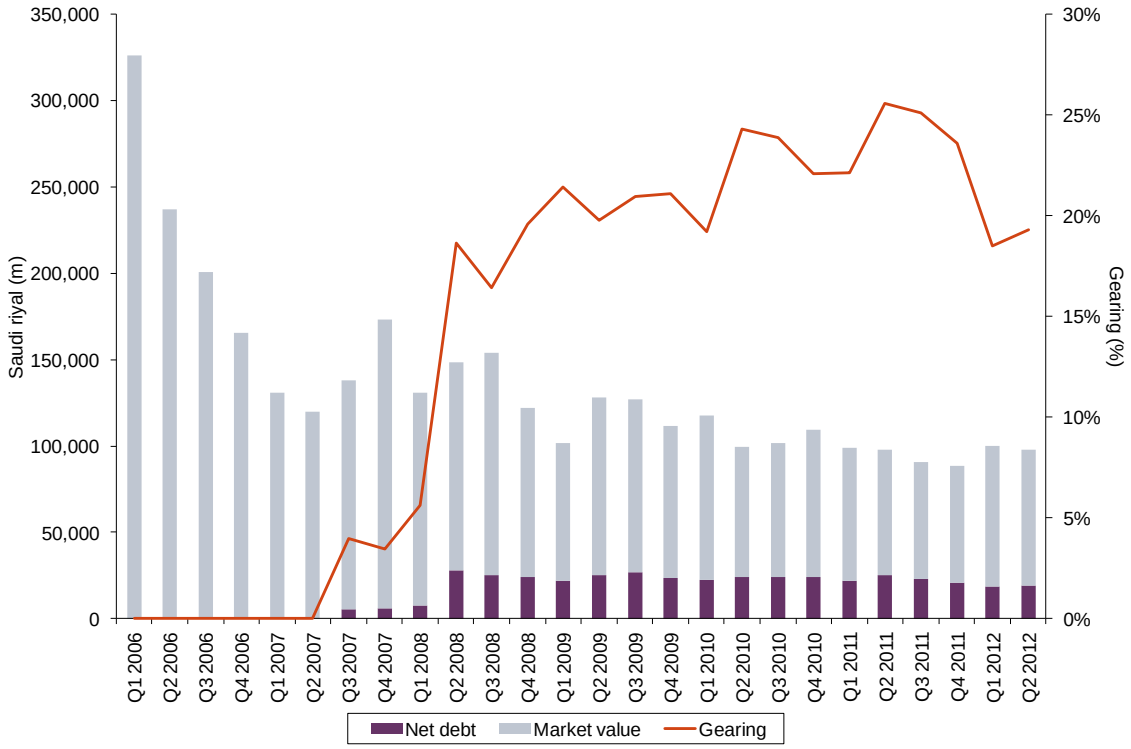
(Saudi riyal, million)



Source: STC 2011 annual report.

87. Figure 8 illustrates that STC's gearing has increased steadily since Q3 2007. This may be—as with Zain a couple of years ago—due to a programme of expansion which is being financed by issuing debt rather than equity, since debt financing may be perceived as a more flexible means of funding. As in the case of Zain, it may be reasonable to think that the trend increase in STC's gearing observed in the last few years may reverse in the longer term.

Figure 8 Estimates of STC's market value of equity, net debt and gearing
(Saudi riyal, million)



Note: Net debt = short-term + long-term borrowings – cash and equivalents – marketable securities – collaterals. Gearing is estimated as the ratio between net debt and the sum of net debt and the market value of equity. Gearing is equal to zero if there is no long-term debt.
Sources: Bloomberg, and the Authority's calculations.

88. In any case, since Bahrain accounts for a very small proportion of Zain's and STC's operations, their current levels of gearing may not be indicative of the longer-term level that would be expected for a mobile telecommunications company operating in Bahrain. Given the tax environment in Bahrain, the current level of gearing for STC is unlikely to provide an appropriate basis to determine the level of gearing for this Determination.

89. The actual capital structure of Batelco suggests that low or zero gearing remain appropriate for a company operating in Bahrain. This is supported by the current actual gearing adopted by Zain. The actual capital structures of both Batelco and Zain provide a cross-check on the assumption that the optimal capital structure for a company operating in Bahrain is close to zero gearing.

4.3 Capital structure in the regulatory context

90. Regulators generally set the allowed rate of return for regulated entities by using a notional gearing assumption—i.e., the level of gearing that might be characteristic of a reasonably financed company carrying out similar operations to the company under consideration—instead of the actual level of gearing. As such, this approach ensures a consistent treatment of the cost of capital for different firms within the industry. The approach reflects a regulatory position that firms, rather than the regulator, are best placed to undertake decisions related to capital structure.

91. In jurisdictions where there is a positive rate of corporate taxation, one of the main advantages to increasing gearing is the tax-deductibility of interest payments. Regulatory attention to notional gearing attempts to limit the potential for over-/under-recovery of tax expenses when the allowed rate of return is set on a pre-tax basis. If notional gearing is set higher than the actual level, the company may under-recover its cost of capital unless it increases gearing to take advantage of tax shields implicitly assumed in the allowed rate of return set by the regulator. However, if the notional gearing level is set lower than the actual level, the regulated company may be able to over-recover its cost of capital compared with what it would incur under the notional capital structure. This is because the company would receive more remuneration for tax than the tax expense actually incurred (on average).

92. When there is a positive rate of corporate taxation, the appropriate notional level of gearing may be determined by reference to regulatory precedents for similar companies and/or the gearing levels of comparator companies. Regulators may also undertake a financeability analysis to assess what gearing level a company is able to support while retaining access to reasonably priced debt finance.

93. As there is no corporate taxation in Bahrain—and hence no risk of companies over-recovering their tax expenses—the Authority considers that there is no reason to assume a notional capital structure that contains debt.

4.4 Approach to capital structure

The Draft Determination

94. The absence of any corporate taxes in Bahrain indicates that the optimal capital structure is likely to be close to 100% equity, owing to the absence of tax shield benefits associated with issuing debt. The company may still choose a positive gearing because of some benefits associated with debt, such as lower agency costs. Also, it may reasonably be expected that if the company does not operate predominantly in Bahrain—e.g., Zain or STC—at the group level the company might choose a positive gearing level which would not necessarily be representative of the gearing ratio which the company would adopt if it operated only in Bahrain. In any case, the Authority considers that the risk of overestimating the cost of capital by adopting a zero-gearing approach is small because the potential gains to the company from adopting higher leverage, and hence bringing the cost of capital down, are likely to be limited.

95. For regulatory purposes, assuming zero gearing would be expected to allow the company at least a sufficient return to cover its cost of capital under any capital structure. A 100% equity-financed structure could be seen to represent an upper bound for the actual cost of capital and allow full recovery of investment costs.

96. A company could still choose to take on some debt instead of relying on 100% equity finance if it can benefit from the lower cost of capital compared to the zero-gearing assumption, or generate other benefits such as access to a liquid source of finance. Therefore, an advantage of assuming an equity-only capital structure in the regulatory determination is that the company is implicitly given discretion to choose the optimal corporate financial policy.

97. For the reasons set out above, the Authority is of the view that zero gearing is appropriate for the calculation of the cost of capital for the provision of regulated telecommunications

services in Bahrain. This is consistent with the view taken by the Authority regarding the appropriate gearing ratio for determining the cost of capital for Bahraini telecommunications service providers in the 2009 Determination. In the Authority's view, there have been no changes since 2009 to justify a departure from this position.

Responses to the Draft Determination

98. All respondents agreed that, in the absence of corporate taxes in Bahrain, the optimal capital structure is likely to be close to 100% equity, and hence the overall cost of capital will be equal to the cost of equity. Zain agreed that an equity-only capital structure is appropriate, due to the absence of corporate taxes in Bahrain, and that the level of gearing of Zain Bahrain is less than 0.5% (the level of gearing of the Zain parent is declining).[26] According to its submission, Batelco agreed with the Authority that an equity-only capital structure is not only consistent with the optimal gearing level but is also significantly more transparent than a non-zero gearing structure.[27] Batelco concluded that the assumption of zero gearing is the most appropriate for regulated companies operating in Bahrain.[28]

The Authority's analysis and conclusion

99. The Authority remains of the view that, for the reasons set out in the Draft Determination, the appropriate capital structure to assume for setting the cost of capital for regulatory purposes is 100% equity.

[26] Zain submission, page 5.

[27] Batelco submission, paragraph 93, page 47.

[28] ibid., paragraph 98, page 48.

5 Risk-free rate

100. The risk-free rate is a key parameter of the cost of capital, to which risk premiums are added to estimate the costs of equity and debt. The nominal risk-free rate comprises the real risk-free rate adjusted for inflation.

101. The nominal risk-free rate is typically estimated with reference to the yield to maturity on debt instruments that are notionally assumed to be free of default risk. Once proxy measures for the risk-free rate have been identified, there are two critical aspects to the estimation process in a regulatory context: the maturity of the proxy security; and the relative weights to place on historical and current data. At a time when there is significant volatility in interest rates and actual or implied real interest rates are negative in several countries, it is also important to have regard to relevant Determinations made by other regulators.

102. The risk-free rate could be estimated based on the yields on the Bahraini government debt securities. Alternatively, as interest rates across different countries are conceptually related according to a set of interest parity conditions, the nominal risk-free rate for Bahrain could be estimated with respect to the current trading yields on government debt from other countries. Such an estimate might require adjustment for risk, expected devaluation and other factors, where relevant.

103. The remainder of the section is structured as follows:

    a. the risk-free rate is defined;

    b. issues associated with estimating the risk-free rate in the regulatory context are reviewed, before presenting estimates of the risk-free rate based on Bahraini government securities;

    c. the conceptual relationship between the risk-free rates in different countries, as predicted by international parity conditions, is discussed and used to identify a suitable international proxy for the risk-free rate in the Bahraini market;

    d. factors that might bias the predictions of such parity conditions are considered, alongside the evidence on these factors, before presenting estimates of the risk-free rate based on US Treasury bond yields;

    e. evidence on recent regulatory precedents is analysed;

    f. the ranges identified by the Authority for the nominal risk-free rate are summarised.

5.1 Definition of the risk-free rate

104. The risk-free rate reflects the remuneration that investors require for inter-temporal transfers of consumption. In a sense, therefore, it is a measure of the time value of money: the return that an investor requires as compensation for sacrificing current consumption in favour of future consumption.

105. A risk-free asset can be defined as one where the actual return is equal to the expected return. This necessarily requires that, when holding a risk-free asset, the investor is not exposed to any risk over the investment horizon.

106. The risk-free rate is a parameter used to estimate both the cost of equity and the cost of debt. Investors require additional risk premia in the form of higher expected returns if they are to hold risky, rather than risk-free, assets.

107. In the context of the regulation of telecommunications services in Bahrain, the relevant definition is the nominal risk-free rate, which is implicitly comprised of a real risk-free rate and an expected level of general price inflation. Expected inflation—and hence the nominal risk-free rate—can vary between geographical markets, as well as over time, and is therefore an important consideration when estimating the risk-free rate in an international context, including when comparing against other regulatory Determinations.

5.2 Estimation of the risk-free rate in the regulatory context

108. The nominal risk-free rate is typically estimated with reference to the yield to maturity on debt instruments that are notionally free of default risk. Where the yields to maturity on nominal government bonds are observed, they typically provide suitable estimates of the nominal risk-free rate if the risk of government default is low.

109. Besides the identification of suitable proxies, determining the nominal risk-free rate involves:

    a. selecting the appropriate maturity of the proxy measure;

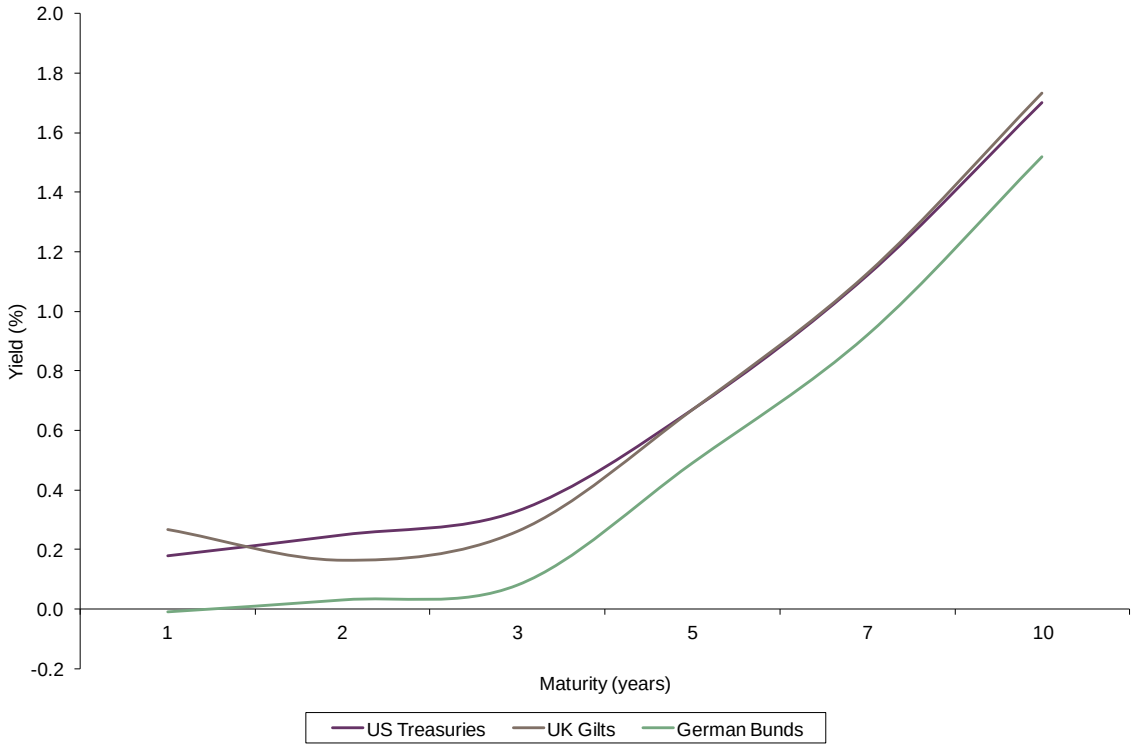
    b. considering the balance between spot yields and historical averages in case there are large deviations.

5.2.1 The maturity of the risk-free rate

The Draft Determination

110. The impact of the choice of maturity on the estimate of the risk-free rate depends on the slope of the yield curve. For example, Figure 9 below shows upward-sloping US, German and UK nominal yield curves, demonstrating that investors currently require higher annual returns for investing over longer time horizons.

Figure 9 Nominal yield curves (%) for USA, Germany and the UK



Note: Yield curve as at 11 September 2012.
Sources: Federal Reserve Bank, Bank of England, Deutsche Bundesbank, and the Authority's calculations.

111. When choosing the maturity for the nominal risk-free rate, a number of approaches can be considered, including:

    a. matching the maturity to the duration of the price control;

    b. ensuring that firms are able to access capital markets for future funding requirements;

    c. matching the maturity to the useful economic lives of assets.

112. Matching to the length of the price control period would align the maturity of the risk-free rate to the period over which the cost of capital used for setting output prices is fixed. If the regulated company were to raise financing for the duration of the current price control and then refinance, it would effectively align its actual cost of raising capital with the regulatory determination of the allowed rate of return for the next price control. This is the approach favoured by a number of regulators.[29]

113. Since there is no defined length for the regulatory period in the case of Bahrain, this cannot be used as a unique reference point for determining the appropriate maturity for the risk-free rate. However, the period for which the present Determination will apply (i.e., three to five years) can be taken as a useful reference point.

[29] For example, Ofcom has regard to the length of the charge control period when selecting its preferred maturity of five years. See Ofcom (2011), "Charge control review for LLU and WLR services", Annex 12, 31 March.

114. Companies' financing and investment decisions do not always match the duration of the price control and investors typically face residual value risk beyond the next control period. Therefore, it is appropriate to consider also maturities that are longer than the length of the control period as the basis for the maturity of the risk-free rate proxy.

115. The estimated cost of raising capital should also take into account the maturity of instruments that broadly match the company's asset lives. This implicitly assumes a degree of asset-liability matching for the company, and may thereby reduce its risk exposure from any asset-liability mismatch that would occur otherwise.

116. The regulatory regime in Bahrain uses regulatory asset lives to calculate regulatory depreciation, which is a component of the "building blocks" used to assess prices. If the maturity for the risk-free rate was based on asset lives longer than currently recorded in the regulatory accounts, then consistency would require corresponding reductions to the regulatory depreciation allowances. The Authority has therefore set the upper-end of the range for the maturity for the risk-free rate based on an estimate of the remaining economic life of assets derived from regulatory asset lives and accumulated depreciation.

117. Analysis of regulatory accounts suggests that the weighted average remaining asset life for the regulated companies is approximately five to seven years, suggesting that maturities of up to seven years may be considered. This assessment takes into account the increases in asset lives applied to certain asset classes from the production of 2010 regulatory accounts onwards.[30]

118. Regulatory precedent can provide some guidance on the approach to assessing the appropriate maturity for the risk-free rate. However, the relevance of past regulatory precedents to cost of capital determination depends on an understanding of different context and circumstances across jurisdictions as well as over time when such determinations were made. For example, maturities used in regulatory precedents fall into a wide range from one to twenty years.[31] The Authority's analysis of yields on government bonds with maturities of up to seven years falls in this range and is slightly higher than Ofcom's "preferred gilt length [of] 5 years" for Openreach, the division within BT in charge of the access network, which is the business segment with particularly long-lived assets, such as ducts.[32]

119. Taking the above considerations into account, the Authority considers the appropriate benchmark for the maturity of the risk-free rate to be a range of three to seven years. The Authority has set the upper-end of the range for the maturity for the risk-free rate based on an estimate of the remaining economic life of assets derived from regulatory asset lives and accumulated depreciation. For the purpose of this Determination, and faced with the current steep yield curve, the Authority intends to follow a conservative approach and estimate the risk-free rate based on government debt instruments of up to seven years' maturity.

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30 Please refer to Batelco's 2009 APM approval and instructions letter (MCD/11/10/100) dated 9 November 2010.

31 For example see Batelco (2009), "Response to TRA's 'Determination of the Cost of Capital'", 23 August, Table 6; and Commerce Commission of New Zealand (2009), "Final TSO Cost Calculation Determination for TSO Instrument for Local Residential Telephone Service for period between 1 July 2007 and 30 June 2008", 7 October.

32 See Ofcom (2009), "A New Pricing Framework for Openreach", 22 May, p. 256. In 2011, Ofcom affirmed: "…we continue to favour the use of 5 year gilt yields when estimating the risk-free rate, (but) we have also considered 10 year gilt yields"—see Ofcom (2011), "Charge control review for LLU and WLR services", Annex 12, 31 March.

Responses to the Draft Determination

120. In its submission,[33] Batelco claimed that the appropriate maturity should be based on the full economic asset life, rather than the remaining asset life, to ensure the access to capital markets required for future funding. Batelco also noted that the cost of capital estimated in the current Determination will be used for a number of purposes other than the price control (for example, testing hypotheses of anti-competitive pricing and cost comparison), which makes the maturity based on the price control duration less relevant.

121. Batelco supported a yield to maturity of five to ten years, citing recent regulatory precedents from Oman, UAE and Italy, where the national regulatory authorities adopted this maturity range.

122. Zain and Viva did not express views on the appropriate maturity for the risk-free rate.

The Authority's analysis and conclusion

123. In determining the appropriate maturity of the risk-free rate, the regulatory precedents from other countries are less relevant than the factors considered by the Authority due to the differences in approach,[34] in asset lives, and regulatory regimes (including duration of the price control).

124. As explained in the 2009 Determination, the Authority considers the most likely scenario to be one in which assets are gradually replaced as they wear out or become obsolete, and investments will be made on an incremental basis. It does not seem plausible to assume that the entire asset base will be replaced at once, which is the implicit assumption to justify the approach proposed by Batelco. Thus, the Authority considers it more appropriate to adopt the maturity for the risk-free rate based on the remaining, rather than the full, economic asset life.

125. The Authority recognises that the price control may not be the only (albeit the principal) application of the cost of capital estimate set in the current Determination. The length of the price control serves, however, as a useful reference point and supports the lower end of the range for the maturity based on the remaining economic asset lives, as discussed above.

126. Finally, it is important to note that, in accordance with the "building blocks" framework, there is a direct link between the asset depreciation allowance and the maturity of the risk-free rate. In other words, if the Authority were to consider extending the asset lives, it would have to reduce the allowance for the annual regulatory depreciation.

127. The Authority remains of the view, therefore, that the appropriate maturity for assessing the risk-free rate is between five and seven years, based on the average remaining economic life of the assets.

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[33] Batelco submission, paragraphs 38 and 39, pages 27–28.

[34] Batelco has not explained on which basis the regulators it mentions have used maturity of five to ten years.

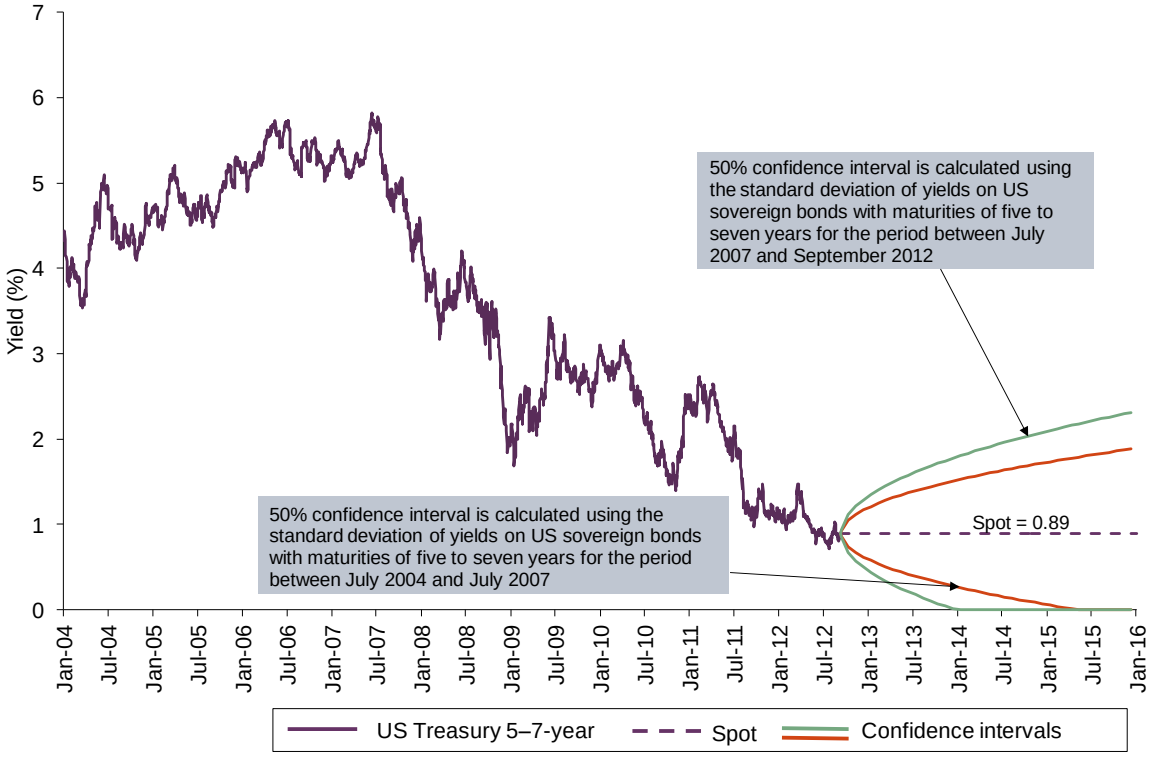
5.2.2 The balance between spot yields and historical averages

The Draft Determination

128. The second key measurement issue is the trade-off between using spot yields or historical averages. In efficient markets, there is no reason to assume that the price signal based on the latest spot estimate is not indicative of the expected, forward-looking returns. However, at times of significant volatility, some consideration may need to be given to long-term historical averages. This approach requires caution because the spot yields should reflect all the relevant, current information and expectations, and hence the most up-to-date price of raising capital.

129. Any estimate of the risk-free rate is subject to a greater degree of uncertainty now than before the financial crisis. The increase in volatility of yields on nominal US Treasury bonds is presented in Figure 10, which shows that the 50% confidence interval for forecasts of the Treasury bond yield is wider when calculated using yields from the period after the start of the financial crisis in 2007 than before.

Figure 10 Increase in uncertainty around the nominal risk-free rate



Note: Based on Bank of America Merrill Lynch US Treasury Index with maturities of five to seven years. Confidence intervals for the risk-free rate are calculated as follows: yield at 11 September 2012 ± 0.67*T*standard deviation (where standard deviation is based on daily changes in yields for the periods 2004–2007 and 2007–2012, and T is the forecast time period after 11 September 2012). The chart assumes that nominal yields will not become negative.
Sources: Datastream, and the Authority's calculations.

130. The volatility of US Treasury bond yields illustrates the current uncertainty associated with yields. An additional factor is the unusual monetary policy environment in the USA, most notably, the impact on Treasury bond yields of multiple rounds of quantitative easing. It suggests that using a risk-free rate higher than current yields might be appropriate to limit

the risk that the regulatory determination of the risk-free rate significantly differs from the actual risk-free rate in the future, and hence allows the companies to finance their operations over the regulatory period.

131. Based on the above considerations, the Authority proposes to use a risk-free rate higher than current yields to reflect the asymmetric risk that this uncertainty presents for financing.

Responses to the Draft Determination

132. In its submission, Batelco noted the Authority's rationale for considering a three-month, one-year and two-year timeframe over which to average bond rates, and submitted that since there is no consensus on the direction of bond rates in the future, it is appropriate to consider a longer historical period[35]. Batelco supported using one- and two-year averages as a way to address significant fluctuations observed in the bond yields over the past few years, and supported the additional 50 basis points ("bp") proposed by the Authority to reflect financial volatility[36].

133. Zain and Viva did not express a view on the use of spot yields versus historical averages.

The Authority's analysis and conclusion

134. The Authority considers that its analysis detailed in the 2009 Determination regarding the balance between spot and historical averages continues to be relevant in light of Batelco's comments. In particular, the Authority remains of the view that the use of historical averages has the disadvantage of being backward-looking, which is in contrast with the forward-looking estimate of the cost of capital used for the purposes of this Determination. In efficient markets, spot rates incorporate all of the publicly available information, which makes historical averages less useful.

135. Due to the currently observed international market distortions caused by quantitative easing, the Authority is of the view that some headroom over spot yields should be allowed to address the asymmetric risk faced by investors. The Authority has allowed (as in the Draft Determination) a 50bp margin above the spot rate to set an upper bound estimate for the risk-free rate.

5.3 Estimation from Bahraini government securities

The Draft Determination

136. Conceptually, the "risk-free" rate for a less diversified, domestic investor can be proxied by the yields on debt issued by the Government of the Kingdom of Bahrain.

137. As the nominal yield on debt issued by the Government of the Kingdom of Bahrain should include a country risk premium, it may not meet the strict definition of a "risk-free" asset, but rather a combination of the risk-free rate and a proxy measure of the "country risk premium" component of a company's cost of capital. Table 2 shows the average nominal yields on bonds issued by the Kingdom and the Central Bank of Bahrain with the duration relevant for the purposes of this Determination.

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[35] Batelco submission, paragraph 41, page 29.

[36] Batelco submission, paragraph 42, page 29.

Table 2 Yields on government securities issued in Bahrain (%)

Averaging period	7-year CBB Intl. Sukuk, 6.3%	10-year Kingdom of Bahrain, 5.5%	Average
Issue date	22 November 2011	31 March 2010	
Time to maturity	6.2 years	7.6 years	
Spot (11 September 2012)	4.0	4.8	4.4
Three months	4.5	5.4	5.0
One year	n/a	5.9	5.9
Two years	n/a	5.7	5.7

Note: n/a denotes that sufficient time has not elapsed since issuance to estimate this average statistic.
Sources: Bloomberg, and the Authority's calculations.

138. The current yield to maturity on the 7-year International Sukuk issued by the Central Bank of Bahrain in November 2011 is 4.0%, while the current yield on the 10-year bond issued by the Kingdom of Bahrain in March 2010 is 4.8%. The average current yield across the two bonds is 4.4%.

139. Relative to the 2009 Determination, the current Determination does not rely on evidence on long-term Ijara Sukuk securities (Islamic Al-Salam securities). As noted in the 2009 Determination, the Government of the Kingdom of Bahrain issues long-term Ijara Sukuk securities on an ad hoc basis and these are therefore priced infrequently. In the absence of frequent data on secondary market trading of these securities, they are less likely to provide an accurate estimate of the current risk-free rate. Given the availability of better data for the purposes of the current Determination—i.e., daily data on yields on government bonds which have been issued since 2009—the Authority has focused on the latter. The Authority notes that the improved quality of market data also increases the reliability of the estimate of the Bahraini risk-free rate and allows for the Authority to place an increased emphasis on the WACC estimate from the perspective of the domestic investor relative to the 2009 Determination.

140. The Authority intends to estimate the risk-free rate based on government bonds with approximately five to seven years remaining until maturity. For the 10-year bond there are 7.6 years remaining to maturity, while for the 7-year Sukuk there are 6.2 years remaining to maturity. The average time to maturity across the two bonds is around seven years, which suggests that a simple average of the current yields on these bonds may provide an approximate estimate, in the absence of more granular market data for the yield on a bond with about seven years to maturity. As such, this evidence may provide a reasonable proxy for the lower bound of the underlying nominal risk-free rate in Bahrain.

141. This estimate reflects the combined risk-free rate and a proxy measure of the country risk premium required by a less diversified investor. No country risk premium needs to be added when calculating the cost of capital from the perspective of the less diversified investor, as the proxies used to estimate the risk-free rate already incorporate such a premium. However, to allow for uncertainty in the way the risk-free rate might evolve over the period for which this Determination will be valid, the Authority proposes an uplift of 50bp to the 4.4% average yield estimate.

142. Therefore, a range of 4.4–4.9% for the risk-free rate is proposed in this Determination, assuming a less diversified, domestic investor. This is a narrower range than the 3.5–5.8% estimate for the domestic risk-free rate in the 2009 Determination, which reflects the availability of better data on Bahraini government securities. The current midpoint of the risk-free rate range from the domestic investor perspective (4.65%) is the same as the midpoint in the 2009 Determination (4.65%).

Responses to the Draft Determination

143. Batelco expressed a preference for using evidence on the three dollar-denominated bonds issued by the government of Bahrain.[37] In addition to the two bonds maturing in 2018 and in 2020 considered by the Authority (7-year International Sukuk and 10-year Kingdom of Bahrain, respectively), Batelco included a bond maturing in 2022.

144. In its central-case estimate for the risk-free rate, Batelco used one- and two-year averages rather than spot rates. Since the bonds maturing in 2018 and 2022 were issued relatively recently and do not have a one- or two-year history, only the 2020 bond was used by Batelco to calculate the risk-free rate. Furthermore, Batelco proposed combining its estimate of the risk-free rate with a financial volatility premium of 50bp.

145. Zain agreed with the range estimate proposed by the Authority for the domestic risk-free rate[38].

The Authority's analysis and conclusion

146. The Authority excluded the bond maturing in 2022 from its analysis because its maturity falls beyond that chosen by the Authority, based on the remaining asset lives. However, the Authority notes that if this bond were to be included, the risk-free rate estimate would not be materially different and would fall within the range of 4.4–4.9% proposed by the Authority.

147. The Authority notes that the approach proposed by Batelco, to use a longer historical period over which to average bond rates as well as to add the 50bp margin, amounts to double-counting the effects of recent volatility. This is not an appropriate approach because both averages and the premium serve the same purpose of addressing the low level of yields currently observed in the market. For the reasons set out above, the Authority has accounted for the uncertainty in future bond rate movements once, through the 50bp margin.

148. For the reasons set out in the Draft Determination, and having considered the comments received, the Authority remains of the view that a range of 4.4–4.9% appropriately reflects the risk-free rate, assuming a less diversified, domestic investor.

5.4 Risk-free rate in the international context

149. Estimating the risk-free rate based on yields on government bonds in other countries can be used to complement estimates based on Bahrain securities. The resulting estimate of the risk-free rate might provide more reliable information about investors' expectations

[37] Batelco submission, Figure 8, page 29.

[38] Zain submission, page 6.

regarding the risk-free rate because it is based on instruments that are frequently traded in liquid financial markets.

150. There is a relationship between interest rates in different countries, which is characterised by a number of "parity conditions". The interest rate parity condition specifies a relationship expected to hold between interest rates or yields on securities issued in different jurisdictions. In particular, the so-called "uncovered interest parity" condition implies that the differential between domestic (e.g., Bahrain) and foreign or "world" (e.g., US) interest rates will be equal to the expected change in the price of the domestic currency in terms of the foreign currency, assuming free capital mobility and no risk.

151. With the fixed exchange rate between the Bahraini dinar and US dollar—based on an arrangement wherein the Central Bank of Bahrain can buy and sell US dollars at rates very close to the official exchange rate—and assuming no risk of a change in this regime, expected currency depreciation would be zero. Hence, the domestic and foreign interest rates might be expected to be equal. Therefore, given the fixed exchange rate, the yields on US government debt can be seen as the appropriate reference point for the risk-free rate for an investor investing in Bahrain.

152. Even where the nominal exchange rate is fixed, the real exchange rate might change over time, if there is a difference in inflation between the domestic and foreign markets. If the domestic market (e.g., Bahrain) has lower inflation than the foreign market (e.g., the USA) and the nominal exchange rate is fixed, the domestic currency is appreciating in real terms. Thus, under the same interest rates, and in the absence of a risk differential, an investor in the domestic market would benefit compared with one investing (and consuming) in foreign markets in the event that the inflation rate in Bahrain is lower than in the foreign market.

153. Using the law of one price, according to the purchasing power parity ("PPP") condition, under the assumption of small or negligible transaction costs and import tariffs, the difference in nominal interest rates between two countries would then be equal to the difference in expected inflation. In other words, if there is a positive inflation differential and arbitrage is possible, PPP requires that the nominal interest rates differ by the difference in inflation such that real interest rates in the two countries remain equal.

154. If the interest parity and PPP conditions hold, the interest rate in the USA provides an appropriate reference point for the international investor investing in Bahrain. If the international investor were assumed to invest (and consume) in Bahrain, they would be earning the Bahraini nominal interest rate, and the same real interest rate as the investor investing in the assets abroad (e.g., in the USA). If the international investor were to invest in Bahrain but use the returns to consume abroad (e.g., in the USA), they would then need to earn the equivalent of the nominal US interest rate that would provide them with the appropriate compensation for the same real interest rate as well as the difference in inflation.

5.5 International risk-free rate in practice

The Draft Determination

155. Persistent inflation differentials between Bahrain and the USA would imply continual changes in the real exchange rate, despite the fixed nominal exchange rate between the Bahraini dinar and the US dollar. This would also imply persistent differences in nominal

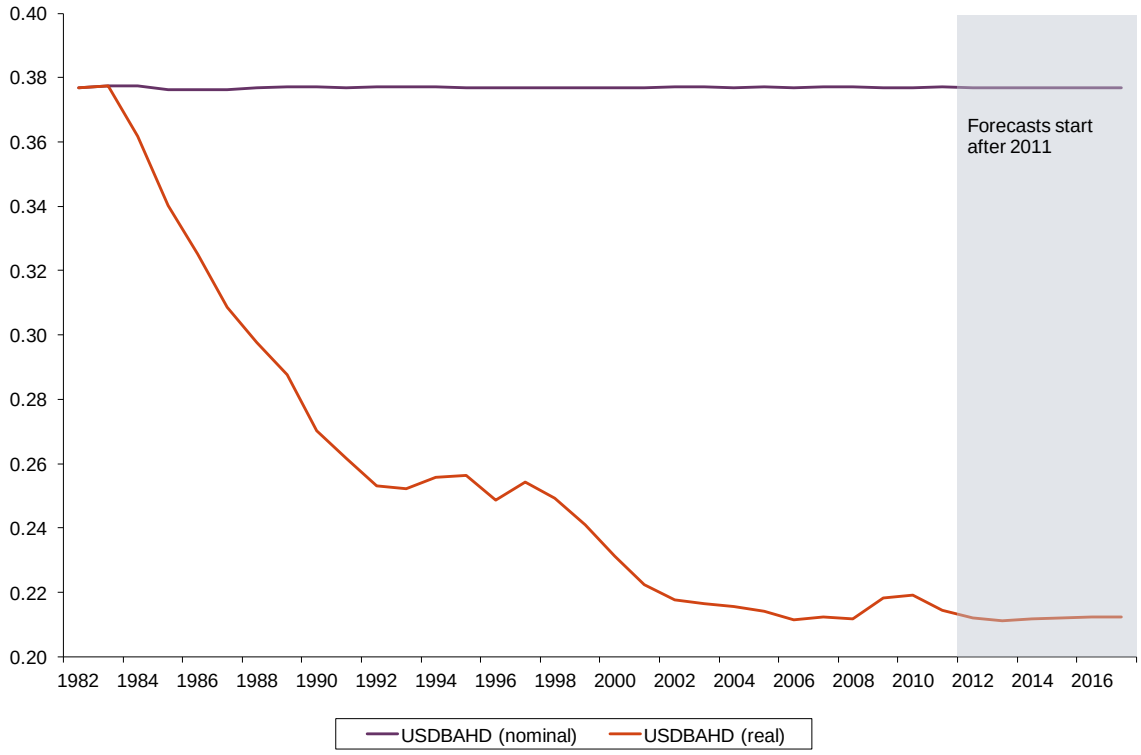
interest rates, even if the interest parity conditions hold. This might not be sustainable in the long run.

156. Figure 11 below shows the real and nominal exchange rates between the Bahraini dinar and the US dollar. Whereas the nominal exchange rate has been fixed at 0.376 dinars to the dollar, the dinar appreciated steadily in real terms against the US dollar between 1982 and 2006. This suggests that differences in inflation rates between the USA and Bahrain persisted for several years, suggesting a difference in the nominal interest rates as well. That is, a higher nominal interest rate in the USA would have been expected to compensate investors for higher inflation in the USA compared with the return on Bahraini assets.

157. Nevertheless, the evidence suggests that, since 2001, the inflation differential has been relatively small (Figure 11). The latest forecasts from the International Monetary Fund ("IMF") suggest that the inflation in both countries will equalise at 2% by 2017. This suggests that yields on US government debt are a good proxy for the nominal risk-free rate in Bahrain and the appropriate reference benchmark for the international investor investing in Bahrain. The Authority therefore considers that the yield on nominal US government debt can be used as a proxy measure for the risk-free rate used to estimate the cost of capital in the international investor scenario.

Figure 11 Real and nominal exchange rates

(Bahraini dinar per US dollar)



Note: The real exchange rate is defined as the nominal exchange rate multiplied by the ratio between the price indices in Bahrain and the USA.
Sources: International Monetary Fund (2012), "World Economic Outlook Database", April, Datastream, and the Authority's calculations.

158. The assumptions underlying the parity conditions described above may not always hold, particularly in the short run, for several reasons. For example, in less developed countries, there could be significant transaction costs associated with cross-border transactions, or there might be imperfect capital mobility. Domestic and foreign assets also might not be substitutable owing to country risk premiums.

159. Investors would also require compensation for economic, political, institutional and financial risks associated with Bahrain, insofar as these affect the risk associated with investing in a company. The discussion thus far has assumed that there is no risk premium associated with domestic assets (i.e., there is no risk premium that investors might require for investing in Bahrain compared with the US benchmark). If the yield on US Treasury bonds is assumed to be the proxy for the international risk-free rate, an international investor might require a country risk premium to invest in companies operating in Bahrain rather than companies operating in the USA. Hence, in the presence of additional country risks, the Bahraini rates of return would be higher than in the USA.[39] This issue is addressed in the section on the country risk premium.

160. If the interest parity conditions hold, then under a floating exchange rate differences in rates of inflation between countries would be expected to be reflected in a differential in nominal interest rates between countries and expected changes in the exchange rate. If the exchange rate is fixed but markets are fully internationally integrated, nominal interest rates and inflation would be expected to equalise.

161. To the extent that markets are segmented into separate national markets, it is possible for there to be differences in interest rates and inflation, particularly in the short run. Therefore, in this Determination the Authority has considered the cost of capital from the perspectives of both international and domestic investors to account for any potential differences.

162. A domestic investor would expect to receive compensation for the domestic rate of inflation to compensate for changes in purchasing power in the domestic market, hence the relevant interest rate would reflect the expected rate of inflation in Bahrain. This is implicitly included in the estimation of the risk-free rate from the perspective of the domestic investor, because this approach is based on yields from securities issued by the Government of the Kingdom of Bahrain. The domestic interest rate could also be approximated by the sum of an international interest rate plus the expected inflation differential and adjusted for country risk if relevant.

163. A foreign investor (e.g., from the USA), would need to be compensated for the rate of inflation in the foreign market. This is because the foreign investor is assumed ultimately to use investment proceeds to fund consumption in the foreign market. If higher returns were permanently available in Bahrain, compared to the foreign market (in the absence of risk of the fixed nominal exchange rate changing), this would represent a risk-free profit opportunity for the foreign investor, which could invest in Bahrain but use proceeds for consumption in the foreign market.[40]

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[39] The relative impact of any persistent difference in expected inflation rates and the presence of a risk premium might be expected to determine the actual differences in nominal interest rates between Bahrain and the USA. These two effects could act in opposite directions and hence may, to some extent, cancel each other out.

[40] As discussed in the section on the country risk premium, exchange rate risk is assumed to be small.

164. In any case, under a fixed exchange rate, significant inflation differentials would not be expected to persist because they would imply permanent shifts in the real exchange rate until price differentials are equalised.

165. The Authority is therefore of the view that, in the absence of risk of the fixed nominal exchange rate changing, the yield on nominal US government debt can be used as a proxy measure for the risk-free rate used to estimate the expected return to the international investor. From the perspective of the domestic investor, the inflation differential is already implicitly accounted for as a part of the yields on securities issued by the Government of the Kingdom of Bahrain. The Authority also notes that any country-specific risks are already accounted for in the country risk premium added to the cost of capital estimates.

Responses to the Draft Determination

166. Although its submission focused on the domestic investor scenario, Batelco provided some comments on the Authority's approach to estimating the risk-free rate in the international investor scenario. According to Batelco, the Authority opted to use only US bonds in its international analysis[41]. Batelco recommended analysing evidence on both UK and US government bonds with five- and ten-year maturities. In addition, Batelco noted that the Authority had not included any allowance for an inflation differential between Bahrain and the USA on the basis that inflation rates in the two countries are expected to equalise by 2017[42]. Batelco disagreed with this, and proposed taking into account the average differential between Bahraini inflation and inflation in the UK and the USA over the period 2013–17, which Batelco estimated to be around 0.2%.[43] T).

167. Zain found the Authority's approach acceptable with regard to the risk-free rate.

The Authority's analysis and conclusion

168. In the Draft Determination, the Authority considered the evidence on the risk-free rate from the USA in the international investor scenario as a starting point of the analysis[44]. However, the Authority did not base its proposed risk-free rate for the international investor scenario on the US bond evidence, as such as approach would have resulted in negative real yields. It is therefore incorrect for Batelco to claim that the Authority had only used US bonds under this scenario. The approach taken by the Authority in estimating the risk-free rate for the international investor scenario is discussed below..

169. With regard to inflation, the Authority now takes the most recent IMF forecast into account, and adopts a 2% inflation expectation in Bahrain over the period 2013–17.

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41 Batelco submission, paragraph 35, page 26.

42 Batelco submission, paragraph 34, page 25.

43 The source of inflation information used by Batelco and the Authority are slightly different in timing. The IMF forecasts are used by both; however, Batelco relies on the updated numbers as at October 2012, whereas the Authority's calculations were made in September 2012 (11 September 2012 was the cut-off date.

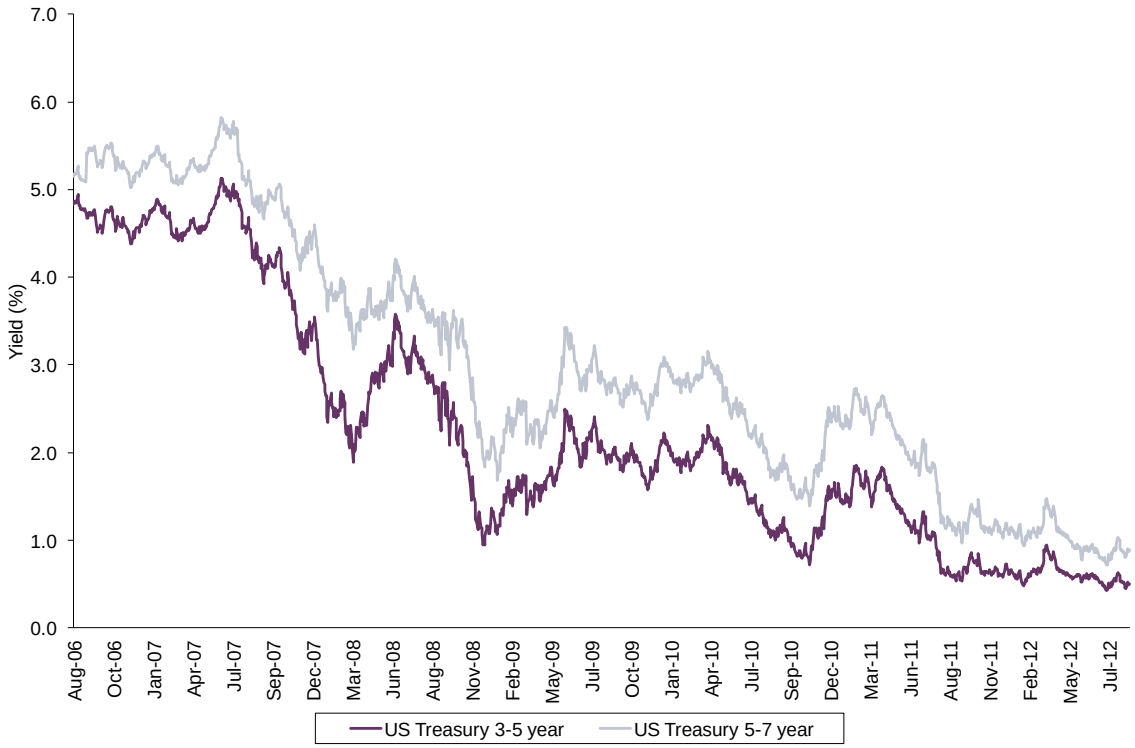
44 The basis for this approach was set out in detail in the 2009 Determination.

5.6 Estimation from US government securities

The Draft Determination

170. The risk-free rate can be proxied by the yield to maturity on US Treasury bonds. Figure 12 below shows the evolution of the yield to maturity on benchmark indices of US Treasury bonds of 3–5-year and 5–7-year maturities. The nominal yield on US Treasury bonds has declined since 2006, especially after the onset of the financial turmoil around July 2007, and as a result of the unusual monetary policy environment in the USA and a number of other countries, often referred to as quantitative easing.

Figure 12 Yields on nominal US Treasury bonds (%)



Note: Based on Merrill Lynch US Treasury Index with maturities of 3–5 years and 5–7 years.
Sources: Datastream, and the Authority's calculations.

171. Table 3 summarises the average yields across different time periods and maturities.

Table 3 Average nominal yields on US Treasury bonds (%)

Averaging period	3–5-year maturity	5–7-year maturity
Spot (11 September 2012)	0.5	0.9
One month	0.5	0.9
Three months	0.5	0.9
One year	0.6	1.1
Three years	1.2	1.9
Five years	1.7	2.5

Note: The spot yields are reported as at 11 September 2012.
Sources: Datastream, and the Authority's calculations.

172. Over the last three years, yields have been following a downward trend, and spot yields for the relevant part of the maturity curve are now 0.9% or lower. Combined with the IMF inflation forecast of 2% for the USA in 2017,[45] this implies a real yield of –1.1%. A negative real yield effectively means that investors are willing to pay for lending money to the government of the USA. It is unlikely that any company would be able to benefit to the same extent as the government of the USA from the unique set of circumstances that have generated negative real yields on US Treasury bonds. Therefore, when estimating the cost of capital for a company, it is necessary to exercise judgement over the extent to which the reductions in real yields on government securities have translated into a reduction in the cost of capital.

173. The next section reviews how regulators have responded to evidence of low or negative real yields on government bonds.

Responses to the Draft Determination

174. Batelco disagreed with the estimates from the perspective of an international investor proposed by the Authority in the Draft Determination. As mentioned previously, Batelco's analysis of the international risk-free rate is based on a mix of UK and US historical evidence, with inflation and currency adjustments. Batelco included the UK on the grounds of being a trading partner of Bahrain and having a liquid government bond market. Batelco estimated the international risk-free rate to be 3.92%, which is an average of 5–10-year bond rates in the USA and the UK, adjusted for inflation differentials.[46] Batelco's estimate of 3.92% also includes a country risk premium of 2.25% and a currency risk premium of 0.5% in the case of the UK (both of which are discussed below). Batelco then added the 0.5% premium proposed by the Authority to reflect recent financial volatility. Batelco noted that the resulting 4.42% is above the higher end of the Authority's proposed range for the risk-free rate under the international investor scenario (3.5–4.0%).

The Authority's analysis and conclusion

175. With regard to Batelco's claim that its estimate of 4.42% lies above the Authority's proposed range for the international risk-free rate, the Authority notes that Batelco's estimate includes a country risk premium (of 2.25%), whereas the Authority's proposed range of 3.5–4.0% does not include a country risk premium. As outlined further below, the Authority proposed adding a country risk premium of 1.7–2.0% in the Draft Determination. Combining the international risk-free rate and the country risk premium used in the Draft Determination produces a range of 5.2–6.0%, which is higher than Batelco's proposed estimate of 4.42%.

176. The Authority remains of the view that it would be inappropriate to use US bond rates to set the international risk-free rate in this Determination, due to the resulting negative implied real interest rate. In order to determine an appropriate risk-free rate for the international investor scenario, it has therefore been necessary to examine alternative

[45] International Monetary Fund (2012), "World Economic Outlook Database", April.

[46] Batelco submission, paragraph 36, page 27. The Authority notes that while Batelco refers to 3.92% in paragraph 36 of its submission, the average rate reported in Batelco's Figure 7 is 3.96%.

evidence. This inevitably involves a degree of carefully exercised judgement, as discussed below.

5.7 Recent regulatory precedents

The Draft Determination

177. In the current environment of extremely low yields for sovereign bonds with high credit ratings, it is appropriate to have regard to and place weight on recent and relevant regulatory precedents.

178. The range of risk-free rate estimates from a number of European regulators is seen in Table 4 below. As noted elsewhere in this section, it is important to control for differences in inflation when comparing nominal risk-free rates that relate to different currencies. For example, the Ofcom precedents of 4.4% are comprised of a real risk-free rate assumption of 1.4% and an inflation assumption of 3.0%. The examples of other regulatory precedents for the real risk-free rate, either implicit in the regulatory determinations or based on the forecast inflation at the time, suggest an average implied real risk-free rate of approximately 2.0%.

179. Given the uncertainty over this parameter and a desire to avoid undue precision, the Authority is of the view that the evidence supports a range for the real risk-free rate of 1.5-2.0%. Combining this with prospective inflation of about 2.0% in Bahrain suggests a range for the nominal risk-free rate of 3.5–4.0%.

Table 4 Selected precedents for nominal risk-free rate

Regulator and year of determination	Country	Company	Risk-free rate
Ofcom (2012)	UK	BT Openreach	4.4%
ARCEP (2011)	France	France Télécom	3.2%
Ofcom (2011)	UK	BT Openreach	4.4%
Ofcom (2011)	UK	BT Group	4.4%
Ofcom (2011)	UK	Rest of BT Group	4.4%
PTS (2011)	Sweden	Fixed-line operators	3.7%
ARCEP (2010)	France	France Télécom, SFR	4.0%
BIPT (2010)	Belgium	Belgacom	4.0%
Agcom (2010)	Italy	Telecom Italia	3.9%

Sources: Ofcom (2012), "Charge control review for LLU and WLR services", March 7th; ARCEP (2011), "Décision fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées de France Télécom pour l'année 2012", December; Ofcom (2011), "Charge control framework for WBA Market 1 services", 20 July; PTS (2011), "Cost of capital determination for fixed-line network", 2 February; ARCEP (2010), "La détermination du taux de rémunération du capital des activités régulées du secteur fixe, du secteur mobile et du secteur de la télédiffusion", January; BIPT (2010), "Décision du Conseil de l'IBPT du 4 mai 2010 concernant le coût du capital pour les opérateurs disposant d'une puissance significative en Belgique", May; Agcom (2010), Resolution 73 on Cost of capital determination for fixed network Telecom Italia.

Responses to the Draft Determination

180. Batelco submitted that the use of regulatory precedents is not appropriate for setting the international risk-free rate because such comparators reflect the characteristics of the national market in question and fail to account for differences in factors such as inflation, country risk, and investor preferences[47].

181. Zain and Viva did not comment on whether there was any justification for taking into consideration regulatory precedents in the analysis of the international risk-free rate.

The Authority's analysis and conclusion

182. The Authority recognises that there are differences in the characteristics of national markets. However, differences in country risk are taken into account via the country risk premium under the international investor scenario. The differences in inflation rates are also captured by deriving the implied real risk-free rate (based on the forecast inflation at the time) and adding the Bahraini expected inflation. Any further inflation adjustment would result in double-counting.

183. The issue of varying investor preferences is already addressed by the Authority in its overall approach to the cost of capital. Domestic and international, and thus diversified, investor scenarios are used to strike a balance between using purely Bahrain-specific and worldwide (in this case, European) estimates.

184. The Authority remains of the view that, given the implications of using US bond rates in the present circumstances, the regulatory precedents identified by the Authority present useful evidence on how other regulators have dealt with the market distortions caused by governments' actions to address the financial crisis that led to negative implied risk-free rates.

5.8 Proposed ranges for the risk-free rate

The Draft Determination

185. Conceptually, and under normal circumstances, the appropriate way to estimate the risk-free rate for the international investor would be by reference to the spot yields on US Treasury bonds. However, in the current environment, the Authority is of the view that it is appropriate to assign significant weight to the recent regulatory precedents to address the issue of negative real yields on US Treasuries. This represents a change in approach to setting this parameter compared with the 2009 Determination.

186. The Authority therefore considers that, from the perspective of an international investor in Bahrain, 3.5–4.0% is an appropriate estimate of the nominal risk-free rate. This represents a significant premium to spot yields on US Treasuries.

187. Therefore, the Authority proposes to use a range for the nominal risk-free rate of 3.5–4.0% from the perspective of the internationally diversified investor. This proposed range for the nominal risk-free rate is higher than the range in the 2009 Determination (3.2–3.7%) owing to an adjustment for the impact of unusual monetary policy on yields.

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[47] Batelco submission, paragraph 37, page 27.

188. The question of whether it is appropriate to add a country risk premium to reflect the additional risk that an investor might face in investing in Bahrain rather than the USA is discussed in the next section.

189. Under the domestic investor scenario considered by the Authority based on a domestic investor, a range of 4.4–4.9% is proposed, based on average yields for securities issued by the Kingdom and the Central Bank of Bahrain. This is narrower than the range of 3.5–5.8% in the 2009 Determination, due to the better quality of market data on returns for Bahraini government bonds. This range implicitly includes a country risk premium.

Responses to the Draft Determination

190. The responses received have been noted in the relevant parts of this analysis of the risk-free rate.

The Authority's analysis and conclusion

191. Having considered the responses received, the Authority remains of the view that:

    a. from the perspective of an international investor in Bahrain a range of 3.5–4.0% is an appropriate estimate of the nominal risk-free rate; and

    b. from the perspective of a domestic investor a range of 4.4–4.9% is an appropriate range for the estimate of the nominal risk-free rate.

192. The range for the international investor is primarily based on the regulatory precedents adjusted for Bahraini forecast inflation, while the range for the domestic investor is based on securities issued by the Government of the Kingdom of Bahrain.

6 Country risk premium

193. Investors may be exposed to additional risk as a result of investing in companies operating in Bahrain rather than companies operating in other countries, such as the USA. To the extent that this risk is systematic and non-diversifiable, investors would expect additional compensation for exposure to that risk.

194. In addition to country risk, there may be currency risk. Currency risk may arise where the cash flows to an investor are denominated in a currency different to that in which the investor intends ultimately to use the proceeds of investment to pay for their consumption of goods and services.

195. The magnitude of the country risk premium for investing in Bahrain can be proxied by sovereign credit risk, which can be estimated with reference to the yields on debt issued by governments with similar sovereign credit ratings to Bahrain. To the extent that sovereign yields reflect risk factors specific to the sovereign rather than companies operating in that country, this approach may over- or underestimate the corporate cost of capital.

196. An estimate of the country risk premium may be added to the risk-free rate for the calculation of the cost of capital in the international investor scenario. However, a country risk premium is not warranted for the scenario which considers the risk-free rate from the perspective of the domestic investor since the yields used to estimate the risk-free rate for that case would already be expected to include such a premium.

197. The remainder of the section is structured as follows:

    a. currency risk is considered, together with an examination of whether an associated premium is applicable to the current assessment;

    b. the concept of country risk and the effect on investors' required returns are discussed next;

    c. country risk premiums are assessed on the basis of sovereign debt spreads;

    d. the Authority's proposed estimate of the country risk premium is presented.

6.1 Currency risk

The Draft Determination

198. The currency risk faced by an investor in assets denominated in Bahraini dinar is that the value of the investment will change as a result of unanticipated movements in the nominal exchange rate. Since the Bahraini dinar has, in effect, been pegged to the US dollar at a constant rate of 0.376 dinars to the dollar since 1980, the nominal exchange rate might be expected to remain constant over the duration of this Determination. Currency risk is unlikely therefore to be a major risk for investment and does not provide justification for an additional premium for currency risk.

Responses to the Draft Determination

199. In its submission, Batelco agreed with the Authority that where the international risk-free rate is based on US bonds, there is no need to allow for currency risk as the Bahraini dinar is pegged to the US dollar. However, Batelco submitted that it may be appropriate to allow

for currency risk in the event that the sample is expanded to include countries whose currencies are not fixed against the Bahraini or US currencies. In such circumstances, Batelco proposed adding a currency risk premium of 0.5% to the risk-free estimates based on UK evidence[48].

200. Zain and Viva did not comment on the issue of currency risk.

The Authority's analysis and conclusion

201. As explained in the previous section, the Authority has made a change in its approach to the risk-free rate from the 2009 Determination, and it is of the view that it is appropriate to assign significant weight to the recent regulatory precedents to address the issue of negative real yields on US Treasuries. It is also worth mentioning that the 3.5–4.0% as a range for the risk free rate represents a significant premium to the spot yields on US treasuries.

202. The Authority also notes that Batelco provided no evidence to support its proposed currency risk margin of 0.5% to be applied to the UK risk-free rate. In principle the currency risk could be an issue. However, given the difficulty in quantifying such an effect, and the lack of a substantiated estimate in the submissions, the Authority considers that the margins already built into its WACC estimate are likely to be sufficient to accommodate such risk.

6.2 Country risk

203. Investments may be exposed to the risk of the country in which they generate cash flows. This risk may be systematic—related to the returns on the global market—or idiosyncratic. From the perspective of a globally diversified investor, any compensation for additional risk would be contingent on whether the risk is systematic or diversifiable.

204. To the extent that country risk is idiosyncratic, it could be diversified by holding a global portfolio of assets. Therefore, globally diversified investors would not be expected to be compensated for this risk, on average, and hence would require no premium for country risk. In practice, the country risk might not be diversifiable and would need to be compensated for in the cost of capital for the following reasons:

    a. imperfect international capital flows and investors' propensity to exhibit a preference for domestic securities—the home-bias puzzle;[49]

    b. an increasing correlation between national economies and equity markets, implying that a greater proportion of the overall risk is non-diversifiable;

    c. a requirement on the regulated company to pay the full amount of the risk premium that investors demand as compensation for the probability of loss from default.[50]

205. The home-bias phenomenon might be due to barriers to international capital flows, the effects of national boundaries, or preferences for geographically proximate investments.[51]

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[48] Batelco submission, paragraph 46, page 30.

[49] French, K. and Poterba, J. (1991), "Investor diversification and international equity markets", *American Economic Review*, **81**, pp. 222–26.

[50] With a positive probability of default, the actual amount the company expects to pay will be lower than the full amount promised to investors, as the companies' payments to creditors would be lowered after a default event.

206. Closer correlation between national economies and equity markets due to increased international trade and capital flows might be expected to have reduced the ease of diversifying non-systematic risks. Hence, investors may now require compensation for a greater element of country risk. Furthermore, there is evidence to suggest that correlation between national equity markets increases at times of crisis.[52]

207. Therefore, if investors require compensation for this risk, it should form part of the allowed returns.

6.3 Estimation of the country risk

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208. The country risk premium could be proxied by sovereign credit risk, which can be estimated by measuring the premium for yields on US dollar-denominated debt issued by the Government of the Kingdom of Bahrain over debt issued by the US Government. This is the approach implicit in the domestic investor scenario.

209. An alternative approach is to benchmark the country risk premium with reference to the yields to maturity on US dollar-denominated sovereign debt issued by countries with a credit rating comparable to that of Bahrain.

210. Bahrain currently has a sovereign long-term foreign currency credit rating of BBB, compared with a sovereign long-term foreign currency credit rating of A in the 2009 Determination.[53]

211. Table 5 below shows current yields on US dollar-denominated BBB-rated bonds issued by sovereign states and due to mature in 2020. The average spread on BBB-rated sovereign bonds (excluding Bahrain) relative to the USA is approximately 170bp. If Bahrain is included in the averaged sample, the spread rises to just above 200bp. It should be noted that in deriving the sovereign spread using spot yields, the incremental country risk is being captured. The implicit assumption is that the effect of quantitative easing and other factors that depress current sovereign bond yields can be observed both in the USA and across the comparator countries, hence the spreads measure the country risk net of these effects. This is potentially a conservative assumption.

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[51] Coval, J. and Moskowitz, T. (1999), "Home Bias at Home: Local Equity Preference in Domestic Portfolios", *Journal of Finance*, **54**:6, December.

[52] Ball, C. and Torous, W. (2000), "Stochastic Correlation Across International Stock Markets", *Journal of Empirical Finance*, **7**:3–4, November, pp. 373–88.

[53] Standard & Poor's (2011), "Research Update: Rating On Bahrain Removed From Watch Negative And Affirmed At 'BBB'; Outlook Negative Due To Latent Political Tensions", 20 July.

Table 5 Spot yields on US dollar-denominated sovereign bonds maturing in 2020

Country	Yield (%)	Spread (bp)
Bahrain (BBB-rated)	5.0	406
Lithuania (BBB-rated)	3.5	262
Peru (BBB-rated)	2.5	162
Russia (BBB-rated)	2.8	195
Mexico (BBB-rated)	2.3	136
Brazil (BBB-rated)	2.2	135
Panama (BBB-rated)	2.2	130
USA (benchmark)	0.9	
Average spread relative to USA		*204*
Average spread relative to USA (excluding Bahrain)		*170*

Notes: Numbers are rounded to one decimal point. Peru has not issued a bond that is due to mature in 2020; therefore, the spread for Peru is based on average spreads for bonds maturing in 2019 and 2025. Yields as at 11 September 2012. The following bonds are considered: Kingdom of Bahrain, 2010, coupon 5 1/2%, 31/03/20; Lithuania, 2010, coupon 7 3/8%, 11/02/20; Peru, 2009, coupon 7 1/8%, 30/03/19; Peru, 2005, coupon 7.35%, 21/07/25; Russia, 2010, coupon 5%, 29/04/20; United Mexican States, 2010, coupon 5 1/8%, 15/01/20; Brazil, 2000, coupon 12 3/4%, 15/01/20; Panama, 2009, coupon 5.2%, 30/01/20. US Treasury benchmark is the Bank of America Merrill Lynch US Treasury Index with maturities of five to seven years.
Source: Datastream.

212. The Authority does not disaggregate the country risk premium into specific components such as the size of the country and economy, the level of diversification of the economy, or the legal and commercial framework. A proxy measure to quantify the level of such risk factors in aggregate is the sovereign credit rating of Bahrain. If Bahrain is significantly more risky than other BBB-rated countries, then it would be expected to have a lower sovereign credit rating.

6.4 Proposed estimate of the country risk premium

213. Considering the evidence on sovereign debt spreads, the Authority proposes to use a conservative estimate of 170–200bp for the country risk premium. This will be added to the required returns from the perspective of an internationally diversified investor. The proposed estimate is higher than the 150bp country risk premium in the 2009 Determination, which incorporates the impact of the downgrade in Bahrain's sovereign long-term foreign currency credit rating. Combining the international risk-free rate and the country risk premium produces a range of 5.2–6.0%, as compared with a range of 4.7–5.2% in the 2009 Determination.

214. As the risk-free rate under the scenario of a less diversified investor is estimated from the yields on debt issued by the Government of the Kingdom of Bahrain, it would be expected to contain a premium for country risk; hence, no additional premium is required from the perspective of the domestic investor.

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215. Although the country risk premium is not relevant to the domestic investor scenario recommended by Batelco, Batelco's submission presented an estimate of the country risk premium for Bahrain of 2.25%, based on the model proposed by Professor Damodaran.[54] This method applies Moody's adjusted bond default spread for Baa1-rated sovereign and then multiplies it by 1.5 to capture higher volatility of emerging equity markets compared to bond markets.[55]

216. Zain agreed with the Authority's proposed range for the country risk premium.[56]

The Authority's analysis and conclusion

217. The Authority is of the view that Professor Damodaran's methodology for estimating the country risk premium is consistent with the approach of the Draft Determination, with the exception of the 1.5 adjustment for the equity market volatility. The Authority notes that Professor Damodaran's estimate of the default spread of a Baa1-rated country is 150bp, which is lower than the 170–200bp range proposed by the Authority. The 1.5 adjustment is based on Professor Damodaran's estimate of the relative equity market volatility for the emerging market economies (calculated as the standard deviation of the equity markets over the standard deviation of the bond markets).

218. The Authority recognises that there is a range of approaches for estimating the country risk premium. The Authority does not disagree with the validity of the upward adjustment for the volatility of equity markets relative to bond markets when deriving a premium for the cost of equity from bond market data. However, the Authority views the risk of overestimation as high when Professor Damodaran's approach is applied to a company in Bahrain given the current context of Bahrain's sovereign credit rating.

219. This is because sovereign default spreads used in the approaches of both the Authority and Professor Damodaran will include a premium for expected loss due to sovereign default. Sovereign bonds do not always have higher default risk and higher yield spreads than bonds issued by companies operating in those countries. It is therefore possible for country risk premiums for companies to be overestimated when they are derived from yield spreads on sovereign bonds. The Authority considers that the approach in this Determination provides an appropriate balance between the risks of over- and under-estimating the company risk premium and that applying Professor Damodaran's approach to yield spreads on BBB-rated sovereign bonds is likely to over-estimate the country risk premium applicable to a company in Bahrain.

220. The lower end of the Authority's range for the country risk premium is based on the credit spread of BBB-rated comparator countries excluding Bahrain. The Authority views this as an appropriate starting point since it is based on a sample that includes comparators only. When added to the international risk-free rate, the overall estimate can be compared with the risk-free rate adopted under the domestic investor scenario. It should be noted, however, that the upper end of the range for the country risk premium does include the Bahraini credit spread.

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[54] Batelco submission, paragraph 47, page 31.

[55] The table with the estimates and the description of Damodaran's method is available at: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html.

[56] Zain submission, page 6.

221. Having considered the comments received, the Authority remains of the view that 170–200bp is an appropriate estimate of the country risk premium under the international investor scenario.

7 Equity risk premium

222. The ERP is a key parameter in the cost of equity. It represents the expected return by an investor over and above the risk-free rate for investing in a portfolio of equities that represents the equity market as a whole. Assuming that investors hold internationally diversified investment portfolios, there is a single world ERP.

223. The robust estimation of the ERP specifically for Bahrain is not possible due to the lack of sufficiently long-run time-series data for the Bahraini equity market. Nevertheless, a comparative analysis of the Bahraini and international equity markets might suggest whether, in principle, one might expect a material difference between the world and the Bahraini ERPs.

224. Several sources of evidence and methods of estimation are available to inform an estimate of the ERP for mature equity markets, including:

    a. long-run averages of realised equity returns in excess of the risk-free rate;

    b. dividend or earnings-growth rate models;

    c. surveys of investor expectations.

225. As estimation methods forecast the average ERP over a given time horizon, a choice needs to be made between using arithmetic or geometric averages.

226. Estimation methods based on long-run average realised excess returns also require consideration of the effects of the recent financial turmoil and the extent to which the average ERP over the forecast horizon is likely to have changed recently, and might be above or below the long-run average. This is important to ensure that capital markets can be accessed by regulated companies.

227. The remainder of the section is structured as follows:

    a. having defined the ERP, the characteristics of Bahraini and international equity markets are compared to see whether there are any material differences that are likely to affect the ERP;

    b. issues associated with the empirical estimation of the ERP are discussed and the estimates of the world ERP presented, which are then compared against regulatory precedents;

    c. the effects of the financial turmoil on the ERP are considered;

    d. the relative illiquidity of the Bahraini equity market is discussed;

    e. finally, the proposed range for the ERP is presented.

7.1 Definition of the equity risk premium

228. The ERP represents the additional expected remuneration above the risk-free rate that investors require to invest in a broad market portfolio of equities. For investment decisions, the forward-looking ERP and cost of equity are relevant, and these can be estimated from historical returns or forward-looking models. The actual forward-looking ERP is unobservable, but can be estimated by modelling expected returns.

229. Under the assumption that international capital markets are integrated, there is a single global ERP. Investors can benefit from global diversification if they hold a global market portfolio. However, to the extent that international capital flow is impaired by transaction costs or other barriers, and investors do not invest in the full global market portfolio because of home bias, investors in different national equity markets might require different ERPs. These variations are present across developed markets.

230. Variations in ERP across countries could be caused by a variety of factors. For example, different weightings of industrial sectors across national stock indices might result in different ERP estimates. In less developed stock markets, where a small number of companies account for a relatively large proportion of total market capitalisations, the effect of such a deviation in risk composition may be more pronounced than for the global average, and this could affect the ERP upward or downward. That said, such deviations are difficult to estimate with any degree of robustness in the absence of long-term data on returns.

7.2 Comparison of Bahraini and international equity markets

231. If there is less-than-perfect international capital flow and there is a degree of segmentation in national equity markets, investors may require different ERPs according to the country in which they are investing. This would require estimation of a Bahrain-specific ERP. However, there is a lack of estimates for a Bahrain-specific ERP that are comparable in robustness to the estimates for some other markets. Dimson, Marsh and Staunton ("DMS"), a widely used source of data on historical ERP estimates, does not report ERP estimates for either Bahrain or other Middle Eastern countries.[57]

232. Direct estimation of the ERP for Bahrain based on excess returns to the Bahrain All-share index over the risk-free rate is unlikely to be robust for the following reasons:

    a. the number of years of data is limited. The Bahrain Bourse began operations in 1989 and the Bahrain All-share index has only existed since 2004;

    b. there is a lack of indicators to estimate robustly the historical risk-free rate for Bahrain that must be subtracted from equity returns to estimate the ERP;

    c. the Bahrain All-share index is relatively illiquid compared with the Financial Times Stock Exchange ("FTSE") All-world index.

233. The relative illiquidity of the Bahrain All-share index is demonstrated in Table 6, which compares annual share turnover ratios for the Bahrain All-share and FTSE All-world indices.

[57] Dimson, E., Marsh, P. and Staunton, M. (2011), "Global Investment Returns Sourcebook 2011", Credit Suisse.

Table 6 Average annual share turnover ratios

Averaging period	Bahrain All-share	FTSE All-world
2-year	0.06	2.86
5-year	0.16	3.58

Note: Annual turnover ratios are defined as the average of the ratio between the value of shares traded per year and total market capitalisation.
Sources: Bloomberg, and the Authority's calculations.

234. The approach adopted in this Determination is similar to the one adopted in the 2009 Determination. It compares the Bahraini equity market with international equity markets to identify whether there are any material differences in volatility, and whether there is any compelling evidence to suggest that the Bahraini ERP differs materially from the world ERP.

235. Table 7 presents estimates of the annualised volatility of the Bahrain All-share and FTSE All-world indices, measured using weekly and monthly returns over 2- and 5-year periods. For each estimate, the volatility of the Bahrain All-share index is lower than that observed for the FTSE All-world index.

Table 7 Annualised volatility of returns (%)

	Bahrain All-share	FTSE All-world
Weekly		
2-year	8.5%	18.2%
5-year	11.3%	24.1%
Monthly		
2-year	6.8%	18.2%
5-year	12.6%	21.9%

Note: Annualised volatility is estimated as the annualised standard deviation of weekly and monthly returns on equity indices. To annualise the returns, the standard deviation is multiplied by the square root of 52 (for weekly data) and 12 (for monthly data).
Sources: Bloomberg, and the Authority's calculations.

236. To the extent that the ERP is correlated with the volatility of equity returns, the data suggests that the Bahraini equity market exhibits a lower volatility relative to the FTSE All-world index. However, owing to the limited number of years of data, and the uncertainty inherent in ERP estimates, it is not possible to reach a firm conclusion about the ERP for Bahrain from this data.

237. The Authority therefore considers that the best estimate of the ERP for Bahrain would be the world ERP. The issue of liquidity is not a factor priced by the CAPM and is therefore addressed separately.

7.3 Estimation of the equity risk premium

238. The ERP can be estimated from long-run averages of historical data, or implied from current market data. The ERP implied by current market data may be more representative

of the forward-looking ERP. However, this technique produces volatile results that are sensitive to assumptions about the risk-free rate and long-run growth rates of dividends or earnings.

239. The Authority considers that robust ERP estimates from independent sources based on long-run averages of historical data constitute a more appropriate basis for estimating a stable long-run ERP for use in a regulatory determination of the cost of capital.

240. Historical data on equity returns in excess of the risk-free rate is available for a number of mature equity markets. As such, the choice of equity market to use as a benchmark is also an important determinant of the estimated ERP. Given that there is wide variation between historical excess equity returns across geographic markets, the Authority considers that a robust approach to estimating the world ERP is to use an average across these markets.

241. The estimated ERP also varies according to whether bonds or bills are used to estimate the risk-free rate. Given that yield curves tend to be upward-sloping, measures against bills of relatively short maturity tend to be higher than those against long-term bonds. An important consideration is consistency with the maturity used for the risk-free rate. Given the time horizon adopted for the risk-free rate, this Determination considers measures of the ERP against longer-term bonds.

242. Estimates of the ERP using historical data can be based on geometric or arithmetic averages. Geometric averages are lower than arithmetic averages and produce what can be seen as an unbiased forecast over a very long time horizon. Arithmetic averages produce unbiased forecasts for 1-year time horizons, according to academic research—a weighted average of the two could be appropriate to forecast time horizons between three and seven years, with the majority of the weight being placed on arithmetic averages.[58]

243. The latest geometric average of historical equity returns in excess of the risk-free rate for the international equity markets that comprise the world portfolio is 3.5% (see Table 8). This may be viewed as a reasonable estimate of the world ERP over a long time horizon. For the purpose of a forecast over a time horizon of up to seven years, the Authority considers the arithmetic average of 4.8% to be more appropriate, assuming that the ERP required by investors is currently similar to its long-term average level.

Table 8 Worldwide equity risk premiums relative to bonds, 1900–2011 (%)

Country	Geometric mean	Arithmetic mean	Standard error	Standard deviation
World	3.5	4.8	1.5	15.6

Note: The world ERP estimates represent averages of the estimates for 17 national equity markets. Returns for the full period 1900–2011 are only available for the UK and USA markets.
Source: Dimson, E., Marsh, P. and Staunton, M. (2012), "Global Investment Returns Sourcebook 2012", Credit Suisse.

[58] The formula for the weight to be placed on the arithmetic average is k = 1 – H/T, where H is the number of years in the forecast horizon and T is the number of years in the historical average. In the case of Bahrain, therefore, the weight on the arithmetic average might be approximately 0.973 = 1 – 3/118. For more details, see Jacquier, E., Kane, A. and Marcus, A. (2005), "Optimal Estimation of the Risk Premium for the Long Run and Asset Allocation: A Case of Compounded Estimation Risk", *Journal of Financial Econometrics*, **3**:1, pp. 37–55.

244. Estimates of the ERP based on historical data are subject to some degree of uncertainty. This uncertainty is reflected in the relatively large standard errors on estimates of the ERP seen in Table 8. The standard error of the estimate for the world ERP is large relative to the central estimate, which suggests that a range of at least 1% point between the low and high estimates of the ERP would be appropriate to reflect the uncertainty of the estimate. Moreover, the high standard error suggests that a point estimate of the ERP would not be appropriate. Therefore, the Authority considers that a range of 4.5–5.5% would be an appropriate estimate for the world ERP.

7.4 Regulatory precedents for the equity risk premium

245. Since there is conceptually a single world ERP applicable to all companies and sectors, it is useful to consider the ERP used by a range of international regulators as a cross-check. The regulatory benchmarks presented in Table 9 below indicate a range from 3.0% to 6.0%. The proposed range of 4.5–5.5% for the world ERP is therefore consistent with regulatory precedent.

Table 9 Regulatory benchmarks on equity risk premium estimates (%)

Country	Regulator	Company	ERP estimate
UK	Ofcom (2012)	BT	5.0
France	ARCEP (2011)	France Télécom	5.0
UK	Ofcom (2011)	BT	5.0
France	ARCEP (2010)	France Télécom, SFR	5.0
Belgium	BIPT (2010)	Operators with SMP	5.3
Finland	FICORA (2009)	Fixed-line operators	5.0–5.5
New Zealand	Commerce Commission of New Zealand (2009)	All regulated companies	5.5[1]
France	ARCEP (2008)	France Télécom	5.0
UK	Ofcom (2009)	BT	4.5–5.0
Ireland	ComReg (2008)	Eircom	4.8–6.0
UK	Competition Commission (2008)	BAA (Stansted)	3.0–5.0
UK	Postcomm (2006)	Royal Mail	3.5–5.0
Netherlands	OPTA (2006)	KPN	6.0
UK	Ofcom (2005)	BT copper access	4.0–5.0
New Zealand	Commerce Commission of New Zealand (2005)	Telecom New Zealand Ltd	5.5[1]

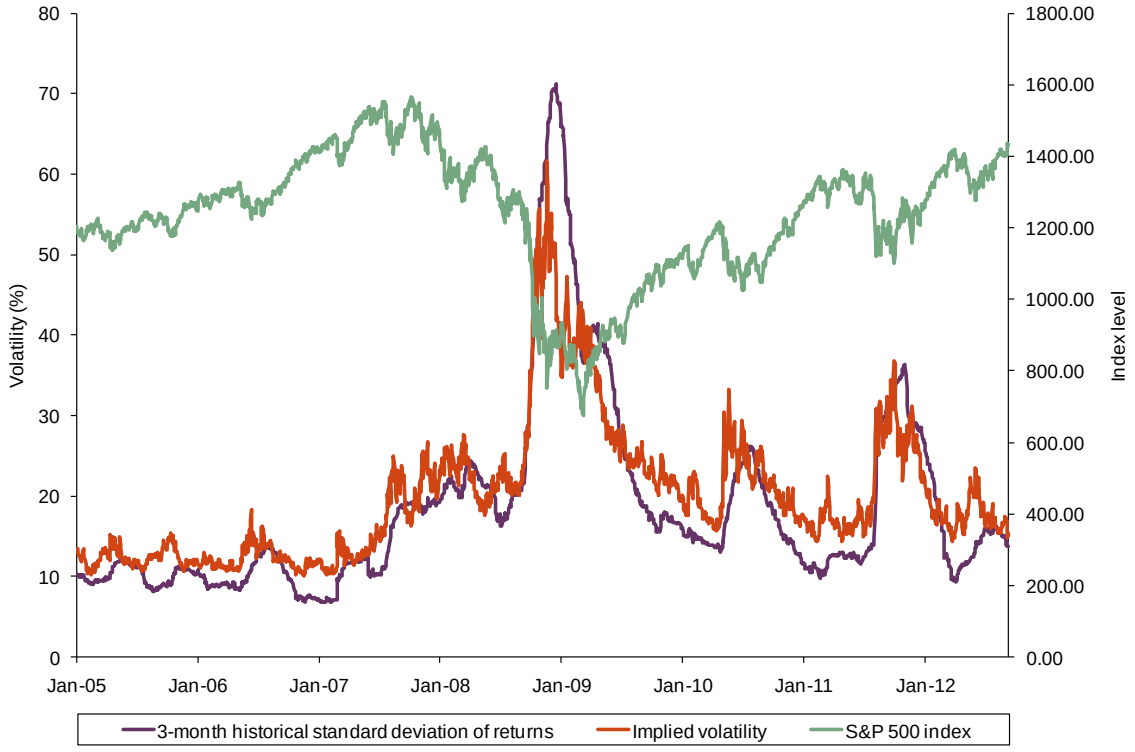
Notes: [1] The Commerce Commission of New Zealand applies the simplified Brennan–Lally CAPM to estimate the cost of equity. As such, the ERP of 7.0% must be adjusted down by the risk-free rate multiplied by the rate of personal income tax, resulting in an ERP of approximately 5.5%, assuming a risk-free rate of approximately 4.5% and a personal income tax rate of 33%.
Source: Regulatory documents.

7.5 The effects of the financial turmoil since 2007

246. When using long time periods to derive more precise estimates of the historical ERP, the greater statistical precision of averages over long time periods has to be balanced against the consideration that, over the short term, the ERP may deviate from its long-term average level, and therefore historical data may not be an accurate estimate of the current ERP. As such, the Authority proposes to use an estimate based on an average over a longer time period, but adjusted, where appropriate, to reflect current market evidence. This reflects a conservative approach.

247. One source of market data that can be used to infer the current ERP and the likelihood of it being above or below its long-run average over the next few years is the volatility implied by the prices of call options on a broad equity index. These prices reflect, among other factors, the price that investors are willing to pay for insurance against equity risk, and hence would be expected to be positively correlated with the ERP. This relationship between implied volatility ("IV") and the ERP has been empirically verified.[59] Figure 13 shows the level of IV on the Standard & Poor's ("S&P") 500 index.

Figure 13 S&P 500 implied and historical volatilities



Sources: Datastream, and the Authority's calculations.

[59] See, for example, Campbell, J.Y., Lo, A. and MacKinley, C. (1997), *The Econometrics of Financial Markets*, Princeton University Press; Scruggs, J.T. (1998), "Resolving the Puzzling Intertemporal Relation Between the Market Risk Premium and the Conditional Market Variance: A Two Factor Approach", *Journal of Finance*, **53**:2; Bliss, R. and Panigirtzoglou, N. (2004), "Option-implied Risk Aversion Estimates", *The Journal of Finance*, **59**, pp. 407–43.

248. After the onset of the financial crisis in August 2007, the level of IV on the S&P 500 increased significantly from its long-term level of approximately 15–20% and then decreased sharply at the end of 2008, continuing to decrease up to April 2010. During summer 2010, the IV climbed up, with a reversal in the latter part of the year, and this pattern has repeated in 2011. The IV remains above pre-financial crisis levels.

249. Statistical ERP estimates based on data for short time horizons are inherently uncertain. A precise estimation of the magnitude of potentially increased returns required by investors is therefore not possible. In order to reflect the evidence of the potential increase in required returns in equity markets, the Authority proposes an uplift of 50bp to the long-run historical arithmetic average world ERP of 5.0%, yielding a point estimate of 5.5% for the forward-looking ERP in a 5.0–6.0% range. This reflects the conservative approach adopted by the Authority to the estimation of the allowed rate of return.

7.6 Liquidity premium

250. The evidence presented earlier[60] suggests that the Bahraini market is characterised by relatively low liquidity. It might be reasonable therefore to assume that both domestic and international investors would require compensation for the costs of illiquidity. This risk includes the possibility of large bid–ask spreads and trading costs, which would reduce expected returns. Hence, although there is no explicit theoretical basis for a liquidity premium under the CAPM framework, an additional liquidity premium might need to be applied to the ERP.

251. Empirical studies have provided some evidence that supports the proposition that liquidity is a factor that investors price into required returns on equity. An early exposition of the hypothesis that expected return is an increasing function of the bid–ask spread was provided by Amihud and Mendelson (1986).[61]

252. Compensation for differences in liquidity across firms in a single equity market has been found to account for a significant component of returns in developed equity markets.[62] Recently, this empirical analysis has been extended to differences in liquidity between equity markets, where positive relationships between liquidity and equity returns have been measured.[63]

253. The extent to which return premiums represent compensation for liquidity rather than for other factors not priced by the CAPM (such as market capitalisation and market to book value ratios) is unclear.[64] Nevertheless, as shown by Table 6, one measure of liquidity—the equity turnover ratio—indicates that the Bahrain Bourse is significantly less liquid than the FTSE All-world index. This suggests that the ERP estimated for more developed stock

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60 See Table 6.

61 Amihud, Y. and Mendelson, H. (1986), "Asset pricing and the bid-ask spread", *Journal of Financial Economics*, **17**, pp. 223–49.

62 Gibson, R. and Mougeot, N. (2004), "The pricing of systematic liquidity risk: Empirical evidence from the US stock market", *Journal of Banking & Finance*, **28**, pp. 157–78.

63 Baekart, G., Harvey, C.R. and Lundblad, C. (2007), "Liquidity and Expected Returns: Lessons from Emerging Markets", *The Review of Financial Studies*, **20**:6, pp. 1783–831.

64 Rouwenhorst, G. (1999), "Local Return Factors and Turnover in Emerging Stock Markets", *Journal of Finance*, **54**:4, August.

markets may underestimate the returns required by an investor in the Bahrain All-share index.

254. A potential source of evidence on the magnitude of the liquidity premium is provided in Acharya and Pedersen (2003), which shows that a security's required return depends on both its expected illiquidity and the covariances of its own return and illiquidity with market return and market illiquidity.[65] The study constructed 25 value-weighted portfolios for all common shares listed on the New York Stock Exchange ("NYSE") and American Stock Exchange ("AMEX") over the period 1964–99, and estimated a variant of the CAPM that controlled for differences in liquidity. The difference in excess returns between the least and most liquid portfolios was approximately 60bp.

255. Acharya and Pedersen estimated a measure of the liquidity premium for the least liquid US stocks compared with the most liquid. This study therefore does not provide a direct estimate of the liquidity premium that an investor in a company listed on Bahrain Bourse might expect compared with one listed on a more developed equity index. In particular, the liquidity premium for large companies in domestic stock markets might be smaller than that for the least liquid stocks in mature stock markets. However, it does suggest an order of magnitude for the premium that might be expected.

256. Given the evidence that additional premiums are required to compensate for investments in illiquid securities, and that the Bahrain Bourse is less liquid than more developed equity markets, the Authority considers that, for the purposes of calculating the cost of capital in this Determination, as in the 2009 Determination, a premium of 50bp is appropriate to allow for the additional illiquidity of the Bahrain Bourse compared with the equity markets used to estimate the ERP. However, the Authority notes that this will overestimate the cost of capital under the domestic investor approach to the extent that yields on Bahraini government bonds also incorporate a liquidity premium.

257. In future Determinations the Authority intends to review whether a liquidity premium continues to be appropriate.

7.7 Proposed estimate of the equity risk premium

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258. Based on the analysis set out above, the Authority considers that an appropriate range for the ERP is 5.5–6.5%. This is based on an estimated range of 4.5–5.5% for the world ERP, a 50bp premium for the effects of financial turmoil in recent years, and a 50bp premium for the relative illiquidity of the Bahraini equity market compared with more mature equity markets. The additional premiums applied to the base ERP estimates reflect the conservative approach adopted by the Authority to the estimation of the required returns. The 5.5–6.5% range for the ERP is higher than in the 2009 Determination, which set a range of 5.1–6.1%. The increase in the ERP has been driven by the increase in the world ERP estimate since 2009.

[65] Acharya, V. and Pedersen, L. (2003), "Asset Pricing with Liquidity Risk", *Journal of Financial Economics*, **77**:2, pp. 375–410.

Responses to the Draft Determination

259. In its submission, Batelco agreed with the Authority's proposed approach to estimating the ERP using long-run historical data, and that rather than attempting to directly estimate an ERP based on the Bahrain All-share index, a world ERP based on DMS data should be considered[66]. Batelco also submitted that other sources can be considered, referring to an ERP estimated by Professor Damodaran for Bahrain (6%). Batelco supported the proposed addition of margins to account for financial turmoil and illiquidity.

260. Batelco questioned the Authority's proposed range of 4.5–5.5% for the world ERP. With regard to the regulatory precedents, Batelco argued that it is not clear whether the regulator chose the world or country-specific ERP evidence for each country, and whether the methodology in each country is comparable with the approach adopted by the Authority (e.g., CAPM framework). Furthermore, according to Batelco,[67] the lower bound of the Authority's range is inconsistent with the Authority's argument that the arithmetic average of 4.8% is more appropriate than the geometric average. Batelco also argued that the Authority's own analysis of the standard error of the world ERP indicates that an appropriate range for the world ERP should be 1.5% rather than the 1% range used in the Draft Determination. Batelco proposed a range of estimates for the ERP of 4.8–6%, and recommended that greater weight be placed on the upper end of this range.

261. Zain agreed with the ERP range proposed by the Authority.[68]

The Authority's analysis and conclusion

262. The Authority used DMS as its primary source of evidence, as it is based on a large sample of historical data, which makes the estimate more robust.[69] Furthermore, the Authority has supplemented DMS-based estimates with two additional premia to reflect the current market conditions as well as the low liquidity of the Bahraini market. These adjustments were made to reflect the likely risk an investor would face by putting their money in Bahraini equity markets in the aftermath of the financial turmoil.

263. Professor Damodaran's approach uses alternative evidence for the ERP. It is based on forward-looking, rather than historical, estimates of dividend yields and future growth rates of the global economy. There are two potential issues that make this approach less relevant and appropriate in the context of the current Determination. First, forward-looking estimates are prone to significant fluctuations over time—in times of financial crisis, dividend yields, and therefore estimated risk premia, tend to be high, whereas in periods of economic boom the opposite is likely to be true. Professor Damodaran's own estimates for the ERP were relatively low prior to 2008, and may therefore have given rise to lower cost of capital estimates in the past. Second, adding a financial turmoil premium to forward-looking estimates double counts its effect. By definition, forward-looking evidence already incorporates any premia expectations.

264. With regard to the ERP range prior to the adjustments, Batelco has misinterpreted the Authority's use of the DMS estimate of 4.8%. The point estimate has first been rounded to 5%, around which a range of 1% has then been added (i.e., 4.5–5.5%). Furthermore, the

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66 Batelco submission, paragraphs 50–53, page 32.

67 Batelco submission, paragraph 54, page 33.

68 Zain submission, pages 6–7.

69 This was the approach taken in the 2009 Determination.

Authority presented evidence to give a general indication of the range. It is not intended to be directly derived from the standard deviations observed in the past.

265. The Authority maintains the position that an appropriate range for the ERP is 5.5–6.5%, based on an estimated range of 4.5–5.5% for the world ERP, a 50bp premium for the effects of the current financial turmoil, and a 50bp premium for the relative illiquidity of the Bahraini equity market in comparison with more mature equity markets. This range has been derived without placing any weight on regulatory precedents as these may not be directly comparable to the current context. However, the Authority notes that the range is high relative to precedents for the ERP from regulatory determinations in other countries.

8 Equity beta

The Draft Determination

266. The equity beta reflects the exposure to systematic risk of a company's equity relative to the overall equity market risk. A range of evidence can be used to estimate equity betas, including direct estimates of betas for companies under consideration and indirect estimates based on comparator companies.

267. In principle, beta estimation can be done for regulated telecommunications services in aggregate, and potentially also for disaggregated business activities. In practice, the latter poses significant empirical challenges in order to arrive at robust estimates. This section explores methods for estimating beta, and discusses potential risk differentials across different businesses in the telecommunications sector.

268. The remainder of the section is structured as follows:

    a. the analytical framework for estimating beta at the aggregate and disaggregate levels is outlined before presenting direct estimates of the equity beta and estimates from comparator companies;

    b. regulatory precedents for asset betas are then presented;

    c. the potential for systematic risk differentials between different business areas in the Bahraini market context is examined;

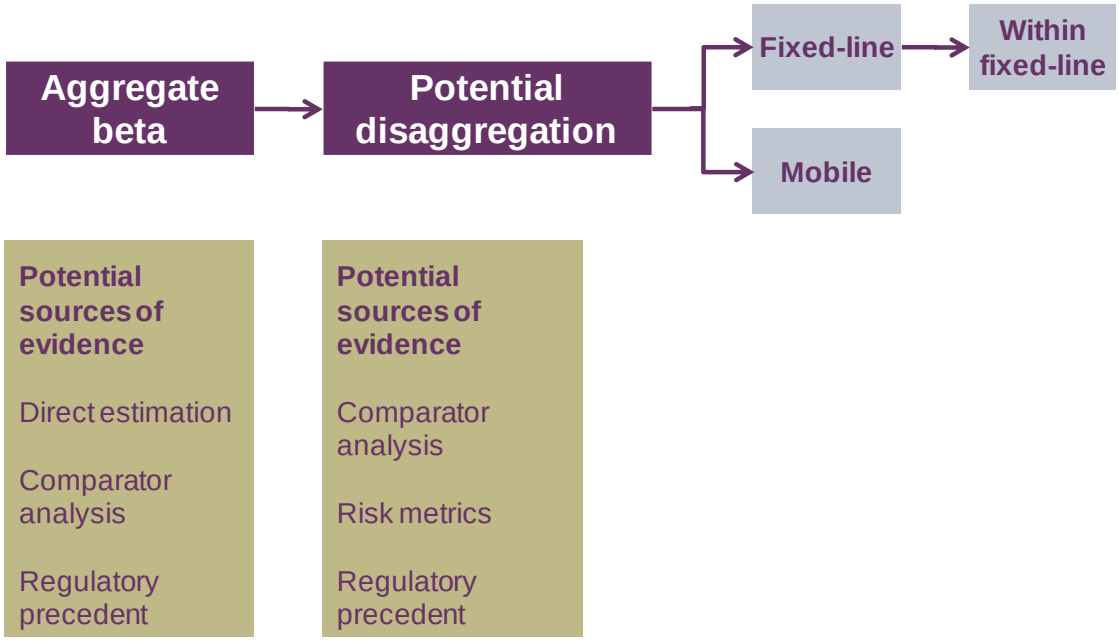
    d. lastly, ranges for the beta for regulated telecommunications services in Bahrain are proposed.

8.1 Analytical framework for estimating beta

269. The beta measures the sensitivity of an investment's return to the market return. The equity beta of the overall equity market is equal to one, and, by construction, the market capitalisation weighted average of the equity betas for the constituents of the market must also equal one. Therefore, the equity beta for an individual company can be interpreted as the amount of systematic or non-diversifiable risk that the company contributes to the market portfolio.

270. The analytical framework used for estimating equity beta in this Determination is depicted in Figure 14 below.

Figure 14 Analytical framework for estimating equity beta



Source: The Authority.

271. The first step is to estimate a beta for all regulated telecommunications services in aggregate—i.e., at the company level. Three sources of evidence are considered:

    a. direct estimation of the equity betas of regulated telecommunications companies operating in Bahrain: Batelco, Zain and STC;

    b. analysis of a wider sample of betas for telecommunications companies comparable to Batelco, Zain and STC;

    c. regulatory precedents for estimates of betas in the telecommunications sector.

272. Once the beta has been estimated at the aggregate level, the extent to which different business areas might have different exposures to systematic risk needs to be considered. Where any differences are found, these need to be quantified, where possible, and supported by robust evidence that allows the delineation of potentially different levels of systematic risk for different telecommunications services with sufficient certainty. The Authority has considered the potential for disaggregation at three levels:

    a. between fixed-line and mobile;

    b. within fixed-line;

    c. for roll-out of ultra-fast broadband compared with existing infrastructure.

273. The sources of evidence available to assess risk differentials between different business areas include:

    a. analysis of betas for companies judged to be “pure-play” comparators to different business areas;

    b. analysis of risk metrics based on accounting or operational data for different business areas;

    c. regulatory precedents for the disaggregation of beta.

274. Equity betas are a function of both the systematic risk of the business and the financial risk deriving from a company's choice of capital structure. Each comparator equity beta must therefore be un-levered according to the appropriate leverage ratio to ensure like-for-like comparison. The asset betas must then be re-levered using the forward-looking leverage ratio estimated for the company or market of interest, which produces an estimate of the forward-looking equity beta.

275. Since this Determination assumes a leverage ratio of 0% for a regulated company operating in the Kingdom of Bahrain, re-levered equity betas will be the same as the estimated asset betas.

8.2 Equity beta estimation: direct estimates

276. Direct estimates of the asset betas for Zain, Batelco and STC are presented in Table 10. These have been obtained using regression analysis measuring the correlation of equity returns for these companies with returns on either the domestic equity markets where the companies are listed or the world equity market.

277. The asset betas presented in the table are derived from Blume-adjusted estimates of equity betas, which are calculated as: $2/3 \times$ raw beta estimate + $1/3 \times 1$. This adjustment is one way to control for the tendency of statistical analysis to overestimate betas higher than one and underestimate betas lower than one.[70] As equity betas for network companies are often lower than one, this adjustment will tend to produce larger, and hence more conservative, beta estimates.

278. The betas are based on weekly returns over 2- and 5-year time horizons, and monthly returns over a 5-year horizon. There is no consensus regarding the frequency of data to use in such analysis. On the one hand, from a theoretical perspective, betas measured using more frequent data are likely to be more affected by statistical biases such as autocorrelation than those measured using less frequent data. This is because of the impact of factors such as thin and non-synchronous trading. On the other hand, betas measured using more frequent data tend to be less uncertain (which would be reflected by narrower confidence intervals). This is because the use of shorter frequencies leads to more observations for the same estimation period.

279. Owing to the potential for illiquid stock markets to affect the results, no beta is estimated using daily data, in order to minimise the risk that the estimates are affected by statistical biases and noise.

[70] Blume, M.E. (1968), "On the Assessment of Risk", *Journal of Finance*, **43**, March.

Table 10 Asset betas: direct estimates (adjusted)[1]

	Domestic[2]			FTSE All-world		
	2-year weekly	5-year weekly	5-year monthly	2-year weekly	5-year weekly	5-year monthly
Zain	1.21	1.01	0.92	0.50	0.53	0.65
Batelco	0.95	0.90	0.75	0.36	0.43	0.40
STC	0.57	0.64	0.68	0.35	0.51	0.64
Average	0.91	0.85	0.78	0.40	0.49	0.56

Notes: Asset betas are based on the equity beta and gearing estimates presented in Tables A6 to A9 in Appendix 4. Asset beta is defined as equity beta multiplied by one minus gearing plus debt beta multiplied by gearing, where debt beta is assumed to be equal to zero. [1] Calculated using the Blume adjustment: 2/3*raw beta + 1/3. Raw betas represent estimated coefficients from a regression where total returns on the equity are regressed on total returns on either the domestic or the world index. If total returns indices are not available then price indices are used instead (see Tables A6 to A9 in Appendix 4). [2] The stock exchange index of the market where a company is listed, for example, Bahrain All-share index, Kuwait Stock Exchange index, and Saudi Tadawul All Share are the domestic indices in the case of Batelco, Zain and STC respectively.
Sources: Datastream, and the Authority's calculations.

280. Table 10 indicates that, when measured against the FTSE All-world index, betas are consistently lower than when measured against the relevant domestic indices. This suggests that investors active in the domestic market may not always hold investment portfolios that are internationally diversified, and that betas measured against domestic indices might be influenced by home bias. This also suggests that it is important to consider the domestic investor perspective alongside the internationally diversified investor perspective.

281. A domestic investor with an investment portfolio that is relatively undiversified across international markets might require compensation for exposure to the systematic risk of a domestic stock market index.

282. Overall, the direct estimates (averages) suggest a range of 0.80–0.90 for the asset beta relevant to a domestic investor, although it should be noted that these estimates suffer from limitations (see paragraphs 283 and 284). These estimates are based on the assumption that the domestic investor does not diversify optimally across geographic markets. Thus, from the theoretical point of view, using these estimates might overstate the required rates of return.

283. Using only a direct estimation of Batelco's equity beta against the Bahrain All-share index is not likely to give a robust estimate of the systematic risk exposure of a notional telecommunications company with activities solely in the Bahrain regulated market. This is because Batelco's market capitalisation is around 12% of the overall market capitalisation of the Bahrain Bourse.[71] Hence, the returns on the Bahrain All-share index can be significantly influenced by those on Batelco. By virtue of the way that the index is constructed, an estimation of beta against this index is likely to be close to one. This suggests that either estimates of beta against the FTSE All-world index or expanding the

[71] Bloomberg.

sample of betas estimated against domestic indices would be preferable from both a theoretical and an empirical point of view.

284. Estimates of beta against both domestic and international indices may also be distorted because Batelco's equity is infrequently traded.[72] As such, its equity returns are likely to provide a relatively poor signal of expected changes in company value compared with equity returns for stocks quoted on more liquid exchanges. Given that beta estimation is based on statistical analysis, the estimate becomes less reliable when less frequent data is used. The extent to which investors demand an additional risk premium for the relative illiquidity of Batelco's equity was considered in the ERP section (see paragraph 250 onwards).

285. An investor with an internationally diversified portfolio would consider company risk relative to an international market index. Table 10 suggests that, on this basis a range of 0.40–0.55 would be relevant for an international investor.

286. The direct estimation of beta therefore suggests that ranges of 0.40–0.55 and 0.80–0.90 may be appropriate estimates of the asset beta for an international and a domestic investor respectively.

8.3 Equity beta estimation: comparator analysis

287. An alternative source of evidence is an analysis of comparator companies. By using information on a wider sample of companies, the concerns about the robustness of direct estimates could be mitigated.

288. Cluster analysis was used to select the comparator companies. Peer comparators were identified through a two-step approach. The first step involved the identification of markets comparable with Bahrain according to selected characteristics of telecommunications markets, as detailed below.

    a. **Total population** allows the identification of markets of a similar size. The size of the market might be important for several reasons, including its impact on the number of operators that may be supported and the potential for economies of scale.

    b. The proportion of **urban population** might be an indicator of the cost structure of the market. For example, the high proportion of urban population in Bahrain might be expected to lower the cost per subscriber of operating a telecommunications network compared with less urbanised countries.

    c. **GDP per head** indicates the level of income per capita, and might therefore be seen as an indicator of the overall wealth of the country, and hence the potential willingness to pay and demand for telecommunications services.

    d. **Fixed-line telephony penetration** might indicate the degree of development of fixed-line telephony in the market, while **mobile telephony penetration** would indicate the importance of mobile telephony in the market. Implicitly, the combination of these two metrics would capture the mix of fixed and mobile telephony in the market.

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[72] For example, in 2011, the average share turnover ratio for Batelco—the total value of Batelco equity traded per year as a percentage of Batelco's market capitalisation—was about 1.9%. By contrast, STC's average share turnover ratio was approximately 10.3% and for Zain the average share turnover ratio was about 10.9%.

e. The **broadband penetration rate** provides a measure of the status of the broadband market and the potential for its growth.

289. These criteria were used to identify markets with characteristics similar to those observed in Bahrain, and the analysis identified a cluster of markets (see Table 11).[73]

Table 11 Comparator markets

	Country
Cluster	Venezuela, Chile, Argentina, Saudi Arabia, Oman, Panama, Libya, Kuwait, United Arab Emirates, Brunei Darussalam

Source: The Authority's analysis.

290. The second step of the analysis involved identifying which of the listed companies from the comparable markets were most comparable to Batelco, Zain and STC. An additional screen was applied to filter out equities with insufficient liquidity to provide robust beta estimates.[74] Furthermore, only companies with at least five years' trading history were included in the comparator sample. The companies were allocated to three clusters depending on their level of dissimilarity to Batelco, Zain or STC—estimated using the 3-year average values for the company characteristics outlined below.[75]

a. The **proportion of revenue from mobile activities** helps to identify whether a company's primary activity is the provision of mobile telecommunications services. This enables the identification of companies with a similar business mix to Batelco, Zain and STC.

b. **Enterprise value** ("EV") represents the market value of the company, and allows identification of companies of a similar size to Batelco, Zain and STC.

c. The **total amount of capital expenditure ("CAPEX") and the ratio of CAPEX to EV** as measures of the intensity of a company's capital investment programme. CAPEX might be regarded as an important additional source of risk since it can substantially reduce net cash flows in the short term.

d. The **ratio of EV to EBITDA** ("earnings before interest, tax, depreciation and amortisation") identifies companies with similar levels of profitability. Companies with higher profitability might be expected to be able to absorb market shocks more easily.

291. Using these criteria, a potential cluster for Batelco was identified, as well as a cluster for Zain. It was found that no company was similar to STC at the group level (see Table 12 and Appendix 3).

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[73] These countries have been selected from the dendrogram presented in Appendix 3 (Figure A1).

[74] Only equities where at least 1% of the outstanding volume was traded each year were included in the analysis.

[75] The dendrogram that shows the level of dissimilarity between companies used in the analysis is presented in Appendix 3 (Figure A2).

Table 12 Comparator markets and telecommunications operators

	Company
Cluster 1—Batelco	Oman Telecom, ENTEL Chile, Telecom Argentina
Cluster 2—Zain	National Mobile Telecommunications Co KSC, Etihad Etisalat (Mobily), Emirates Telecom (Etisalat)
Cluster 3—STC	No comparators

Source: The Authority's analysis.

292. Table 13 presents the results of beta estimation from the comparator analysis based on clustering of companies.[76]

Table 13 Asset betas: comparator companies (adjusted)[1]

	Domestic[2]			FTSE All-world		
	2-year weekly	5-year weekly	5-year monthly	2-year weekly	5-year weekly	5-year monthly
Average for Zain's comparators	0.85	0.79	0.68	0.35	0.55	0.52
Average for Batelco's comparators	0.81	0.83	0.77	0.68	0.70	0.66
Average (overall)	0.83	0.81	0.72	0.55	0.64	0.59

Notes: Asset betas are based on the equity beta and gearing estimates presented in Tables A6 to A9 in Appendix 4. Asset beta is defined as equity beta multiplied by one minus gearing plus debt beta multiplied by gearing, where debt beta is assumed to be equal to zero. NMTC is excluded from the comparator sample for 2-year weekly and 5-year weekly data due to its low liquidity. [1] Calculated using the Blume adjustment:
(2/3-)*raw beta + (1/3). Raw betas represent estimated coefficients from a regression where total returns on the equity are regressed on total returns on either the domestic or the world index. If total returns indices are not available then price indices are used instead (see Tables A6 to A9 in Appendix 4). [2] The stock exchange index of the market where a company is listed, for example, Bahrain All-share index, Kuwait Stock Exchange index and Saudi Tadawul All Share, are the domestic indices in the case of Batelco, Zain and STC respectively.
Sources: Datastream, and the Authority's calculations.

293. A domestic investor with an investment portfolio that is relatively undiversified across international markets may require compensation for exposure to the systematic risk of a domestic stock market index. Overall, the averages across comparator estimates suggest a range of 0.70–0.85 for the asset beta relevant to a domestic investor.

294. In contrast, an investor with an internationally diversified portfolio would consider company risk relative to an international market index. Similar to the direct estimates of betas for Batelco, Zain and STC, betas for comparator companies estimated against the FTSE All-world index are lower than betas estimated against domestic equity indices. This suggests that investors benefit from international diversification and consequently might be

[76] Table A10 in Appendix 4 provides a detailed review of comparator asset betas.

expected to target lower required returns. The averages across comparator estimates suggest that a range of 0.55–0.65 would be relevant for an international investor.

8.4 Regulatory precedents

295. Recent regulatory precedents on the cost of capital provide a potentially useful reference point for the asset beta for telecommunications companies. However, a degree of caution needs to be exercised when interpreting this evidence since it is likely to include an element of judgement by regulators rather than being based on primary market data. Table 14 summarises a selection of regulatory precedents for fixed-line operators. They range from 0.41 to 0.73.

Table 14 Selected precedents for fixed-line asset beta

Regulator and year of determination	Country	Company	Asset beta[1]
Ofcom (2012)	UK	BT Openreach	0.41–0.55
ARCEP (2011)	France	France Télécom	0.48
Ofcom (2011)	UK	BT Openreach	0.41–0.55
Ofcom (2011)	UK	BT Group	0.46–0.59
Ofcom (2011)	UK	Rest of BT Group	0.51–0.65
PTS (2011)	Sweden	Fixed-line operators	0.54
CMT (2011)	Spain	Telefónica de España	0.43
ARCEP (2010)	France	France Télécom, SFR	0.60
BIPT (2010)	Belgium	Belgacom	0.50
Agcom (2010)	Italy	Telecom Italia	0.43
Ofcom (2009)	UK	BT Openreach	0.55
Ofcom (2009)	UK	BT Group	0.61
Ofcom (2009)	UK	Rest of BT Group	0.68
FICORA (2009)	Finland	Fixed-line operators	0.55–0.70

Note: [1] Asset betas were implied from the reported equity betas, gearing and an assumption of a zero debt beta, except for the UK, Sweden and Finland, where asset betas were reported in determination documents.
Sources: Ofcom (2012), "Charge control review for LLU and WLR services", 7 March; ARCEP (2011), "Décision fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées de France Télécom pour l'année 2012", December; Ofcom (2011), "Charge control framework for WBA Market 1 services", 20 July; PTS (2011), "Cost of capital determination for fixed-line network", 2 February; ARCEP (2010), "La détermination du taux de rémunération du capital des activités régulées du secteur fixe, du secteur mobile et du secteur de la télédiffusion", January; BIPT (2010), "Décision du Conseil de l'IBPT du 4 mai 2010 concernant le coût du capital pour les opérateurs disposant d'une puissance significative en Belgique", May; Agcom (2010), Resolution 73 on Cost of capital determination for fixed network Telecom Italia; CMT (2010), "Resolución sobre la propuesta de ABERTIS TELECOM, S.A.U., de tasa anual de coste de capital a aplicar en la Contabilidad de Costes del ejercicio 2010", 14 October; Ofcom (2009), "A New Pricing Framework for

Openreach", 22 May; FICORA (2009), "Assessment principles for the pricing of fixed network interconnection", 12 August.

296. Table 15 summarises a selection of regulatory precedents for mobile operators. They range from 0.51 to 1.20.

Table 15 Selected precedents for mobile asset beta

Regulator and year of determination	Country	Company	Asset beta[1]
ARCEP (2011)	France	Orange France, SFR, Bouygues Telecom, Orange Caraïbe, SRR	0.62
Ofcom (2011)	UK	Efficient mobile operator	0.56
CMT (2011)	Spain	Telefónica Móviles España	0.51
PTS (2011)	Sweden	Mobile operators	0.65
ARCEP (2010)	France	Orange France, SFR, Bouygues Télécom, Orange Caraïbe, SRR	0.77
BIPT (2010)	Belgium	Belgacom, Mobistar, KPN Group	0.55
CMT (2010)	Spain	Vodafone España	0.54
FICORA (2009)	Finland	Mobile operators	1.10–1.20

Note: [1] Asset betas were implied from the reported equity betas, gearing and an assumption of a zero debt beta, except for the UK and Finland, where asset betas were reported in determination documents. Sources: ARCEP (2011), "Décision fixant le taux de remuneration du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des opérateurs mobiles pour l'année 2012", December; Ofcom (2011), "Wholesale mobile voice call termination. Modelling Annexes", 15 March; CMT (2011), "Resolución sobre la propuesta de Telefónica Móviles España, S.A.U. de tasa anual de retorno a aplicar para el cómputo de los costes de capital en la contabilidad de costes del ejercicio 2011", 14 July; PTS (2011), "Comments on cost of capital proposal for mobile operators", 9 February; ARCEP (2010), "La détermination du taux de rémunération du capital des activités régulées du secteur fixe, du secteur mobile et du secteur de la télédiffusion", January; BIPT (2010), "Décision du Conseil de l'IBPT du 4 mai 2010 concernant le coût du capital pour les opérateurs disposant d'une puissance significative en Belgique", May; CMT (2010), "Resolución sobre la propuesta de VODAFONE ESPAÑA, S.A.U., de tasa anual de coste de capital a aplicar en la Contabilidad de Costes en el periodo 1 de abril de 2010 a 31 de marzo de 2011", 29 July; FICORA (2009), "Principles of mobile call termination pricing", 1 July.

297. Overall, regulatory precedents for asset betas broadly support the ranges for asset betas estimated earlier in this section. The ranges for asset betas estimated in this section fall within the ranges of regulatory precedents.

8.5 Disaggregate equity beta

298. Different projects and business activities of a company might exhibit different risk characteristics. For regulated telecommunications services in Bahrain, these differences could occur along the following dimensions:

a. fixed-line/mobile telecommunications;

b. within fixed-line telecommunications;

c. risk differentials for ultra-fast broadband.

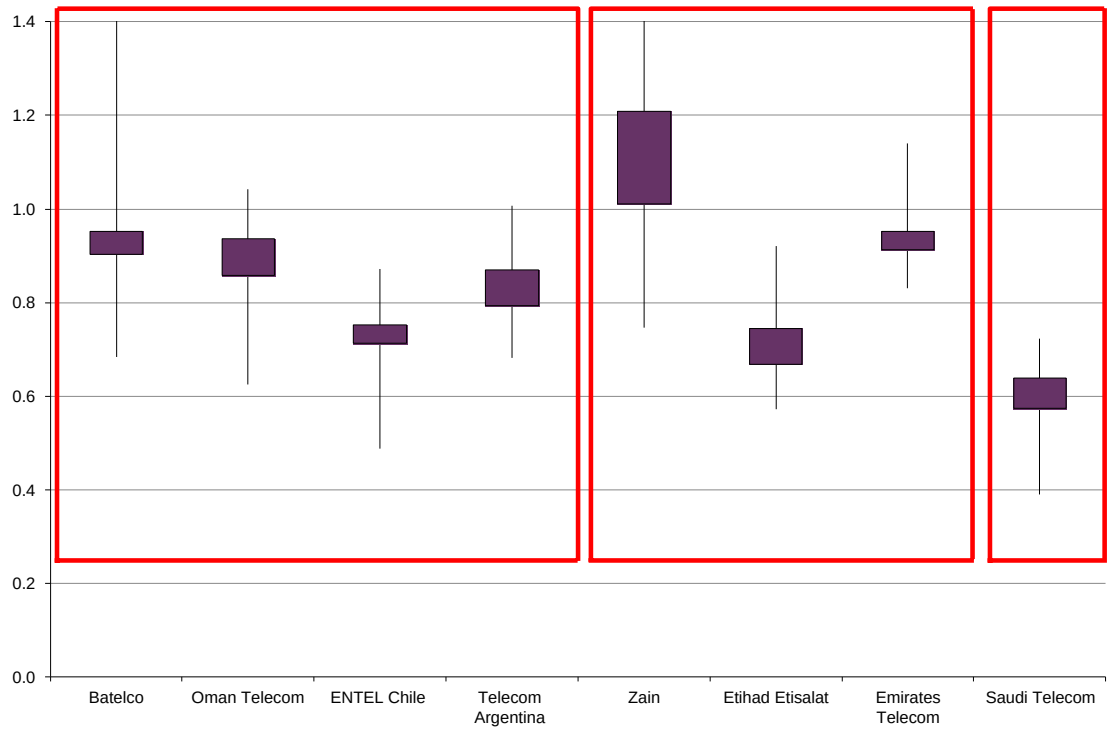
299. Since a project- or business-specific allowed rate of return may provide more economically efficient investment incentives, it is important to assess whether the level of risk might be materially different for various activities of a company, and hence whether there might be justification for adopting different costs of capital for different business segments.

8.5.1 Fixed/mobile risk differentials

300. One source of evidence is to estimate risk differentials based on betas for comparator companies to mobile and fixed-line activities. However, in practice there are very few, if any, "pure" fixed-line or "pure" mobile operators, restricting the comparison to one between principally mobile and integrated operators. In the context of the Bahraini telecommunications market, mobile and integrated activities could be proxied by the comparators to Zain/STC and Batelco respectively.

301. Figure 15 below shows asset beta estimates for Batelco and its comparators on the left, Zain and its comparators in the centre, and STC on the right. Consideration of the point estimates together with the uncertainty around these estimates does not suggest that, based on the sample relevant for Bahrain, there is a systematic difference between the asset betas for mobile and integrated operators.

Figure 15 Asset beta ranges and estimation errors



Note: Equity beta estimates are based on domestic indices. The solid bars represent the ranges between the
2- and 5-year weekly estimates. The lines measure two standard errors above and below the bars. NMTC is excluded from the comparator sample for 2-year weekly and 5-year weekly data due to its low liquidity.
Sources: Bloomberg, and the Authority's calculations.

302. To the extent that betas for comparator companies cannot be used to assess whether there are statistically significant differences, bottom-up analysis of segmental data on business characteristics might be able to capture the differences in actual risks between

fixed and mobile activities. Examples of potential, measurable bottom-up risk metrics include:

a. revenue, cost and profit volatility (including demand risk);

b. operational gearing (fixed to variable costs);

c. CAPEX intensity and depreciation (including technology risk);

d. growth rates (market maturity).

303. However, even if various metrics of risk differentials could be shown to be statistically significant, it is difficult to translate them robustly into WACC differentials. If risk differentials are implemented incorrectly there is a risk that they will distort rather than improve cost of capital estimates and hence incentives. For example, if one business activity is incorrectly judged to have less exposure to systematic risk than another activity, and the beta and WACC are lowered accordingly, the allowed return for this activity will be below the actual cost of capital, and hence discourage investment in this activity.

304. The third source of evidence which might suggest risk differentials between fixed and mobile activities is regulatory precedent, as already discussed with reference to Table 14 and Table 15. Past empirical research has indicated that there may be some risk differentials between fixed and mobile markets. For example, in the UK, when revising the charges for the provision of wholesale voice call termination in 2005, Ofcom determined that the equity beta for mobile operators was above the beta for the fixed-line business, although there are a number of issues[77] related to these estimates.[78] From the consumer perspective, convergence might imply greater substitutability between services provided over fixed-line and mobile networks. Furthermore, as mobile and fixed-line telecommunications services increasingly compete with each other, fixed-line operators are looking to more risky areas for additional revenue and are adopting new commercial policies. For example, in the UK, Ofcom has noted: "The pricing strategies of fixed and mobile operators also play a role in determining the extent to which fixed lines are substituted for mobile connections. BT is the only incumbent operator in Europe which does not have its own mobile network, so is more vulnerable to the threat from mobile, and has developed strategies to reduce this threat."[79]

305. Although a number of regulators have adopted separate asset betas for fixed-line and mobile activities, the differences between fixed-line and mobile betas estimated by regulators appear to be narrowing over time. The Authority considers that there is no robust evidence to support introducing such a differential in Bahrain in this Determination. The lack of pure-play mobile operators, and specifically the lack of comparators for STC, makes it difficult to establish whether a statistically significant difference in betas for fixed-line relative to mobile players exists in the Bahraini market.

306. Also relevant is the consideration of the Bahraini context in understanding whether there are indications of significantly higher business risk related to the mobile business relative

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[77] For example, aside from statistical issues such as selecting the appropriate benchmark, frequency and window for estimation, Ofcom identified difficulty in isolating relevant activities for beta estimation as mobile operators in the UK were part of larger groups which included substantial non-UK and non-mobile activities. For more detail see Oftel (2003), "Proposals for the identification and analysis of markets, determination of market power and setting of SMP conditions", Annex E, December.

[78] Ofcom (2005), "Wholesale Mobile Call Termination", Statement, June, p. 123.

[79] Ofcom (2010), "The Consumer Experience 2010", Research Document, 7 December.

to fixed-line operations. It could be argued that in Bahrain fixed-line operations face equal, if not greater, business risk than mobile operations, due to longer asset lives, and the speed of technological progress, which has allowed for significant substitution over time for fixed-line services by alternative services offered over 3G and WiMax. Given the lack of compelling evidence on the relative riskiness of fixed-line and mobile operations, the Authority does not propose to apply separate asset betas to fixed and mobile activities.

8.5.2 Risk differentials within fixed-line activities

307. Another way to potentially disaggregate the beta of the fixed-line operations of telecommunications companies is between access, core and retail operations (described below, alongside their business characteristics), often in line with the split in the regulatory accounts.

    a. **Local access network** includes the customer-dedicated network components running from the local exchanges to the end-user premises (houses and businesses). It enables the company's retail division to deliver telecommunications products to end-users. Products provided under the local access network could include unbundled local loops, wholesale terminating segments of leased lines, and wholesale broadband access.

    b. **Core network** comprises all network components, with the exception of those used in the local access network. It enables a company's customers to communicate with customers of the same or another operator, or to access services provided by another operator directly. Products provided under the core network could include wholesale call origination/termination, wholesale transit/interconnection services (national and international), and wholesale trunk segments of leased lines.

    c. **Retail business** is made up of all of the activities involved in the sale of services to end-users (businesses and individuals). Retail products can be broadly classified as "volume-sensitive" (e.g., fixed local, national and international calls, calls to mobile, calls to the Internet, public payphones and directory enquiries), and "non-volume-sensitive" (e.g., retail access and, to a lesser extent, retail broadband and leased lines). Other services include operator assistance, premium-rate services, managed answering services, and virtual private network/Internet Protocol virtual private network services.

308. The difficulty of finding pure-play comparators for different business areas within fixed-line activities is even greater than finding comparators for fixed-line operations overall. This difficulty arises because of the lack of examples of separate parts of fixed-line businesses being operated by distinct companies with publicly traded equity.

309. There is also very limited regulatory precedent for separating out access networks from fixed-line activities more generally. In the UK, Ofcom has estimated a lower asset beta for BT's operationally separated access network unit, Openreach, which owns the copper-access network, compared with the rest of BT Group.[80] However, given the differences between the UK and Bahraini markets, the Authority places relatively little weight on this evidence.[81]

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[80] Ofcom (2008), "A New Pricing Framework for Openreach – second consultation", 5 December.

[81] The UK does not form one of the comparator markets to Bahrain identified in Table 11.

310. As in the case of fixed-line compared with mobile activities, the Authority does not have access to data that would allow a robust, bottom-up estimation of risk differentials between different fixed-line activities. Therefore, the Authority does not propose to apply separate asset betas to different fixed-line activities in this Determination.

8.5.3 Risk differentials for roll-out of ultra-fast broadband

311. Investments in infrastructure associated with roll-out of ultra-fast broadband in Bahrain may, in principle, be exposed to a different level of risk than the infrastructure that already exists. The Authority notes that the deployment of fibre access in Bahrain is currently limited, mainly to new developments. When and to the extent that a substantial fibre-to-the-premises deployment occurs in Bahrain, the Authority will consider what adjustments could be required to the cost of capital, including whether the approach to estimating the asset beta needs to be amended to better reflect any likely risk differentials associated with such a deployment.

8.6 Proposed approach to equity beta

312. Based on the above analysis, the Authority proposes to estimate the equity beta for regulated telecommunications services in aggregate, with no disaggregation between separate business areas.

313. As the leverage ratio assumed in this Determination is 0%, the equity beta and asset beta ranges are equal.

314. From the perspective of an international investor, the Authority considers that a range of 0.50–0.60 would be appropriate. This puts similar weight on direct estimates (which range from 0.40 to 0.55) and estimates from comparator companies (which range from 0.55 to 0.65).

315. For a domestic investor, the Authority considers that a range of 0.75–0.85 would be appropriate. This puts similar weight on direct estimates (which range from 0.80 to 0.90) and estimates from comparator companies (which range from 0.70 to 0.85), despite the concerns about the statistical reliability of estimates of Batelco's equity beta against the Bahrain All-share index.

316. These ranges are based on evidence from both direct estimates and comparator betas regressed against international and domestic equity indices for the international and domestic investor respectively. The domestic investor is likely to face a higher beta as a result of holding a less diversified portfolio of investments. Although there is no theoretical basis for justifying limited diversification, this Determination takes these estimates into account.

317. The proposed range for the domestic investor (0.75–0.85) is higher than the equivalent range presented in the 2009 Determination (0.65–0.80).

318. The range for the international investor has narrowed from 0.55–0.70 in the 2009 Determination to 0.50–0.60 proposed in the current Determination.

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319. Both Batelco and Zain raised concerns about the beta disaggregation issue, making reference to various international regulatory precedents. According to Batelco, the

Authority should define separate WACCs (and implicitly separate betas) in order to reflect differing levels of systematic risk faced by the operators and business units within an operator[82]. Zain disagreed with the Authority's view that the level of systematic risk does not differ between fixed and mobile services. Zain suggested that the Authority use a neutral equity beta of 1, given the lack of reliable international estimates, while avoiding any "subjectivity" in setting this parameter. Zain stated that this has been adopted by other regulators, although it did not give specific examples [83]

320. Batelco argued that the estimation of the asset beta should be based primarily on direct estimates of Batelco's beta, using 2-year weekly and 1-year daily information (omitting the 5-year data used by the Authority as, it argues, this would be inconsistent with the timeframe assumed for the risk-free rate). Batelco's estimate of its asset beta is 0.93.[84]

321. Later in its submission, Batelco argued that it is appropriate to calculate separate WACCs for fixed line and mobile operations.[85] Batelco proposed that the fixed line WACC should be further disaggregated into a WACC for the access network and a WACC for the rest of the fixed line operation. Batelco referred to other regulators that have estimated separate betas for specific business units, including Ofcom, which has set different betas for different parts of BT's fixed line business.[86]

322. According to Batelco, such a disaggregation of the fixed line WACC into access and non-access components is justified due to differences in the income elasticity of demand for different telecommunications services,[87] which, according to Batelco, is the most recognised driver of differential systematic risk[88]. Batelco argued that the asset beta for the access operation should be set with reference to asset betas of gas, water and electricity distribution utility companies, because these companies supply services characterised by a low income elasticity of demand that is likely to be comparable to the services supplied by the access division of a telecommunications company. Batelco claimed that this is consistent with the approach taken by Ofcom in the UK and the ACCC in Australia. Based on utility company benchmarks, Batelco proposed an asset beta of 0.52 for the copper access business[89].

323. Notwithstanding its comment about "appropriateness" of calculating separate WACCs for fixed line and mobile businesses, Batelco agreed with the Authority's proposal not to disaggregate the two. Batelco makes a point that mobile phones have become increasingly essential to many customers, and demand elasticity for the fixed and mobile services are converging.[90]

324. Given this, Batelco derived the WACC (and implicitly the asset beta) for the non-access part of the fixed line operation to ensure that the individual business unit WACCs reconcile

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82 Batelco submission, paragraph 25, page 12.

83 Zain submission, page 7.

84 Batelco submission, paragraph 66 and Figure 11, page 38.

85 Batelco submission, paragraph 103, page 50.

86 Batelco submission, paragraphs 103-104, pages 50–51.

87 Batelco submission, paragraph 114, pages 53–54.

88 Batelco submission, paragraph 69, page 39.

89 Batelco submission, paragraph 116, page 56.

90 Batelco submission, paragraph 107, page 52.

to the overall Batelco WACC, although the individual business unit betas are not explicitly reported in Batelco's submission.

325. Batelco raised a number of additional issues relating to the methodology proposed by the Authority[91]: the exclusion of evidence on daily beta estimates; limiting the comparator set to a restricted number of demand characteristics applied in the cluster analysis; and taking into account beta estimates for Zain and STC, despite the fact that the Bahraini operations are a small part of the groups' activities. Additionally, Batelco recommended relying on beta estimated relative to the domestic index. Batelco argued that domestic evidence is not distorted since Batelco's share of the Bahrain Bourse is only 10% as of November 2012, and the investor base is predominantly domestic.

326. In its submission, Batelco also discussed the need for Batelco to be compensated for the future deployment of next-generation access ("NGA") networks—for example, through an uplift to the WACC—due to the existence of a significant risk differential with its core business.[92] Batelco referred to the systematic, as well as regulatory, risks inherent in investments of this type, and alluded to regulatory precedent in the Netherlands and the European Commission's viewpoint in support of this argument. Batelco's proposed uplift is not quantified in its submission. Batelco also discusses alternative ways of compensating for the NGA investment.[93]

The Authority's analysis and conclusion

327. The Authority recognises that there may be differences in the systematic risk faced by the various parts of a telecommunications operator's business. As noted in the Draft Determination, potential disaggregation of betas could occur along the lines of the fixed and mobile operations, and within the fixed line operation (in terms of access and core, as well as to reflect risk differentials in the deployment of fibre-based networks).

328. The Authority has significant concerns with Batelco's beta analysis. These concerns primarily relate to the constituent betas that are implied by Batelco for each of the business units, summarised in Table 16.

Table 16 Batelco's analysis of disaggregated betas

Business unit	Weights[1]	Asset beta
Fixed access	40%	0.52
Fixed other	30%[2]	1.48[3]
Mobile	30%	0.93
Integrated	100%	0.93

Note: [1] Weights represent the value of the regulatory asset base of each business unit. [2] Core network (15%) plus international network (15%). [3] Calculated by the Authority based on Batelco's submission.

329. As shown in Table 16, the implicit asset beta for the non-access fixed line operation is 1.48. This is the beta that is required in order to reconcile the individual business unit betas with Batelco's overall beta estimate of 0.93.

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91 Batelco submission, paragraphs 65, pages 35–38, and paragraphs 67–75, pages 39–41.

92 Batelco submission, Section E.

93 Batelco submission, paragraphs 141, pages 65–66.

330. In other words, Batelco's analysis indicates that the beta for the non-access fixed line operation (1.48) is significantly higher (by a factor of nearly 3) than for the fixed access operation (0.52), as well as for the integrated operation (0.93). In the Authority's view, this is unreasonable and casts substantial doubt on the reliability of the Batelco analysis.

331. To illustrate this, the Authority refers to a similar disaggregation undertaken by Ofcom in which separate asset betas were estimated for BT's access unit (Openreach) and the Rest of BT. The Ofcom example was one of the regulatory precedents referred to in the Batelco submission;[94] in fact, it was the only such precedent in which a split along the lines proposed by Batelco was implemented. As reported earlier, Ofcom's range for Openreach's asset beta in 2011 was 0.41–0.55, compared to a range of 0.51–0.65 for the Rest of BT. Ofcom's beta range for the Rest of BT was 20–25% higher than its range for Openreach. By comparison, Batelco's proposed beta for its non-access fixed operation is 184% higher than for its fixed access network.

332. The Authority notes that if Batelco's estimate of the asset beta for the fixed access network is used, and this is increased by 25% for the non-access fixed network in line with the Ofcom example, the resulting non-access fixed beta would be 0.65. Using Batelco's weights, the overall beta for the fixed line operation would be 0.575. If Batelco's argument that the fixed and mobile operations are likely to face similar levels of systematic risk, this implies that the overall asset beta for Batelco should also be 0.575. The Authority notes that this is significantly lower than the range of betas proposed in the Draft Determination under the domestic investor scenario (0.75–0.85).

333. Given the above concerns, the Authority has placed no weight on Batelco's analysis of disaggregated asset betas. The Authority remains of the view, as discussed in the Draft Determination, that there is no robust methodology or sufficiently reliable evidence to estimate an appropriate beta differential in this context.

334. Zain's suggestion of adopting an equity beta of 1 implies that the systematic risk of a telecommunications operator in Bahrain is the same as that of a broad equity market. This assertion is not substantiated in Zain's submission, nor is it supported by either the domestic or the international evidence available to the Authority.

335. With regard to Batelco's additional recommendations on the methodology, the Authority does not see a strong argument to adjust the adopted range estimates, for the following reasons.

336. First, the precision of beta estimates increases with the number of datapoints. According to Batelco, this supports the use of daily data. However, under both the direct and comparator approaches, there is the issue of insufficient liquidity based on turnover ratios, as well as the number of trading days with no price changes. As noted in the Draft Determination, concerns over the potential for illiquid stock markets to affect the results are addressed by choosing weekly and monthly data rather than daily data, while concerns over having sufficient datapoints are addressed by using data over two- and five-year time horizons.

337. Second, the Authority does not agree that the estimation of beta over a five-year period requires that the risk-free rate be estimated as an average over a five-year period. When forming the best forward-looking estimate of the cost of capital, betas have to be estimated

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[94] See Batelco submission, paragraph 103, page 50.

using statistical analysis and therefore will be based on a certain amount of historical data. Shorter time periods produce less robust estimates and therefore the Authority has used two- and five-year time horizons. For the risk-free rate, current market bond yields would be expected to reflect the best forward-looking view. Longer time periods produce less accurate estimates and a five-year average would not place sufficient weight on more recent evidence.

338. Third, the comparator set chosen aims to identify the countries and then companies with similar characteristics to Bahrain and Bahraini telecommunications operators, respectively. The Authority aims to identify the closest set of comparators with reference to a number of proxy measures for systematic risk. This serves as alternative evidence to the direct estimates. The Authority notes that if the comparator sample is broadened then the beta estimate would decrease, according to Batelco's own calculations.

339. The Authority also notes that while Batelco has expanded the set of comparator operators for the purposes of benchmarking asset betas, and presented the expanded list of operators in an appendix, it is not clear how Batelco identified the additional operators. The relevant comparability criteria to which Batelco refers include income elasticity of demand and the form of regulation.[95] However, Batelco does not provide evidence of the values of these criteria for each of the comparator operators listed in its submission.

340. The Authority considers that Batelco's market capitalisation as a proportion of the Bahrain Bourse total capitalisation has not decreased enough relative to the 12% at the time of the Draft Determination for the robustness of this estimate of beta to have increased. Neither has the Authority seen evidence that companies in Bahrain cannot access international capital markets. Therefore, the Authority considers that beta estimates against an international index provide relevant evidence.

341. Having considered the comments received, the Authority continues to hold the view that the evidence suggests that an appropriate range for the equity beta from the perspective of an international investor is 0.50–0.60, and an appropriate range from the perspective of a domestic investor is 0.75–0.85.

[95] Batelco submission, paragraph 69, page 39.

9 Additional considerations

342. The Authority has added this section to address the additional comments raised by Batelco in its response.

Responses to the Draft Determination

343. Batelco's submission proposed an additional 0.33% compensation for equity financing.[96] A similar uplift is discussed in the cost of debt section of Batelco's submission, but to the extent that the proposed gearing is zero, this does not affect its final WACC estimates.

The Authority's analysis and conclusion

344. While, in principle, it may be reasonable to include compensation for the costs of raising new equity, such costs will only be incurred in respect of new equity and should not be applied across existing equity. The Authority notes that the volume of outstanding Batelco shares has remained unchanged between 2008 and 2011, and there is no evidence to suggest that Batelco plans to raise additional equity in the near future and will thus require compensation for it.

345. The Authority also notes that Batelco provides no justification for the 0.33%.

346. Therefore, the Authority has decided not to include additional allowance for the equity financing in its WACC calculation.

[96] Batelco submission, paragraph 84, page 45.

10 Cost of capital estimates

The Draft Determination

347. This section combines the results for individual parameters from all previous sections in order to estimate the overall cost of capital for regulated telecommunications activities in Bahrain.[97]

348. The estimates of each individual cost of capital parameter are characterised by a degree of uncertainty, at least partly due to the recent financial turmoil. This uncertainty needs to be accounted for when determining the point estimate in order to ensure that the estimated rate of return allows a telecommunications company operating in Bahrain to raise necessary financing. There are at least two sources of uncertainty:

    a. uncertainty surrounding the current value of the parameter being estimated;

    b. uncertainty surrounding the potential evolution of the value of a given parameter in the future.

349. Table 17 reflects this uncertainty by presenting a range for the cost of capital for a notional telecommunications company operating in Bahrain from the perspective of an internationally diversified investor. The low and high ends of the ranges for the individual parameters are combined to give a range for the overall nominal cost of capital. The midpoint of the overall range is also presented.

Table 17 Summary of the cost of capital parameters—international investor

Parameter	Low	Midpoint	High
Nominal risk-free rate (%)	3.5		4.0
Country risk premium (%)	1.7		2.0
ERP (%)	5.5		6.5
Asset beta	0.50		0.60
Equity beta	0.50		0.60
Cost of equity (%)	8.0		9.9
WACC (nominal, %)	**8.0**	**8.9**	**9.9**

Source: The Authority.

350. The Authority has also estimated the cost of capital from the perspective of a domestic, potentially less diversified investor using domestic market data, as presented in Table 18 below.

[97] The results represent a vanilla WACC (post-tax cost of equity, pre-tax cost of debt). However, as there is no corporation tax in Bahrain, this is equal to the pre-tax (and post-tax) WACC.

Table 18 Summary of the cost of capital parameters—domestic investor

Parameter	Low	Midpoint	High
Nominal risk-free rate (%)	4.4		4.9
Country risk premium (%)[1]	0.0		0.0
ERP (%)	5.5		6.5
Asset beta	0.75		0.85
Equity beta	0.75		0.85
Cost of equity (%)	8.5		10.4
WACC (nominal, %)	**8.5**	**9.5**	**10.4**

Note: [1] The country risk premium is implicitly included in the risk-free rate.
Source: The Authority.

351. As stated in paragraph 30, for the purpose of the current Determination the Authority considers that it is appropriate to place similar weight on the internationally diversified investor and the domestic investor scenarios. This is due to recent market developments which have increased the quality of data available to estimate the cost of capital under the domestic investor scenario, and which also suggest that, relative to the 2009 Determination, it may be more difficult for Bahraini companies to access international capital markets due to uncertainty in the domestic economy.

352. In the 2009 Determination, the Authority's point estimate for the WACC was 9.0%, which was above the midpoints of both the international base-case scenario, and the alternative domestic scenario. This was justified on the basis of adopting a cautious approach to the estimation of the cost of capital and ensuring that there was a suitable environment for long-term investment.

353. For the purposes of the current Determination, the Authority has had regard to the midpoint estimates under the international and domestic investor scenarios. Placing similar weight on the indicative midpoint estimates of the international and domestic investor scenarios would result in a point estimate for the cost of capital of approximately 9.2%. However, the Authority is proposing a cost of capital of 9.5% to again ensure that incentives for efficient long-term investment in regulated telecommunications services are maintained in Bahrain.

354. For the reasons given in this Determination, the Authority considers that a proposed WACC of 9.5% fully takes into account the relevant risks associated with the financing of investments in the provision of regulated telecommunications services in Bahrain. The proposed WACC will ensure that Licensed Operators who have been found to have SMP and/or dominance will be appropriately compensated for the capital costs that they face when making such investments. This in turn will maintain incentives for efficient investment, and will allow the regulated entities to continue to attract the capital required to underpin the development of the telecommunications sector in Bahrain while ensuring that access seekers and consumers face regulated charges which include a fair return.

355. In determining the proposed WACC in this Determination, the Authority has carefully considered what changes have occurred since the 2009 Determination. In the 2009 Determination, the Authority's point estimate for the cost of capital was 9.0%. This represented a significant reduction from the 12.2% cost of capital that had been estimated

by the Authority in 2005. Given the significant revisions to the methodology between 2005 and 2009 to bring the analysis more into line with best practice in cost of capital estimation, and the significant decrease in the cost of capital that this entailed, the Authority included an additional 50bp in the 2009 cost of capital as a transitional arrangement. The Authority considers that a transitional arrangement from 2009 to 2013 is no longer required. A cost of capital of 9.5% for 2013 is 50bp higher than the 2009 Determination once transitional arrangements are excluded. The Authority considers that an increase in the point estimate is appropriate, given the changes that have occurred since 2009, including the downgrade of Bahrain's sovereign long-term credit rating.

356. Compared with the 2009 Determination, the midpoint of the range for the international investor is higher by 40bp, which incorporates an increase in the country risk premium for Bahrain.

357. The midpoint of the range for the domestic investor has increased by about 80bp relative to the 2009 Determination, primarily as a result of increases in the ERP and the asset beta estimates.

358. A cost of capital of 9.5% is considerably higher than most recent regulatory precedents for either fixed or mobile telecommunications. However, the recent regulatory precedents are not directly comparable, as in most cases they relate to companies operating in countries with lower country risk than Bahrain.

Responses to the Draft Determination

359. Batelco recommended using the higher end of the range for cost of capital parameters to compensate investors for regulatory and asymmetric risks. Batelco submitted that its overall WACC should be set at 12.93%, with disaggregated WACCs of 10.06% for fixed access, 16.76% for other fixed, and 12.93% for mobile.

360. In its submission, Zain discussed the need to incentivise investment in the future upgrade of the existing networks in the context of the current Determination. Zain proposed a WACC within the range of 11%-12%.

361. Both Batelco and Zain expressed a preference for the domestic approach because it takes into account Bahrain-specific information, and there is an increased availability of domestic evidence compared with the 2009 Determination.

362. The cost of capital estimates proposed by the operators are summarised in the tables below.

Table 19 Batelco's WACC as proposed in its submission

Parameter	Value	Comments
Nominal risk-free rate (%)	6.13	Average of 1- and 2-year average yield on 2020 bond + fin vol premium
Country risk premium (%)	0.00	Only domestic approach
ERP (%)	7.00	Damodaran estimate of 6% + financial turmoil + illiquidity premia
Asset beta	0.93	Direct estimates for Batelco's beta: average of 1-year daily and 2-year weekly
Equity beta	0.93	
Equity financing	0.33	Transaction costs
Cost of equity (%)	12.93	
WACC (nominal, %)	**12.93**	

Table 20 Zain's WACC as proposed in its submission

	International			Domestic		
Parameter	**Low**	**Midpoint**	**High**	**Low**	**Midpoint**	**High**
Nominal risk-free rate (%)	3.50		4.00	4.40		4.90
Country risk premium (%)	1.70		2.00	0.00		0.00
ERP (%)	5.50		6.50	5.50		6.50
Asset beta	1.00		1.00	1.00		1.00
Equity beta	1.00		1.00	1.00		1.00
Cost of equity (%)	10.7		12.5	9.9		11.4
WACC (nominal, %)	**10.7**	**11.6**	**12.5**	**9.9**	**10.7**	**11.4**

Note: Zain agreed with all parameters proposed by the Authority, with the exception of the asset beta.

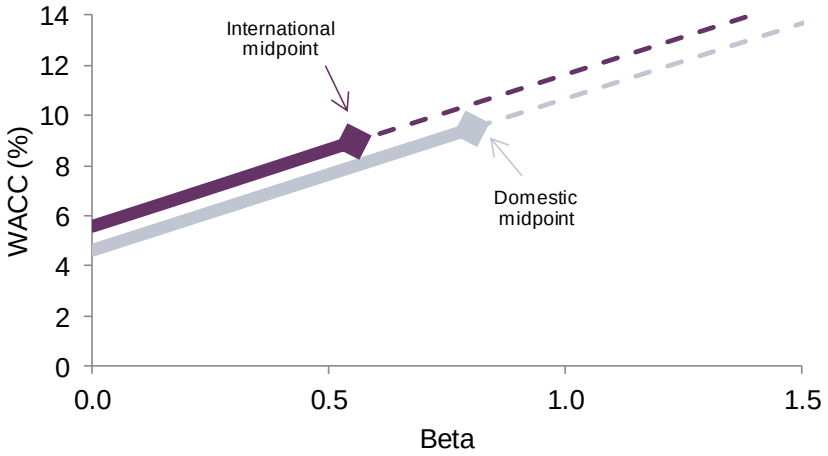
The Authority's analysis and conclusion

363. In estimating the cost of capital in the current Determination, the Authority has used two scenarios, one in which the perspective of an international investor is taken, and one in which that of a domestic investor is taken. The Authority notes that the cost of capital under each of these scenarios should theoretically converge. If there were a significant

difference then in the absence of restrictions on the movement of capital, a company would be expected to raise finance from the less expensive source.

364. The cost of capital under the two approaches is compared in Figure 16 below. The lines intercept the y-axis at the risk-free rate (domestic approach) and the risk-free rate plus the country risk premium (international approach). The slope of each line is the equity risk premium. The position of the WACC estimate on each line is determined by the beta estimate under each approach. Figure 16 indicates that although different parameter estimates are used in each approach, the combinations of these parameters produce similar estimates of the WACC.

Figure 16 Comparison of international and domestic WACC



Note: The y-axis starting point for the cost of capital line is the risk-free rate in the domestic scenario, and the risk-free rate plus country risk premium in the international scenario.
Source: The Authority.

365. The Authority notes that the estimation of the parameters that make up the WACC is subject to a degree of judgement and imprecision, particularly in the current context of volatile financial markets. In such circumstances, the Authority considers that the use of the two scenarios discussed in this Determination provides a more robust basis for estimating the WACC, as compared to relying on a single estimation approach.

366. In terms of the approach taken, and the estimation of the individual parameters, the Authority has carefully considered the merits of the arguments raised in the submissions on the Draft Determination. The Authority has responded to the submissions in the current Determination.

367. The prospects of NGA and other investment with a different risk profile are uncertain at this stage. However, the Authority intends to revisit this discussion in the future as the need arises. The regulatory treatment of these investments should be justified on the basis of evidence that there is a relatively higher risk associated with such investment.

368. The Authority has also had regard to the potential asymmetric consequences of setting the WACC too low relative to setting the WACC too high. A conservative approach has been adopted to each parameter of the calculation (including the addition of a number of uplifts to individual parameter estimates to reflect uncertainty and current market conditions), and

the final estimate is above the average of the midpoints in the international and domestic investor approaches.

369. Overall, the Authority remains of the view that a cost of capital of 9.5% is appropriate to apply to regulated telecommunications services in Bahrain. This is comparable to the vanilla WACC applied in regulatory regimes where there is corporate taxation. The Authority considers this to represent a cautious approach to setting the overall cost of capital because this value is above the average of the range (9.2%) suggested by the international and domestic evidence.

Appendix 1: Comparison of 2009 and 2013 cost of capital estimates

Table A1 Summary of the cost of capital parameters—2009 Determination

	International			Domestic		
Parameter	**Low**	**Midpoint**	**High**	**Low**	**Midpoint**	**High**
Nominal risk-free rate (%)	3.2		3.7	3.5		5.8
Country risk premium (%)	1.5		1.5	0.0		0.0
ERP (%)	5.1		6.1	5.1		6.1
Asset beta	0.55		0.70	0.65		0.80
Equity beta	0.55		0.70	0.65		0.80
Cost of equity (%)	7.5		9.5	6.8		10.7
WACC (nominal, %)	**7.5**	**8.5**	**9.5**	**6.8**	**8.7**	**10.7**

Source: The Authority.

Table A2 Summary of the cost of capital parameters—2013 Determination

	International			Domestic		
Parameter	**Low**	**Midpoint**	**High**	**Low**	**Midpoint**	**High**
Nominal risk-free rate (%)	3.5		4.0	4.4		4.9
Country risk premium (%)	1.7		2.0	0.0		0.0
ERP (%)	5.5		6.5	5.5		6.5
Asset beta	0.50		0.60	0.75		0.85
Equity beta	0.50		0.60	0.75		0.85
Cost of equity (%)	8.0		9.9	8.5		10.4
WACC (nominal, %)	**8.0**	**8.9**	**9.9**	**8.5**	**9.5**	**10.4**

Note: Parameters have been presented to two significant figures.
Source: The Authority.

Appendix 2: Regulatory precedents for the cost of capital

Table A3 Selected precedents for the cost of capital for fixed-line telecommunications
(nominal, vanilla)

Regulator and year of determination	Country	Company	WACC (%)
TRA UAE (2012)	UAE	Etisalat	6.9 (implied)
Ofcom (2012)	UK	BT Openreach	7.4 (implied)
ARCEP (2011)	France	France Telecom	6.5 (implied)
Ofcom (2011)	UK	BT Openreach	7.4 (implied)
Ofcom (2011)	UK	BT Group	7.8 (implied)
Ofcom (2011)	UK	Rest of BT Group	8.2 (implied)
PTS (2011)	Sweden	Fixed-line operators	7.1 (implied)
CMT (2011)	Spain	Telefónica de España	7.6 (implied)
ARCEP (2010)	France	France Télécom, SFR	7.5 (implied)
BIPT (2010)	Belgium	Belgacom	7.3 (implied)
Agcom (2010)	Italy	Telecom Italia	7.1 (implied)
Ofcom (2009)	UK	BT Openreach	8.0 (implied)
Ofcom (2009)	UK	BT Group	8.3 (implied)
Ofcom (2009)	UK	Rest of BT Group	8.7 (implied)
FICORA (2009)	Finland	Fixed-line operators	8.1 (implied)

Note: Vanilla WACC refers to the weighted average of pre-tax cost of debt and post-tax cost of equity. Vanilla WACC was implied using information provided in regulatory documents.
Sources: TRA UAE (2012), "Etisalat's Regulated Weighted Average Cost of Capital", July; Ofcom (2012), "Charge control review for LLU and WLR services", March 7th; ARCEP (2011), "Décision fixant le taux de rémunération du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des activités fixes régulées de France Télécom pour l'année 2012", December; Ofcom (2011), "Charge control framework for WBA Market 1 services", 20 July; PTS (2011), "Cost of capital determination for fixed-line network", 2 February; CMT (2011), "Resolución sobre la propuesta de TELEFÓNICA DE ESPAÑA, S.A.U., de tasa anual de coste de capital a aplicar en la Contabilidad de Costes del jercicio 011", 26 May; ARCEP (2010), "La détermination du taux de rémunération du capital des activités régulées du secteur fixe, du secteur mobile et du secteur de la télédiffusion", January; BIPT (2010), "Réponses à la consultation sur le coût du capital pour les opérateurs puissants en Belgique", April; Agcom (2010), Resolution 73 on Cost of capital determination for fixed network Telecom Italia; Ofcom (2009), "A New Pricing Framework for Openreach", 22 May; FICORA (2009), "Assessment principles for the pricing of fixed network interconnection", 12 August.

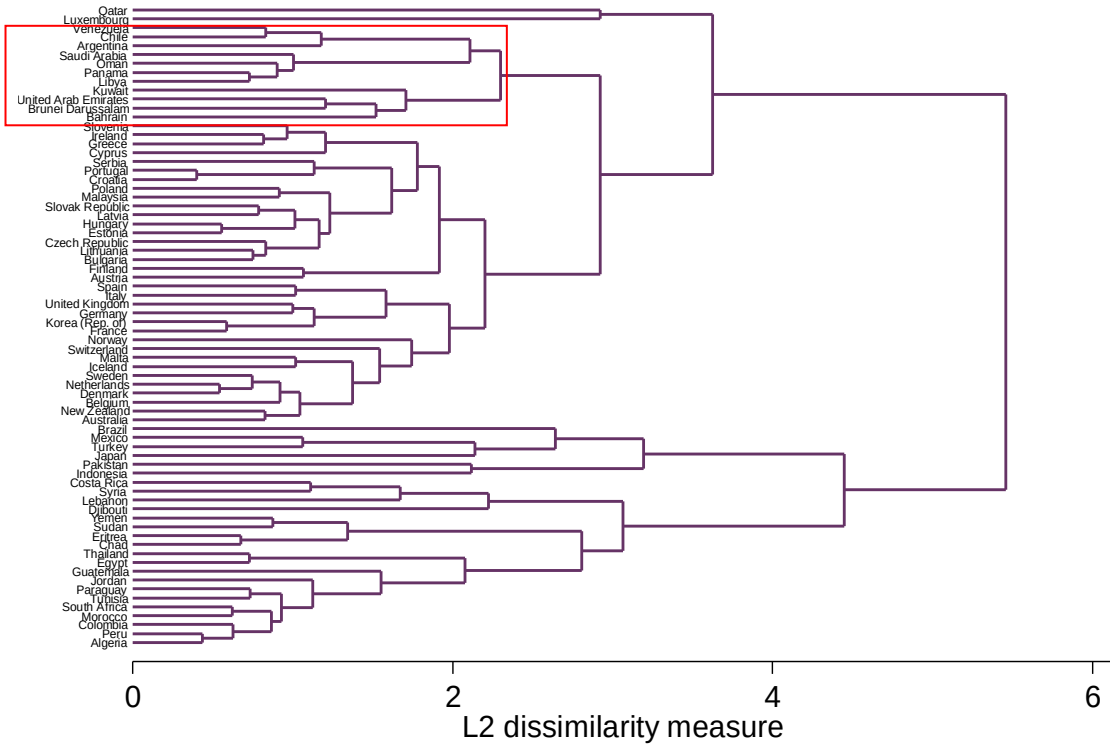
Table A4 Selected precedents for the cost of capital for mobile telecommunications
(nominal, vanilla)

Regulator and year of determination	Country	Company	WACC (%)
TRA UAE (2012)	UAE	Etisalat	7.2 (implied)
APCEP (2011)	France	Orange France, SFR, Bouygues Telecom, Orange Caraïbe, SRR	6.7 (implied)
Ofcom (2011)	UK	Efficient mobile operator	7.1 (implied)
CMT (2011)	Spain	Telefónica Móviles España	8.1 (implied)
PTS (2011)	Sweden	Mobile operators	7.3 (implied)
ARCEP (2010)	France	Orange France, SFR, Bouygues Télécom, Orange Caraïbe, SRR	8.1 (implied)
BIPT (2010)	Belgium	Belgacom, Mobistar, KPN Group	7.3 (implied)
CMT (2010)	Spain	Vodafone España	7.9 (implied)
FICORA (2009)	Finland	Mobile operators	10.9 (implied)

Note: Vanilla WACC refers to the weighted average of pre-tax cost of debt and post-tax cost of equity. Vanilla WACC was implied using information provided in regulatory documents.
Sources: TRA UAE (2012), "Etisalat's Regulated Weighted Average Cost of Capital", July; ARCEP (2011), "Décision fixant le taux de remuneration du capital employé pour la comptabilisation des coûts et le contrôle tarifaire des opérateurs mobiles pour l'année 2012", December; Ofcom (2011), "Wholesale mobile voice call termination. Modelling Annexes", 15 March; CMT (2011), "Resolución sobre la propuesta de Telefónica Móviles España, S.A.U. de tasa anual de retorno a aplicar para el cómputo de los costes de capital en la contabilidad de costes del ejercicio 2011", 14 July; PTS (2011), "Comments on cost of capital proposal for mobile operators", 9 February; ARCEP (2010), "La détermination du taux de rémunération du capital des activités régulées du secteur fixe, du secteur mobile et du secteur de la télédiffusion", January; BIPT (2010), "Réponses à la consultation sur le coût du capital pour les opérateurs puissants en Belgique", April; CMT (2010), "Resolución sobre la propuesta de VODAFONE ESPAÑA, S.A.U., de tasa anual de coste de capital a aplicar en la Contabilidad de Costes en el periodo 1 de abril de 2010 a 31 de marzo de 2011", 29 July; FICORA (2009), "Principles of mobile call termination pricing", 1 July.

Appendix 3: Equity beta cluster analysis dendrograms

Figure A1 Dendrogram: level of dissimilarity between Bahrain and world telecommunications markets



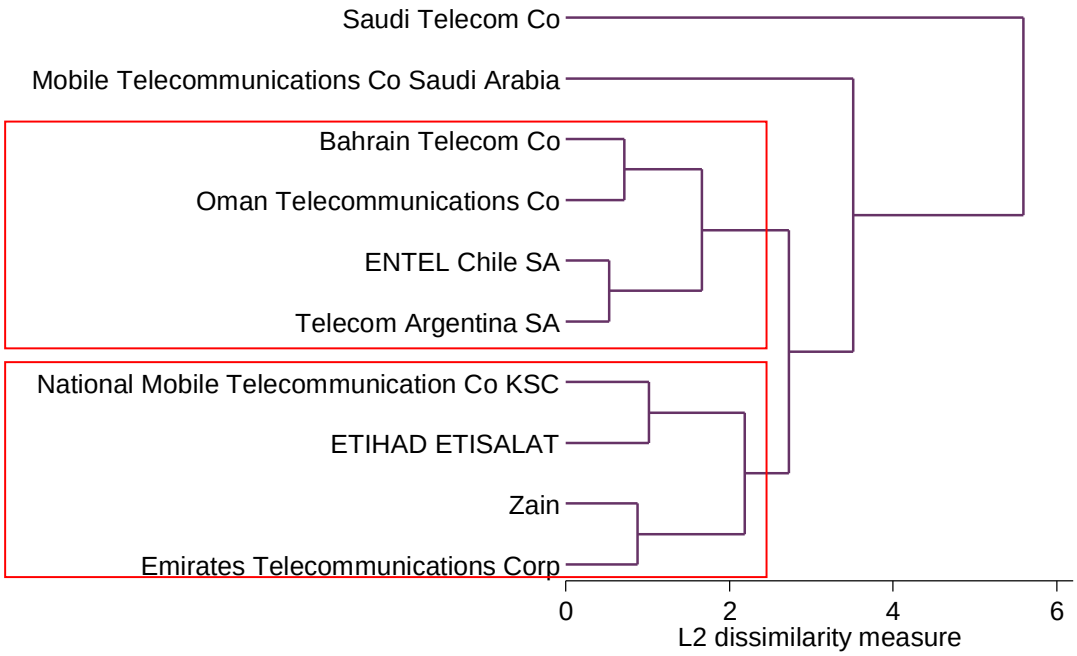
Sources: ITU data, World Bank data, and the Authority's calculations.

Table A5 Telecommunications operators in comparator markets

Country	Telecommunications operators
UAE	Emirates Telecommunications Corp (Etisalat), EMIRATES INTEGRA
Kuwait	Zain, National Mobile Telecommunication Co KSC, HITS TELECOM HOL
Saudi Arabia	STC, Etihad Etisalat (Mobily), National Mobile Telecommunication Co KSC, Etihad Atheeb Te
Oman	Oman Telecommunications, Omani Qatari Telecommunications
Chile	ENTEL Chile, CTC-A, Cia de Telefonos de Coyhaique, Telefónica Larga Distancia
Venezuela	Cia Anonima Nacional Telefonos de Venezuela
Argentina	Telecom Argentina, NORTEL INVERS-PF, TELEFONICA HLDG
Panama	n/a
Libya	n/a
Brunei	n/a
Bahrain	Batelco, Zain and STC

Source: The Authority.

Figure A2 Dendrogram: level of dissimilarity between Batelco, Zain, STC and telecommunications companies operating in comparable markets



Sources: Bloomberg, and the Authority's calculations.

Appendix 4: Equity beta estimates and gearing for comparator telecommunications companies

Table A6 Equity betas for comparator companies (2-year, weekly)

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.20	0.47	0.79	0.86
ENTEL Chile	0.72	0.82	0.73	0.82
Telecom Argentina	0.79	0.86	0.80	0.87
National Mobile Telecommunication Co KSC	0.34	excluded[4]	0.53	excluded[4]
Etihad Etisalat	0.19	0.46	0.80	0.87
Emirates Telecom	–0.04	0.31	0.93	0.95
Batelco	0.04	0.36	0.93	0.95
Zain	0.26	0.51	1.35	1.24
STC	0.19	0.46	0.61	0.74

Notes: [1] Domestic index refers to the stock exchange index of the market where a company is listed, for example, Bahrain Stock Exchange index, Kuwait Stock Exchange index and Saudi Tadawul All Share, are the domestic indices in the case of Batelco, Zain and STC respectively. [2] Raw betas represent estimated coefficients from a regression where total returns on the equity are regressed on total returns on either the domestic or the world index. If total returns indices are not available then price indices are used instead. [3] Calculated using the Blume adjustment: (2/3)*raw beta + (1/3). [4] NMTC is excluded from the comparator sample for 2-year weekly and 5-year weekly data due to its low liquidity.
Sources: Datastream, and the Authority's calculations.

Table A7 Equity betas for comparator companies (5-year, weekly)

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.41	0.61	0.91	0.94
ENTEL Chile	0.69	0.80	0.82	0.88
Telecom Argentina	0.93	0.95	0.87	0.91
National Mobile Telecommunication Co KSC	0.50	excluded[4]	0.79	excluded[4]
Etihad Etisalat	0.60	0.73	0.74	0.82
Emirates Telecom	0.26	0.51	0.87	0.91
Batelco	0.15	0.43	0.86	0.90
Zain	0.43	0.62	1.27	1.18
STC	0.45	0.63	0.68	0.79

Notes: [1] Domestic index refers to the stock exchange index of the market where a company is listed, for example, Bahrain Stock Exchange index, Kuwait Stock Exchange index and Saudi Tadawul All Share, are the domestic indices in the case of Batelco, Zain and STC respectively. [2] Raw betas represent estimated coefficients from a regression where total returns on the equity are regressed on total returns on either the

domestic or the world index. If total returns indices are not available then price indices are used instead. [3] Calculated using the Blume adjustment: (2/3)*raw beta + (1/3). [4] NMTC is excluded from the comparator sample for 2-year weekly and 5-year weekly data due to its low liquidity.
Sources: Datastream, and the Authority's calculations.

Table A8 Equity betas for comparator companies (5-year, monthly)

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.42	0.61	0.75	0.83
ENTEL Chile	0.64	0.76	0.75	0.84
Telecom Argentina	0.76	0.84	0.80	0.87
National Mobile Telecommunication Co KSC	0.16	0.44	0.41	0.61
Etihad Etisalat	0.62	0.74	0.57	0.71
Emirates Telecom	0.29	0.52	0.80	0.87
Batelco	0.10	0.40	0.62	0.75
Zain	0.64	0.76	1.12	1.08
STC	0.67	0.78	0.76	0.84

Notes: [1] Domestic index refers to the stock exchange index of the market where a company is listed, for example, Bahrain Stock Exchange index, Kuwait Stock Exchange index and Saudi Tadawul All Share, are the domestic indices in the case of Batelco, Zain and STC respectively. [2] Raw betas represent estimated coefficients from a regression where total returns on the equity are regressed on total returns on either the domestic or the world index. If total returns indices are not available then price indices are used instead. [3] Calculated using the Blume adjustment: (2/3)*raw beta + (1/3).
Sources: Datastream, and the Authority's calculations.

Table A9 Gearing level for comparator companies (%)

Company	Country	2-year gearing	5-year gearing
Oman Telecom	Oman	0%	0%
ENTEL Chile	Chile	13%	15%
Telecom Argentina	Argentina	0%	13%
National Mobile Telecommunication Co KSC	Kuwait	2%	4%
Etihad Etisalat	Saudi Arabia	14%	19%
Emirates Telecom	UAE	0%	0%
Batelco	Bahrain	0%	0%
Zain	Kuwait	2%	14%
STC	Saudi Arabia	23%	19%

Note: Gearing is calculated on a quarterly basis.
Sources: Datastream, and the Authority's calculations.

Table A10 Asset betas for comparator companies

2-year, weekly

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.20	0.47	0.79	0.86
ENTEL Chile	0.63	0.71	0.64	0.71
Telecom Argentina	0.79	0.86	0.80	0.87
National Mobile Telecommunication Co KSC	0.33	excluded[4]	0.52	excluded[4]
Etihad Etisalat	0.17	0.40	0.69	0.74
Emirates Telecom	–0.04	0.31	0.93	0.95
Batelco	0.04	0.36	0.93	0.95
Zain	0.26	0.50	1.32	1.21
STC	0.14	0.35	0.47	0.57

5-year, weekly

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.41	0.61	0.91	0.94
ENTEL Chile	0.60	0.68	0.71	0.75
Telecom Argentina	0.93	0.83	0.87	0.79
National Mobile Telecommunication Co KSC	0.49	excluded[4]	0.78	excluded[4]
Etihad Etisalat	0.51	0.59	0.63	0.67
Emirates Telecom	0.26	0.51	0.87	0.91
Batelco	0.15	0.43	0.86	0.90
Zain	0.42	0.53	1.24	1.01
STC	0.35	0.51	0.53	0.64

5-year, monthly

	FTSE All-world		Domestic[1]	
	Raw[2]	Adj[3]	Raw[2]	Adj[3]
Oman Telecom	0.42	0.61	0.75	0.83
ENTEL Chile	0.55	0.65	0.65	0.71
Telecom Argentina	0.76	0.73	0.80	0.75
National Mobile Telecommunication Co KSC	0.16	0.42	0.40	0.58
Etihad Etisalat	0.53	0.60	0.49	0.58

Emirates Telecom	0.29	0.52	0.80	0.87
Batelco	0.10	0.40	0.62	0.75
Zain	0.62	0.65	1.09	0.92
STC	0.52	0.64	0.59	0.68

Note: Asset betas are based on the equity beta and gearing estimates presented in Tables A6 to A9 in Appendix 4. Asset beta is defined as equity beta multiplied by one minus gearing plus debt beta multiplied by gearing, where debt beta is assumed to be zero. [1] Domestic index refers to the stock exchange index of the market where a company is listed, for example, Bahrain Stock Exchange index, Kuwait Stock Exchange index and Saudi Tadawul All Share, are the domestic indices in the case of Batelco, Zain and STC respectively. [2] Based on the raw equity beta which represents an estimated coefficient from a regression where returns on the equity are regressed on returns on either the domestic or the world index. [3] Adjusted beta is calculated using the Blume adjustment: (2/3)*raw beta + (1/3). [4] NMTC is excluded from the comparator sample for 2-year weekly and 5-year weekly data due to its low liquidity.
Sources: Datastream, and the Authority's calculations.