Equity beta for a benchmark Australian water network service provider

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Executive Summary

This report has been prepared at the request of Icon Water. The context of our report is

- Icon Water is preparing an estimate of the weighted average cost of capital (WACC) in preparation for the 2018-2023 Regulatory Review of its regulated water and sewage services (2018 Water Price Reset); and

- significant developments in the approach used to estimating WACC since the previous Regulatory Review (2013-2018).

Our report adopts the same approach as previous analysis undertaken by HoustonKemp on comparable water utilities in the United Kingdom and North America. We identify companies classified by Industry Classification Benchmark as 'water utilities' listed on the New York, NASDAQ and London exchanges.

After removing companies that were not comparable to Icon Water, and those for which data was not available, we undertook twelve equity beta calculations, including:

- equity beta for individual water utilities, using both weekly and monthly returns; and

- equally weighted and value weighted portfolios of water utilities, using both weekly and monthly returns.

In our opinion, there is no single correct method for calculating the equity beta for a benchmark efficient water and sewerage utility, and so all statistically robust estimates should be considered in developing a plausible equity beta range. Figure 1 shows the results of our analysis of the equity betas of the UK and North American water utilities.

Figure 1 Results of market estimates of the equity beta for a water utility
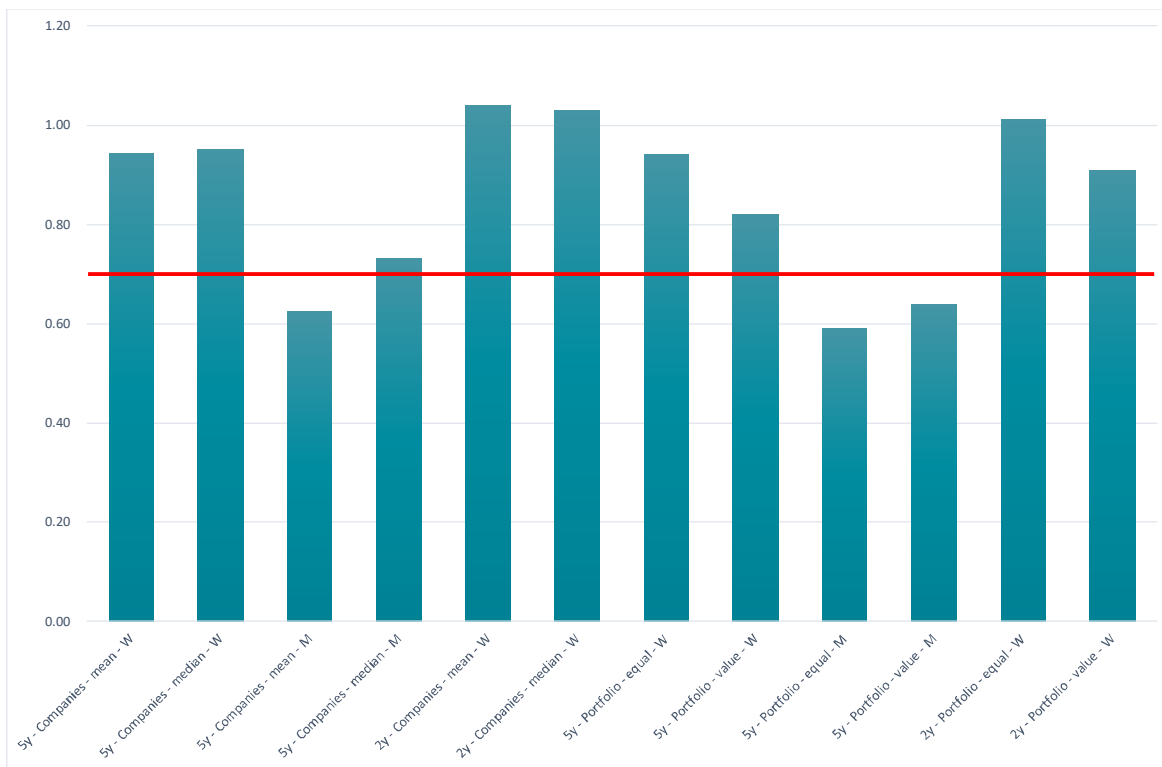
Figure 1 shows an equity beta range with:

- a lower bound of 0.59, consistent with the 5-year equal weighted portfolio; and

- an upper bound of 1.04, consistent with the mean of the individual water utilities using weekly data and a 2-year period.

Our analysis of prevailing equity betas of comparable North American and UK water businesses finds an equity beta range of 0.6 to 1.0 for Icon Water. Our study of the equity betas of comparable water utilities in North America and the United Kingdom provides considerable support for the continued adoption of the Industry Panel's equity beta of at least 0.7 in Icon Water's 2018 Water Price Reset. Figure 1, highlights that 75 per cent of the equity beta estimates (ie eight of the twelve) are higher than the Industry Panel's equity beta of 0.7.

Our finding of an equity beta range of between 0.6 and 1.0 suggests that the prevailing equity beta of a benchmark water utility is higher than that previously estimated.[1] Consequently, our analysis intimates that:

- a decision to continue with the Industry Panel equity beta of 0.7 for the 2018 Water Price Reset is conservative; and

- if future research confirms that the equity beta of water businesses has increased then regulators should consider raising the equity beta for water utilities in subsequent regulatory periods.

In section 4 of this report, we review equity beta decisions for regulated water businesses by other Australian jurisdictional regulators. Our review indicates that there is a high degree of consistency in the equity beta decisions made by Australian jurisdictional regulators, with regulators determining an equity beta of between 0.65 and 0.70 for metropolitan Australian water utilities. Consequently, the Industry Panel's equity beta of 0.7 is consistent with that adopted in similar regulatory determinations.

We also find that the QCA's decisions for Seqwater and SunWater, which set an equity beta of 0.55, should not be relied on as relevant precedent in Icon Water's 2018 Water Price Reset. This is because the QCA acknowledged that the equity beta for these companies was below that of a typical water business such as Icon Water due to these water companies servicing irrigation customers rather than a diversified domestic and industrial customer base.

Finally, section 5 highlights that it has been known for more than 40 years that empirical versions of the CAPM tend to underestimate the returns to low-beta assets. This evidence indicates that an equity beta closer to a central value of 1 should be adopted when applying the CAPM. Therefore, adopting an equity beta of 0.7, which is in the bottom half of the observed equity beta range of between 0.6 and 1.0 is inherently conservative.

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[1] Note that HoustonKemp found an equity beta range of between 0.6 and 0.8 for Sydney Water in 2013.

1. Introduction

This report has been prepared at the request of Icon Water. The context of our report is the regulatory review of Icon Water's regulated water and sewerage services for 2018 to 2023.

Icon Water has asked us to provide an expert opinion on the appropriate value of the equity beta for use in estimating the WACC for Icon Water for the five-year regulatory control period commencing 1 July 2018, within the framework of the Sharpe-Lintner capital asset pricing model (CAPM). This will include determining an appropriate range for the value of the equity beta and the appropriate equity beta point estimate. In doing so, HoustonKemp should:

- adopt an approach consistent with contemporary regulatory practice in Australia and overseas;

- include an assessment of market data on the equity beta for water utilities;

- include a review of relevant recent decisions by other regulators in Australia;

- have regard to the legislative criteria to which the ICRC must have regard in making a price direction;

- provide an opinion on whether the value of the equity beta of 0.7 used in the 2015 Industry Panel Decision[2] is appropriate for use in estimating Icon Water's WACC in the forthcoming regulatory control period; and

- address any other matter HoustonKemp considers relevant to the estimation of equity beta for use in estimating the WACC for Icon Water.

The remainder of our report is structured as follows:

- section 2 sets out the context for this report and the role of the equity beta in estimating the cost of equity;

- section 3 outlines the market evidence of the equity beta for a benchmark water and wastewater business and provides our recommended reasonable range for the equity beta based on the outlined market data;

- section 4 reviews Australian jurisdictional decisions on the equity beta for regulated water utilities; and

- section 5 considers other information that is relevant in setting a point estimate of the equity beta for a benchmark efficient business in the circumstances of Icon Water.

Our report has two appendices which provide more information on our methodology, and the details of comparable companies used in the analyses of market data.

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[2] Industry Panel, *Review of the Independent Competition and Regulatory Commission's 2013 Price Direction for Regulated Water and Sewerage Services in the ACT | Final Report*, April 2015 (the "Industry Panel report"), p. 72.

2. Context

The capital asset pricing model (CAPM) developed by Sharpe (1964) and Lintner (1965) is commonly regarded as the first asset pricing theory.[3]

Sharpe and Lintner's insight is that the return that an investor will require on an individual asset will be determined not by how risky that asset would be if held alone, but by how the asset contributes to the risk of the portfolio that the investor holds.

The Sharpe-Lintner CAPM is expressed as the following equation:

$$E(R_j) = R_f + \beta_j [E(R_m) - R_f]$$

where

$E(R_j)$ = is the expected return on asset j;

R_f = is the risk-free rate;

β_j = asset j's equity beta, which measures the contribution of the asset to the risk, measured by standard deviation of return, of the market portfolio; and

$E(R_m)$ = the expected return to the market portfolio of risky assets where the difference between the expected return on the market and the risk-free rate is colloquially known as the market risk premium.

The CAPM applies the equity beta to scale the market risk premium (MRP) up or down to reflect the asset's risk premium (the premium above the risk-free rate) that equity holders would require to hold that particular asset as part of its well-diversified portfolio.

This simple relation between mean return and beta provides market participants and regulators with what, in principle, should be a simple way of estimating a firm's return on equity. In practice, however, applying this theoretical model is more complicated because one cannot observe the return to the market portfolio of all risky assets. The market portfolio of all risky assets includes not only stocks, for which returns are readily observable, but also corporate bonds, real estate and human capital, for which returns are not readily observable.

Because of these difficulties, an empirical version of the CAPM typically estimates the equity beta using published equity market returns using the following equation:

$$\beta_e = \frac{Cov(r_a, r_b)}{Var(r_a)}$$

This formula represents the covariance between the return on the listed stock (r_a) and the return on a broad market index (such as the All Ordinaries in Australia) (r_b), divided by the variance of the return on the broad market index. Data services such as that available from Bloomberg provide historical market prices and dividend information, which allow returns to be calculated.

It is important to note that the use of a market index that only includes equity assets is a substantial departure from the theory of the CAPM, under which the market portfolio should include all assets. As a result, even if the CAPM model is correct and investors are only concerned with the beta of a stock relative

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[3] Sharpe, William F., Capital asset prices: A theory of market equilibrium under conditions of risk, Journal of Finance 19, 1964, pp. 425-442.

Lintner, John, The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets, Review of Economics and Statistics 47, 1965, pp. 13-37.

to the market portfolio of all risky assets, there is no reason to believe that an empirical version of the CAPM that uses the return on an equity market index as a proxy for the return to the market portfolio of all risky assets will produce unbiased estimates of the returns that investors require. We discuss the evidence and implications of any potential biases in the CAPM in section 5.

Finally, we note that theory does not provide any guidance on the practical estimation of the equity beta from historical market data. In particular, theory provides no direction on the period that returns should be estimated (ie, daily, weekly, monthly or annually) or the period over which beta should be estimated, ie, all available data or more recent data such as the last two or five years.[4] In our opinion, regard should be had to all statistically robust estimates of the equity beta, with different methods for calculating the equity beta providing a plausible range for a benchmark water business.

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[4] We note that good statistical practice suggests that any estimate of the equity beta should be over a period sufficient to provide statistically significant estimates of the equity beta.

3. Equity beta – range estimates

This section briefly describes the data we have assessed to estimate the equity beta for a benchmark water utility. Section 3.2 sets out the results of our analysis of the equity betas of individual companies using both weekly and monthly data. Section 3.3 tabulates the estimated equity betas of portfolios of comparable water and wastewater businesses using:

- equally weighted and value weighted portfolios;
- weekly and monthly data; and
- different estimation periods.

Section 3.4 sets out our recommended equity beta range for a benchmark efficient water utility based on regressions of comparable international water companies.

3.1　Market data

3.1.1　Comparable companies

We identified comparable water utilities by first searching the Bloomberg database for companies that:

- are listed on the New York, NASDAQ, Toronto, London and Australian exchanges; and
- are classified as Industry Classification Benchmark (ICB) subsector 'water utilities'.

We identified 22 water utilities that satisfied these criteria. For each of these companies, we then reviewed the business description available on the Bloomberg database and company websites to determine comparability with Icon Water. In our preferred portfolio, we eliminated 11 companies from the list of 22 identified water utilities. The reasons for eliminating those companies included that:

- they operated in developing countries;
- they derived a material proportion of revenue from activities other than the provision of water and wastewater distribution services; or
- there is no publicly available financial data for the utilities.

We therefore identified 11 comparable water utilities from the United States, Canada and the United Kingdom. A description of each of these companies is provided in Appendix A.2. Table 3.1 below provides further information on the list of comparable companies.

Table 3.1 Comparable water utilities used for analysis

Firm	Ticket	Data availability	Leverage (per cent)	Market capitalisation (US $m)
North American Utilities				
American States Water	AWR US Equity	March 1988 to February 2017	20.5	1,277
American Water Works	AWK US Equity	June 2008 and February 2017	40.3	9,325
Aqua Water	WTR US Equity	September 1980 to February 2017	27.0	4,620
Artesian Resources	ARTNA US Equity	June 1994 to February 2017	37.4	200
California Water Service	CWT US Equity	March 1984 to February 2017	32.0	1,142
Connecticut Water Service	CTWS US Equity	March 1984 to February 2017	31.5	412
Middlesex Water	MSEX US Equity	March 1984 to February 2017	28.3	416
SJW Corporation	SJW US Equity	September 1980 to February 2017	38.1	645
York Water	YORW US Equity	June 1994 to February 2017	21.9	303
UK Utilities				
Dee Valley Water Group	DVW LN Equity	December 1994 to February 2017	45.4	89
Severn Trent	SVT LN Equity	September 1991 to February 2017	49.8	6,999
United Utilities Group	UU/ LN Equity	September 1990 to February 2017	52.9	8,527

Note: Leverage and market capitalisation are averages from the last day of June and December, over 5 years

Table 3.1 shows that we have identified nine North American water utilities and three water utilities from the United Kingdom. However, because the water utilities in the United Kingdom are typically much larger than those in North America, UK water utilities represent close to half the total market capitalisation of comparable water utilities.

3.1.2 Market indices

On the basis that the comparable companies we identified are domiciled in North America and the United Kingdom, we use the FTSE all share index[5] for the United Kingdom and the MSCI North American index[6] for North America.

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[5] The FTSE all-share index is a capitalisation weighted index comprised of the FTSE 350 and the FTSE SmallCap indices and has the Bloomberg ticker 'ASX Index'.

[6] The MSCI North American index is a free-float weighted index with the Bloomberg ticker 'MXNA Index'.

3.2   Results of individual water utilities

Table 3.2 below presents the individual beta estimates for the individual companies identified as comparable water utilities in the United States, Canada and the United Kingdom.

Table 3.2 Individual beta estimates

Firm	Ticker	2 years		5 years			
		Weekly		Weekly		Monthly	
		Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
North American Equities							
American States Water	AWR US Equity	1.23	0.30	1.21	0.20	0.82	0.55
American Water Works	AWK US Equity	0.63	0.18	0.57	0.12	0.28	0.27
Artesian Resources	ARTNA US Equity	1.03	0.32	0.80	0.17	0.22	0.41
California Water Service	CWT US Equity	1.08	0.28	1.04	0.16	1.10	0.41
Connecticut Water Service	CTWS US Equity	0.89	0.29	0.95	0.17	0.11	0.38
Middlesex Water	MSEX US Equity	1.49	0.36	1.25	0.18	0.78	0.50
SJW Corporation	SJW US Equity	1.28	0.30	1.12	0.16	0.37	0.41
York Water	YORW US Equity	1.73	0.38	1.52	0.21	1.12	0.51
UK Equities							
Dee Valley Water Group	DVW LN Equity	0.13	0.17	0.22	0.10	0.39	0.27
Severn Trent	SVT LN Equity	0.99	0.13	0.90	0.11	0.95	0.24
United Utilities Group	UU/ LN Equity	0.95	0.14	0.79	0.09	0.73	0.24

Table 3.3 summarises the results of the individual company equity beta estimates and discloses that:

- water utilities in the United Kingdom generally have lower equity beta, compared to North American firms;

- using 5-year weekly data results in the most statistically robust equity beta estimates, whereas the standard errors of the beta estimates derived from monthly data are material; and

- the equity beta estimates derived using weekly data are generally higher than estimates derived from monthly data.

Table 3.3 Summary statistics for individual beta estimates

	2 years	5 years	
	Weekly	Weekly	Monthly
Mean			
North American utilities	1.17	1.06	0.60
UK utilities	0.69	0.64	0.69
All utilities	1.04	0.94	0.62
Median			
North American utilities	1.16	1.08	0.58
UK utilities	0.95	0.79	0.73
All utilities	1.03	0.95	0.73

3.3 Results of portfolios of water utilities

In addition, to estimating individual company beta estimates we have constructed the following two portfolios of the 11 identified comparable water utilities from the United States, Canada and the United Kingdom:[7]

- an equal weighted portfolio where each of the comparable water utilities have an equal weight in the portfolio;

- a value weighted portfolio where the relative weights of the comparable water utilities are determined on the basis of market capitalisation.

Table 3.4 below presents equity beta estimates from our analysis of our equal and value weighted portfolios with weekly and monthly data for 2-year and 5-year estimation periods.

Table 3.4 Portfolio estimates

Portfolio weighting	2 years		5 years			
	Weekly		Weekly		Monthly	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Equal weight	1.01	0.20	0.94	0.10	0.59	0.28
Value weighted	0.91	0.15	0.82	0.09	0.64	0.24

In the following sections, we draw inferences from the various approaches to estimating the equity beta, as presented in Table 3.4 above.

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[7] A detailed description of our methodology is set out in Appendix A1 of this report.

Estimation period and data frequency

The standard error increases materially when a two-year estimation period is used instead of a 5-year estimation period, and when analysis uses monthly data, as opposed to weekly. In both instances, this results from a reduction in the number of observations for analysis.

Weighting

We estimate the equity beta using both equally weighted and value weighted portfolios.

Table 3.4 shows that an equal weighted portfolio gives rise to higher estimates of the equity beta, as compared to the value weighted portfolio, when weekly data is used. However, the opposite is true when monthly data is used.

3.4 Reasonable range of equity beta from market data

In our opinion, the equity beta range should be determined by estimates derived from:

- both mean and median estimates of beta from individual water utilities; and
- both the equally weighted and value weighted portfolio.

Figure 3.1 illustrates our quantitative analysis that supports a reasonable equity beta range from market data to be:

- an upper bound of 1.0; and
- a lower bound of 0.6.

Figure 3.1 Results of market estimate of the equity beta for a water utility
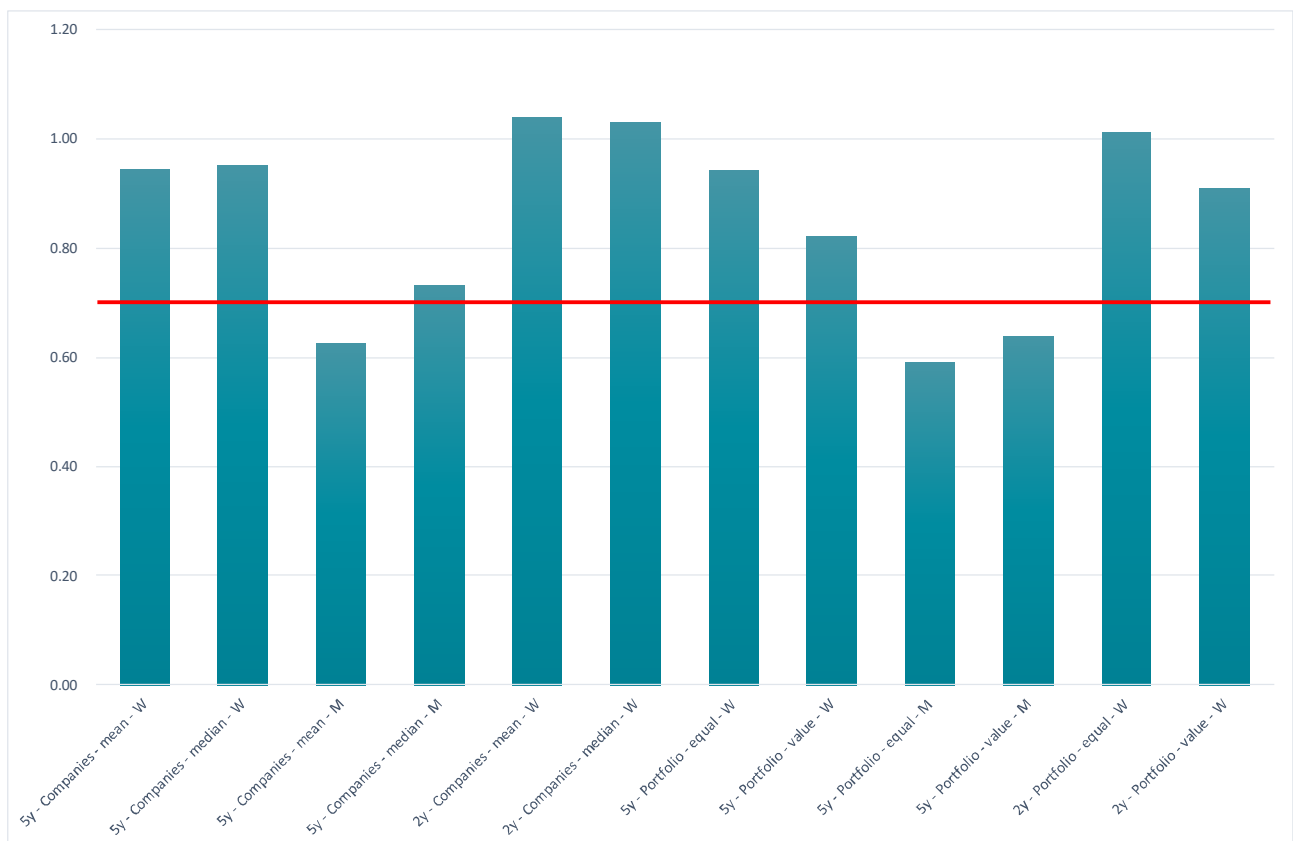
Our analysis of the equity betas of comparable water utilities in North America and the United Kingdom provides considerable support for the continued adoption of the Industry Panel's equity beta of 0.7 in Icon Water's 2018 Water Price Reset. Figure 3.1 highlights that 75 per cent of the equity beta estimates (ie eight of the twelve) are higher than the Industry Panel's equity beta of 0.7. Furthermore, an equity beta of 0.7 is close to the bottom of the equity beta range, which suggests that this is a conservative value especially given the known bias in the empirical versions of the CAPM which tend to underestimate the returns of low beta assets.[8]

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[8] The issue of low beta bias is discussed in greater detail in section 5 of this report.

4. Equity beta – regulatory decisions

This section provides a comparison of equity beta values determined by other Australian jurisdictional regulators in recent decisions for regulated water utilities. We find that there is strong support from comparable regulatory decisions for the continuation of the Industry Panel's decision to adopt an equity beta of 0.7 in Icon Water's 2018 Water Price Reset.

Our review identifies that some previous decisions should be given greater weight in the ICRC's deliberations than others. Part 4 of the ICRC Act requires that the ICRC when making a pricing direction for a regulated industry is required to:[9]

> … promote the efficient investment in, and efficient operation and use of regulated services for the long term interests of consumers in relation to the price, quality, safety, reliability and security of the service.

Further, the ICRC in making a price direction must also have regard to:[10]

> an appropriate rate of return on any investment in the regulated industry;

We examine comparable decisions to determine the extent to which they are valuable precedent for Icon Water's 2018 Water Price Reset based on the following criteria:

- whether the characteristics of the regulated business are comparable to Icon Water;

- whether the respective authority's statutory objective (if any) and the matters it is required to consider in regulatory decision-making are comparable to those of the ICRC; and

- whether it is possible to ascertain and assess the regulator's methodology, and if so, whether the equity beta implemented is estimated analytically or determined by precedent.

Table 4.1 shows a summary of our analysis that is expanded upon for the remainder of this section. Our analysis indicates that the recent determinations of the Independent Pricing and Regulatory Tribunal (IPART) for Sydney Water and the Essential Services Commission of Victoria (ESC) for Melbourne Water are of highest precedential value to the ICRC's decision on Icon Water's equity beta in its 2018 Water Price Reset.

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[9] ICRC Act, s 19L.

[10] ICRC Act, s 20(2)(d).

Table 4.1: Precedential value of comparable water authority decisions

Authority	Date	Equity beta	Business characteristics relevance	Regulatory objective relevance	Equity beta precedential value	Overall precedential value
IPART	June 2016	0.70[11]	High	High	High	High
ESC (Melbourne Water)	June 2016	0.65[12]	High	High	Medium	High
ESC (Goulburn-Murray Water)	June 2016	0.70[13]	Medium	High	Medium	Medium
ESCOSA	June 2016	0.70[14]	High	High	Low	Medium
ERA	January 2013	0.65[15]	High	High	Low	Medium
QCA	April 2013	0.55[16]	Low	High	Low	Low
TasER	April 2015	0.65[17]	High	High	Low	Low

4.1 Analysis of IPART's Sydney Water Corporation determination

Our examination of IPART's price review decision for Sydney Water indicates that it is of high precedential value for the ICRC to consider in Icon Water's 2018 Water Price Reset based on our criteria. Sydney Water has similar business characteristics to Icon Water and provides similar services, such as water supply and wastewater services, which implies it has a similar risk profile to Icon Water.[18]

IPART operates under the *Independent Pricing and Regulatory Tribunal Act 1992* (IPART Act) which has a regulatory framework that is consistent with Part 4 of the ICRC Act. The IPART Act sets out matters to be considered by IPART in making pricing determinations that are substantively similar to those the ICRC is required to consider in making a pricing direction for Icon Water,[19] including:[20]

- the need for greater efficiency in the supply of services so as to reduce costs for the benefit of consumers and taxpayers;
- standards of quality, reliability and safety of the services concerned;
- the appropriate rate of return on any investment in the regulated industry; and
- the borrowing, capital and cash flow requirements of people providing regulated services and the need to renew or increase relevant assets in the regulated industry.

IPART also implements a transparent WACC methodology, which includes equity beta estimation, with a similar objective to the statutory objective of the ICRC in making a pricing direction:[21]

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[11] IPART, *Review of prices for Sydney Water Corporation,* June 2016, p. 125.

[12] ESC, *Melbourne Water price review | Final decision,* June 2016, p. 53.

[13] ESC, *Goulburn-Murray Water price review*, June 2016, p. 33.

[14] ESOSA, *SA Water regulatory determination 2016,* June 2016, p. 125.

[15] ERA, *Inquiry into the efficient costs and tariffs of the Water Corporation, Aqwest and the Busselton Water Board,* January 2013, p. 164.

[16] QCA, *SunWater irrigation price review 2012-17*, May 2012, p. 493.

[17] Office of the Tasmanian Economic Regulator, *2015 price determination investigation | Regulated water and sewerage services in Tasmania,* April 2015, p. 45.

[18] IPART, *Review of prices for Sydney Water Corporation,* June 2016, p. 1.

[19] *Independent Competition and Regulatory Commission Act 1997* (ACT), s 20(2).

[20] *Independent Pricing and Regulatory Tribunal Act 1992* (NSW), s 15.

[21] IPART, *Review of WACC methodology*, December 2013, p. 10.

> [To be] consistent with the long-term interests of consumers, as we consider that these interests are best served through efficient investment and the commercially sustainable provision of efficient services.

IPART implements an equity beta of 0.7[22] that is estimated by a transparent and analytical process to facilitate efficient investment in water services. The methodology examines as many comparable firms as possible to acquire a reasonable industry estimate of the equity beta using current market data and long term averages.[23]

This methodology is consistent with an equity beta study submitted by Sydney Water from HoustonKemp Economists that estimated the equity betas of 16 comparable international water companies, as well as the equity beta for three equally weighted portfolios of these firms.[24] This study confirmed the IPART's finding in 2012 of the equity beta for a water business to be between 0.6 and 0.8.[25]

We consider IPART's price review decision for Sydney Water to be of high precedential value to the ICRC as efficient investment in water services and the long-term interests of consumers are promoted due to the analytical framework implemented to estimate the equity beta.

4.2   Analysis of the ESC's Melbourne Water determination

Our analysis of the ESC's price review for Melbourne Water indicates that the determination is of high precedential value for the ICRC to consider in its price review of Icon Water. Melbourne Water has a similar business structure to Icon Water and provides services, such as bulk water and sewerage, implying a similar risk structure to Icon Water.[26]

The ESC has a similar statutory objective to the ICRC under the *Essential Services Commission Act 2001* (Vic), namely to promote the long term interests of Victorian consumers, and, in seeking to achieve this objective, it is required to have regard to the price, quality and reliability of essential services.[27]

In its price review decision for Melbourne Water, the ESC implements an equity beta of 0.65[28] in a method that is consistent with its objective of long term consumer welfare. Its value for the equity beta is based on a past empirical study of domestic water businesses with consideration for current market conditions and relevant precedent.[29] In undertaking its analytical estimation of the equity beta, the ESC considers the methodology implemented in the ACCC's *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010* (Pricing Principles) and indicates that its methodology is broadly consistent with the approach shown in the ACCC's Pricing Principles.[30]

The use of an analytical framework and consideration of regulatory precedent is consistent with the ICRC's objective to promote efficiency, including in particular efficient investment, and we consider this determination to be of high precedential value to the ICRC's price review of Icon Water.

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[22] IPART, *Review of prices for Sydney Water Corporation,* June 2016, p. 125.

[23] IPART, *Review of WACC methodology*, December 2013, p. 21.

[24] HoustonKemp, *Equity beta for a benchmark Australian water network service provider,* June 2015, p. 9.

[25] IPART, *Review of prices for Sydney Water Corporation's water, sewerage, stormwater drainage and other services | From 1 July 2012 to 30 June 2016 | Final Report,* June 2012, *p. 208.*

[26] ESC, *Melbourne Water price review 2016 | Final decision*, June 2016, p. 53.

[27] *Essential Services Commission Act 2001* (Vic), s 8.

[28] ESC, *Melbourne Water price review 2016 | Final decision*, June 2016, p. 49.

[29] ESC, *Greater metropolitan water businesses | Final decision*, June 2013, p. 103.

[30] ESC, *2013 Water price review | Guidance on water plans*, October 2011, pp. 6, 62.

4.3   Analysis of the ESC's Goulburn-Murray Water determination

Our examination of the ESC's price review of Goulburn-Murray Water finds that it has some relevance to the ICRC's review. Goulburn-Murray Water provides similar services to Icon Water but does have some different business characteristics to Icon Water as it has a focus on large scale irrigation projects.[31]

Goulburn-Murray Water's infrastructure related services (the majority of its services) are regulated under the *Water Charge (Infrastructure) Rules 2010* (Cth) (WCIR) as a result of a referral of power by Victoria to the Commonwealth following the Murray-Darling Basin Agreement among Basin States to manage the Basin's shared water uniformly across jurisdictions. The ACCC is responsible under the WCIR for approving or determining the regulated charges of water entities in the Murray-Darling Basin. However, the ESC has been accredited by the ACCC to perform this function under the WCIR in accordance with Part 9 of those Rules. A condition of accreditation is that the ESC apply pricing principles developed by the ACCC when approving regulated charges under the WCIR - being the ACCC's Pricing Principles referred to in our analysis of Melbourne Water above.[32]

The ACCC's Pricing Principles prescribe the individual parameter values to be used in calculating the WACC, including an equity beta of 0.7.[33] In its price determination for Goulburn-Murray Water, the ESC was required to apply the equity beta of 0.7 from the ACCC's Pricing Principles.

The ACCC formulated its Pricing Principles having regard to the requirements for approving or determining charges in rule 29 of Part 6 of the WCIR, which require the regulator to be satisfied that forecast revenue is reasonably likely to meet the prudent and efficient costs of providing infrastructure services in the regulatory period (rule 29(2)).[34] In addition, the regulator is required to have regard to whether the regulated charges would contribute to achieving the Basin water charging objectives and principles in Schedule 2 of the *Water Act 2007* (Cth), which include promoting efficient and sustainable use of water infrastructure assets (rule 29(4)).

While we find this regulatory framework where the ESC is required to apply the equity beta in the ACCC's Pricing Principles not to be directly comparable to the ICRC's framework for making its price direction for Icon Water under which the ICRC has a discretion in determining the equity beta, the equity beta value of 0.7 may still be a relevant value to consider as the ACCC methodology of estimating the beta is analytical, transparent and is estimated under a regulatory framework with the objective of promoting efficiency.[35]

As part of its analysis in determining the value of the equity beta, the ACCC noted the absence of any publicly listed Australian water businesses. However, the ACCC concluded that the underlying industry characteristics suggest that rural water businesses are likely to face similar levels of systematic risk as energy transmission and distribution provider. The ACCC conclusion was supported by a report from Frontier Economics that found, while not perfect, the equity betas of listed Australian companies that derive substantial portions of their revenue from regulated energy networks were adequate proxies for a regulated water business.[36]

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[31] ESC, *Goulburn-Murray Water price review 2016*, June 2016, p. 45.

[32] ACCC, *Water Charge (Infrastructure) Rules | Application by Essential Service Commission of Victoria for accreditation | Final decision,* February 2012, p. 8; ACCC, *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010*, July 2011.

[33] ACCC, *Water Charge (Infrastructure) Rules | Application by Essential Service Commission of Victoria for accreditation | Final decision,* February 2012, p. 17; ACCC, *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010*, July 2011, p. 28.

[34] ACCC, *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010*, July 2011, pp. 12-13 and 23.

[35] ACCC, *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010*, July 2011, pp. 33-38.

The ACCC noted that the evidence collected by the Australian Energy Regulator (AER) in its 2009 review of the WACC parameters for electricity distribution and transmission network service providers indicated a range of equity beta values for these companies between 0.4 and 0.7.[37] The ACCC considered that it would be appropriate to adopted a value at the top of this range (ie, 0.7) for regulated water businesses.

We consider the ESC's decision to adopt an equity beta of 0.7 for Goulburn-Murray Water to be relevant to the determination of Icon Water's equity beta in its 2018 Water Price Reset, because:

- the regulatory framework for the ACCC's determination of a 0.7 equity beta value in its Pricing Principles is consistent with the regulatory objective set out in the ICRC Act; and

- in deciding to apply an equity beta of 0.7 in its Pricing Principles, the ACCC relied on independent expert advice on the equity beta.

However, we note that Goulburn-Murray Water mainly services large scale irrigation projects, in contrast to Icon Water that provides water and sewerage services to a diversified metropolitan customer base. Accordingly, the precedential value of this decision to Icon Water's 2018 Water Price Reset is not as high as IPART's Sydney Water decision or the ESC's Melbourne Water decision examined above.

4.4   Analysis of the ESCOSA's South Australia Water determination

Our examination of the Essential Service Commission of South Australia's (ESCOSA's) price review for South Australia Water (SA Water) finds that it is fairly relevant as precedent for the ICRC's review of Icon Water. SA Water provides similar water services to Icon Water, including drinking water and sewerage services, which makes it a comparable firm to Icon Water with a similar risk profile.[38]

The ESCOSA is also subject under the *Water Infrastructure Act 2012* (SA) to similar regulatory objectives and considerations as the ICRC, such as:[39]

- to promote efficiency, competition and innovation in the water industry; and

- to promote the economically efficient use and operation of, and investment in, significant infrastructure so as to promote effective competition in upstream and downstream markets.

The ESCOSA implements an equity beta of 0.7 based on a detailed study of comparable jurisdictional authorities.[40] Having regard to all the methodologies reviewed, the ESCOSA determines a value of 0.7 is likely to be a reasonable estimate based on the current empirical evidence and Australian regulatory precedent.[41] The examination of empirical evidence and regulatory precedent is consistent with the ESCOSA and the ICRC's objective to promote efficiency in the water industry but as it is not based on an analytical estimation framework we do not consider it to have as strong precedential value as other regulators' decisions, such as IPART's Sydney Water decision and the ESC's Melbourne Water decision.

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[37] ACCC, *Pricing principles for price approvals and determinations under the Water Charge (Infrastructure) Rules 2010*, July 2011, p. 35.

[38] ESCOSA, *SA Water regulatory rate of return 2016-20*, March 2015, p. 8.

[39] *Water Industry Act 2012* (SA)*,* s 3.

[40] ESCOSA, *SA Water regulatory rate of return 2016-20*, March 2015, p. 71.

[41] ESCOSA, *SA Water regulatory rate of return 2016-20*, March 2015, p. 71.

4.5 Analysis of the ERA's Water Corporation, Aqwest and Busselton Water determination

Our examination of the Economic Regulation Authority's (ERA's) tariff determination for Water Corporation, Aqwest and Busselton Water finds that it is fairly relevant as precedent for the ICRC's review of Icon Water. The water companies that the ERA reviews provide similar services to Icon Water, such as water supply and wastewater services, which give these companies a similar risk profile to Icon Water.[42]

The ERA also operates under a similar legislative mandate to the ICRC under the *Economic Regulation Authority Act 2003* (WA). The matters the ERA is required by the ERA Act to consider include:[43]

- the long-term interests of consumers in relation to the price, quality and reliability of goods and services provided in relevant markets; and

- the need to encourage investment in relevant markets.

The ERA used the QCA's price determination for the Gladstone Area Water Board which implemented an equity beta value of 0.65 and a report prepared by The Allen Consulting Group for the ESC's recent price review of gas distribution industries.[44] The latter study estimated a range of equity beta between 0.5 and 0.8 for a large portfolio of Australian and international utility and energy related businesses.

We consider this price determination to be of some precedential value to the ICRC's review as it does rely on some regulatory precedent and an analytical study. However, a more comprehensive examination of other authorities' methodologies or an analytical study prepared expressly for water service providers would go further to ensure the promotion of efficient investment and long term consumer welfare.

4.6 Analysis of the QCA's SunWater and Seqwater determinations

Our analysis of the Queensland Competition Authority's (QCA's) price determinations for SunWater's and Seqwater's irrigation services indicates that these determinations should not be considered as precedent for the ICRC's price review of Icon Water's services. We combine our analysis of SunWater and Seqwater, as the price review for Seqwater replicates the approach for SunWater and they give rise to the same issues regarding their application to Icon Water.[45] We find that there are fundamental differences between the matters relevant to the QCA's determinations (including the characteristics of the regulated entities' customers and a Ministerial Direction limiting the assets subject to a rate of return) and the matters relevant to the ICRC's decision in Icon Water's 2018 Water Price Reset that indicates the ICRC should not use the QCA's determinations as relevant precedent.

In making a water price determination, the QCA is required under the *Queensland Competition Authority Act 1997* (QCA Act) to consider matters that are similar to those the ICRC is required to consider under Part 4 of the ICRC Act such as:[46]

- the need for efficient resource allocation;

- the cost of providing the activity in an efficient way;

- the quality of the activities constituting the water supply activity; and

- the appropriate rate of return on water suppliers' assets.

Despite these legislative similarities, the regulatory issues considered by the QCA are not comparable to the issues faced by the ICRC. The Ministerial Direction only allowed SunWater and Seqwater to earn a

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[42] ERA, *Inquiry into tariffs of the Water Corporation, Aqwest and Busselton Water,* January 2013, p. 2.

[43] *Economic Regulation Authority Act 2003* (WA), s 26.

[44] ERA, *Inquiry into tariffs of the Water Corporation, Aqwest and Busselton Water,* January 2013, p. 58.

[45] QCA, *Seqwater irrigation price review 2013-17*, April 2013, p. 265.

[46] *Queensland Competition Authority Act 1997* (QLD), s 170ZI.

commercial rate of return on network augmentations commissioned after a specified date, being the commencement of the regulatory period.[47] The capital costs of the network augmentations that are commissioned during the regulatory period would represent a minor portion of the regulatory asset base of each of SunWater and Seqwater.

The QCA's examination of the systematic risk of SunWater concluded:[48]

> The Authority noted that SunWater considers it now has the lowest equity beta of a regulated water business in Australia. It is considered appropriate that the measure of systematic risk appropriate to SunWater's irrigation activities only would be below that recorded for most regulated water businesses (as a whole) in Australia, given that these businesses typically provide water-related services to urban and industrial customers as well as (in some cases) irrigators. The Authority considers, therefore, that it is appropriate for the SunWater's irrigation business asset and equity beta to be low relative to other regulated water businesses;

Further, the QCA concluded that SunWater was the most appropriate comparator for assessing the systematic risk of Seqwater's irrigation cashflows.[49] On this basis it adopted the same equity beta for Seqwater as that determined for SunWater. It follows that the decision to adopt an equity beta of 0.55 by the QCA is not a good guide to the equity beta of a water related service provider with a significant urban and industrial customer base such as Icon Water.

We do not consider the equity beta determined for SunWater and Seqwater by the QCA to be a relevant precedent for Icon Water. The QCA explicitly reduced the equity beta for both SunWater and Seqwater because the assets for which a return on capital is provided service irrigation customers, rather than urban and industrial customers of the kind serviced by the assets of other regulated water businesses such as Icon Water. In other words, the equity beta determined for SunWater and Seqwater are not relevant precedents because Icon Water services urban and industrial customers which the QCA acknowledges would result in higher levels of systematic risk compared to water utilities that service irrigation customers.

4.7 Analysis of TasER's TasWater price determination

Our examination of the Office of the Tasmanian Economic Regulator's (TasER) price determination indicates that this determination should not be considered as precedent for ICRC's price review of Icon Water. Although there are similarities between the business characteristics of TasWater and Icon Water and between the statutory objectives of TasER and the ICRC and the matters they are required to consider in regulatory decision making, we are not able to ascertain the method that TasER implements to obtain its equity beta value of 0.65.

TasWater provides similar services to Icon Water including water and sewerage services, which gives it a similar risk profile to Icon Water.[50] TasER operates under the *Water and Sewerage Industry Act 2008* (Tas) that sets out regulatory pricing principles, including that the price is to provide effective incentives to promote economic efficiency, reduce costs or otherwise improve productivity with respect to a regulated service.[51]

Despite these regulatory similarities, we do not consider this price determination should be relied on by the ICRC as regulatory precedent as we are not able to ascertain or assess the method that TasER implements or any sources used to implement its equity beta value of 0.65 after a long literature review. It is our opinion

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[47] A commercial rate of return is allowed for network augmentations commissioned after 30 June 2012 for SunWater and 30 June 2013 for Seqwater.

[48] QCA, *SunWater irrigation price review 2012-17*, May 2012, p. 501.

[49] QCA, *Seqwater irrigation price review 2013-17*, April 2013, p. 274.

[50] Office of the Tasmanian Economic Regulator, *2015 price determination investigation | Regulated water and sewerage services in Tasmania,* April 2015, p. IX.

[51] *Water and Sewerage Act 2008* (Tas)*,* s 68.

that a previous determination should not be relied upon for regulatory precedent unless the method adopted in that determination is transparent and repeatable.

4.8 Summary of our examination of relevant equity betas

Our examination of recent price determinations of comparable jurisdictional authorities indicates that there is a high degree of consistency in the equity beta decisions made by Australian jurisdictional regulators. With one exception, regulators have determined an equity beta of between 0.65 and 0.70 for Australian water utilities. The one exception was the decisions by the QCA that set an equity beta of 0.55, however, the regulator in making these decisions acknowledged that the equity beta adopted for Seqwater and SunWater was below that of a typical water business due to the characteristics of customers served by the water services companies.

In our opinion, the Sydney Water and Melbourne Water decisions to set an equity beta of 0.7 and 0.65, respectively are of particularly relevance for Icon Water because:

- IPART and the ESC have a comparable WACC objectives which is to promote the long-term interests of consumers by ensuring efficient investment in regulated services;

- Sydney Water and Melbourne Water are both comparable regulated water and wastewater businesses that service a predominantly urban and industrial customer base; and

- IPART and the ESC in making their decisions had regard to market evidence on the prevailing equity beta of a benchmark water and wastewater business.

These comparable regulatory decisions provide strong support for the continuation of the 0.7 equity beta determined by the Industry Panel in Icon Water's 2018 Water Price Reset.

5. Other information on the equity beta

Although the CAPM is an intuitive and simple financial model, it has been known for more than 40 years that empirical versions of the CAPM tend to underestimate the returns to low-beta assets, a phenomenon that is colloquially referred to as the low beta bias. By way of example, Mehrling (2005) notes that:[52]

> 'The very first [Wells Fargo] conference was held in August 1969 at the University of Rochester in New York State ... The focus of the first Wells Fargo conference was on empirical tests of the CAPM ... the most significant output of the first conference was the paper of Fischer Black, Michael Jensen, and Myron Scholes (BJS), titled "The Capital Asset Pricing Model: Sosssme Empirical Tests," eventually published in 1972. ... One important consequence of the BJS tests was to confirm earlier suggestions that low-beta stocks tend to have higher returns and high-beta stocks tend to have lower returns than the theory predicts.'

However, the low-beta bias observed in the CAPM does not necessarily invalidate the model, because the empirical version of the CAPM typically employed departs from the theoretical version.

The SL CAPM predicts that there should a positive linear relation between the expected returns to assets and their betas computed relative to the market portfolio of *all risky assets*. However, the empirical version of the CAPM, including that applied by IPART, measures the risk of an asset relative to a portfolio of stocks, whose value constitutes a relatively small proportion of the value of all risky assets. Therefore, the return to a portfolio of stocks may not be a good proxy for the return to the market portfolio of all risky assets.

There is a substantial body of work from reputable sources in both the United States and Australia that indicates that the CAPM will underestimate the returns to low-beta assets. NERA (2015)[53] assesses the empirical performance of the CAPM using monthly data from January 1969 to December 2013 for Australian stocks, drawn from SIRCA's Share Price and Price Relative (SPPR) database.[54] [55]

NERA (2015) uses in-sample and out-sample tests to examine whether there is evidence against the restrictions imposed by the CAPM. In-sample tests use the full sample of data whereas, in contrast, out-sample tests split the full sample of data up.

On the basis of the in-sample tests, NERA (2015) finds that:[56]

> … the evidence indicates that the SL CAPM significantly underestimates the returns generated by low-beta portfolios and overestimates the returns generated by high-beta portfolios. In other words, the model has a low-beta bias.

and that:[57]

> The evidence is particularly strong for low-beta portfolios – the SL CAPM underestimates the returns to the five lowest-beta portfolios by around three to five per cent per annum. Thus the evidence against the model is both economically and statistically significant.

Similarly, the out-of-sample tests indicate that the SL CAPM underestimates the returns to low beta portfolios.[58] Moreover, NERA (2015) also tests a 'naïve' model that states that the mean returns to all

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[52] Mehrling, P., *Fischer Black and the revolutionary idea of finance*, Wiley, 2005, pp. 104-105.

[53] NERA, *Empirical Performance of Sharpe-Lintner and Black CAPMs*, February 2015.

[54] NERA, *Empirical Performance of Sharpe-Lintner and Black CAPMs*, February 2015, p. 21.

[55] Note that a number of HoustonKemp staff were previously affiliated with NERA including Simon Wheatley who was the author of the NERA 2015 report.

[56] NERA, *Empirical Performance of Sharpe-Lintner and Black CAPMs*, February 2015, p. ii.

[57] NERA, *Empirical Performance of Sharpe-Lintner and Black CAPMs*, February 2015, p. 27.

[58] NERA, *Empirical Performance of Sharpe-Lintner and Black CAPMs*, February 2015, p. 38.

equities are the same and finds that it cannot reject the hypothesis that such a model generates unbiased estimates.

This evidence indicates that an equity beta closer to a central value of 1 should be adopted when applying the CAPM. It also suggests that the need to set a point estimate for the equity beta at the top of a range increases when that equity beta range is substantially less than 1.

6. Conclusion

Icon Water has asked HoustonKemp to provide an opinion on whether the value of the equity beta of 0.7 used in the 2015 Industry Panel Decision is appropriate for use in estimating Icon Water's WACC in the 2018 Water Price Reset. Our analysis set out in this report strongly supports the adoption of an equity beta of at least 0.7 consistent with that used in the 2015 Industry Panel Decision because:

- our estimates of the prevailing equity betas of comparable North American and UK water businesses finds:
  - > an equity beta range of 0.6 to 1.0 for Icon Water; and
  - > 75 per cent of the equity beta estimates (ie eight of the twelve) are higher than the Industry Panel's equity beta of 0.7; and
- our review of regulatory decisions for water businesses finds a high degree of consistency in the equity beta decisions with regulators determining an equity beta of between 0.65 and 0.70 for metropolitan Australian water utilities.

In our opinion the adoption of an equity beta of 0.7 for the 2018 Water Price Reset would be a prudent conservative decision because:

- it would be in the bottom half of the prevailing equity beta range for comparable North American and UK water businesses; and
- of the concerns that the empirical versions of the CAPM have been found to underestimate the returns to low-beta assets which suggests that an equity beta closer to a central value of 1 should be adopted when applying the CAPM.

In our opinion, if future research confirms that the equity beta of water businesses has increased then regulators should consider raising the equity beta for water utilities in subsequent regulatory periods.

A1.   Methodology

In this appendix we describe our approach to estimating the equity beta range. Although we use a number of different methodologies, each is consistent in that it estimates the equity beta using an OLS regression of stock returns against market returns.

A1.1   Individual estimates and portfolios

We analyse the comparable water utilities using three approaches, ie:

1. by treating the equity beta estimate for each comparable water utility as an individual observation;
2. by compiling an equal weighted portfolio of comparable water utilities; and
3. by compiling a value weighted portfolio of comparable water utilities.

In the first approach, we regress the returns of each company against the return on the market in which it is domiciled and so derive an equity beta estimate and an associated standard error for each company. We then compute the mean and median estimates of the group. It is easier, however, to assess the significance of mean estimates of beta by forming portfolios, therefore, we also compile equally weighted and value-weighted portfolios of the comparable companies.

For the purpose of implementing the second and third approaches we downloaded from Bloomberg data for non-United States companies and indices in United States dollars.

In the second approach, we compile a portfolio comprising, at each point in time, the companies for which data is available, where each company has an equal weight in the portfolio. The return to this portfolio of water utilities is regressed against the return to a joint market index that combines the North American and UK market indices. This joint market index is weighted, at each point in time, by the number of UK and North American companies contained in the portfolio of water utilities.

The third approach is similar to the second approach; however, the weights used to compile the portfolio and joint market index are determined on the basis of market capitalisation. Specifically, we compile a portfolio of water utilities, at each point in time, which is weighted by the market capitalisation of the water utilities at the start of each period. Similarly, the weights for the joint market index, at each point in time, are determined by the market capitalisation of UK and North American water utilities that comprise the portfolio of water utilities.

The primary difference between the equal weight and value-weighted portfolios is that UK water utilities are given relatively more weight in the value-weighted portfolio, since all four of the UK firms are large water utilities.

A1.2   Adjustments

The comparable water utilities we identified were financed using different proportions of debt and equity. However, the level of a company's financial leverage has implications for its exposure to systematic risks, and so we re-levered our beta estimates to reflect the benchmark leverage used to weight the amount of debt and equity finance in the Industry Panel report's cost of capital calculation in the 2015 decision, ie, all beta estimates are re-leveraged to 60 percent debt.[59]

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[59] Where a comparable firm has a gearing ratio different from the assumed benchmark, the observed beta of the comparable firm is re-levered using the re-leverage formula adopted by the AER. See: AER, *Electricity transmission and distribution network service providers | Review of the weighted average cost of capital (WACC) parameters: Final Decision*, May 2009, pp. 265-267.

A1.3   Data frequency and estimation period

We downloaded daily price data from Bloomberg and converted these price data to weekly and monthly returns. We note that using weekly data increases the precision of estimates, as compared with using monthly data.

Further, we also estimate the equity beta using different estimation periods. We note that while using a longer estimation period increases the number of observations, it also increases the likelihood that the resultant estimate will not reflect a company's risk profile due to a recent change in that risk profile. Consequently, we have calculated the equity betas using a sample period that includes:

- data from February 2012 to February 2017 (ie, the last 5-years) for our analysis of equally weighted and value-weighted portfolios; and

- data from February 2015 to February 2017 (ie, the last 2-years) for our analysis of equally weighted and value-weighted portfolios.

Note that monthly estimates were only generated using 5-years of data, using 2-years of month data (ie, 24 observations) did not produce statistically robust estimates.

A2.   Company descriptions

A2.1   Companies identified by ICB search and included in our analysis

A2.1.1   American States Water Co

American States Water Co has two subsidiaries; Golden State Water Company and American States Utility Service. Golden State Water Company provides water services to customers in California, as well as electricity to customers in the Big Bear recreational area. The majority of its revenues comes from its water utility segment, at $328.5 million in 2015, compared to its electricity segment, $36 million in 2015.[60] American States Utility Services provides operations, maintenance and construction management services for water and wastewater systems located on US military bases. American States Water Services earned $94 million in revenue in 2015.

In our opinion, American States Water Co is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.2   American Water Works Co Inc

American Water Works Company provides drinking water, wastewater and other related services to residential, commercial and industrial customers in 47 states in the US and in Ontario, Canada.[61]

In our opinion, American Water Works is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.3   Artesian Resources Corp

Artesian Resources Corporation operates a holding company of eight wholly-owned subsidiaries that offer water, wastewater and other services in Delaware, Maryland and Pennsylvania.[62]

In our opinion, Artesian Resources Corporation is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.4   California Water Service Group

California Water Service Group consists of six subsidiaries which predominantly provide production, storage, treatment, testing, distribution and sale of water for domestic, industrial, public and irrigation uses, and for fire protection.[63]

In our opinion, California Water Service Group is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.5   Connecticut Water Svc Inc

Connecticut Water Service Inc owns five subsidiaries, and in 2016, approximately 95 percent of its net income was attributable to the water operations of its regulated water companies, with the remainder coming from unregulated water and sewer operations and from real estate transactions.[64]

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[60] American States Water, *2015 Annual Report*, p. 1.

[61] American Water Works Company, *2015 Annual Report – Form 10-K*, p. 3.

[62] Artesian Resources Corp, *2015 Annual Report – Form 10-K*, p. 4.

[63] California Water Service Group, *2015 Annual Report – Form 10-K,* p. 5.

[64] Connecticut Water, *2016 annual report – Form 10-K*, p. 6.

In our opinion, Connecticut Water Service Inc is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.6   Middlesex Water Co

Middlesex Water Company owns and operates regulated water utility and wastewater systems in New Jersey, Delaware and Pennsylvania in the US. It also operates water and wastewater systems under contract on behalf of municipal and private clients in New Jersey and Delaware.[65]

In our opinion, Middlesex Water Company is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.7   Severn Trent PLC

Severn Trent PLC is organised into two main business segments; Regulated Water and Waste Water and Business Services.[66] Regulated Water and Waste Water includes the wholesale water and waste water activities of the group's regulated Severn Trent Water and its retail services to domestic customers. Business Services includes Operating Services businesses in the US, UK, Ireland and Italy, non-household retail activities, and the group's renewable energy business. Most of Severn Trent's business is in water and waste water; Regulated water and waste water accounted for £1,506 million of group turnover, compared to Business Services, which accounted for £674.6 million. [67]

In our opinion, Severn Trent PLC is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.8   SJW Group

SJW Group is a holding company with four subsidiaries; San Jose Water Company, SJWTX, Inc., SJW Land Company and Texas Water Alliance Limited. [68] San Jose Water Company provides water services to customers in San Jose, California. SJWTX, Inc., provides water services to customers in a region between San Antonio and Austin, Texas. SJW Land Company owns under developed land and owns and operates commercial buildings in California and Tennessee. Texas Water Alliance Limited undertakes activities that are necessary to develop a water supply project in Texas. In 2016, $333.0 million of operating revenue was from water utility services, and $6.7 million were from real estate services.[69]

In our opinion, SJW Corp is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.9   United Utilities Group Plc

United Utilities manages the regulated water and wastewater network in North West England through its subsidiary United Utilities Water. The vast majority of United Utilities assets and profits are derived from its regulated UK water business.[70]

In our opinion, United Utilities is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

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[65] Middlesex Water Company, *2015 Annual Report – Form 10-K*, p 2.

[66] Severn Trent, *2016 Annual Report,* p. 123.

[67] Severn Trent, *2016 Annual Report,* p. 125.

[68] SJW Group, *2016 Annual Report – Form 10-K*, p. 23.

[69] SJW Group, *2016 Annual Report – Form 10-K*, p. 29.

[70] United Utilities, *2016 Annual Report,* p. C4.

A2.1.10   York Water Co

York Water Company impounds, purifies and distributes water, and owns and operates wastewater collection systems and treatment systems. York Water operates in Pennsylvania in the US.[71]

In our opinion, York Water is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.1.11   Dee Valley Group plc

Dee Valley Group plc supplies drinking water to domestic and business customers in north-east Wales and north-west Cheshire.[72]

In our opinion, Dee Valley Group is an appropriate comparator company that should be included in the group of companies used to estimate the equity beta for Icon Water.

A2.2   Companies identified by ICB, but not included in our analysis

A2.2.1   Aqua America Inc

Aqua American Inc is a holding company for regulated utilities providing water or wastewater services to customers in Pennsylvania, Ohio, Texas, Illinois, North Carolina, New Jersey, Indiana and Virginia.[73] The company has a 'growth-through-acquisition' strategy, and completed 84 acquisitions, or other growth ventures, during the five-year period ended December 31 2016.[74]

The substantial acquisition activity of Aqua America raises questions as to the extent that market beta estimates for this company capture the underlying risk of owning and operating a water and wastewater businesses as opposed to the growth through acquisition strategy. In our opinion, Aqua America should be removed from the group of comparable companies used to estimate Icon Water's equity beta.

A2.2.2   AquaVenture Holdings Ltd

AquaVenture Holdings is a holding company that provides customers 'Water-as-a-Service' solutions through two operating platforms: Seven Seas Water and Quench. These Water-as-a-Service solutions are desalinisation and wastewater treatment services for governmental, municipal, industrial and hospitality customers.[75]

AquaVenture Holdings' business is water purification technologies, as opposed to provision of water and wastewater services. In our opinion, AquaVenture Holdings is not an appropriate comparator for Icon Water.

A2.2.3   Armadale Capital PLC

Armadale Capital Plc operates a diversified investing company focused on natural resource projects in Africa.[76] In our opinion, Armadale Capital Plc is not an appropriate comparator for Icon Water.

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[71] York Water Company, *2016 Annual Report – Form 10-K*, p. 4.

[72] Dee Valley Group, *2015/2016 Financial Report*, p. 2.

[73] Aqua America, *2016 Annual Report – Form 10-K*, p. 2.

[74] Aqua America, *2016 Annual Report – Form 10-K*, p. 7.

[75] AquaVenture Holdings*, 10-Q*, 18 November 2016, p. 6.

[76] Armadale Capital PLC, *2015 Annual Report*, p. 6.

A2.2.4 AWG Parent Company

Anglian Water Group's principal business is Anglian Water, the group's regulated water and recycled water company, which serves around six million customers in the east of England and Hartlepool.[77]

Data was unavailable for our period.

A2.2.5 Cadiz Inc

Cadiz Inc. is a land and water resource development company with 45,000 acres of land in California, underlain with groundwater resources.[78] The company's objective is to realise the highest and best use of the land and water resources in an environmentally responsible way.

Cadiz does not provide water and wastewater services. In our opinion, Cadiz Inc is not an appropriate comparator company for Icon Water.

A2.2.6 Cia de Saneamento Basico do Estado de Sao Paulo (SABESP)

SABESP is a mixed capital company that was founded in 1973 and is currently responsible for supplying water and collecting and treating sewage in the 366 municipalities of São Paulo state.[79]

In our opinion, SABESP is not an appropriate comparator company for Icon Water due its region of operations.

A2.2.7 Consolidated Water Co

Consolidated Water Company is involved in water projects and acquisition opportunities in the Caribbean, the Americans, Mexico and Asia.[80]

In our opinion, Consolidated Water Company is not an appropriate comparator company for Icon Water due its region of operations.

A2.2.8 Cypress Energy Partners LP

Cypress Energy Partners, L.P. provides midstream services, including pipeline inspection, to producers and pipelines companies, and water and environmental services to US onshore oil and natural gas producers and trucking companies.[81]

Cypress Energy Partners does not provide water and wastewater services. Therefore, in our opinion, AquaVenture Holdings is not an appropriate comparator for Icon Water.

A2.2.9 Modern Water plc

Modern Water plc is the holding company of a trading group, the principal activities of which are to own, develop and supply technologies, products and services related to the provision of fresh water and the treatment and disposal of waste water.[82]

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[77] Anglian Water Group, *2016 Annual Report*, p. 6.

[78] Cadiz, *2016 Annual Report – Form 10-K*, p. 1.

[79] Sabesp company website, <http://www.sabesp.com.br/CalandraWeb/CalandraRedirect/?temp=4&proj=investorsnew&pub=T&db=&docid=71F4969B84C2B98183 2576A1003EB0F3&docidPai=20F007048600A1178325769000748F7B>, viewed 20 March 2015.

[80] Consolidated Water, *2015 Annual Report*, p. 5.

[81] Cypress Energy Partners, *2016 Annual Report – Form 10-K*.

[82] Modern Water PLC website, *2015 Annual Report*, p. 2.

Modern Water plc develops technology related to water and wastewater services, as opposed to providing those services. Therefore, in our opinion, AquaVenture Holdings is not an appropriate comparator for Icon Water.

A2.2.10   Pennon Group Plc

Pennon Group Plc operates and invests primarily in the areas of water and sewerage services and waste management. Pennon Group has three major subsidiaries; South West Water Limited and Bournemouth Water and Viridor Limited. South West Water and Bournemouth Water provide water and wastewater services for several counties in southern England, while Viridor Limited is a major UK recycling, renewable energy and waste management business.[83] In 2016, £547 million in revenue came from regulated water and waste water services undertaken by South West Water and regulated water services undertaken by Bournemouth Water, while £806.2 million was derived from waste recycling and recovery services provided by Viridor.[84]

In our opinion, Pennon is not an appropriate comparator company for Icon Water because a minority of its revenue is derived from the provision of water and wastewater services.

A2.2.11   Pure Cycle Corp

Pure Cycle Corporation is a vertically integrated provider of water and wastewater services to companies in Colorado.[85] In 2015, Pure Cycle Corporation sold substantially all the assets comprising the Company's agricultural segment. Prior to this sale, the company operates two lines of business; a wholesale water and wastewater business, and an agricultural farming business.[86]

In our opinion, Pure Cycle Corp is not an appropriate comparator for Icon Water due to this change in business activities.

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[83] Pennon Group website, <http://www.pennonannualreport.co.uk/2016/overview/who-we-are/>, viewed on 20 March 2017.

[84] Pennon Group, *2016 Annual Report*, p. 129.

[85] Pure Cycle Corporation website, <http://www.purecyclewater.com/about-us.html>, viewed on 20 March 2017

[86] Pure Cycle Corporation, *2016 Annual Report – Form 10-K*, p. F-22.

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