

1 April 2019



WHAT

We are asking stakeholders to comment on a new method of using market data to estimate equity beta. We intend to consider these estimates, along with other evidence on beta, as an input to our decisions on beta in future price reviews.



WHY

The equity beta is an input to our Weighted Average Cost of Capital (WACC). It indicates the level of systematic risk that a firm is exposed to. We use it to estimate the cost of equity. The riskier the firm's industry, the higher the cost of equity.

The cost of equity is an important determinant of the rate of return on capital that a regulated firm is allowed to earn.



WHO

You may have an interest in the way beta is measured if you are a regulated firm, a shareholder or a customer of one.



HOW

The following pages describe the proposed new method of estimating beta. We start with a target industry or industries containing firms with a similar risk profile to the firm in question. We apply objective screening rules to remove firms from the

sample where stock trades are infrequent or important data is missing.

For the remaining firms, we estimate the degree of correlation between each firm's returns and the returns to the market overall. After correcting for differences in financial risk (related to debt levels), we find the median beta value for the set of valid proxy firms.

We would then consider that median beta value in the context of other evidence on beta, including other regulatory decisions. In doing so, we would have regard to submissions from stakeholders.



WHEN

We publish the results of our approach to estimating beta in all price reviews. Should we adopt the proposed approach, we would commence using it for price reviews that begin after 1 July 2019.



WHAT NEXT

We invite written comment on this proposed equity beta estimation method.

Submissions are due by 24 April 2019. We prefer submissions via our online form, available on our website

www.ipart.nsw.gov.au.

Enquiries should be directed to Mike Smart (02) 9113 7728.

mike_smart@ipart.nsw.gov.au

How we calculate the equity beta

In this fact sheet we outline a new analytical process that we are developing for using market data to estimate the equity beta. This new process implements the decisions we made in our 2018 WACC review to improve the way we estimate the equity beta.¹

To illustrate how this method would work, we have estimated a water industry beta using our new method. However, we have not applied this estimate in the three current water price reviews, as we are still developing this process and we have not yet consulted with stakeholders on the new method. Instead, we have applied our existing water industry beta in those reviews. We note that our current standard water industry beta (0.7), is similar to the estimate derived here (0.74).

We would have regard to the equity beta estimated with this method along with other evidence on beta in our future WACC decisions.

Summary of the process

We have developed a framework for selecting proxy companies in a given industry and estimating the equity beta for these firms. The purpose of this framework is to generate a beta estimate that applies objective and defensible decision rules to market data. These procedures are described below and are divided into three main sections:

- ▼ Pre-estimation screening rules
- ▼ Data quality and liquidity filters and
- ▼ Post-estimation screening rules.

The basic process is outlined below in Figure E.1 which shows the decision rules and sample selection process.

¹ IPART, *Review of our WACC method, Final Report – Research*, February 2018.

Figure 1 Sample company selection process

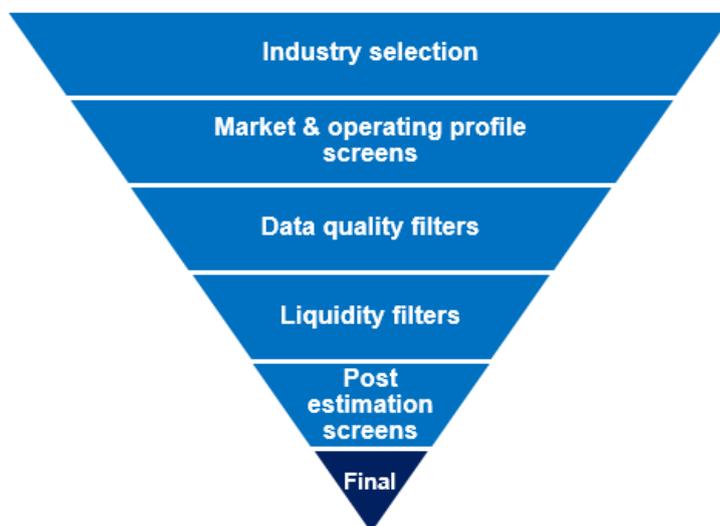


Table 1 Sample selection rule summary

Criteria
Pre-estimation screening rules
Industry
What industry, or industries, should be used to identify proxy firms?
Firm Characteristics
Does the firm operate in the nominated industry?
Does the firm undertake their activities in capital markets that are sufficiently similar to Australia?
Does the firm have a similar operating profile to the benchmark efficient firm?
Market
Is the sovereign's government bond market sufficiently deep and liquid?
Is the sovereign's equity market sufficiently deep and liquid?
Is the firm's international headquarters consistent with their actual operating market?
Operating Profile
Is firm revenue predominately in the nominated industry?
Liquidity filters & data quality
Remove a monthly observation for a given stock if there is less than 10 days of trading data available
Remove a monthly observation for a given stock if the calculated Amihud measure exceeds the threshold of 25.
Remove firm if it has less than 36 months of trading data available.
Post-estimation screening rules
Is the sample size sufficiently large?
Are the estimates consistent (no extreme outliers)?
Are there obvious biases in the results?

Pre-estimation screening rules (firm characteristics)

We have proposed three characteristic screens for the selection of proxy companies. The selection of companies is based on the nomination of industries that have similar risk characteristics to the benchmark entity for which we calculate the WACC. Often, we would choose the industry that the regulated firm operates in. However, if the industry sector is narrow, or if it mainly comprises government-owned enterprises, there may be few if any listed firms to observe. In those cases we may examine industries upstream or downstream on which the benchmark entity relies.

To pass the first screen, sample firms must:

1. Operate in a nominated industry (review-specific and possibly including relevant industries nominated by stakeholders, as appropriate).
2. Undertake their activities in capital markets that are sufficiently similar to Australia.
3. Exhibit a similar operating profile to the benchmark efficient firm.

Industry

The industry of the benchmark efficient firm is a broad proxy for the risk profile of that firm, ie, that all firms within a common industry group face the same or similar business risks.

The Thompson Reuters Business Classification (TRBC) is one of many industry classification schemes. It divides publicly traded equities into 54 industries and 136 sub-industries. Table 1 below shows the number of active water-related firms in each of the TRBC classification levels.

Table 2 Active firms under different levels of TRBC classification

Classification level	Name	Number of active firms
Industry	Gas, Water & Multi-utilities	624
Sub-industry	Water	228

Source: Thompson Reuters Datastream

To estimate a water industry beta, we have used firms in the “Water” sub-industry definition. This could potentially exclude companies which operate under similar conditions. By considering other related industries – for example electricity network operators when estimating WACC for water utilities – we may broaden the scope of potential comparators (with some additional risk of bias).

Market

Given the benchmark efficient firm is Australian, we seek to include markets that approximate Australia’s sovereign characteristics. Therefore, we consider there are three main questions which determine the comparability of international firms:

1. Is the sovereign’s government bond market sufficiently deep and liquid?
2. Is the sovereign’s equity market sufficiently deep and liquid?
3. Is the firm’s international headquarters consistent with their actual operating market?

The current sample excludes companies that trade on the Chinese, Russian and a selection of African stock exchanges on the basis they exhibit sufficiently different sovereign characteristics and may bias the result.

In our illustration, this decision rule reduces the sample size from 228 to 198 companies.

Operating profile

In terms of business structure, we consider whether the firm's revenue is predominately in the nominated industry.

For this preliminary analysis, the 'water' sub-industry is our nominated industry, and we have therefore assumed the majority of the firms' revenue comes from activities related to water supply and treatment.

For this illustration we made no adjustments to the sample on the basis of differences in operating profile.

Data quality

Further screens are made to the sample if insufficient data is returned from Datastream. We exclude firms that:

- ▼ Do not return an International Securities Identification Number (ISIN), because relevant data for the firm cannot actually be extracted.
- ▼ Do not return a market index code, as we would not be able to identify the market in which the firm operates.
- ▼ Are no longer trading. This is discussed further below.
- ▼ Return a connection error.

In our illustration, this reduces the sample size from 198 to 128 firms.

Beta estimation liquidity filters

In the 2018 WACC review we decided to exclude thinly-traded stocks when estimating equity betas. These stocks could produce distorted estimates due to stale price data. We applied three liquidity filters in the beta estimation process, as outlined below.

Remove months with less than 10 days of trading data for a given stock

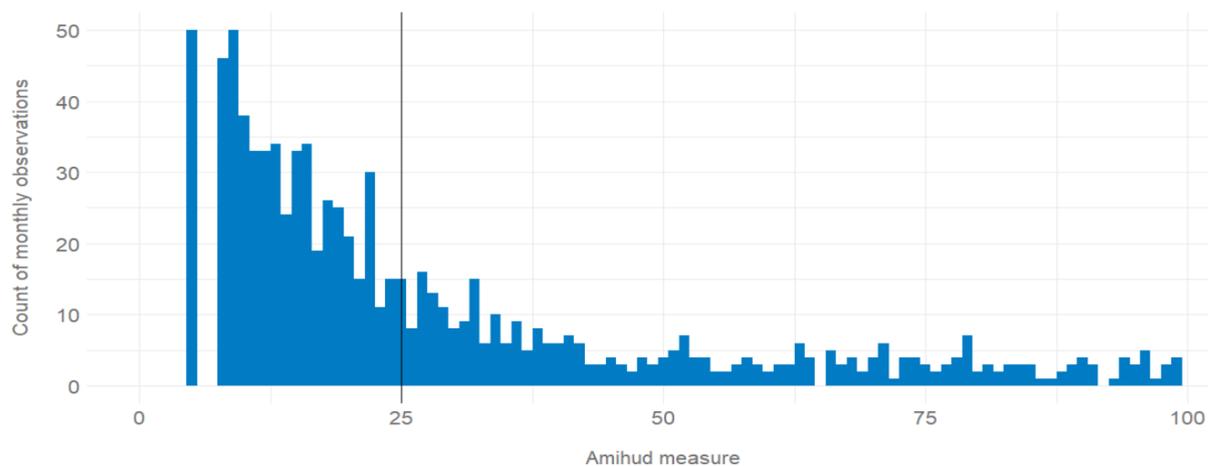
We first removed a monthly observation for a given stock if there was less than 10 days of trading data available. A large portion of the monthly observations fail to meet the first liquidity hurdle. Only around 70% of the monthly observations for all companies have more than 10 days of trading data.

In our illustration, applying this decision rule reduces the sample size from 128 to 83 firms.

Exclude firm-months which exceed Amihud threshold

The Amihud measure approximates the price impact of illiquidity². Using the Amihud measure as a screening tool, we removed a monthly observation for a given stock if the calculated Amihud measure exceeds the threshold of 25. The threshold value we selected for the Amihud measure was benchmarked against historical equity returns data for the Australian stock market. Figure 2 below shows the number of monthly observations excluded after the Amihud filter is applied.

Figure 2 Distribution of monthly observations by Amihud measure



Data source: Datastream, IPART

In our illustration, this decision rule reduces the sample size from 83 to 72.

Exclude firms with less than 36 months of available data

After applying the above filters, if a given firm has less than 36 months of trading data available, we exclude this company from the sample. In our view a time series of less than three years is too short to calculate a reliable medium-run beta estimate. In many instances, a short time series will represent a newly established firm, which is likely inconsistent with our consideration of a mature benchmark efficient firm. Furthermore, short time series are more prone to measurement error, reducing the reliability of results.

In our illustration, this decision rule reduces the sample from 72 to a final proxy list of 45 firms.

Post-estimation screening rules

The post-estimation screens focus on the equity beta outputs for the sample of individual firms, to ensure estimates are robust and appear unbiased. We would accept the proxy sample as final where:

1. The sample size is sufficiently large.
2. Estimates appear to be consistent, with no clear outliers excluded from the sample.

² IPART, *Review of our WACC method, Final Report – Research*, February 2018, p 62.

- There is no obvious bias in the results. This includes assessing the results against other estimates of beta (eg, from Datastream, Bloomberg, historical estimates by IPART and other comparable regulators, or academic estimates).

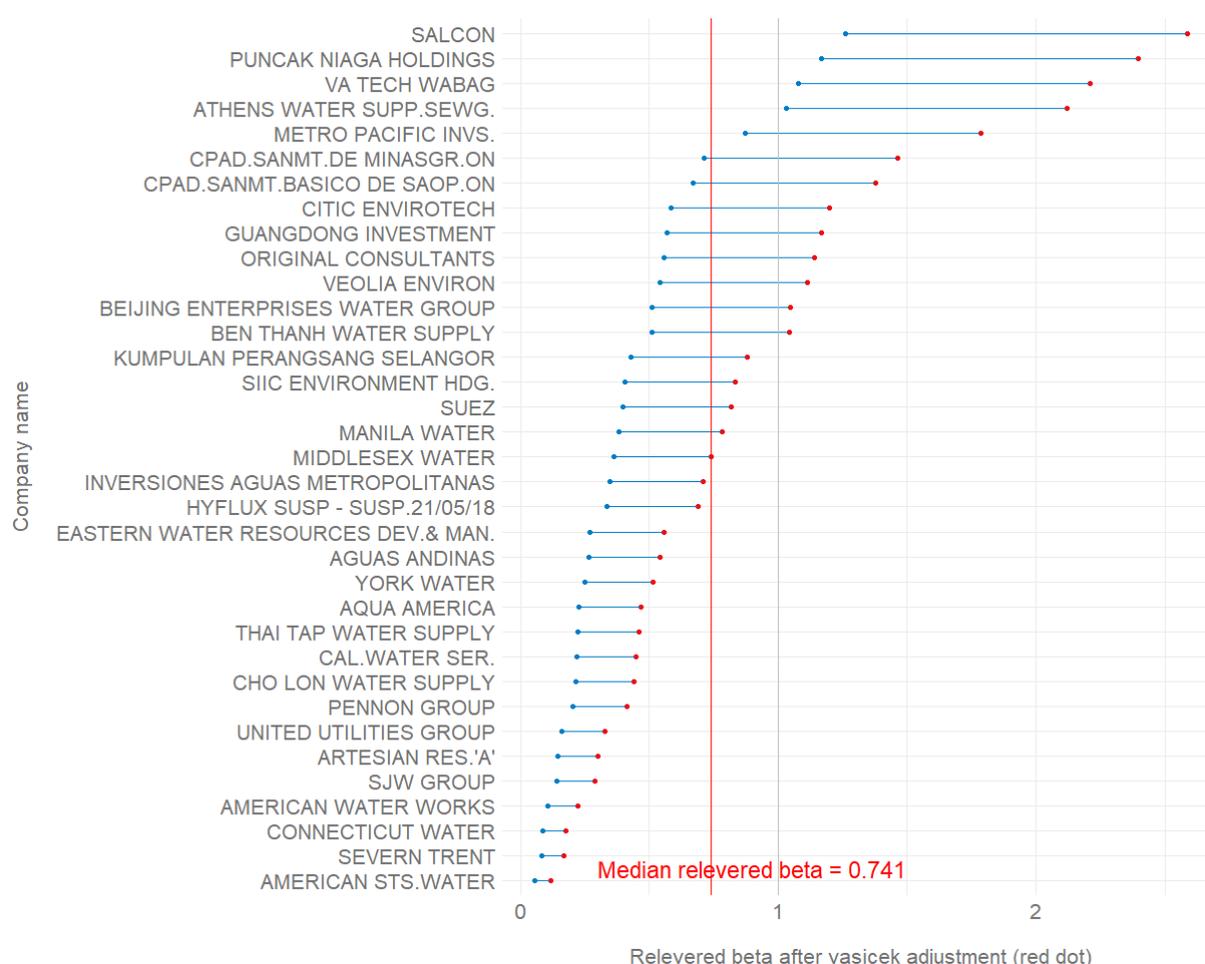
In our illustration, no changes have been made to the current estimate based on these screening rules.

Current estimate

Figure 3 below shows a median equity beta estimate of about 0.7 for the final sample of proxy firms in our illustration for a water business. The blue dots show the unlevered asset beta estimate after we have applied the Vasicek adjustment.³ The red dots are the final relevered equity beta estimate using a 60% gearing rate.

Datastream did not return gearing information for some companies and these firms have been removed from the final sample, reducing it to 35. In the future, we intend to source gearing via other sources (eg, Bloomberg) so these firms can be retained in the sample.

Figure 3 Relevered beta estimate from sample of 35 water-utilities at 60% gearing



Data source: Datastream, IPART

³ IPART, *Review of our WACC method, Final Report – Research*, February 2018, p 64.

Areas for development

We have automated the process for estimating the equity beta using an R script, which obtains financial market data directly through a Datastream API.⁴ The advantage of this approach is that it increases the replicability of our process. The exact same process would be followed in reviews across time, with only the specific proxy companies that are included and the timeframe for the analysis changing.

However, in the short-term, we have identified the three following opportunities that we will explore to improve the robustness of the equity beta estimate.

Incorporate ‘dead’ firms using supplementary data sources

Limitations of the Datastream API mean our sample is limited to active firms only. This creates survivorship bias, because companies that have stopped trading still have valid historical return data which can be used in the estimation process. Going forwards, we intend to incorporate Bloomberg data (in addition to Datastream data) to include information for firms that have stopped trading.

Use different industry classification schemes to increase sample size of proxy firms

Firms identified through alternative industry classification schemes, such as the Global Industry Classification Standard (GICS) and the Bloomberg Industry Classification Standard (BICS) may be useful in increasing the sample size.

Develop more formal post-screening tests

Going forwards, we will consider developing formal robustness checks, eg, tests for statistical significance, autocorrelation and heteroskedasticity. We seek feedback from stakeholders on the appropriate robustness checks we could include, provided they are meaningful, simple to interpret and calculate.

⁴ R is a programming language and free software environment for statistical computing and graphics supported by the R Foundation for Statistical Computing.