Equity beta

Sydney Water's response to IPART's fact sheet

Sydney WATER

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Executive summary

Sydney Water is pleased to provide its response to IPART's equity beta fact sheet[1]. This submission outlines our views in relation to IPART's proposed approach to estimating equity beta. This review is in the context of IPART's broader review of the WACC method.

We applaud IPART's objective of developing a process to obtain "a beta estimate that applies objective and defensible decision rules to market data"[2]. We consider that IPART's existing approach to estimating the equity beta for regulatory decisions works well. IPART has proposed a number of clarifications to its existing process which will enhance the accuracy and replicability of its beta decisions.

IPART indicates that it will continue to interpret market-based equity beta values in the context of other evidence[3]. We support this approach as it recognises the need to incorporate an element of judgment into regulatory process to ensure that outputs of a method remain appropriate as circumstances and market conditions change. The approach should be sufficiently flexible so that best practice in beta estimation techniques and changes in market conditions can be incorporated at each review.

In particular, we support IPART's proposal to:

- Consider empirical beta estimates in tandem with other information when setting the regulatory beta;
- Use external data providers for industry classification;
- Use liquidity filters, including the Amihud measure, to improve data quality in an objective and replicable manner; and
- Use all available returns.

We propose the following enhancements to IPART's proposed process:

- When considering the equity beta for a water utility, broaden the sample of comparator firms to include infrastructure firms that are listed on the ASX;
- Assign explicit weightings to different groups of comparator firms;
- Compute beta using weekly returns instead of monthly returns, and use all five definitions of the week (i.e., Monday to Monday, Tuesday to Tuesday and so on). If IPART decides to use monthly returns, a month should be defined as four weeks and all 20 starting points for each four-week period should be used;
- Exclude firms with fewer than 60 months of trading data, instead of 36; and

[1] IPART, *Estimating Equity Beta - Fact Sheet,* April 2019.
[2] Ibid., p 2.
[3] Ibid., p 1.

- Include outliers unless there is a clear reason for their exclusion (e.g., erroneous classification) because the median is equipped to indicate central tendency in a sample with outliers.

Our comments draw on the principles set out by IPART in its recent review of the WACC. We emphasise the principle of stability, and our comments centre around achieving stable equity beta estimates over time.

The rest of this submission provides our comments relating to:

- IPART's proposed process in the context of IPART's WACC review principles and how empirical equity beta results could be used by IPART when determining the regulatory equity beta (Chapter 1);
- pre-estimation screening rules (Chapter 2);
- liquidity and data quality filters (Chapter 3); and
- post-estimation screening rules (Chapter 4).

1 Context

This section provides our views on the principles IPART set out in its WACC review and the method of obtaining a regulatory equity beta from analysis of listed company stock returns.

1.1 A principles-based approach

As this review of the equity beta is within the context of the broader WACC review, we acknowledge the principles IPART has already set out[4]. We also support IPART's goal for this review, which is to generate "a beta estimate that applies objective and defensible decision rules to market data"[5]. Our comments are therefore targeted towards both achieving this goal and pursuing the principles set out in Figure 1.

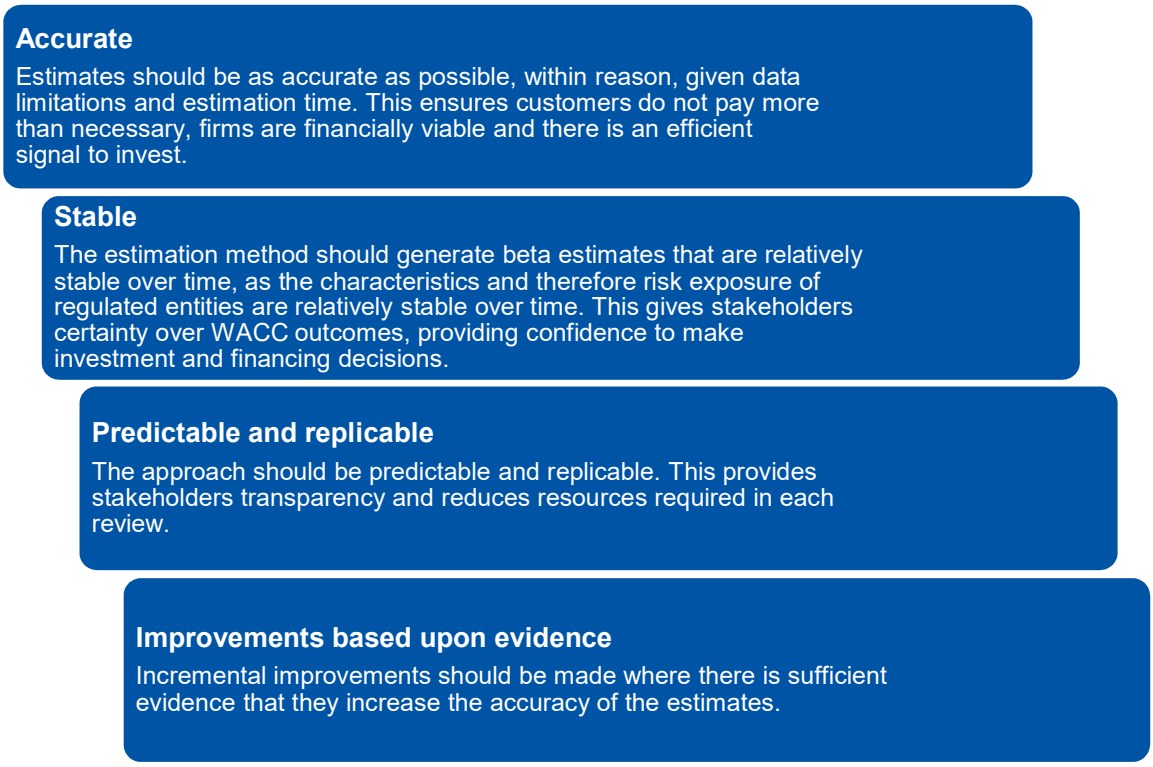


Figure 1: Adapted from IPART's principles for the WACC review

We consider that this goal, combined with IPART's principles, will lead to robust and stable equity beta estimates that are embedded in empirical evidence and fit for regulatory application.

[4] IPART, *Review of our WACC method, Final Report,* February 2018, p 14.
[5] IPART, *Estimating Equity Beta - Fact Sheet,* April 2019, p 2.

We emphasise stability

IPART should place considerable weight on the principle of stability over time when developing an equity beta process, and selecting equity beta estimates. Our submission proposes enhancements to IPART's proposed process that place primary importance on the principle of stability. We emphasise stability because:

- Estimating equity beta with any accuracy or certainty is difficult and empirical studies are often not conclusive.
- Systematic risk is determined by the economic exposure of a firm (i.e., how the value of a firm is affected by changes in economic conditions) and its leverage (all else equal, more leverage implies more risk to shareholders). For a water utility, both characteristics – economic exposure and leverage – are relatively stable over time. Therefore, the equity beta should also be relatively stable over time. When beta estimates change markedly from one study to another, this normally reflects a short time series, or variation in the selection of comparable firms, rather than any real change in risk exposure. We seek to minimise fluctuations in revenue from one period to another purely because of variation in sample composition or stock returns.
- The equity beta is an influential parameter in IPART's WACC calculation. All else equal, a 0.1 change in the equity beta results in a change of around 30 basis points to the WACC.
- Instability in equity beta estimates will increase our costs. Unstable values could damage our credit rating, resulting in increased debt funding costs.

Balancing the need for transparent process with the need for expert judgment

IPART outlines a process to derive market-based estimates of the equity beta. IPART indicates that this market-based beta would be considered in the context of other evidence.

We support IPART prescribing a method where appropriate, retaining a degree of discretion to recognise the place for expert judgment. We consider a process should be viewed as a 'starting point', rather than a binding and prescriptive approach to valuing beta.

On one hand, a well-defined process increases transparency and replicability of regulatory decisions. This certainty improves our ability to understand and predict the way in which IPART may value beta. It also makes arranging debt finance easier by lowering estimation error in the risks to debt servicing.

On the other hand, it is not possible to account for every contingency that could lead to an erroneous outcome. Due to their inherent uncertainty, results of empirical studies are typically highly variable and low in reliability. Expertise is needed to both estimate values and interpret results. A highly codified approach may produce a method that does not deliver reliable results if market conditions change and the method is not sufficiently responsive.

A flexible, adaptive approach with a degree of discretion allows new research on estimation techniques to be embedded in decision-making, ultimately improving pricing efficiency. For example, new research on the influence of outliers, liquidity, and market segmentation, could help inform decisions at each review.

While some areas of the beta process can be prescribed, we consider that there are areas that require judgment (e.g., selection of comparable firms, screening rules, industry weighting schemes, etc.). It is not possible for IPART to specify in advance how it would exercise judgment in every possible circumstance. Over time, the exercise of discretion at each review can be reflected in a better-defined regulatory process.

1.2 Applying the empirical beta results to regulatory decisions

Empirical results to be considered in the context of other evidence

We support IPART's recognition that empirical beta results need to be interpreted in the context of other evidence[6]. While we support IPART's proposal to estimate a market-based equity beta value at each review, the regulatory beta should be changed only when:

- there is persistent and statistically reliable empirical evidence (i.e., the beta estimate incorporated in a decision should not change merely because one short period of time generated a higher or lower beta estimate than another short period of time); and
- it is informed by expert finance judgment.

Market-based estimates of equity beta do not necessarily reflect underlying changes in the systematic risk of the industry because of the high level of error and uncertainty in the analysis. We would be concerned if IPART altered its standard industry parameter valuations due to statistical noise rather than fundamental changes in risk.

In past decisions, IPART has considered empirical equity beta results for a benchmark water firm and interpreted these results in the context of evidence from a suite of other sources, including its past practice[7]. This approach has worked well. It ensures that the equity beta provides that the rate of return balances the needs of shareholders and users and provides an efficient signal for investment in and use of water infrastructure.

Other considerations when deciding on the regulatory beta

IPART should consider evidence from a range of sources when estimating the regulatory equity beta, including:

- statistical information on the strength of the analysis;
- the principles for the WACC review as shown in Figure 1; and
- the consequence of the regulatory equity beta within the context of the Sharpe-Lintner CAPM and the WACC method.

We caution against the use of other regulators' decisions or data providers' beta estimates as benchmarks. Once IPART has made its decision on the best estimation approach and sample

[6] IPART, *Estimating Equity Beta - Fact Sheet,* April 2019, p 1.
[7] See for example, IPART, *Review of prices for Sydney Water Corporation – Issues Paper,* September 2015; and IPART, *Review of prices for Sydney Water Corporation – Draft Report,* March 2016, Appendix I.

composition, the actual beta estimates themselves of other regulators are redundant. IPART will already have the information it needs to make an informed beta estimate.

With respect to data providers' beta estimates (e.g., Bloomberg, Thomson Reuters) there is no information in these beta estimates that is not provided by IPART's own regressions of stock returns on market returns. Additionally, there are aspects of the data providers' estimates that reflect those data providers' decisions as to returns interval (e.g. weekly returns, monthly returns) and estimation period (e.g. 5 years, 10 years).

IPART has the ability to use all available returns. Data providers use a subset of all available returns in their default position. For this reason, we urge IPART to consider using all reference points within a returns interval (e.g., if using weekly returns, estimate beta five times using Monday to Monday returns, Tuesday to Tuesday returns, etc., versus the default position of data providers to use only Friday to Friday returns).

2 Pre-estimation screening rules

We propose that:

- the sample of comparator firms is broadened to include infrastructure firms that are listed on the ASX; and
- weightings are assigned to different groups of comparator firms to inform judgment.

2.1 Industry and firm characteristics

Selecting comparable firms

IPART's fact sheet demonstrates how its proposed process could be applied to estimate the equity beta for the benchmark water utility. It has sampled firms in the 'water' sub-industry classification and notes that it may consider other related industries, such as electricity network operators, which may "broaden the scope of potential comparators (with some additional risk of bias)"[8].

We agree with IPART's approach of including overseas water utilities. However, we consider that the sample should be extended to include firms that are listed on the ASX that face similar systematic risk to the benchmark firm.

The task at hand is to construct a sample of firms that represent the benchmark firm, which IPART defines as "a firm operating in a competitive market and facing similar risks to the regulated business"[9]. For the purposes of estimating beta for the water industry, it is not possible to directly observe the equity beta of the Australian benchmark water utility from market data as there are no listed Australian water utilities; comparators can only be 'second best'.

For the purposes of estimating an Australian water utility beta, we submit that IPART should sample infrastructure stocks listed on the ASX (e.g., energy utilities, transport and telecommunications) as well as considering water utilities listed on overseas exchanges. Broadening the sample to include local infrastructure firms listed on the ASX introduces additional suitable comparators for the benchmark. This is because these firms face similar risks to the benchmark firm. Their inclusion both increases the number of observations and introduces stocks listed on the ASX.

The features of a monopoly water business that determine its systematic risk exposure are its:

- high capital intensity;
- long-lived assets;
- a monopoly position; and
- inelastic demand for its product.

[8] IPART, *Estimating Equity Beta - Fact Sheet,* April 2019, p 4.
[9] IPART, *WACC method final decision – Final report,* February 2018, p 21.

These characteristics are shared by infrastructure stocks listed on the ASX (energy utilities, transport and telecommunications) and the ASX-listed firms operate in the same legal and economic environment. These characteristics also apply to water businesses listed overseas, but the overseas-listed businesses operate in different legal and economic environments. To rely exclusively on *water* infrastructure listed *outside Australia* rather than *non-water* infrastructure listed *in Australia* means that the water utility service is the only characteristic that matters for sample selection, and that the economic and regulatory environment is irrelevant.

We are able to identify firm characteristics of non-water infrastructure businesses that are different to an Australian water utility. For example, it is easy to demonstrate that Telstra and Sydney Airport are different to Sydney Water. But we can only identify differences because we have first-hand knowledge of the businesses of Telstra and Sydney Water. If we were to research the overseas-listed water utilities to acquire the same degree of knowledge we have with respect to ASX-listed non-water infrastructure, we would likely find many differences to an Australian water utility. For example, regulation is different (the dividend discount model is often used rather than the SL CAPM, there is a greater degree of negotiation in the regulatory process rather than submissions and decisions), the industry composition of the market index is different (overseas-listed indices have a higher proportion of technology and health care stocks and a lower proportion of financial services and basic materials stocks compared to Australia) and US water networks are older than those in Australia and could need substantial investment due to contamination of the water supply.

Providing water services is not necessarily the defining characteristic for determining a comparable firm. Country and industry are both relevant, with industry defined broadly to encompass non-water infrastructure businesses on the basis of their capital intensity, asset life, monopoly position, and inelastic demand.

While a useful input into a judgment on equity beta, the betas on overseas stocks are derived by regressing the returns of each firm against the return of its local market index. This does not necessarily accord with the composition of the ASX.

We propose that IPART consider including overseas-listed water utilities and ASX-listed non-water infrastructure firms under the Thomson Reuters classifications shown in Table 1. We do not propose including overseas listed non-water infrastructure firms in the sample as they are 'twice removed' from the benchmark – that is they are neither listed on the ASX nor are they from the water industry.

Table 1: Relevant Thomson Reuters industry classifications

Level 1	Level 2	Level 3	Level 4
Utilities	Multiline utilities	Multiline utilities	Multiline utilities
	Water and related utilities	Water and related utilities	Water and related utilities not elsewhere classified Water supply and irrigation systems Sewerage treatment facilities
	Natural gas utilities	Natural gas utilities	Natural gas utilities not elsewhere classified Natural gas distribution
	Electric utilities and independent power producers	Electric utilities	Electric utilities not elsewhere classified Renewable utilities Fossil fuel electric utilities
Industrials	Transport infrastructure	Highways and rail tracks	Highways and rail tracks not elsewhere classified Highway operators
		Marine port services	Marine port services not elsewhere classified Marine cargo handling services
		Airport operators and services	Airport operators and services not elsewhere classified
Telecommunications services	Telecommunications services	Telecommunications services	Telecommunications network infrastructure

Source: Thomson Reuters

A weighting scheme can reconcile beta estimates from different industries

After constructing a sample from a range of industries, it is important to define how much weight to assign to each industry. Determining a weighting scheme is unavoidable and should be transparent. This is illustrated in the following example.

Suppose a sample comprises 20 water businesses from the US and five water businesses from the UK. One approach would be to place equal weight on each observation (4%). But this means that the US carries 80% weight in the analysis and the UK 20% weight. If the regulator has a view that there is no material difference in the reliability of an observation from the US versus an observation from the UK then this weighting scheme is consistent with the regulator's view. But if the regulator formed a view that a firm in the UK was more informative than a firm in the US, then assigning only 20% weight to UK firms would be inappropriate.

Now suppose a sample comprises 20 water businesses from the US and 10 non-water infrastructure firms from Australia. Assigning equal weight to each firm means that US water businesses contribute 67% weight to the result, and Australian non-water infrastructure businesses contribute 33% weight to the result. If a series of mergers occurred so that there are only 10 US-listed water businesses, there would be a 50:50 assignment to country and industry purely because of corporate activity of listed water businesses that led to a series of delistings.

These scenarios illustrate that beta should not be determined by how many firms are listed in particular countries or in particular industries. We do not propose a particular weighting scheme. Instead, this analysis is intended to only demonstrate that by not explicitly assigning a weighting, an implicit judgment is made.

We consider that any judgment on weightings should be explicit, rather than be left unstated. We consider that a market-based beta estimate that is informed this way will lead to a richer understanding of the systematic risk faced by the benchmark firm. Weightings should be determined in consultation with stakeholders. Given the subjectivity of a decision on weighting schemes, we suggest sensitivity analyses of alternative weighting schemes as a way to inform the regulatory beta.

2.2 Market

IPART states that it intends to apply three filters to determine whether a firm can be included based upon its home market (being a country).

- 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 the firm's actual operating market?

We support this approach. We consider that the first two filters are consistent with markets being well-developed, which is important for comparability to the benchmark firm.

'Deep and liquid' is a qualitative filter. We consider that there is an opportunity for IPART to improve transparency and replicability of the beta process by defining quantifiable and objective measures to ascertain whether a market is sufficiently deep and liquid.

3 Liquidity and data quality

We consider IPART's proposed liquidity filters to be appropriate and we support using as long a timeframe for the analysis as possible. We propose that IPART:

- calculate beta using weekly returns data;
- repeat analysis using all start and end points within the week; and
- exclude a firm if it has fewer than 60 months of trading data available, instead of 36.

3.1 Liquidity filters

IPART proposes to remove stock returns for a month that has fewer than 10 trading days of data available and apply the Amihud liquidity score[10]. We support this approach. These filters are objective and transparent. This enhances the predictability and replicability of IPART's approach.

IPART has set the Amihud cut-off score at 25, which means that for every $1 million of shares traded, the price impact is expected to be 2.5%. We consider this threshold to be appropriate.

3.2 Frequency of returns

We note IPART intends to compute betas using monthly returns. We submit that IPART should conduct weekly computations. This is because monthly returns are more prone to unusual price movements. Using weekly returns rather than monthly returns to estimate beta provides a larger number of observations. This results in a more statistically reliable and stable beta estimate.

The only reason to use weekly or monthly returns at all is that returns on a daily basis could be affected by time-series correlation in the returns. That is, returns could systematically go in one direction (positive time-series correlation) or systematically reverse (negative time-series correlation). This can bias beta estimates because the time-series correlation breaks the link between market movements and price movements for individual stocks. Weekly returns are sufficiently long for time-series correlation to no longer be a problem.

If IPART considers monthly computations are appropriate, we propose that IPART consider weekly returns in addition to monthly returns. Data from both monthly and weekly frequencies can be incorporated by averaging the computations.

3.3 Repeat analysis using all start and end points within the week

We propose that IPART repeats its beta computation using all possible returns data. That is, if IPART uses weekly returns (which we recommend), the regression should be conducted five times, once for each day of the week (i.e., Monday to Monday, Tuesday to Tuesday and so on).

[10] IPART, *Estimating Equity Beta - Fact Sheet,* April 2019, pp 5-6.

The beta estimate for a given firm can change substantially based upon the definition of a week. If IPART chooses to analyse monthly returns, then a similar approach can also be adopted. IPART could standardise the definition of a month to be four weeks, then repeat its computations 20 times using 20 different start and end points for each four week period. Once the analysis is conducted with all observations, the beta estimates can be averaged to obtain a market-based beta for each firm.

This approach has two key benefits:

- It does not rely on an arbitrary start and end point for the definition of a returns interval; and
- It minimises error by simply repeating the analysis using all possible definitions of a week or month.

3.4 Timeframe for analysis

IPART proposes to exclude firms with fewer than three years of trading data[11]. IPART has recognised the importance of having sufficient time series, noting that short time series are "more prone to measurement error, reducing the reliability of results"[12]. We agree with this principle, but submit that five years, or 60 months, is a more appropriate timeframe.

We consider that a firm should be removed if it has fewer than 60 months of trading data available. This will enhance the stability and reduce statistical noise of beta observations. Beta values can vary considerably over time if estimating using short returns window. The finance literature suggests that the time series properties improve when a longer period is used, giving rise to the five-year 'rule of thumb'[13]. All historical returns should be included in the analysis if they meet other criteria to enhance stability.

[11] Ibid., p 6.
[12] Ibid.
[13] Groenewold and Fraser, *Forecasting Beta: How Well Does the 'Five-Year Rule of Thumb' Do?,* Journal of Business Finance & Accounting 27(7&8):953-982, October 2000.

4 Post-estimation screening rules

We propose the following enhancements to IPART's process:

- a confidence interval approach can inform the reliability of the data and ascertain whether the sample is sufficiently large;
- rather than excluding outliers automatically, outliers should be investigated further before they are excluded; and
- the median is appropriate to measure central tendency in the presence of outliers.

We support IPART cross-checking for biases and spurious results in its beta analysis. This approach recognises that any process is as a 'starting point', rather than a binding and prescriptive approach to estimating beta.

4.1 Is the sample size sufficiently large?

IPART raises the general question of whether the sample size is "sufficiently large"[14]. While IPART does not quantify a threshold for "sufficiently large", we consider that it is reasonable for IPART to refine the definition by application over time and on a case-by-case basis. There is no generally accepted definition of a sufficient sample size for beta estimation, either from research or practice.

We consider IPART's proposal to estimate a confidence interval for beta based on the dispersion of beta estimates from its sample to be useful when considering whether further actions are necessary. For example, it may signal that the sample requires extension, or it can indicate the reliability of the results, informing how much weight can be placed on the resulting beta estimates.

We propose a practical way to evaluate sample size in the box below. IPART could measure the relationship between sample size and estimation error to quantify the relationship between sample size and comparability with a 'confidence interval' approach.

Confidence interval approach

Estimate a confidence interval for beta based upon the dispersion of beta estimates from the sample. If the confidence interval is too wide to make a reliable decision, then the sample size can be increased with additional firms.

The additional firms may less comparable to the benchmark firm than the original firms. But as more firms are considered, the confidence interval could either narrow or widen. This is because the confidence interval is based on both the standard deviation of observations and the number of observations. More observations with similar beta estimates produce a narrower confidence interval. More observations with different beta estimates would result in a wider confidence interval.

[14] IPART, *Estimating Equity Beta - Fact Sheet*, April 2019, p 6.

4.2 Are there extreme outliers?

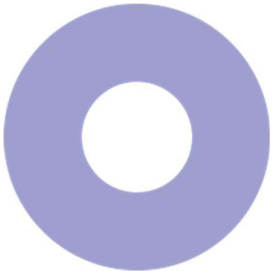
We agree with IPART's view that the presence of extreme outliers is a relevant post-estimation check. IPART has not stated how it intends to identify extreme outliers or what it plans to do if outliers are identified.

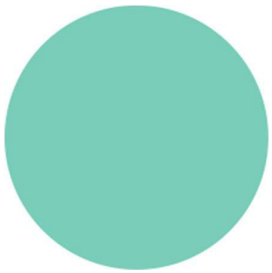
We propose that if outliers are identified, this should lead to further inspection of the firm and its returns. The firm should not automatically be excluded. This is because the reason for a firm producing outlier results is important. For example, the firm may be misclassified. If this is the case, IPART should consider excluding it from the sample. But a firm should not automatically be excluded for producing outlier results. The presence of outlier results alone is not sufficient.

Only when there is evidence that a firm or an event does not represent the systematic risk of the benchmark firm should it be excluded as an outlier. If there is no evidence of this, the median is an appropriate statistical tool to measure the central tendency of a sample where there are outliers or a non-symmetrical distribution.

4.3 Are there obvious biases in the results?

We support IPART reviewing the dataset for obvious biases. We interpret this post-estimation screening question to be somewhat of a 'catch-all'; a screen that acknowledges the limitations of any standardised process. Despite there being a step-by-step process for compiling and analysing the sample, there is always the chance that something has not been considered by IPART in advance which could lead to a spurious result. This provides a final sense-check.





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