Q. What are the key elements in the aged data life analysis?

A. The life analysis requires that the account be examined across various time frames. The placement and experience bands are the primary technique used in the life analysis to construct life tables and are used by depreciation analysts to observe changes over time. The life table is the information used to graph a survivor curve and fit.

Q. What does the placement band analyze?

A. The placement bands are a group of vintages that show the composite retirement history from the asset's installation to the present. The placement band illustrates changes in technology and materials that occur.

Q. What does the experience band analyze?

A. The experience band is a composite retirement history of all vintages during a select period of time. These can be helpful in isolating the effects on the group of assets over a specified period of time.

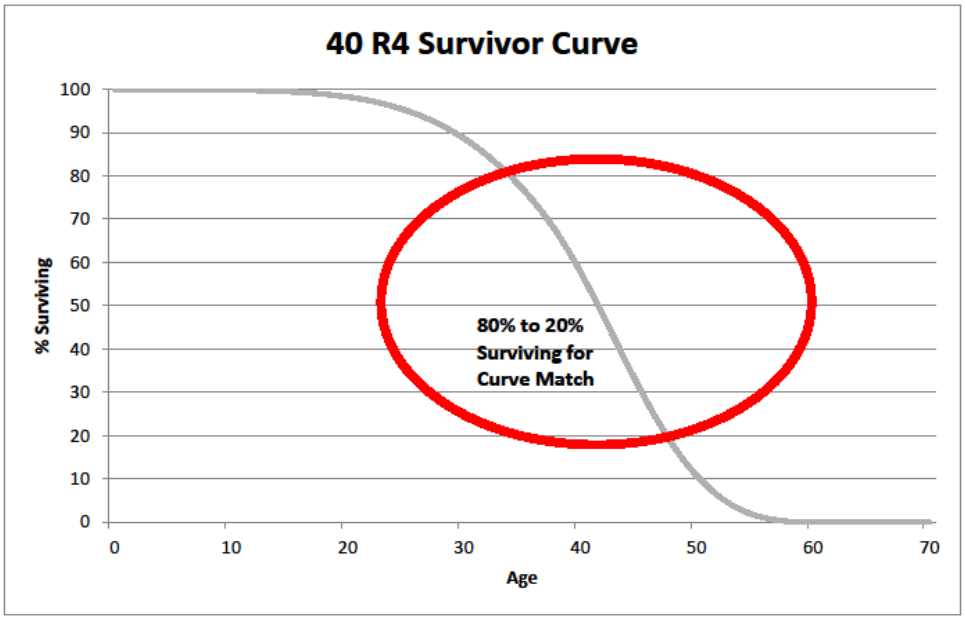
Q. How do these bands get used?

A. The depreciation analyst will evaluate the data in the placement and experience bands in various ways, generally using what is referred to as rolling bands and shrinking bands. This helps identify trends in the data that can demonstrate a changing life characteristic for the account. The selection of band width is also an important aspect of the analysis. Ultimately, various curve fits are made that assist the depreciation analyst in evaluating and recommending an average service life ("ASL") and associated dispersion pattern.

Q. Are there any industry standard texts that provide guidance on what is considered to be adequate or sufficient history for performing an actuarial analysis?

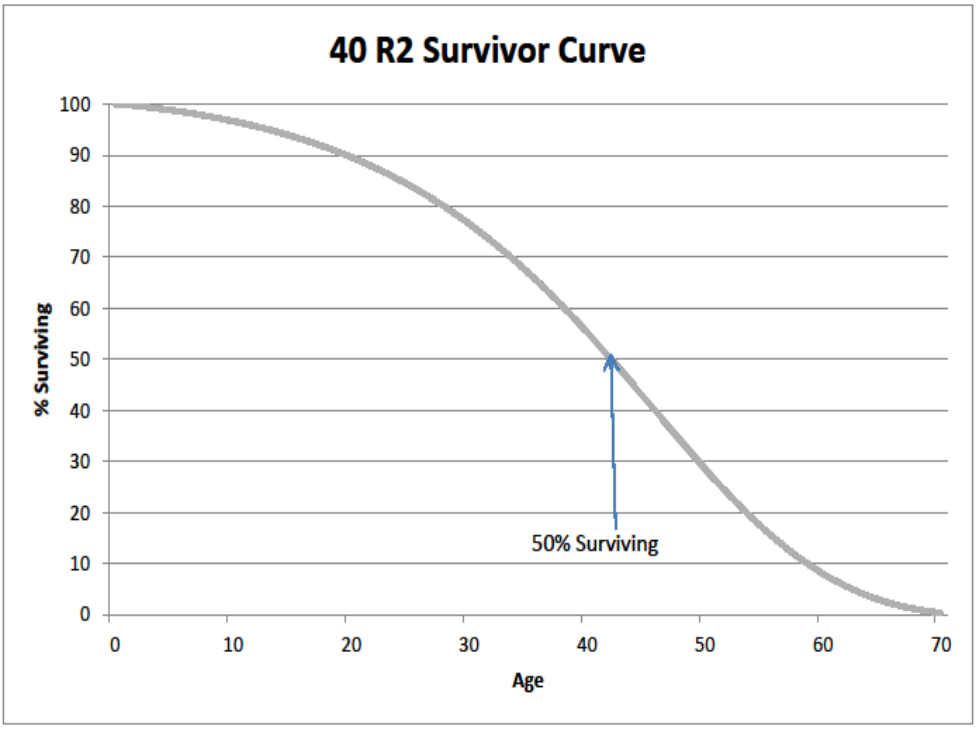
A. Yes. The NARUC publication states that a band width needs to include enough data to provide some confidence in the reliability of the resulting curve fit and be narrow enough to see if there is an emerging trend. It also goes on to say that, for longer life plant (e.g., conduit), widths of ten or more years may be necessary.[1] As discussed below, there can be little confidence that the selections based solely on actuarial analysis represent the history and future of the assets in the various accounts. As the noted treatise, Depreciation Systems, explains, "Often the middle section of the curve (that section ranging from approximately 80% to 20% surviving) is given more weight than the first and last sections. The middle section is relatively straight and is the portion of the curve that often best characterizes the survivor curve.[2] This is depicted in the illustrative graph provided below.

[1] NARUC Public Utility Depreciation Practices, p. 115.
[2] Depreciation Systems (1994), p.46-47.



Additionally, the NARUC depreciation manual discusses a stub curve, which is an observed survivor curve that does not reach 0% surviving, stating "it is desirable to have the stub curve drop below 50% surviving."[3] The below illustrative graph indicates where the desired 50% and below area is on a survivor curve.

[3] NARUC Public Utility Depreciation Practices, p. 120.



Q. You mention band width above. How does that factor into this discussion on the number of years in the aged data base?

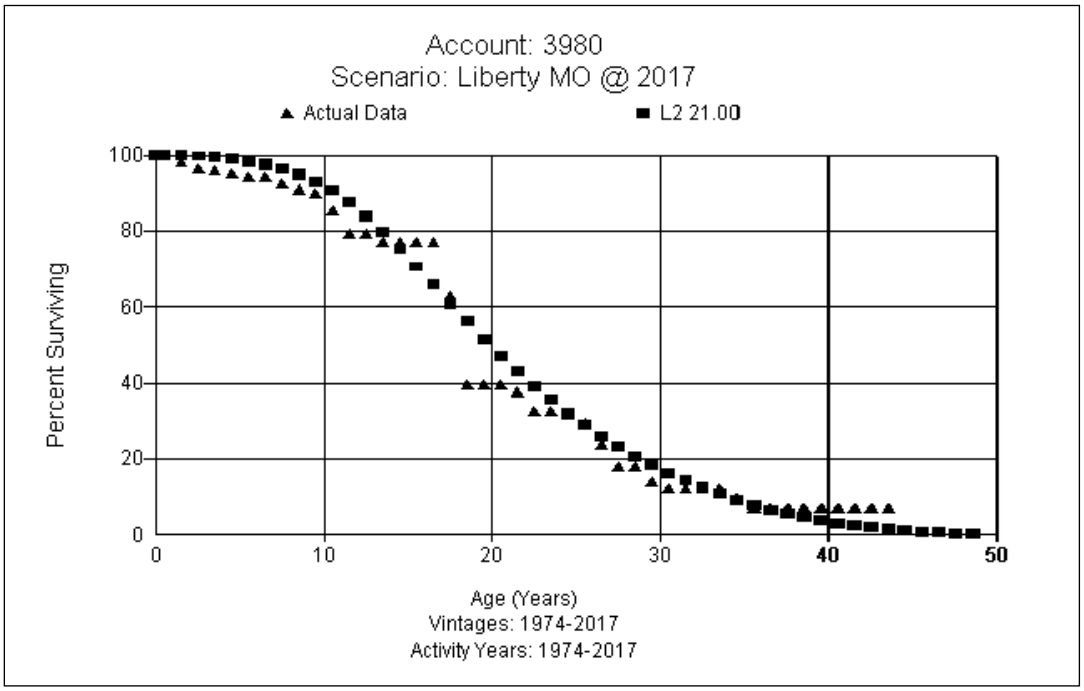
A. Banding is a way of combining a number of years of data for analysis. It allows for creating a statistically valid analysis, averaging historical experience, and smoothing of the experience over time. As stated in the NARUC depreciation manual, there are three reasons to use bands: (1) to increase the sample size; (2) to smooth the observed data; and (3) to identify trends.[4] The primary reason for noting this is that, without more years

[4] Ibid, p. 113.

in the database than is available to Liberty Missouri, some of the benefits to performing an actuarial analysis are mitigated or absent.

Q. Can you provide an example of different results with varying placement and experience bands?

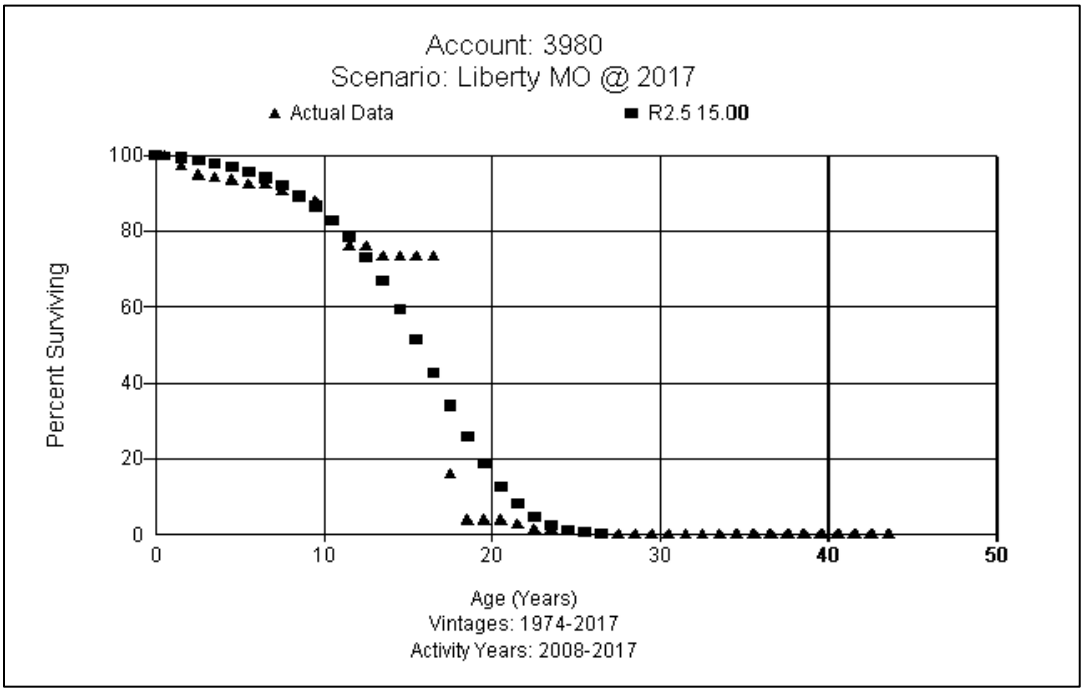
A. Yes. I will use account 3980 Miscellaneous Equipment to illustrate results for various placement and experience bands. The oldest surviving vintage is 1974, so the widest placement band is 1974-2017. The first year that shows retirement activity is 2008, which would be the first year of the experience band. If one was to run a band of 1974-2017 for both placement and experience bands, the analysis would show a representation like the graph below.



This graphical representation of the account history shows the blue triangles as the actuarial data and the green rectangles as the Iowa curve matching the observed data. The graph above is inaccurate because it uses experience band years where there is no

experience (i.e. no available retirement activity) and inflates the exposures in the observed life table, thereby giving false results.

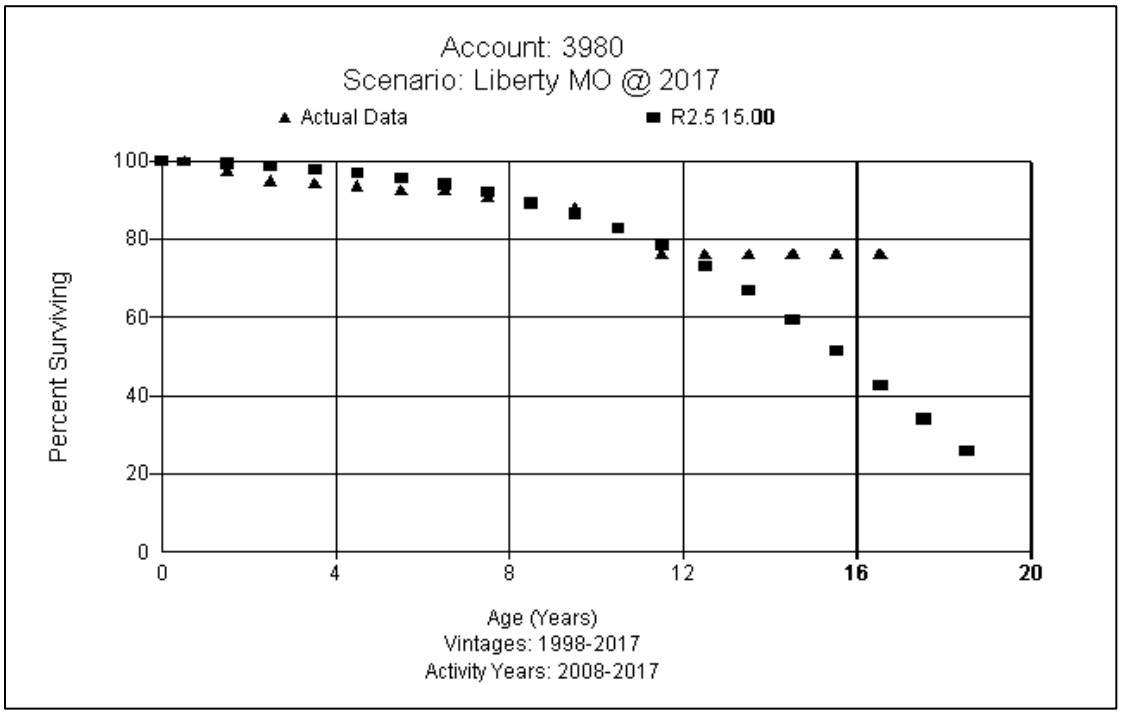
The correct graph would be to use the 1974-2017 placement band and 2008-2017 experience band. That graph would look substantially different, as shown in Figure xx.



In this case, the curve shows a shorter life and a steeper dispersion. This representation more accurately captures the historical retirement activity for this account. Refined selections like this form part of my informed judgment rather than solely using the overall band for placement and experience without looking at the underlying activity.

Q. What would a different placement band with the same experience band show?

A. The graph below shows a more recent placement band of 1998-2017 and the same selected experience band of 2008-2017. That analysis is shown below.



The stub curve does not go as far as the previous graph but the same curve and life still provide a good match to the data.