**Description**

`ipolate` creates in `newvar` a linear interpolation of `yvar` on `xvar` for missing values of `yvar`. Because interpolation requires that `yvar` be a function of `xvar`, `yvar` is also interpolated for tied values of `xvar`. When `yvar` is not missing and `xvar` is neither missing nor repeated, the value of `newvar` is just `yvar`.

**Quick start**

Create `y2` containing a linear interpolation of `y1` on `x` for observations with missing values of `y1` or tied values of `x`

```
ipolate y1 x, generate(y2)
```

As above, but use interpolation and extrapolation

```
ipolate y1 x, generate(y2) epolate
```

As above, but perform calculation separately for each level of `catvar`

```
by catvar: ipolate y1 x, generate(y2) epolate
```

**Menu**

Data > Create or change data > Other variable-creation commands > Linearly interpolate/extrapolate values
Syntax

```
ipolate yvar xvar [if] [in], generate(newvar) [epolate]
```

by is allowed; see [D] by.

Options

generate(newvar) is required and specifies the name of the new variable to be created.
epolate specifies that values be both interpolated and extrapolated. Interpolation only is the default.

Remarks and examples

> Example 1

We have data points on y and x, although sometimes the observations on y are missing. We believe that y is a function of x, justifying filling in the missing values by linear interpolation:

```
. use https://www.stata-press.com/data/r16/ipolxmpl1
. list, sep(0)
```

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>1.5</td>
</tr>
<tr>
<td>4.</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>3.5</td>
</tr>
<tr>
<td>7.</td>
<td>4</td>
</tr>
</tbody>
</table>

```
. ipolate y x, gen(y1)
(1 missing value generated)
. ipolate y x, gen(y2) epolate
. list, sep(0)
```

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
<th>y1</th>
<th>y2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>0</td>
<td>.</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>1.5</td>
<td>4.5</td>
<td>4.5</td>
</tr>
<tr>
<td>4.</td>
<td>2</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>5.</td>
<td>3</td>
<td>.</td>
<td>12</td>
</tr>
<tr>
<td>6.</td>
<td>3.5</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>7.</td>
<td>4</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>
Example 2

We have a dataset of circulations for 10 magazines from 1980 through 2003. The identity of the magazines is recorded in `magazine`, circulation is recorded in `circ`, and the year is recorded in `year`. In a few of the years, the circulation is not known, so we want to fill it in by linear interpolation.

```
use https://www.stata-press.com/data/r16/ipolxmpl2, clear
by magazine: ipolate circ year, gen(icirc)
```

When the `by` prefix is specified, interpolation is performed separately for each group.

Methods and formulas

The value $y$ at $x$ is found by finding the closest points $(x_0, y_0)$ and $(x_1, y_1)$, such that $x_0 < x$ and $x_1 > x$ where $y_0$ and $y_1$ are observed, and calculating

$$y = \frac{y_1 - y_0}{x_1 - x_0} (x - x_0) + y_0$$

If `epolate` is specified and if $(x_0, y_0)$ and $(x_1, y_1)$ cannot be found on both sides of $x$, the two closest points on the same side of $x$ are found, and the same formula is applied.

If there are multiple observations with the same value for $x_0$, then $y_0$ is taken as the average of the corresponding $y$ values for those observations. $(x_1, y_1)$ is handled in the same way.

Reference


Also see

`[MI] mi impute` — Impute missing values