# spline3() — Cubic spline interpolation

## Description

`spline3(x, y)` returns the coefficients of a cubic natural spline $S(x)$. The elements of $x$ must be strictly monotone increasing.

`spline3eval(spline_info, x)` uses the information returned by `spline3()` to evaluate and return the spline at the abscissas $x$. Elements of the returned result are set to missing if outside the range of the spline. $x$ is assumed to be monotonically increasing.

## Syntax

```
real matrix spline3(real vector x, real vector y)
real vector spline3eval(real matrix spline_info, real vector x)
```

## Remarks and examples

`spline3()` and `spline3eval()` is a translation into Mata of Herriot and Reinsch (CUBNATSPLINE) (1973).

For $xx$ in $[x_i, x_{i+1})$:

$$S(xx) = \{(d_it + c_i)t + b_i\}t + y_i$$

with $t = xx - x_i$.

`spline3()` returns $(b, c, d, x, y)$ or, if $x$ and $y$ are row vectors, $(b, c, d, x', y')$.

## Conformability

### spline3(x, y):

- $x$: $n \times 1$ or $1 \times n$
- $y$: $n \times 1$ or $1 \times n$
- result: $n \times 5$

### spline3eval(spline_info, x):

- spline_info: $n \times 5$
- $x$: $m \times 1$ or $1 \times m$
- result: $m \times 1$ or $1 \times m$
Diagnostics

`spline3(x, y)` requires that $x$ be in ascending order.

`spline3eval(spline_info, x)` requires that $x$ be in ascending order.

Reference


Also see

[M-4] Mathematical — Important mathematical functions