

Package ‘schumaker’

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Type Package

Title Schumaker Shape-Preserving Spline

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Description This is a shape preserving spline which is guaranteed to be monotonic and concave or convex if the data is monotonic and concave or convex. It does not use any optimisation and is therefore quick and smoothly converges to a fixed point in economic dynamics problems including value function iteration. It also automatically gives the first two derivatives of the spline and options for determining behaviour when evaluated outside the interpolation domain.

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LazyData TRUE

Suggests knitr, numDeriv, cobs, scam, microbenchmark

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

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ppmak *ppmak*

Description

Create a Spline with given intervals and quadratic coefficients This is an internal function that is called from the Schumaker function. It roughly works like ppmak in matlab.

Usage

```
ppmak(IntStarts, SpCoefs, Vectorised = TRUE)
```

Arguments

IntStarts	This is a vector with the start of each interval
SpCoefs	This is a matrix with three columns. The first is the coefficient of the squared term followed by linear term coefficients and constants.
Vectorised	This is a boolean parameter. Set to TRUE if you want to be able to input vectors to the created spline. If you will only input single values set this to FALSE as it is a bit faster.

Value

A spline function for the given intervals and quadratic curves. Each function takes an x value (or vector if Vectorised = TRUE) and outputs the interpolated y value (or relevant derivative).

ppmak2Deriv *ppmak2Deriv*

Description

#' Create the second derivative of the Spline defined by given intervals and quadratic coefficients This is an internal function that is called from the Schumaker function.

Usage

```
ppmak2Deriv(IntStarts, SpCoefs, Vectorised = TRUE)
```

Arguments

IntStarts	This is a vector with the start of each interval
SpCoefs	This is a matrix with three columns. The first is the coefficient of the squared term followed by linear term coefficients and constants.
Vectorised	This is a boolean parameter. Set to TRUE if you want to be able to input vectors to the created spline. If you will only input single values set this to FALSE as it is a bit faster.

Value

A spline function for the given intervals and quadratic curves. Each function takes an x value (or vector if Vectorised = TRUE) and outputs the interpolated y value (or relevant derivative).

 ppmakDeriv

ppmakDeriv

Description

Create the derivative of the Spline defined by given intervals and quadratic coefficients This is an internal function that is called from the Schumaker function.

Usage

```
ppmakDeriv(IntStarts, SpCoefs, Vectorised = TRUE)
```

Arguments

IntStarts	This is a vector with the start of each interval
SpCoefs	This is a matrix with three columns. The first is the coefficient of the squared term followed by linear term coefficients and constants.
Vectorised	This is a boolean parameter. Set to TRUE if you want to be able to input vectors to the created spline. If you will only input single values set this to FALSE as it is a bit faster.

Value

A spline function for the given intervals and quadratic curves. Each function takes an x value (or vector if Vectorised = TRUE) and outputs the interpolated y value (or relevant derivative).

 Schumaker

Create a Schumaker Spline

Description

Create a Schumaker Spline

Usage

```
Schumaker(x, y, ff = "Not-Supplied", Vectorised = TRUE,
  Extrapolation = c("Curve", "Constant", "Linear"))
```

Arguments

x	A vector of x coordinates
y	A corresponding vector of y coordinates
ff	(Optional) A corresponding vector of gradiants at the data points. If not supplied this is estimated.
Vectorised	This is a boolean parameter. Set to TRUE if you want to be able to input vectors to the created spline. If you will only input single values set this to FALSE as it is a bit faster.
Extrapolation	This determines how the spline function responds when an input is recieved outside the domain of tt. The options are "Curve" which outputs the result of the point on the quadratic curve at the nearest interval, "Constant" which outputs the FF value at the end of the tt domain and "Linear" which extends the spline using the gradient at the edge of tt.

Value

A list with 3 spline functions. Thee first spline is is for the input points, the second spline is the first derivative of the first spline, the third spline is the second derivative. Each function takes an x value (or vector if Vectorised = TRUE) and outputs the interpolated y value (or relevent derivative).

References

Judd (1998). Numerical Methods in Economics. MIT Press

Examples

```
x = seq(1,6)
y = log(x)
SSS = Schumaker(x,y, Vectorised = TRUE)
Spline = SSS[[1]]
SplineD = SSS[[2]]
Spline2D = SSS[[3]]
xarray = seq(1,6,0.01)
Result = Spline(xarray)
Result2 = SplineD(xarray)
Result3 = Spline2D(xarray)
plot(xarray, Result, ylim=c(-0.5,2))
lines(xarray, Result2, col = 2)
lines(xarray, Result3, col = 3)
```

SchumakerIndInterval *SchumakerIndInterval*

Description

This creates quadratic coefficients for one interval of a domain. This is an internal function that is called from the Schumaker function.

Usage

SchumakerIndInterval(z, s, Smallt)

Arguments

z	This is the y value at edges of an interval.
s	This is the slope at edges of an interval.
Smallt	This is x values at the edge of an interval.

Value

The location of the knot and quadratic coefficients for an interval.

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