SkewStudent Documentation

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Contents

CHAPTER 1

Introduction

The distribution was proposed in *[R1]*.

The probability density function is given by

$$f\left(x|\eta,\lambda\right)=\begin{cases}bc\left(1+\frac{1}{\eta-2}\left(\frac{a+bx}{1-\lambda}\right)^{2}\right)^{-(\eta+1)/2}, & x<-a/b,\\ bc\left(1+\frac{1}{\eta-2}\left(\frac{a+bx}{1+\lambda}\right)^{2}\right)^{-(\eta+1)/2}, & x\geq-a/b,\end{cases}$$

where $2<\eta<\infty$, and $-1<\lambda<1$. The constants a, b, and c are given by

$$a=4\lambda c\frac{\eta-2}{\eta-1},\quad b^{2}=1+3\lambda^{2}-a^{2},\quad c=\frac{\Gamma\left(\frac{\eta+1}{2}\right)}{\sqrt{\pi\left(\eta-2\right)}\Gamma\left(\frac{\eta}{2}\right)}.$$

A random variable with this density has mean zero and unit variance. The distribution becomes Student t distribution when $\lambda=0$.

CHAPTER 2

References

CHAPTER 3

Examples

```
>>> skewt = SkewStudent(eta=3, lam=-.5)
>>> arg = [-.5, 0, .5]
```

```
>>> print(skewt.pdf(arg))
[ 0.29791106  0.53007599  0.72613873]
```

```
>>> print(skewt.cdf(arg))
[ 0.21056021  0.38664586  0.66350259]
```

```
>>> print(skewt.ppf([.1, .5, .9]))
[-0.9786634   0.19359403  0.79257129]
```

```
>>> print(skewt.rvs(size=(2, 3)))
[[ 0.02398666 -0.61867166 -1.25345387]
 [-0.68277535 -0.30256514 -0.04516005]] #random
```

CHAPTER 4

Class documentation

class skewstudent.skewstudent.**SkewStudent**(*eta=10.0*, *lam=-0.1*)

Skewed Student distribution class.

Attributes

eta	(float) Degrees of freedom. $2 < \eta < \infty$
lam	(float) Skewness. $-1 < \lambda < 1$

Methods

pdf(arg)	Probability density function (PDF).
cdf(arg)	Cumulative density function (CDF).
ppf(arg)	Inverse cumulative density function (ICDF).
rvs([size])	Random variates with mean zero and unit variance.

cdf(*arg*)

Cumulative density function (CDF).

Parameters **arg** : array

Grid of point to evaluate CDF at

Returns array

CDF values. Same shape as the input.

pdf(*arg*)

Probability density function (PDF).

Parameters **arg** : array

Grid of point to evaluate PDF at

Returns array

PDF values. Same shape as the input.

rvs(*size=1*)

Random variates with mean zero and unit variance.

Parameters **size** : int or tuple

Size of output array

Returns array

Array of random variates

Bibliography

[R1] Hansen, B. E. (1994). Autoregressive conditional density estimation. *International Economic Review*, 35(3), 705–730. <http://www.ssc.wisc.edu/~bhansen/papers/ier_94.pdf>

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