

# Package ‘Risk’

June 8, 2017

**Type** Package

**Title** Computes 26 Financial Risk Measures for Any Continuous Distribution

**Version** 1.0

**Date** 2017-06-05

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**Depends** R (>= 3.0.1)

**Description** Computes 26 financial risk measures for any continuous distribution. The 26 financial risk measures include value at risk, expected short-fall due to Artzner et al. (1999) <DOI:10.1007/s10957-011-9968-2>, tail conditional median due to Kou et al. (2013) <DOI:10.1287/moor.1120.0577>, expectiles due to Newey and Powell (1987) <DOI:10.2307/1911031>, beyond value at risk due to Longin (2001) <DOI:10.3905/jod.2001.319161>, expected proportional short-fall due to Belzunce et al. (2012) <DOI:10.1016/j.insmatheco.2012.05.003>, elementary risk measure due to Ahmadi-Javid (2012) <DOI:10.1007/s10957-011-9968-2>, omega due to Shadwick and Keating (2002), sortino ratio due to Rollinger and Hoffman (2013), kappa due to Kaplan and Knowles (2004), Wang (1998)'s <DOI:10.1080/10920277.1998.10595708> risk measures, Stone (1973)'s <DOI:10.2307/2978638> risk measures, Luce (1980)'s <DOI:10.1007/BF00135033> risk measures, Sarin (1987)'s <DOI:10.1007/BF00126387> risk measures, Bronshtein and Kurenkova (2009)'s risk measures.

**License** GPL (>= 2)

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2017-06-08 15:19:54 UTC

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|              |  |
|--------------|--|
| Risk-package | <i>Computes 26 Financial Risk Measures for Any Continuous Distribution</i> |
|--------------|--|

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### Description

Computes 26 financial risk measures, including value at risk, expected shortfall due to Artzner et al. (1999) <DOI:10.1007/s10957-011-9968-2>, tail conditional median due to Kou et al. (2013) <DOI:10.1287/moor.1120.0577>, expectiles due to Newey and Powell (1987) <DOI:10.2307/1911031>, beyond value at risk due to Longin (2001) <DOI:10.3905/jod.2001.319161>, expected proportional shortfall due to Belzunce et al. (2012) <DOI:10.1016/j.insmatheco.2012.05.003>, elementary risk measure due to Ahmadi-Javid (2012) <DOI:10.1007/s10957-011-9968-2>, omega due to Shadwick and Keating (2002), sortino ratio due to Rollinger and Hoffman (2013), kappa due to Kaplan and Knowles (2004), Wang (1998)'s <DOI:10.1080/10920277.1998.10595708> risk measures, Stone (1973)'s <DOI:10.2307/2978638> risk measures, Luce (1980)'s <DOI:10.1007/BF00135033> risk measures, Sarin (1987)'s <DOI:10.1007/BF00126387> risk measures, Bronshtein and Kurelenkova (2009)'s risk measures.

**Details**

Package: Risk  
Type: Package  
Version: 1.0  
Date: 2017-06-05  
License: GPL(>=2)

financial risk measures

**Author(s)**

Saralees Nadarajah, Stephen Chan

Maintainer: Saralees Nadarajah <Saralees.Nadarajah@manchester.ac.uk>

**References**

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- F. Belzunce, J. F. Pinar, J. M. Ruiz and M. A. Sordo, Comparison of risks based on the expected proportional shortfall, *Insurance: Mathematics and Economics*, 51, 2012, 292-302 <DOI:10.1016/j.insmathco.2012.05.003>
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- S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted
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- F. M. Longin, Beyond the VaR, *Journal of Derivatives*, 8, 2001, 36-48 <DOI:10.3905/jod.2001.319161>
- R. D. Luce, Several possible measures of risk, *Theory and Decision*, 12, 1980, 217-228 <DOI:10.1007/BF00135033>
- W. K. Newey and J. L. Powell, Asymmetric least squares estimation and testing, *Econometrica*, 55, 1987, 819-847 <DOI:10.2307/1911031>
- T. Rollinger and S. Hoffman, Sortino ratio: A better measure of risk, *Risk Management*, 2013, 40-42
- R. K. Sarin, Some extensions of Luce's measures of risk, *Theory and Decision*, 22, 1987, 125-141 <DOI:10.1007/BF00126387>
- W. F. Shadwick and C. Keating, A universal performance measure, *Journal of Performance Measurement*, 2002
- B. K. Stone, A general class of three-parameter risk measures, *The Journal of Finance*, 28, 1973, 675-685 <DOI:10.2307/2978638>
- S. Wang, An actuarial index of the right-tail risk, *North American Actuarial Journal*, 2, 1988, 88-101 <DOI:10.1080/10920277.1998.10595708>

---

BKg1

*Bronshtein And Kurelenkova (2009)'s First Risk Measure*

---

### **Description**

Computes the first risk measure due to Bronshtein and Kurelenkova (2009)

### **Usage**

```
BKg1(spec, alpha, a, b, ...)
```

### **Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

### **Value**

An object of the same length as alpha, giving Bronshtein and Kurelenkova (2009)'s first risk measure of the distribution specified by spec

### **Author(s)**

Stephen Chan, Saralees Nadarajah

### **References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

E. Bronshtein and J. Kurelenkova, Complex risk measures in portfolio optimization, Ufa State Aviation Technical University, Russia, 2009

### **Examples**

```
BKg1("norm", 0.9, -Inf, Inf)
```

**Description**

Computes the second risk measure due to Bronshtein and Kurelenkova (2009)

**Usage**

```
BKg2(spec, alpha, a, b, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving Bronshtein and Kurelenkova (2009)'s second risk measure of the distribution specified by spec

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

E. Bronshtein and J. Kurelenkova, Complex risk measures in portfolio optimization, Ufa State Aviation Technical University, Russia, 2009

**Examples**

```
BKg2("norm", 0.9, -Inf, Inf)
```

---

BKg3

*Bronshstein And Kurelenkova (2009)'s Third Risk Measure*

---

### Description

Computes the third risk measure due to Bronshstein and Kurelenkova (2009)

### Usage

```
BKg3(spec, alpha, a, b, beta, ...)
```

### Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| beta  | a non-negative real valued parameter, see Chan and Nadarajah for details                                |
| ...   | other parameters  |

### Value

An object of the same length as alpha, giving Bronshstein and Kurelenkova (2009)'s third risk measure of the distribution specified by spec

### Author(s)

Stephen Chan, Saralees Nadarajah

### References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
E. Bronshstein and J. Kurelenkova, Complex risk measures in portfolio optimization, Ufa State Aviation Technical University, Russia, 2009

### Examples

```
BKg3("norm", 0.9, -Inf, Inf, 1)
```

**Description**

Computes the fourth risk measure due to Bronshtein and Kurelenkova (2009)

**Usage**

```
BKg4(spec, alpha, a, b, beta, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| beta  | a non-negative real valued parameter, see Chan and Nadarajah for details                                |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving Bronshtein and Kurelenkova (2009)'s fourth risk measure of the distribution specified by spec

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
E. Bronshtein and J. Kurelenkova, Complex risk measures in portfolio optimization, Ufa State Aviation Technical University, Russia, 2009

**Examples**

```
BKg4("norm", 0.9, -Inf, Inf, 1)
```

---

bvar

*Beyond Value At Risk Due To Longin (2001)*

---

### Description

Computes beyond value at risk for a given ditribution

### Usage

```
bvar(spec, alpha, a, ...)
```

### Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with beyon values at risk  |
| a     | the lower end point of the distribution specified by spec   |
| ...   | other parameters  |

### Value

An object of the same length as alpha, giving beyond values ar risk computed.

### Author(s)

Stephen Chan, Saralees Nadarajah

### References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

F. M. Longin, Beyond the VaR, Journal of Derivatives, 8, 2001, 36-48 <DOI:10.3905/jod.2001.319161>

### Examples

```
bvar("norm", 0.9, a=-Inf)
```



---

epsg

*Expected Proportional Shortfall Due To Belzunce et al. (2012)*

---

## Description

Computes expected proportional shortfall for a given ditribution

## Usage

```
epsg(spec, alpha, ...)
```

## Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with expected proportional shortfalls                                      |
| ...   | other parameters  |

## Value

An object of the same length as alpha, giving expected proportional shortfalls computed.

## Author(s)

Stephen Chan, Saralees Nadarajah

## References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

F. Belzunce, J. F. Pinar, J. M. Ruiz and M. A. Sordo, Comparison of risks based on the expected proportional shortfall, Insurance: Mathematics and Economics, 51, 2012, 292-302 <DOI:10.1016/j.insmatheco.2012.05.003>

## Examples

```
epsg("norm", 0.9)
```

---

esg *Expected Shortfall Due To Artzner et al. (1999)*

---

**Description**

Computes expected shortfall for a given ditribution

**Usage**

```
esg(spec, alpha, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with expected shortfall  |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving expected shortfall computed.

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
P. Artzner, F. Delbaen, J. M. Eber and D. Heath, Coherent measures of risk, Mathematical Finance, 9, 1999, 203-228 <DOI:10.1111/1467-9965.00068>

**Examples**

```
esg("norm", 0.9)
```

---

|        |                    |
|--------|--------------------|
| expect | <i>Expectation</i> |
|--------|--------------------|

---

**Description**

Computes expectation for a given ditribution

**Usage**

```
expect(spec, a, b, ...)
```

**Arguments**

|      |   |
|------|---|
| spec | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| a    | the lower end point of the distribution specified by spec   |
| b    | the upper end point of the distribution specified by spec   |
| ...  | other parameters  |

**Value**

A scalar, giving the expected value of the distribution specified by spec

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

**Examples**

```
expect("norm", -Inf, Inf)
```

---

expp

*Expectiles Due To Newey And Powell (1987)*

---

## Description

Computes expectiles for a given ditribution

## Usage

```
expp(spec, alpha, a, b, ...)
```

## Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with expectiles  |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

## Value

An object of the same length as alpha, giving expectiles computed.

## Author(s)

Stephen Chan, Saralees Nadarajah

## References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
W. K. Newey and J. L. Powell, Asymmetric least squares estimation and testing. *Econometrica*, 55, 1987, 819-847 <DOI:10.2307/1911031>

## Examples

```
expp("norm", 0.9, a=-Inf, b=Inf)
```

---

expvar

*An Elementary Risk Measure Due To Ahmadi-Javid (2012)*

---

### Description

Computes the elementary risk measure for a given distribution

### Usage

```
expvar(spec, alpha, a, b, ...)
```

### Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a positive valued parameter, see Chan and Nadarajah for details   |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

### Value

An object of the same length as alpha, giving the elementary risk measure of the distribution specified by spec

### Author(s)

Stephen Chan, Saralees Nadarajah

### References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

A. Ahmadi-Javid, Entropic value-at-risk: A new coherent risk measure. *Journal of Optimization Theory and Applications*, 155, 2012, 1105-1123 <DOI:10.1007/s10957-011-9968-2>

### Examples

```
expvar("norm", 0.9, -Inf, Inf)
```

---

kappag

*Kappa Risk Measure Due To Kaplan And Knowles (2004)*

---

### Description

Computes the Kappa risk measure for a given ditribution

### Usage

```
kappag(spec, alpha, n, a, b, ...)
```

### Arguments

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter, see Chan and Nadarajah for details   |
| n     | a positive integer valued parameter, see Chan and Nadarajah for details                                 |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

### Value

An object of the same length as alpha, giving the Kappa risk measure of the distribution specified by spec

### Author(s)

Stephen Chan, Saralees Nadarajah

### References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

P. D. Kaplan and J. A. Knowles, Kappa: A generalized downside risk-adjusted performance measure, Miscellaneous Publication, Morningstar Associates and York Hedge Fund Strategies, 2004

### Examples

```
kappag("norm", 2, 5, -Inf, Inf)
```

---

`luceg1`*Luce (1980)'s First Risk Measure*

---

**Description**

Computes the first risk measure due to Luce (1980)

**Usage**

```
luceg1(spec, a, b, aa, bb, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>aa</code>   | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>bb</code>   | a non-negative valued parameter, see Chan and Nadarajah for details                                     |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Luce (1980)'s first risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

R. D. Luce, Several possible measures of risk, Theory and Decision, 12, 1980, 217-228 <DOI:10.1007/BF00135033>

**Examples**

```
luceg1("unif", 0, 1, 1, 0)
```

---

`luceg2`*Luce (1980)'s Second Risk Measure*

---

**Description**

Computes the second risk measure due to Luce (1980)

**Usage**

```
luceg2(spec, a, b, aa, bb, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>aa</code>   | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>bb</code>   | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Luce (1980)'s second risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

R. D. Luce, Several possible measures of risk, Theory and Decision, 12, 1980, 217-228 <DOI:10.1007/BF00135033>

**Examples**

```
luceg2("unif", 0, 1, 1, 0)
```



---

`luceg3`*Luce (1980)'s Third Risk Measure*

---

**Description**

Computes the third risk measure due to Luce (1980)

**Usage**

```
luceg3(spec, a, b, aa, bb, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>aa</code>   | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>bb</code>   | a non-negative valued parameter, see Chan and Nadarajah for details                                     |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Luce (1980)'s third risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

R. D. Luce, Several possible measures of risk, Theory and Decision, 12, 1980, 217-228 <DOI:10.1007/BF00135033>

**Examples**

```
luceg3("unif", 0, 1, 1, 0)
```

---

luceg4

*Luce (1980)'s Fourth Risk Measure*

---

### Description

Computes the fourth risk measure due to Luce (1980)

### Usage

```
luceg4(spec, a, b, aa, bb, ...)
```

### Arguments

|      |   |
|------|---|
| spec | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| aa   | a positive valued parameter, see Chan and Nadarajah for details   |
| bb   | a positive valued parameter, see Chan and Nadarajah for details   |
| a    | the lower end point of the distribution specified by spec   |
| b    | the upper end point of the distribution specified by spec   |
| ...  | other parameters  |

### Value

A scalar, giving Luce (1980)'s fourth risk measure of the distribution specified by spec

### Author(s)

Stephen Chan, Saralees Nadarajah

### References

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

R. D. Luce, Several possible measures of risk, Theory and Decision, 12, 1980, 217-228 <DOI:10.1007/BF00135033>

### Examples

```
luceg4("norm", -Inf, Inf, 1, 0)
```

---

`omegag`*Omega Risk Measure Due To Shadwick And Keating (2002)*

---

**Description**

Computes the omega risk measure for a given ditribution

**Usage**

```
omegag(spec, alpha, a, b, ...)
```

**Arguments**

|                    |   |
|--------------------|---|
| <code>spec</code>  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>alpha</code> | a real valued parameter, see Chan and Nadarajah for details   |
| <code>a</code>     | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>     | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>   | other parameters  |

**Value**

An object of the same length as `alpha`, giving the omega risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
W. F. Shadwick and C. Keating, A universal performance measure, Journal of Performance Measurement, 2002

**Examples**

```
omegag("norm", 2, -Inf, Inf)
```

---

`saring1`*Sarin (1987)'s First Risk Measure*

---

**Description**

Computes the first risk measure due to Sarin (1987)

**Usage**

```
saring1(spec, a, b, k, c, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>k</code>    | a non-zero real valued parameter, see Chan and Nadarajah for details                                    |
| <code>c</code>    | a non-zero real valued parameter, see Chan and Nadarajah for details                                    |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Sarin (1987)'s first risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
R. K. Sarin, Some extensions of Luce's measures of risk, Theory and Decision, 22, 1987, 125-141  
<DOI:10.1007/BF00126387>

**Examples**

```
saring1("norm", -Inf, Inf, 1, 0)
```

---

`saring2`*Sarin (1987)'s Second Risk Measure*

---

**Description**

Computes the second risk measure due to Sarin (1987)

**Usage**

```
saring2(spec, a, b, aa, bb1, bb2, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>aa</code>   | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>bb1</code>  | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>bb2</code>  | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Sarin (1987)'s second risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

R. K. Sarin, Some extensions of Luce's measures of risk, Theory and Decision, 22, 1987, 125-141  
<DOI:10.1007/BF00126387>

**Examples**

```
saring2("norm", -Inf, Inf, 1, 1, 1)
```

---

`saring3`*Sarin (1987)'s Third Risk Measure*

---

**Description**

Computes the third risk measure due to Sarin (1987)

**Usage**

```
saring3(spec, a, b, aa, bb1, bb2, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>aa</code>   | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>bb1</code>  | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>bb2</code>  | a positive real valued parameter, see Chan and Nadarajah for details                                    |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Sarin (1987)'s third risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
R. K. Sarin, Some extensions of Luce's measures of risk, Theory and Decision, 22, 1987, 125-141  
<DOI:10.1007/BF00126387>

**Examples**

```
saring3("norm", -Inf, Inf, 1, 1, 1)
```

---

`sortinog`*Sortino Ratio Due To Rollinger And Hoffman (2013)*

---

**Description**

Computes the Sortino ratio for a given distribution

**Usage**

```
sortinog(spec, alpha, a, b, ...)
```

**Arguments**

|                    |   |
|--------------------|---|
| <code>spec</code>  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>alpha</code> | a real valued parameter, see Chan and Nadarajah for details   |
| <code>a</code>     | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>     | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>   | other parameters  |

**Value**

An object of the same length as `alpha`, giving the Sortino ratio of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted  
T. Rollinger and S. Hoffman, Sortino ratio: A better measure of risk, Risk Management, 40-42, 2013

**Examples**

```
sortinog("norm", 2, -Inf, Inf)
```

---

`stoneg1`*Stone (1973)'s First Risk Measure*

---

**Description**

Computes the first risk measure due to Stone (1973)

**Usage**

```
stoneg1(spec, x0, k, a, b, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>x0</code>   | a real valued parameter, see Chan and Nadarajah for details   |
| <code>k</code>    | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Stone (1973)'s first risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

B. K. Stone, A general class of three-parameter risk measures, *The Journal of Finance*, 28, 1973, 675-685 <DOI:10.2307/2978638>

**Examples**

```
stoneg1("norm", 8, 3, -Inf, Inf)
```



---

`stoneg2`*Stone (1973)'s Second Risk Measure*

---

**Description**

Computes the second risk measure due to Stone (1973)

**Usage**

```
stoneg2(spec, x0, k, a, b, ...)
```

**Arguments**

|                   |   |
|-------------------|---|
| <code>spec</code> | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| <code>x0</code>   | a real valued parameter, see Chan and Nadarajah for details   |
| <code>k</code>    | a positive valued parameter, see Chan and Nadarajah for details   |
| <code>a</code>    | the lower end point of the distribution specified by <code>spec</code>                                  |
| <code>b</code>    | the upper end point of the distribution specified by <code>spec</code>                                  |
| <code>...</code>  | other parameters  |

**Value**

A scalar, giving Stone (1973)'s second risk measure of the distribution specified by `spec`

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

B. K. Stone, A general class of three-parameter risk measures, *The Journal of Finance*, 28, 1973, 675-685 <DOI:10.2307/2978638>

**Examples**

```
stoneg2("norm", 8, 3, -Inf, Inf)
```

---

|     |   |
|-----|---|
| tcm | <i>Tail Conditional Mean Due To Kou et al. (2013)</i> |
|-----|---|

---

**Description**

Computes tail conditional median for a given ditribution

**Usage**

```
tcm(spec, alpha, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with tail conditional median   |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving tail conditional medians computed.

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

S. Kou, X. Peng and C. C. Heyde, External risk measures and Basel accords, Mathematics of Operations Research, 38, 2013, 393-417 <DOI:10.1287/moor.1120.0577>

**Examples**

```
tcm("norm", 0.9)
```

---

|      |                      |
|------|----------------------|
| varg | <i>Value At Risk</i> |
|------|----------------------|

---

**Description**

Computes value at risk for a given ditribution

**Usage**

```
varg(spec, alpha, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | the probabilities associated with values at risk  |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving values at risk computed.

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

**Examples**

```
varg("norm", 0.9)
```

---

|        |   |
|--------|---|
| wangg1 | <i>Wang (1998)'s First Risk Measure</i> |
|--------|---|

---

**Description**

Computes the first risk measure due to Wang (1998)

**Usage**

```
wangg1(spec, alpha, a, b, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving Wang (1998)'s first risk measure of the distribution specified by spec

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted

S. Wang, An actuarial index of the right-tail risk, North American Actuarial Journal, 2, 1998, 88-101 <DOI:10.1080/10920277.1998.10595708>

**Examples**

```
wangg1("lnorm", 0.9, 0, Inf)
```

---

wangg2

*Wang (1998)'s Second Risk Measure*

---

**Description**

Computes the second risk measure due to Wang (1998)

**Usage**

```
wangg2(spec, alpha, a, b, ...)
```

**Arguments**

|       |   |
|-------|---|
| spec  | a character string specifying the distribution (for example, "norm" corresponds to the standard normal) |
| alpha | a real valued parameter taking values in (0, 1), see Chan and Nadarajah for details                     |
| a     | the lower end point of the distribution specified by spec   |
| b     | the upper end point of the distribution specified by spec   |
| ...   | other parameters  |

**Value**

An object of the same length as alpha, giving Wang (1998)'s second risk measure of the distribution specified by spec

**Author(s)**

Stephen Chan, Saralees Nadarajah

**References**

- S. Chan and S. Nadarajah, Risk: An R package for risk measures, submitted
- S. Wang, An actuarial index of the right-tail risk, North American Actuarial Journal, 2, 1998, 88-101 <DOI:10.1080/10920277.1998.10595708>

**Examples**

```
wangg2("lnorm", 0.9, 0, Inf)
```

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