# Package 'vasicek'

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**Title** Miscellaneous Functions for Vasicek Distribution

**Version** 0.0.3

**Description** Provide a collection of miscellaneous R functions related to the Vasicek distribution with the intent to make the lives of risk modelers easier.

**License** GPL (>= 2)

**URL** https://github.com/statcompute/vasicek

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**Depends** R (>= 3.6.0)

**Imports** stats, mvtnorm

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.1.1

**NeedsCompilation** no

**Repository** CRAN

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## Contents

## gof_ks *Kolmogorov-Smirnov goodness-of-fit test for the Vasicek distribution*

### Description

The function gof_ks performs Kolmogorov-Smirnov goodness-of-fit test for the Vasicek distribution

### Usage

```
gof_ks(x, Rho, P)
```

### Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |
| Rho | The Rho parameter in the Vasicek distribution |
| P | The P parameter in the Vasicek distribution |

### Value

A list with statistical test result, including ks stat and p-value.

### Examples

```
x <- vsk_rvs(100, Rho = 0.2, P = 0.1)
gof_ks(x, Rho = 0.2, P = 0.1)
```

## vsk_cdf *Calculating the cumulative distribution function of Vasicek*

### Description

The function vsk_cdf calculates the cumulative distribution function of Vasicek.

### Usage

```
vsk_cdf(x, Rho, P)
```

### Arguments

| | |
|---|---|
| x | A numeric vector in the [0, 1] interval that is supposed to follow the Vasicek distribution |
| Rho | The Rho parameter in the Vasicek distribution |
| P | The P parameter in the Vasicek distribution |

## Value

A numeric vector with the corresponding cdf.

## Examples

```
vsk_cdf(c(0.278837772815679, 0.5217229060260343), Rho = 0.2, P = 0.3)
# [1] 0.5 0.9
```

---

vsk_dmm *Estimating Vasicek parameters by using direct moment matching*

---

## Description

The function vsk_mle estimates parameters in the Vasicek distribution by using direct moment matching.

## Usage

```
vsk_dmm(x)
```

## Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |

## Value

A list with Vasicek parameters, namely Rho and P.

## Examples

```
vsk_dmm(vsk_rvs(1000, Rho = 0.2, P = 0.1))
# $Rho
# [1] 0.2135844
# $P
# [1] 0.1025469
```

vsk_imm *Estimating Vasicek parameters by using indirect moment matching*

## Description

The function vsk_imm estimates parameters in the Vasicek distribution by using indirect moment matching.

## Usage

```
vsk_imm(x)
```

## Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |

## Value

A list with Vasicek parameters, namely Rho and P.

## Examples

```
vsk_imm(vsk_rvs(1000, Rho = 0.2, P = 0.1))
# $Rho
# [1] 0.2110422
# $P
# [1] 0.1024877
```

vsk_mle *Estimating Vasicek parameters by using maximum likelihood estimator*

## Description

The function vsk_mle estimates parameters in the Vasicek distribution by using maximum likelihood estimator.

## Usage

```
vsk_mle(x)
```

## Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |

## Value

A list with Vasicek parameters, namely Rho and P.

## Examples

```
vsk_mle(vsk_rvs(1000, Rho = 0.2, P = 0.1))
# $Rho
# [1] 0.2110976
# $P
# [1] 0.1025469
```

---

vsk_pdf *Calculating the probability density function of Vasicek*

---

## Description

The function vsk_pdf calculates the probability density function of Vasicek.

## Usage

```
vsk_pdf(x, Rho, P)
```

## Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |
| Rho | The Rho parameter in the Vasicek distribution |
| P | The P parameter in the Vasicek distribution |

## Value

A numeric vector with the corresponding pdf.

## Examples

```
vsk_pdf(c(0.01, 0.02), Rho = 0.2, P = 0.3)
# [1] 0.07019659 0.22207564
```

## vsk_ppf *Calculating the percentile point function of Vasicek*

### Description

The function vsk_ppf calculates the percentile point function of Vasicek.

### Usage

```
vsk_ppf(Alpha, Rho, P)
```

### Arguments

| | |
|---|---|
| Alpha | A numeric vector of probabilities |
| Rho | The Rho parameter in the Vasicek distribution |
| P | The P parameter in the Vasicek distribution |

### Value

A numeric vector with the corresponding ppf.

### Examples

```
vsk_ppf(c(0.5, 0.9), Rho = 0.2, P = 0.3)
# [1] 0.2788378 0.5217229
```

## vsk_qbe *Estimating Vasicek parameters by using quantile-based estimator*

### Description

The function vsk_qbe estimates parameters in the Vasicek distribution by using quantile-based estimator. It is not recommended for small sample size.

### Usage

```
vsk_qbe(x)
```

### Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |

### Value

A list with Vasicek parameters, namely Rho and P.

## Examples

```
vsk_qbe(vsk_rvs(1000, Rho = 0.2, P = 0.1))
# $Rho
# [1] 0.1941091
# $P
# [1] 0.1019701
```

---

vsk_Rho *Estimating Vasicek Rho parameter by assuming the know P parameter*

---

## Description

The function vsk_Rho estimates Rho parameter in the Vasicek distribution by using maximum likelihood estimator, assuming the known P parameter.

## Usage

```
vsk_Rho(x, p)
```

## Arguments

| | |
|---|---|
| x | A numeric vector in the (0, 1) interval that is supposed to follow the Vasicek distribution |
| p | A numeric vector in the (0, 1) interval. p has the same length as x. Each value of p can be a constant or varying. |

## Value

A scalar representing the Rho parameter in the Vasicek distribution.

## Examples

```
x <- vsk_rvs(1000, Rho = 0.2, P = 0.1)
p <- rep(mean(x), length(x))
vsk_Rho(x, p)
# 0.2110976
```

vsk_rvs *Generating random numbers for the Vasicek distribution*

## Description

The function vsk_rvs generates random numbers for the Vasicek distribution.

## Usage

```
vsk_rvs(n, Rho, P, seed = 1)
```

## Arguments

| | |
|---|---|
| n | An integer for the number of observations. |
| Rho | The Rho parameter in the Vasicek distribution. It is in the range of (0, 1). |
| P | The P parameter in the Vasicek distribution. It is in the range of (0, 1). |
| seed | An integer that is used as the seed value to generate random numbers. |

## Value

A list of random number that follows the Vasicek distribution.

## Examples

```
vsk_rvs(10, Rho = 0.2, P = 0.1)
```

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