

# Package ‘cosinor’

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**Type** Package

**Title** Tools for Estimating and Predicting the Cosinor Model

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**Description** A set of simple functions that transforms longitudinal data to estimate the cosinor linear model as described in Tong (1976). Methods are given to summarize the mean, amplitude and acrophase, to predict the mean annual outcome value, and to test the coefficients.

**URL** <https://github.com/sachsmc/cosinor>

**Depends** R (>= 2.11.0)

**Imports** ggplot2, shiny

**Suggests** knitr

**License** MIT + file LICENSE

**LazyData** true

**VignetteBuilder** knitr

**RoxygenNote** 7.2.1

**NeedsCompilation** no

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cosinor.lm	<i>Fit cosinor model</i>
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### Description

Given an outcome and time variable, fit the cosinor model with optional covariate effects.

### Usage

```
cosinor.lm(formula, period = 12, data, na.action = na.omit)
```

### Arguments

formula	Formula specifying the model. Indicate the time variable with <code>time()</code> and covariate effects on the amplitude and acrophase with <code>amp.acro()</code> . See details for more information.
period	Length of time for a complete period of the sine curve.
data	Data frame where variable can be found
na.action	What to do with missing data

### Details

This defines special functions that are used in the formula to indicate the time variable and which covariates effect the amplitude. To indicate the time variable wrap the name of it in the function `time()`. To indicate a variable which affects the acrophase/amplitude, wrap the name in `amp.acro()`. This will then do all the transformations for you. See examples for usage.

### References

Tong, YL. Parameter Estimation in Studying Circadian Rhythms, *Biometrics* (1976). 32(1):85–94.

### Examples

```
cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)
```

---

cosinor.lm.default      *Fit cosinor model*

---

### Description

Given an outcome and time variable, fit the cosinor model with optional covariate effects.

### Usage

```
cosinor.lm.default(formula, ...)
```

### Arguments

formula	Formula specifying the model. Indicate the time variable with <code>time()</code> and covariate effects on the amplitude and acrophase with <code>amp.acro()</code> . See details.
...	other arguments

### Details

This defines special functions that are used in the formula to indicate the time variable and which covariates effect the amplitude. To indicate the time variable wrap the name of it in the function `time()`. To indicate a variable which affects the acrophase/amplitude, wrap the name in `amp.acro()`. This will then do all the transformations for you. See examples for usage.

### Examples

```
cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)
```

---

cosinor\_analyzer      *Shiny application to demonstrate cosinor fit*

---

### Description

Given a dataset, specify the outcome, time variable, and optional covariates. The app will then perform a cosinor analysis and plot the results.

### Usage

```
cosinor_analyzer(data = NULL)
```

### Arguments

data	Data frame to analyze
------	-----------------------

**Examples**

```
## Not run:
library(shiny)
cosinor_analyzer(vitamind)

## End(Not run)
```

---

get_varnames	<i>Extract variable names from terms object, handling specials</i>
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**Description**

Extract variable names from terms object, handling specials

**Usage**

```
get_varnames(Terms)
```

**Arguments**

Terms	a terms object
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ggplot_cosinor.lm	<i>Plot a cosinor model</i>
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**Description**

Given a cosinor.lm model fit, generate a plot of the data with the fitted values. Optionally allows for plotting by covariate levels 0 and 1.

**Usage**

```
ggplot_cosinor.lm(object, x_str = NULL)
```

**Arguments**

object	An object of class cosinor.lm
x_str	Character vector naming the covariate(s) to be plotted. May be NULL to plot overall curve

**Examples**

```
fit <- cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)
ggplot_cosinor.lm(fit, "X")
```

---

predict.cosinor.lm      *Predict from a cosinor model*

---

### Description

Given a time variable and optional covariates, generate predicted values from a cosinor fit. Default prediction is the mean value, optionally can predict at a given month

### Usage

```
## S3 method for class 'cosinor.lm'  
predict(object, newdata, ...)
```

### Arguments

object	An object of class cosinor.lm
newdata	Optional new data
...	other arguments

### Examples

```
fit <- cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)  
predict(fit)
```

---

print.cosinor.lm      *Print cosinor model*

---

### Description

Given an outcome and time variable, fit the cosinor model with optional covariate effects.

### Usage

```
## S3 method for class 'cosinor.lm'  
print(x, ...)
```

### Arguments

x	cosinor.lm object
...	passed to summary

```
print.summary.cosinor.lm
```

*Print the summary of a cosinor model*

---

### Description

Print the summary of a cosinor model

### Usage

```
## S3 method for class 'summary.cosinor.lm'  
print(x, ...)
```

### Arguments

x	An object of class <code>summary.cosinor.lm</code>
...	Currently unused

### Examples

```
fit <- cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)  
summary(fit)
```

---

```
print.test
```

*Print test of model*

---

### Description

Print test of model

### Usage

```
## S3 method for class 'test'  
print(x)
```

### Arguments

x	test object
---	-------------

---

print.test\_cosinor      *Print results of test of cosinor model*

---

**Description**

Print results of test of cosinor model

**Usage**

```
## S3 method for class 'test_cosinor'  
print(x, ...)
```

**Arguments**

x	test_cosinor object
...	Arguments passed to print

---

simulate\_cosinor      *Simulate data from a cosinor model*

---

**Description**

This function simulates data from a cosinor model with a single covariate, where the time scale is month, and optionally allows for single covariate effects on the mean, amplitude, and acrophase.

**Usage**

```
simulate_cosinor(n, beta.mean = 2, beta.amp = 0, beta.acro = 0)
```

**Arguments**

n	Sample size
beta.mean	Effect on the mean (intercept)
beta.amp	Effect on the amplitude
beta.acro	Effect on the acrophase

---

summary.cosinor.lm      *Summarize a cosinor model*

---

### Description

Given a time variable and optional covariates, generate inference a cosinor fit. Gives estimates, confidence intervals, and tests for the raw parameters, and for the mean, amplitude, and acrophase parameters. If the model includes covariates, the function returns the estimates of the mean, amplitude, and acrophase for the group with covariates equal to 1 and equal to 0. This may not be the desired result for continuous covariates.

### Usage

```
## S3 method for class 'cosinor.lm'
summary(object, ...)
```

### Arguments

object            An object of class cosinor.lm  
 ...                Currently unused

### Examples

```
fit <- cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)
summary(fit)
```

---

test\_cosinor            *Test for differences in a cosinor model*

---

### Description

Given a time variable and optional covariates, generate inference a cosinor fit. For the covariate named (or vector of covariates), this function performs a Wald test comparing the group with covariates equal to 1 to the group with covariates equal to 0. This may not be the desired result for continuous covariates.

### Usage

```
test_cosinor(object, x_str, param = "amp")
```

### Arguments

object            An object of class cosinor.lm  
 x\_str             Character naming the covariate whose amplitude/acrophase will be tested  
 param            Character string naming the parameter to test, either "amp" for amplitude or "acr" for acrophase

**Examples**

```
fit <- cosinor.lm(Y ~ time(time) + X + amp.acro(X), data = vitamind)
test_cosinor(fit, "X", "amp")
```

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update_covnames	<i>Replace covariate names with descriptive text</i>
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**Description**

Replace covariate names with descriptive text

**Usage**

```
update_covnames(names)
```

**Arguments**

names	Coefficient names to update
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vitamind	<i>Vitamin D</i>
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**Description**

Simulated data set to illustrate the cosinor model. Y is an outcome variable that varies of time time according to a cosine curve. The binary covariate X is associated with the mean and amplitude of the cosine curve.

**Usage**

```
vitamind
```

**Format**

A data frame with 3 variables: X, Y, time.

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