

Package ‘MultiGrey’

July 21, 2025

Type Package

Title Fitting and Forecasting of Grey Model for Multivariate Time Series Data

Version 0.1.0

Depends R(>= 2.10)

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

Description Grey model is commonly used in time series forecasting when statistical assumptions are violated with a limited number of data points. The minimum number of data points required to fit a grey model is four observations. This package fits Grey model of First order and One Variable, i.e., GM (1,1) for multivariate time series data and returns the parameters of the model, model evaluation criteria and h-step ahead forecast values for each of the time series variables. For method details see, Akay, D. and Atak, M. (2007) <[DOI:10.1016/j.energy.2006.11.014](https://doi.org/10.1016/j.energy.2006.11.014)>, Hsu, L. and Wang, C. (2007).<[DOI:10.1016/j.techfore.2006.02.005](https://doi.org/10.1016/j.techfore.2006.02.005)>.

License GPL (>= 2.0)

Encoding UTF-8

Imports zoo, stats

RoxxygenNote 7.3.2

NeedsCompilation no

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multigreyfit

Fit the GM (1, 1) model for multivariate time series data

Description

The multigreyfit function fits the GM (1,1) model for multivariate time series data and computes its model parameters as well as different model evaluation criteria.

Usage

```
multigreyfit(data)
```

Arguments

data Input multivariate time series data.

Details

This function returns the parameters of the fitted grey model, i.e., a and b which are known as control variable and developing coefficient respectively for each of the variables in the multivariate timeseries data. This function also returns the mean square error (MSE), mean absolute error (MAE), root mean square error (RMSE) and relative mean absolute percentage error (MAPE) values of the fitted GM (1, 1) model for each of the variables in the multivariate time series data.

Value

A list with the following components:

a	Control variable, i.e., parameter of fitted GM (1, 1) model for each of the time series variables.
b	Developing coefficient, i.e., parameter of fitted GM (1, 1) model for each of the time series variables.
mse	Mean Squared Error (MSE) for each time series variable.
rmse	Root Mean Square Error (RMSE) of fitted GM (1, 1) model for each of the time series variables
mape	Relative Mean Absolute Percentage Error (MAPE) of fitted GM (1, 1) model for each of the time series variables
mae	Mean Absolute Error (MAE) of fitted GM (1, 1) model for each of the time series variables

References

- Akay, D. and Atak, M. (2007). Grey prediction with rolling mechanism for electricity demand forecasting of Turkey. *Energy*, 32(9), 1670-1675.<DOI:10.1016/j.energy.2006.11.014>
- Deng, J. (1989). Introduction to grey system theory. *The Journal of Grey System*, 1(1), 1-24.
- Hsu, L.C. and Wang, C.H. (2007). Forecasting the output of integrated circuit industry using a grey model improved by Bayesian analysis. *Technological Forecasting and Social Change*, 74(6), 843-853.<DOI:10.1016/j.techfore.2006.02.005>

Examples

```
# Example data
xt <- c(640, 684, 713, 745, 809, 811, 883, 893, 904, 935, 1044, 1069)
yt <- c(50, 64, 93, 113, 131, 152, 164, 201, 224, 268, 286, 290)
zt <- c(550, 504, 493, 413, 431, 352, 364, 301, 294, 268, 286, 230)
data <- cbind(xt, yt, zt)

# Apply the multigreyfit function
multigreyfit(data)
```

multigreyforecast	<i>Forecast the GM (1, 1) model for multivariate time series data</i>
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Description

The multigreyforecast function computes the h-step ahead forecast values for each of the variables in the multivariate time series data.

Usage

```
multigreyforecast(data, h)
```

Arguments

data	Input multivariate time series data.
h	The forecast horizon.

Details

This function returns the h-step ahead forecasted values of the fitted GM (1, 1) model for each of the variables in the multivariate time series data.

Value

A h-step ahead forecast values

forecast	h-step ahead forecast values corresponding to each of the variables in the multivariate time series data.
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References

Akay, D. and Atak, M. (2007). Grey prediction with rolling mechanism for electricity demand forecasting of Turkey. *Energy*, 32(9), 1670-1675.<DOI:10.1016/j.energy.2006.11.014>

Deng, J. (1989). Introduction to grey system theory. *The Journal of Grey System*, 1(1), 1-24.

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Examples

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# Example data
xt <- c(640, 684, 713, 745, 809, 811, 883, 893, 904, 935, 1044, 1069)
yt <- c(50, 64, 93, 113, 131, 152, 164, 201, 224, 268, 286, 290)
zt <- c(550, 504, 493, 413, 431, 352, 364, 301, 294, 268, 286, 230)
data <- cbind(xt, yt, zt)

# Apply the multigreyfit function
multigreyforecast(data, h=3)
```

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