

Package ‘hmix’

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Type Package

Title Hidden Markov Model for Predicting Time Sequences with Mixture Sampling

Version 1.0.3

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Description An algorithm for time series analysis that leverages hidden Markov models, cluster analysis, and mixture distributions to segment data, detect patterns and predict future sequences.

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Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

Imports normalp (>= 0.7.2), glogis (>= 1.0-2), gld (>= 2.6.6), purrr (>= 1.0.1), HMM (>= 1.0.1), mc2d (>= 0.2.0), cubature (>= 2.1.0), dplyr (>= 1.1.2)

URL https://rpubs.com/giancarlo_vercellino/hmix

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

Depends R (>= 2.10)

NeedsCompilation no

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Repository CRAN

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`dummy_set`*A simple data set with stock close prices*

Description

A data frame with the close prices for AMZN, NVDA and IBM

Usage`dummy_set`**Format**

data frame with 4 columns and 1925 rows.

Source

Yahoo Finance

`hmix`*hmix: an algorithm for time series analysis that leverages hidden Markov models, cluster analysis, and mixture distributions to segment data, detect patterns and predict future sequences.*

Description

An algorithm for time series analysis that leverages hidden Markov models, cluster analysis, and mixture distributions to segment data, detect patterns and predict future sequences.

`hmix` function segments the time series with k-means clustering, fits an HMM to model state transitions, and generates future predictions over a specified horizon. It evaluates model accuracy by calculating the Continuous Ranked Probability Score (CRPS) across multiple test points, producing error metrics that assess the model's predictive performance and robustness.

Usage

```
hmix(  
  ts,  
  horizon,  
  centers = 10,  
  n_hidden = 4,  
  seed = 42,  
  n_tests = 20,  
  warmup = 0.5  
)
```

Arguments

ts	A numeric vector representing the time series data.
horizon	Integer. The prediction horizon, specifying how many future points to forecast.
centers	Integer. Number of clusters for k-means clustering. Default: 10.
n_hidden	Integer. Number of hidden states in the Hidden Markov Model. Default: 4.
seed	Integer. Random seed for reproducibility. Default: 42.
n_tests	Integer. Number of testing points for back-testing. Default: 20.
warmup	Numeric. Proportion of the time series used as the warm-up period before testing. Default: 0.5.

Value

This function returns a list containing:

- model: The HMM model along with its estimated parameters.
 - hmm_model: The object includes classified observations, initial HMM and trained HMM.
 - pred_funs: Prediction functions for each point in horizon (rfun, dfun, pfun, qfun)
- error_sets: A list of error metrics calculated for each testing point (at this time, CRPS).

Author(s)

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See Also

Useful links:

- https://rpubs.com/giancarlo_vercellino/hmix

Examples

```
# Example usage of hmix function:
result <- hmix(dummy_set$AMZN, horizon = 10, centers = 5, n_hidden = 3, n_tests = 2)
print(result$model)
print(result$error_sets)

# Random sampling for each point in predicted horizon
result$model$pred_funs$t1$rfun(10)

# ICDF for each point in horizon
result$model$pred_funs$t5$qfun(c(0, 1))

# PDF for each point in horizon
result$model$pred_funs$t8$dfun(tail(ts))

# CDF for each point in horizon
result$model$pred_funs$t10$pfun(tail(ts))
```

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* **datasets**

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