Package 'dymo'

October 8, 2025

Type Package

Title Dynamic Mode Decomposition Forecasting with Conformal Predictive
Sampling

Version 2.0.0

Description The DYMO package provides tools for multi-feature time-series forecasting using a Dynamic Mode Decomposition (DMD) model combined with conformal predictive sampling for uncertainty quantification.

License GPL-3

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

Imports ggplot2 (>= 4.0.0), rlang (>= 1.1.6)

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

Suggests knitr, testthat (>= 3.0.0)

Config/testthat/edition 3

Depends R (>= 4.5.0)

NeedsCompilation no

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Repository CRAN

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Description

Dynamic Mode Decomposition for Multivariate Time Feature Prediction

DYMO is an R package for multi-feature time-series forecasting using Dynamic Mode Decomposition (DMD) on scaled returns. It reconstructs future levels by compounding predicted dynamics and applies conformal predictive sampling to generate calibrated uncertainty distributions. The result is a fast, interpretable, and distribution-free forecasting framework with fully empirical predictive intervals and ggplot visualizations.

Usage

```
dymo(
  df,
  horizon,
  n_windows = 10,
  ci = 0.8,
  smoother = FALSE,
  min_feats = NULL,
  max_feats = NULL,
  dates = NULL,
  error_scale = "naive",
  error_benchmark = "naive",
  seed = 42,
  n_samp = 1000,
  eig_max_mod = 0.995
)
```

Arguments

df	A data frame or matrix of numeric time features, where each column represents a different time series of equal length. Must contain at least two features.
horizon	Positive integer. Number of forecast steps ahead (horizon) to predict.
n_windows	Positive integer. Number of validation windows used for residual and error estimation. Default: 10.
ci	Numeric in (0, 1). Confidence level for the conformal predictive intervals. Default: 0.8.
smoother	Logical. Whether to apply automatic LOESS smoothing to the input time series before modeling. Default: FALSE.
min_feats, max_feats	
	Positive integers. Minimum and maximum number of features to combine in the multifeature DMD. By default both are set to the total number of columns in df.

dates	Optional vector of 'Date' objects (same length as the rows of df). If supplied, forecast plots will use date labels and forecast dates will be extrapolated automatically.
error_scale	Character string specifying the scaling used in normalized error metrics. Options: "naive" (average one-step absolute error of the historical series) or "deviation" (standard deviation of the series). Default: '"naive"'.
error_benchmark	
	Character string specifying the benchmark used for relative error metrics. Options: "naive" (last value persistence) or "average" (mean value). Default: "naive".
seed	Positive integer. Random seed for reproducibility. Default: 42.
n_samp	Positive integer. Number of conformal samples to draw for each feature and horizon. Default: 1000.
eig_max_mod	Numeric in (0,1]. Maximum allowed eigenvalue modulus for DMD eigenmodes (values greater than this are clipped to prevent divergence). Default: 0.995.

Value

A list with three top-level components:

'comb_metrics' A data frame containing averaged forecast metrics and scores for all tested feature combinations and DMD ranks. Columns include rank, prediction scores, and standard error metrics such as MAE, MAPE, RMSSE, MASE, etc.

'best_model' A list summarizing the best-performing feature combination and DMD rank, containing:

'best_combination' Character string describing which features and rank were selected.

'quant_preds' List of matrices (one per feature) summarizing forecast quantiles, mean, and standard deviation for each horizon.

'point_forecast' Matrix of point (mean) forecasts on the original level scale. Rows = features, columns = forecast steps.

'samples' List of matrices (one per feature) containing conformal resampled level trajectories (n_samp x horizon).

'empfuns' List of empirical distribution functions per feature and horizon. Each element contains: rfun(n), pfun(x), qfun(p), dfun(x).

'testing_errors' Vector of average forecast error metrics for the best rank and feature combination.

'plots' List of ggplot objects visualizing the historical data, forecast mean, and predictive intervals for each feature.

'time_log' Character string giving the elapsed computation time in "hh:mm:ss" format.

Author(s)

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See Also

Useful links:

- <https://rpubs.com/giancarlo_vercellino/dymo>

Examples

```
dymo(time_features[,c(2, 3, 4)], horizon = 10, dates = time_features$dates)
```

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time_features	*time features example: IBM, AAPL, AMZN, GOOGL and MSFT Close Prices*

Description

A data frame with with daily with daily prices for some Big Tech Companies since March 2017.

Usage

```
time_features
```

Format

A data frame with 6 columns and 1336 rows.

Source

finance.yahoo.com

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