

Package ‘fable.ata’

July 22, 2025

Type Package

Title 'ATAforecasting' Modelling Interface for 'fable' Framework

Version 0.0.6

Date 2023-06-11

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Description

Allows ATA (Automatic Time series analysis using the Ata method) models from the 'ATAforecasting' package to be used in a tidy workflow with the modeling interface of 'fabletools'. This extends 'ATAforecasting' to provide enhanced model specification and management, performance evaluation methods, and model combination tools. The Ata method (Yapar et al. (2019) <[doi:10.15672/hujms.461032](https://doi.org/10.15672/hujms.461032)>), an alternative to exponential smoothing (described in Yapar (2016) <[doi:10.15672/HJMS.201614320580](https://doi.org/10.15672/HJMS.201614320580)>, Yapar et al. (2017) <[doi:10.15672/HJMS.2017.493](https://doi.org/10.15672/HJMS.2017.493)>), is a new univariate time series forecasting method which provides innovative solutions to issues faced during the initialization and optimization stages of existing forecasting methods. Forecasting performance of the Ata method is superior to existing methods both in terms of easy implementation and accurate forecasting. It can be applied to non-seasonal or seasonal time series which can be decomposed into four components (remainder, level, trend and seasonal).

Imports stats, rlang, tibble, dplyr, tsibble, distributional, tsbox, lubridate

Depends fabletools (>= 0.3.3), ATAforecasting (>= 0.0.60)

License GPL (>= 3)

URL <https://alsabtay.github.io/fable.ata/>

BugReports <https://github.com/alsabtay/fable.ata/issues>

Encoding UTF-8

RoxygenNote 7.2.3

ByteCompile true

NeedsCompilation no

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Repository CRAN

Date/Publication 2023-06-19 19:00:02 UTC

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AutoATA	<i>ATAforecasting: Automatic Time Series Analysis and Forecasting using Ata Method with Box-Cox Power Transformations Family and Seasonal Decomposition Techniques</i>
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Description

Returns $ATA(p,q,\phi)(E,T,S)$ applied to time series data. The Ata method based on the modified simple exponential smoothing as described in Yapar, G. (2016) <doi:10.15672/HJMS.201614320580>, Yapar G., Capar, S., Selamlar, H. T., Yavuz, I. (2017) <doi:10.15672/HJMS.2017.493> and Yapar G., Selamlar, H. T., Capar, S., Yavuz, I. (2019) <doi:10.15672/hujms.461032> is a new univariate time series forecasting method which provides innovative solutions to issues faced during the initialization and optimization stages of existing methods. Forecasting performance of the Ata method is superior to existing methods both in terms of easy implementation and accurate forecasting. It can be applied to non-seasonal or seasonal time series which can be decomposed into four components (remainder, level, trend and seasonal). This methodology performed well on the M3 and M4-competition data.

Usage

```
AutoATA(formula, ...)
```

Arguments

formula	Model specification (see "Specials" section).
...	Other arguments

Value

A model specification.

Specials

The `_specials_` define the methods and parameters for the components (level, trend, seasonality, accuracy, transform, holdout) of an ATA method.

There are a couple of limitations to note about ATA method:

- It supports only additive error term.
- It does not support exogenous regressors.
- It does not support missing values. You can complete missing values in the data with imputed values (e.g. with `[tsibble::fill_gaps()]`, `[tidyr::fill()]`, or by fitting a different model type and then calling `[fabletools::interpolate()]`) before fitting the model.

level: The 'level' special is used to specify the form of the level term.

```
level(parP = NULL, level_fixed = TRUE, initial_level = "none")
```

'parP'	The value of the smoothing parameter for the level. If 'p = 0', the level will not change over time. Conversely,
'level_fixed'	If TRUE, "pStarQ" -> First, fits ATA(p,0) where p = p* is optimized for q=0. Then, fits ATA(p*,q) where q is
'initial_level'	If NULL, "none" is default. If "none", ATA Method calculates the pth observation in data for level. If "mean"

trend: The 'trend' special is used to specify the form of the trend term and associated parameters.

```
trend(type = "A", parQ = NULL, initial_trend = "none", opt_trend = "none",
      parPHI = NULL, parPHI_range = c(0.8, 1.0), parPHI_increment = 0.01,
      uroot_test = "adf", uroot_alpha = 0.05, uroot_type = "level")
```

'type'	The form of the trend term: either none ("N"), additive ("A"), multiplicative ("M") or damped variants
'parQ'	The value of the smoothing parameter for the slope. If 'q = 0', the slope will not change over time. Con
'parPHI'	The value of the dampening parameter for the slope. If 'phi = 0', the slope will be dampened immediat
'parPHI_range'	If 'phi=NULL', 'parPHI_range' provides bounds for the optimised value of 'phi'.
'parPHI_increment'	If 'phi=NULL', 'parPHI_increment' provides increment step for searching 'phi'. If NULL, 'parPHI_in
'initial_trend'	If NULL, "none" is default. If "none", ATA Method calculates the qth observation in data for trend. If
'trend_opt'	Default is 'none'. If 'fixed' is set, "pBullet" -> Fits ATA(p,1) where p = p* is optimized for q = 1. If 's
'uroot_test'	Type of unit root test before all type seasonality test. Possible values are "adf", "pp" and "kpss".
'uroot_alpha'	Significant level of the unit root test, possible values range from 0.01 to 0.1.
'uroot_type'	Specification of the deterministic component in the regression for unit root test. Possible values are "lev
'uroot_maxd'	Maximum number of non-seasonal differences allowed.

season: The 'season' special is used to specify the form of the seasonal term and associated parameters. To specify a nonseasonal model you would include 'season(method = "N")'.

Examples

```
library(fable.ata)
as_tsibble(USAccDeaths) %>% model(ata = AutoATA(value ~ trend("A") + season("A")))
```

components.ATA	<i>Extract estimated states from an ATA model.</i>
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Description

Extract estimated states from an ATA model.

Usage

```
## S3 method for class 'ATA'
components(object, ...)
```

Arguments

object	An estimated model.
...	Unused.

Value

A [fabletools::dable()] containing estimated states.

fitted.ATA	<i>Extract fitted values</i>
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Description

Extracts the fitted values from an estimated ATA model.

Usage

```
## S3 method for class 'ATA'
fitted(object, ...)
```

Arguments

object	An estimated model.
...	Unused.

Value

A vector of fitted values.

forecast.ATA	<i>Forecast a model from the fable ATA model</i>
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Description

Forecast a model from the fable ATA model

Usage

```
## S3 method for class 'ATA'
forecast(
  object,
  new_data,
  h = NULL,
  ci_level = 95,
  negative_forecast = TRUE,
  onestep = FALSE,
  ...
)
```

Arguments

object	The time series model used to produce the forecasts
new_data	A ‘tsibble’ containing future information used to forecast.
h	The forecast horizon (can be used instead of ‘new_data’ for regular time series with no exogenous regressors).
ci_level	Confidence Interval levels for forecasting. Default value is 95.
negative_forecast	Negative values are allowed for forecasting. Default value is TRUE. If FALSE, all negative values for forecasting are set to 0.
onestep	Default is FALSE. if TRUE, the dynamic forecast strategy uses a one-step model multiple times ‘h’ forecast horizon) where the prediction for the prior time step is used as an input for making a prediction on the following time step.
...	Other arguments

Value

A vector of fitted residuals.

Examples

```
library(fable.ata)
as_tsibble(USAccDeaths) %>%
  model(ata = AutoATA(value ~ trend("A") + season("M"))) %>% forecast(h=24)
```

format.ATA	<i>Format of ATA model</i>
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Description

Format of ATA model

Usage

```
## S3 method for class 'ATA'  
format(x, ...)
```

Arguments

x	An estimated model.
...	Unused.

Value

The forecasting model's name.

glance.ATA	<i>Glance an ATA model</i>
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Description

Glance an ATA model

Usage

```
## S3 method for class 'ATA'  
glance(x, ...)
```

Arguments

x	An estimated model.
...	Unused.

Value

A one row tibble summarising the model's fit.

Examples

```
library(fable.ata)  
as_tsibble(USAccDeaths) %>%  
  model(ata = AutoATA(value ~ trend("A") + season("M"))) %>% glance()
```

model_sum.ATA	<i>Summary of ATA model</i>
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Description

Summary of ATA model

Usage

```
## S3 method for class 'ATA'
model_sum(x, ...)
```

Arguments

x An estimated model.
... Unused.

Value

The model's summary specs.

report.ATA	<i>Specialized Screen Print Function of ATA model</i>
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Description

Specialized Screen Print Function of ATA model

Usage

```
## S3 method for class 'ATA'
report(object, ...)
```

Arguments

object An estimated model.
... Unused.

Value

a summary for the results of the ATAforecasting

Examples

```
library(fable.ata)
as_tsibble(USAccDeaths) %>% model(ata = AutoATA(value ~ trend("A") + season("M"))) %>% report()
```

residuals.ATA	<i>Extract model residuals</i>
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Description

Extracts the residuals from an estimated ATA model.

Usage

```
## S3 method for class 'ATA'
residuals(object, ...)
```

Arguments

object	An estimated model.
...	Unused.

Value

A vector of residuals.

tidy.ATA	<i>Tidy a ATA model</i>
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Description

Tidy a ATA model

Usage

```
## S3 method for class 'ATA'
tidy(x, ...)
```

Arguments

x	An estimated model.
...	Unused.

Value

The model's coefficients in a 'tibble'.

Examples

```
library(fable.ata)
as_tsibble(USAccDeaths) %>%
  model(ata = AutoATA(value ~ trend("A") + season("M"))) %>% tidy()
```

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