Package 'wex'

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Type Package

Title Compute the Exact Observation Weights for the Kalman Filter and Smoother

Version 0.1.0

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Description Computes the exact observation weights for the Kalman filter and smoother, based on the method described in Koopman and Harvey (2003) <www.sciencedirect.com/science/article/pii/S0165188902000611>.
The package supports in-depth exploration of state-space models, enabling researchers and practitioners to extract meaningful insights from time series data.
This functionality is especially valuable in dynamic factor models, where the computed weights can be used to decompose the contributions of individual variables to the latent factors.
See the README file for examples.

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Encoding UTF-8

Imports FKF

LazyData true

URL https://github.com/timginker/wex

BugReports https://github.com/timginker/wex/issues

RoxygenNote 7.3.2

NeedsCompilation no

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Depends R (>= 3.5.0)

Repository CRAN

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Contents

`indicators` *Sample Data with 10 Economic Indicators*

Description

A dataset containing 10 monthly economic indicators, covering the period from January 2000 to November 2021. All variables have been log-differenced, when necessary, to achieve stationarity.

Usage

```
indicators
```

Format

A data frame with 263 rows and 11 variables:

date Date values (format: YYYY-MM-DD)

total_production Total industrial production in Israel

retail_revenue Trade revenue

services_revenue Service revenue

employment Employment (excluding absent workers)

export_services Exports of services

building_starts Building starts

import_consumer_goods Imports of consumer goods

import_production_inputs Imports of production inputs

export_goods Exports of goods

job_openings Job openings

Source

Public data from various sources

wex *Exact observation weights for the Kalman filter and smoother.*

Description

This function computes the exact observation weights for the Kalman filter and smoother, as described by Koopman and Harvey (2003). The implementation of `wex` builds upon the existing `FKF` package (see: https://CRAN.R-project.org/package=FKF).

Usage

```
wex(a0 = NULL, P0 = NULL, Tt, Zt, HHt, GGt, yt, t)
```

Arguments

`a0`	A `vector` giving the initial value/estimation of the state variable. By default is set to zero.
`P0`	A `matrix` giving the variance of a0. By default is a diagonal matrix of 10^6.
`Tt`	An `array` giving the factor of the transition equation (see **Details**).
`Zt`	An `array` giving the factor of the measurement equation (see **Details**).
`HHt`	An `array` giving the variance of the innovations of the transition equation (see **Details**).
`GGt`	An `array` giving the variance of the disturbances of the measurement equation (see **Details**).
`yt`	An $n \times d$ matrix, where d is the dimension and n is the number of observations. `matrix` containing the observations. "NA"-values are allowed (see **Details**).
`t`	An observation index for which the weights are returned.

Details

State space form

$$\alpha_{t+1} = T_t \alpha_t + H_t \eta_t,$$
$$y_t = Z_t \alpha_t + G_t \epsilon_t,$$

where y_t represents the observed data (possibly with NA's), and α_t is the state vector.

Value

Weight matrices for filtering (Wt) and smoothing (WtT).

References

Koopman, S. J., & Harvey, A. (2003). Computing observation weights for signal extraction and filtering. *Journal of Economic Dynamics and Control*, **27**(7), 1317-1333.

Examples

```
# Decompose a local level model (Nile data set)
data(Nile)
y <- Nile
wts <- wex(Tt=matrix(1),
Zt=matrix(1),
HHt = matrix(1385.066),
GGt = matrix(15124.13),
yt = t(y),
t=50)
```

Index