

Package ‘flubase’

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Type Package

Title Baseline of mortality free of influenza epidemics

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Description This function estimates the baseline of mortality free of influenza epidemics, and the respective excess deaths, for more than one time series (age groups, gender, regions, etc) using one of the four methods available.

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flubase-package

Estimates a baseline free of influenza epidemic effects

Description

This package contains a set of functions to estimate the mortality (or other indicator) baseline free of influenza epidemics for one or more than one time series (age groups, gender, regions, etc) using one of four methods made available, implemented respectively in [baseRM](#), [baseSA](#), [baseIt_RM](#) and [baseIt_SA](#).

Details

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Type: Package
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Date: 2009-02-23
License: GPL >=2

Author(s)

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References

Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).

Serfling RE Methods for Current Statistical Analysis of Excess Mortality Pneumonia-Influenza Deaths Public Health Reports 1963; 78 6:494 506.

K. Choi and S.B. Thacker An evaluation of influenza mortality surveillance 1962-1979. American Journal of Epidemiology 1981; 113 3: 215 216.

Lui K-J and Kendal A.P. Impact of influenza epidemics on mortality in the united states from October 1972 to May 1985. American Journal of Public Health 1987; 77(6):712 716.

L. Simonsen, M.J. Clarke, D. Williamson, D.F. Stroup, N.H. Arden and L.B. Schonberger The impact of influenza vaccination on seasonal mortality in the US elderly population. American Journal of Public Health 1997; 87(12):1994 1950.

See Also

[flubase](#), [baseRM](#), [baseSA](#), [baseIt_RM](#), [baseIt_SA](#)

baseIt_RM	<i>Baseline free of influenza epidemic effects: iterative procedure with cyclical regression model</i>
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Description

This function estimates the mortality (or other indicator) baseline, free of influenza epidemics, using an iterative procedure. The baseline for each flu-year (week 27 to week 26 or month 7 to month 6) is estimated from fitting a cyclical regression model to a training set of previous flu-years, without the periods with excess deaths associated with influenza epidemics. In each iteration the model identifies the periods with excess deaths as those weeks (months) above the 95 CI of the baseline.

Usage

```
baseIt_RM(nod, todeath, epi, flu_year, ny, tb, te, pe, ni = 5, train = 5, per)
```

Arguments

nod	a vector with the number of deaths (or other indicator) by week or month
todeath	a vector that contains the time index (week or month number)
epi	a vector that indicates if the week or month belongs to the epidemic period, in which case epi=1. Otherwise, epi=0
flu_year	a vector that indicates the flu year. It is an index for the set of 52 weeks or 12 months, that initiate at week 27 and ends at week 26 of the next civil year, or iniate at month 7 and ends at month 6 of the next civil year, depending on the time unit of data.
ny	number of years in study
tb	initial week (tb=48) or month (tb=12) of the fixed epidemic period
te	final week (te=17) or month (te=4) of the fixed epidemic period
pe	pe = 0 if the user provides the epidemic periods in the epi parameter; otherwise if pe = 1 the function uses a fixed period from week 47 to week 17 or from month 12 to month 4.
ni	represents the number of inical flu-years to inicialize the the iterative procedure, by default is equal to 4
train	is the set of flu years used to predict the baseline for the flu year i+1, by default is equal to 5
per	per=52 if the data is weekly or per=12 if the data is monthly

Details

The objective of this function is to estimate a mortality baseline without the effect of influenza epidemics. With this purpose the function starts fitting a cyclical regression model to the first ni flu years of mortality time series after excluding the epidemic periods, i.e. the values of nod when epi=0. Then it engages in an iterative procedure where in each iteration the function forecasts the

baseline of mortality without the effect of influenza epidemics for flu year $i+1$ using the model fitted to the flu years $i-\text{train}+1$ to i . In each iteration the function also identifies the periods with excess mortality associated to influenza epidemics in year $i+1$, as those where the observed mortality initiate with two consecutive observations above the 95 CI of the forecasted baseline and ends with two observations below the 95 CI of the forecasted baseline. These periods are returned in da variable.

Value

The function will return a list

baseIt_RM\$beta0	containing the mortality (or other indicator) baseline without the effect of influenza epidemics
baseIt_RM\$beta_up	containing the upper 95 CI of the baseline
baseIt_RM\$da	a dummy variable indicating the periods with excess deaths associated with the occurred influenza epidemics

Note

The n_i must be minor or equal to `train`.

Author(s)

Nunes B, Natario I and Carvalho L.

References

Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).

Serfling RE Methods for Current Statistical Analysis of Excess Mortality Pneumonia-Influenza Deaths Public Health Reports 1963; 78 6:494 506.

Lui K-J and Kendal A.P. Impact of influenza epidemics on mortality in the united states from october 1972 to may 1985. American Journal of Public Health 1987; 77(6):712 716.

L. Simonsen, M.J. Clarke, D- Williamson, D.F. Stroup, N.H. Arden and L.B. Schonberger The impact of influenza vaccination on seasonal mortality in the US elderly population. American Journal of Public Health 1997; 87(12):1994 1950.

See Also

[baseIt_SA](#), [baseSA](#), [baseIt_RM](#), [flubase](#)

baseIt_SA	<i>Baseline free of influenza epidemic effect: iterative procedure with seasonal ARIMA model</i>
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Description

This function estimates the mortality (or other indicator) baseline, free of influenza epidemics, using an iterative procedure. The baseline for each flu-year (week 27 to week 26 or month 7 to month 6) is estimated from fitting a seasonal ARIMA model to all previous flu-years, without the periods with excess deaths associated with influenza epidemics. In each iteration the model identifies the periods with excess deaths as those weeks (months) above the 95 CI of the baseline.

Usage

```
baseIt_SA(nod, todeath, epi, flu_year, ny, tb, te, pe, ni = 4, per)
```

Arguments

nod	a vector with the number of deaths (or other indicator) by week or month
todeath	a vector that contains the time index (week or month number)
epi	a vector that indicates if the week or month belongs to the epidemic period, in which case epi=1. Otherwise, epi=0
flu_year	a vector that indicates the flu year. It is an index for the set of 52 weeks or 12 months, that initiate at week 27 and ends at week 26 of the next civil year, or initiate at month 7 and ends at month 6 of the next civil year, depending on the time unit of data.
ny	number of years in study
tb	initial week (tb=48) or month (tb=12) of the fixed epidemic period
te	final week (te=17) or month (te=4) of the fixed epidemic period
pe	pe = 0 if the user provides the epidemic periods in the epi parameter; otherwise if pe = 1 the function uses a fixed period from week 47 to week 17 or from month 12 to month 4.
ni	ni=5 represents the number of initial flu-years to initialize the iterative procedure
per	per=52 if the data is weekly or per=12 if the data is monthly

Details

The objective of this function is to estimate a mortality baseline without the effect of influenza epidemics. With this purpose the function starts fitting a cyclical regression model to the first ni flu years of the mortality time series, after excluding the epidemic periods i.e. the values of nod when epi=0, in an iterative way. Then it engages in an iterative procedure where in each iteration the function forecasts the baseline of mortality without the effect of influenza epidemics for flu year i+1, using a predefined seasonal ARIMA model to the flu years 1 to i. In each iteration the function

also identifies the periods with excess mortality associated to influenza epidemics in year $i+1$, as those where the observed mortality initiate with two consecutive observations above the 95 CI of the forecasted baseline and ends with two observations below the 95 CI of the forecasted baseline. These periods are returned in da variable.

Value

The function will return a list

baseIt_SA\$beta0 containing the mortality (or other indicator) baseline without the effect of influenza epidemics

baseIt_SA\$beta_up containg the upper 95 CI of the baseline

baseIt_SA\$da a dummy variable indicating the periods with excess deaths associated with the occurred influenza epidemics

Author(s)

Nunes B, Natario I and Carvalho L.

References

Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).

K. Choi and S.B. Thacker An evaluation of influenza mortality surveillance 1962-1979. American Journal of Epidemiology 1981; 113 3: 215 216.

See Also

[baseIt_RM](#), [baseSA](#), [baseIt_RM](#), [flubase](#)

baseRM	<i>Baseline free of influenza epidemic effects: non iterative procedure with cyclical regression model</i>
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Description

This function obtains a mortality (or other indicator) baseline, free of influenza epidemic effects, using a non iterative procedure. The baseline is estimated from a cyclical regression model fitted to the mortality time series without the epidemic periods. The periods with excess deaths associated to influenza are those periods, within the epidemic ones, where the observed mortality is above the 95 CI of the fitted model.

Usage

```
baseRM(nod, todeath, epi, flu_year, ny, tb, te, pe, per)
```

Arguments

nod	a vector with the number of deaths (or other indicator) by week or month
todeath	a vector that contains the time index (week or month number)
epi	a vector that indicates if the week or month belongs to the epidemic period, in which case epi=1. Otherwise, epi=0
flu_year	a vector that indicates the flu year. It is an index for the set of 52 weeks or 12 months, that initiate at week 27 and ends at week 26 of the next civil year, or iniate at month 7 and ends at month 6 of the next civil year, depending on the time unit of data.
ny	number of years in study
tb	initial week (tb=48) or month (tb=12) of the fixed epidemic period
te	final week (te=17) or month (te=4) of the fixed epidemic period
pe	pe = 0 if the user provides the epidemic periods in the epi parameter; otherwise if pe = 1 the function uses a fixed period from week 47 to week 17 or from month 12 to month 4.
per	per=52 if the data is weekly or per=12 if the data is monthly

Details

The objective of this function is to estimate a mortality baseline without the effect of influenza epidemics. With this purpose the function fits a cyclical regression model to the mortality time series after excluding the epidemic periods, i.e. the values of nod when epi=0. The fitted values from this model is the baseline of mortality without the effect of influenza epidemics. The function also returns the the periods with excess mortality associated to influenza epidemics, as those where the observed mortality initiate with two consecutive observations above the 95 CI of the baseline and ends with two observations bellow the 95 CI of the baseline. These periods are returned in da variable.

Value

The function will return a list

baseRM\$beta0	containing the mortality (or other indicator) baseline of without the effect of influenza epidemics
baseRM\$beta_up	containg the upper 95 CI of the baseline
baseRM\$da	a dummy variable indicating the periods with excess deaths associated with the occurred influenza epidemics

Author(s)

Nunes B, Natario I and Carvalho L.

References

Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).

Serfling RE Methods for Current Statistical Analysis of Excess Mortality Pneumonia-Influenza Deaths Public Health Reports 1963; 78 6:494 506.

Simonsen L, Reichert TA, Viboud C, Blackwelder WC, Taylor RJ, Miller M. The Impact of Influenza Epidemics on Mortality: Introducing a Severity Index Archives of Internal Medicine 2005; 165:265 272.

Zucs WHP, Buchholz U and Uphoff H. Influenza associated excess mortality in germany, 1985 to 2001 Emerging Themes in Epidemiology 2005; 2(6):1 9.

Rizzo C, Viboud C, Montomoli E, Simonsen L, Miller MA. Influenza related mortality in the Italian elderly: No decline associated with the increasing vaccination coverage Vaccine 2006; 24:6468 6475.

See Also

[baseSA](#), [baseIt_RM](#), [baseIt_RM](#), [flubase](#)

baseSA	<i>Baseline free of influenza epidemic effects: non iterative procedure with seasonal ARIMA model</i>
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Description

This function estimates the mortality (or other indicator) baseline, free of influenza epidemics, using a non iterative procedure. The baseline is estimated from a seasonal ARIMA model fitted to the mortality time series without the epidemic periods. The periods with excess deaths associated to influenza epidemics are those periods, within the epidemic ones, where the observed mortality is above the 95 CI of fitted model.

Usage

```
baseSA(nod, todeath, epi, flu_year, ny, tb, te, pe, per)
```

Arguments

nod	a vector with the number of deaths (or other indicator) by week or month
todeath	a vector that contains the time index (week or month number)
epi	a vector that indicates if the week or month belongs to the epidemic period, in which case epi=1. Otherwise, epi=0
flu_year	a vector that indicates the flu year. It is an index for the set of 52 weeks or 12 months, that initiate at week 27 and ends at week 26 of the next civil year, or iniate at month 7 and ends at month 6 of the next civil year, depending on the time unit of data.

ny	number of years in study
tb	initial week (tb=48) or month (tb=12) of the fixed epidemic period
te	final week (te=17) or month (te=4) of the fixed epidemic period
pe	pe = 0 if the user provides the epidemic periods in the epi parameter; otherwise if pe = 1 the function uses a fixed period from week 47 to week 17 or from month 12 to month 4.
per	per=52 if the data is weekly or per=12 if the data is monthly

Details

The objective of this function is to estimate a mortality baseline without the effect of influenza epidemics. With this purpose the function fits a cyclical regression model to the mortality time series after excluding the epidemic periods, i.e. the values of nod corresponding to epi=0. Then the function replaces the nod values where epi=1 by the model estimates. In the next step it fits to this new time series the seasonal ARIMA model using the auto.arima function of the forecast package. The fitted values from this new model is the mortality baseline without the effect of influenza epidemics. The function also returns the the periods with excess mortality associated to influenza epidemics, as those where the observed mortality initiate with two consecutive observations above the 95 CI of the baseline and ends with two observations bellow the 95 CI of the baseline. These periods are returned in da variable.

Value

The function will return a list

baseSA\$beta0	containing the estimated mortality (or other indicator) baseline without the effect of influenza epidemics
.	.
baseSA\$beta_up	containing the upper 95 CI of the baseline
baseSA\$da	a dummy variable indicating the periods with excess deaths associated with the occurred influenza epidemics

Note

This function needs at least 5 years data to give reliable results

Author(s)

Nunes B, Natario I and Carvalho L.

References

- Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).
- Serfling RE Methods for Current Statistical Analysis of Excess Mortality Pneumonia-Influenza Deaths Public Health Reports 1963; 78 6:494 506.

See Also

[baseRM](#), [baseIt_RM](#), [baseIt_SA](#), [flubase](#)

flubase

Baseline free of influenza epidemic effects

Description

This function estimates the mortality (or other indicator) baseline free of influenza epidemics for one or more than one time series (age groups, gender, regions, etc) using one of four methods made available in the package, implemented respectively in [baseRM](#), [baseSA](#), [baseIt_RM](#) and [baseIt_SA](#).

Usage

```
flubase(dat, groups, per, pe = 0, method, indicator = "mortality", g_label)
```

Arguments

dat	a data.frame with all the variables needed: <code>dados\$group</code> indicating the group where each time series belongs, <code>dados\$year</code> indicating the civil year, <code>dados\$todeath</code> is the time unit index that can be week or month, <code>dados\$nod</code> are the number of deaths observed at that time and <code>dados\$epi</code> is an indicator variable of the epidemic period (<code>dados\$epi=1</code> if the week or month belongs to the epidemic period and <code>dados\$epi=0</code> otherwise).
groups	number of groups considered, e.g. number of age groups, regions, etc.
per	<code>per=52</code> for weekly data or <code>per=12</code> for monthly data
pe	<code>pe = 0</code> if the user provides the epidemic periods in <code>dados\$epi</code> and <code>pe = 1</code> otherwise, in case which the function uses a fixed period from week 48 to week 17 or from month 12 to month 4.
method	the method used to estimate the baseline, <code>method=c("nrm","nsa","irm","isa")</code> . <code>method=nrm</code> : non iterative multiple regression, <code>method=nsa</code> : non iterative seasonal ARIMA, <code>method=irm</code> : iterative multiple regression and <code>method=isa</code> : iterative seasonal ARIMA
indicator	a text string indicating the name of the indicator. By default <code>indicator="mortality"</code>
g_label	a vector string of length the number of groups, containing the labels for the groups, e.g. <code>g_label=c("male","female")</code> or <code>g_label=c("0-14 yrs","15-44 yrs","45-64 yrs","65+ yrs")</code>

Details

In order to use the methods `irm` and `isa` the time series must initiate in the week 27 or month 7 and end at week 26 or month 6 of the next year.

Value

The function will return a list flubase, with the original data set plus

flubase\$beta0	containing the mortality (or other indicator) baseline of without the effect of influenza epidemics
flubase\$beta_up	containing the upper 95 CI for the baseline
flubase\$da	a dummy variable indicating the periods with excess deaths
flubase\$ex	the excess deaths

This function delivers the following outputs: a text file with the original data set plus four new variables, the baseline (base0), the upper 95 confidence limit (dados\$base_up), the periods with excess deaths (dados\$da) and the excess deaths, estimated for each week or month (dados\$ex); a time series graph for each group (age group, gender, etc) where the blue line represents the observed mortality, the black line the estimated baseline, the red line the upper 95 confidence limit of the baseline, the gray rectangles the epidemic periods and the yellow rectangles the periods with excess deaths.

Author(s)

Nunes B, Natario I and Carvalho L.

References

- Nunes B, Natario I, Carvalho L. Time series methods for obtaining excess mortality. Submitted to Statistical Methods in Medical Research (2009).
- Serfling RE Methods for Current Statistical Analysis of Excess Mortality Pneumonia-Influenza Deaths Public Health Reports 1963; 78 6:494 506.
- K. Choi and S.B. Thacker An evaluation of influenza mortality surveillance 1962-1979. American Journal of Epidemiology 1981; 113 3: 215 216.
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See Also

[baseIt_RM](#), [baseSA](#), [baseIt_SA](#), [baseRM](#)

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