

# Package ‘forsearch’

October 13, 2022

**Version** 2.3.0

**Title** Outlier Diagnostics for Some Linear Effects and Linear Mixed Effects Models

**Description** Identifies potential data outliers and their impact on estimates and analyses. Uses the forward search approach of Atkinson and Riani, “Robust Diagnostic Regression Analysis”, 2000, <ISBN: 0-387-95017-6> to prepare descriptive statistics of a dataset that is to be analyzed by `stats::lm()`, `stats::glm()`, or `nlme::lme()`. Includes graphics functions to display the descriptive statistics.

**License** GPL (>= 3)

**SystemRequirements** gmp (>= 4.1)

**Imports** Hmisc(>= 4.6-0), Cairo(>= 1.5-14), ggplot2(>= 3.3.5), nlme(>= 3.1-152), tibble(>= 3.1.6)

**Encoding** UTF-8

**RoxygenNote** 7.1.2

**Depends** R (>= 2.10)

**Suggests** rmarkdown, knitr

**VignetteBuilder** knitr

**NeedsCompilation** no

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**Repository** CRAN

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forsearch-package	<i>Diagnostic Analysis Using Forward Search Procedure for Various Models Outlier Diagnostics for Some Linear Effects and Linear Mixed Effects Models</i>
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## Description

Identifies potential data outliers and their impact on estimates and analyses. Uses the forward search approach of Atkinson and Riani, "Robust Diagnostic Regression Analysis", 2000, <ISBN: 0-387-95017-6> to prepare descriptive statistics of a dataset that is to be analyzed by `stats::lm()`, `stats::glm()`, or `nlme::lme()`. Includes graphics functions to display the descriptive statistics.

## Details

The DESCRIPTION file:

```

Package:      forsearch
Version:     2.3.0
Title:       Outlier Diagnostics for Some Linear Effects and Linear Mixed Effects Models
Authors@R:   person("William", "Fairweather", email = "wrf343@flowervalleyconsulting.com", role = c("aut", "cre"))
Description: Identifies potential data outliers and their impact on estimates and analyses. Uses the forward search approach of Atkinson and Riani, "Robust Diagnostic Regression Analysis", 2000, <ISBN: 0-387-95017-6> to prepare descriptive statistics of a dataset that is to be analyzed by stats::lm(), stats::glm(), or nlme::lme(). Includes graphics functions to display the descriptive statistics.
License:     GPL (>= 3)
SystemRequirements: gmp (>= 4.1)
Imports:     Hmisc(>= 4.6-0), Cairo(>= 1.5-14), ggplot2(>= 3.3.5), nlme(>= 3.1-152), tibble(>= 3.1.6)
Encoding:    UTF-8
Roxygen:     list(markdown = TRUE)
RoxygenNote: 7.1.2
Depends:     R (>= 2.10)
LazyData:    TRUE

```

Suggests: rmarkdown, knitr  
 VignetteBuilder: knitr  
 Author: William Fairweather [aut, cre]  
 Maintainer: William Fairweather <wrf343@flowervalleyconsulting.com>

## Index of help topics:

forsearch-package	Diagnostic Analysis Using Forward Search Procedure for Various Models Outlier Diagnostics for Some Linear Effects and Linear Mixed Effects Models
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forsearch_lm	Create Statistics Of Forward Search in a Linear Model Database
forsearch_lme	Create Statistics Of Forward Search In a Linear Mixed Effects Database
identifyCoeffs	Index To Identify Fixed and Random Coefficients To Appear Together on Plot
identifyFixedCoeffs	Index To Identify Fixed Coefficients To Appear Together on Plot
plotdiag.AICX	Plot Diagnostic AIC Statistics
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plotdiag.deviance.residuals	Plot Diagnostic Statistics Of Deviance Residuals
plotdiag.deviences	Plot Diagnostic Deviance Statistics
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plotdiag.residuals	Plot Diagnostic Statistics Of Residuals Or Squared Residuals
plotdiag.s2	Plot Diagnostic Statistics Of Residual Variation
plotdiag.tstats	Plot Diagnostic T Statistics
search.history	Create Tabular History Of Forward Search
showme	Display Abbreviated Output Of FORSEARCH_LM Function
showmegl	Display Abbreviated Output Of FORSEARCH_GLM Function

showmelme                      Display Abbreviated Output Of FORSEARCH\_LME  
Function

Ensure that data frame has a leading column of observation numbers. Run `forsearch_xxx` to create a file of diagnostic statistics to be used as input to such plotting functions as `plotdiag.residuals`, `plotdiag.params.fixed`, `plotdiag.params.random`, `plotdiag.s2`, `plotdiag.leverage`, and `plotdiag.Cook`. The file of diagnostic statistics can be voluminous, and utility functions of `showme`, `showmelme`, and `showmegl` (for `lm`, `lme` and `glm` analyses, respectively) display the output more succinctly. Plotting of statistics for fixed and for random coefficients is limited by graphical restraints in some cases. The function `identifyCoeffs` provides a set of indexing codes so that `plotdiag.params.random` can display diagnostics for selected fixed or random model parameters. The function `identifyFixedCoeffs` does the same for `lm` models.

### Author(s)

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Maintainer: NA William R. Fairweather <wrf343 at flowervalleyconsulting.com>

### References

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.  
Pinheiro, JC and DM Bates. Mixed-Effects Models in S and S-Plus, Springer, New York, 2000.

---

forsearch\_glm                      *Create Statistics Of Forward Search in a Generalized Linear Model  
Database*

---

### Description

Prepares summary statistics at each stage of forward search for subsequent plotting. Forward search is conducted in three steps: Step 1 to identify minimal set of observations to estimate unknown parameters, and Step 2 to add one observation at each stage such that observations in the set are best fitting at that stage. A preliminary step (Step 0) contains code for pre-processing of the data.

### Usage

```
forsearch_glm(initial.sample, cobs, response.cols, indep.cols, family, data,
estimate.phi=TRUE, skip.step1=NULL, diagnose=FALSE, verbose=TRUE)
```

### Arguments

`initial.sample` Number of random sets of observations in Step 1 of forward search  
`cobs`                      Number of observations to include in each innermost subset of Step 1  
`response.cols`      Column number(s) of response(s)  
`indep.cols`              Column number(s) of independent variables  
`family`                      Error distribution and link

data	Name of database
estimate.phi	TRUE causes phi to be estimated; FALSE causes phi to be set = 1
skip.step1	NULL, or vector of observation numbers to include at end of Step 1
diagnose	TRUE causes printing of intermediate steps of function
verbose	TRUE causes function identifier to display before and after run

### Details

No compounding of independent variables is performed within this function. Cross products of two or more variables, functions of single variables, etc. must be explicit and must be represented by another variable in the independent set.

### Value

LIST	
Rows in stage	Observation numbers of rows included at each stage
Family	Family and link
Number of model parameters	Number of fixed effect parameters
Fixed parameter estimates	Matrix of parameter estimates at each stage
Residual deviance	Vector of deviances
Null deviance	Vector of null deviances
PhiHat	Vector of values of phi parameter
Deviance residuals and augments	Deviance residuals with indication of whether each is included in fit
AIC	Vector of AIC values
Leverage	Matrix of leverage of each observation at each stage
Call	Call to this function

### Author(s)

William R. Fairweather

### References

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

### Examples

---

 forsearch\_lm

*Create Statistics Of Forward Search in a Linear Model Database*


---

### Description

Prepares summary statistics at each stage of forward search for subsequent plotting. Forward search is conducted in two steps: Step 1 to identify minimal set of observations to estimate unknown parameters, and Step 2 to add one observation at each stage such that observations in the set are best fitting at that stage.

### Usage

```
forsearch_lm(formula, data, initial.sample, diagnose = FALSE, verbose = TRUE)
```

### Arguments

formula	Fixed effects formula as described in stats::lm
data	Name of database
initial.sample	Number of observations in Step 1 of forward search
diagnose	TRUE causes printing of intermediate steps of function
verbose	TRUE causes function identifier to display before and after run

### Value

LIST

Rows in stage    Observation numbers of rows included at each stage

Standardized residuals

Matrix of errors at each stage

Number of model parameters

Rank of model

Sigma            Estimate of random error at final stage; used to standardize all residuals

Fixed parameter estimates

Matrix of parameter estimates at each stage

s<sup>2</sup>              Estimate of random error at each stage

Leverage         Matrix of leverage of each observation at each stage

Modified Cook distance

Estimate of sum of squared changes in parameter estimates at each stage

Call              Call to this function

### Author(s)

William R. Fairweather

## References

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

## Examples

---

forsearch_lme	<i>Create Statistics Of Forward Search In a Linear Mixed Effects Database</i>
---------------	---

---

## Description

Prepares summary statistics at each stage of forward search for subsequent plotting. Forward search is conducted in three steps: Step 0 to set up accounting for group structure, Step 1 to identify minimal set of observations to estimate unknown parameters, and Step 2 to add one observation at each stage such that observations in the set are best fitting at that stage.

## Usage

```
forsearch_lme(fixed, data, random, formula, response.column, initial.sample, robs,
  skip.step1=NULL, XmaxIter = 1000, XmsMaxIter = 1000,
  Xtolerance = 0.01, XniterEM = 1000, XmsMaxEval = 400, XmsTol = 1e-05,
  Xopt = "optim", diagnose = FALSE, verbose = TRUE)
```

## Arguments

fixed	2-sided formula for fixed effects
data	data frame, first column of which must be "Observation"
random	1-sided formula for random effects
formula	a formula of the form $\text{resp} \sim \text{cov} \mid \text{group}$ where $\text{resp}$ is the response, $\text{cov}$ is the primary covariate, and $\text{group}$ is the (non-nested) grouping factor
response.column	Column number of response variable
initial.sample	Number of observations in Step 1 of forward search
robs	Number of observations to include in Step 1 of forward search from each sub-group
skip.step1	NULL or a vector of integers for rows to be included in Step 1
XmaxIter	lme control parameter
XmsMaxIter	lme control parameter
Xtolerance	lme control parameter
XniterEM	lme control parameter
XmsMaxEval	lme control parameter

XmsTol	lme control parameter
Xopt	lme control parameter
diagnose	TRUE causes printing of intermediate steps of function
verbose	TRUE causes function identifier to display before and after run

### Details

Group structure is ignored in calculating errors of fit in Step 1. That is, predictions derive from lm fit and not lme fit. Diagnostic statistics are obtained from lme fits. Argument 'formula' is used to identify the innermost group structure and the observations in each level.

### Value

LIST	
Rows in stage	Observation numbers of rows included at each stage
Standardized residuals	Matrix of errors at each stage
Number of model parameters	Rank of model
Sigma	Estimate of random error at final stage; used to standardize all residuals
Fixed parameter estimates	Matrix of parameter estimates at each stage
s <sup>2</sup>	Estimate of random error at each stage
Leverage	Matrix of leverage of each observation at each stage
Modified Cook distance	Estimate of sum of squared changes in parameter estimates at each stage
Fit statistics	AIC, BIC, and log likelihood
Call	Call to this function

### Author(s)

William R. Fairweather

### References

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.  
 Pinheiro, JC and DM Bates. Mixed-Effects Models in S and S-Plus, Springer, New York, 2000.  
<https://CRAN.R-project.org/package=nlme>

### Examples



---

identifyCoeffs	<i>Index To Identify Fixed and Random Coefficients To Appear Together on Plot</i>
----------------	---

---

**Description**

Runs the defined, grouped linear mixed effects (lme) model. Displays the resulting fixed and random coefficients. Attaches codes for identifying them to the plotting functions of this package.

**Usage**

```
identifyCoeffs(fixed, data, random,
               XmaxIter = 1000, XmsMaxIter = 1000,
               Xtolerance = 0.01, XniterEM = 1000, XmsMaxEval = 400, XmsTol = 1e-05,
               Xopt = "optim",
               diagnose = FALSE, verbose = TRUE)
```

**Arguments**

fixed	2-sided formula for fixed effects
data	Name of file (to be) run by forsearch_lme
random	1-sided formula for random effects
XmaxIter	lme control parameter
XmsMaxIter	lme control parameter
Xtolerance	lme control parameter
XniterEM	lme control parameter
XmsMaxEval	lme control parameter
XmsTol	lme control parameter
Xopt	lme control parameter
diagnose	If TRUE, displays code to help diagnose main function errors
verbose	If TRUE, indicates beginning and end of function

**Details**

Plotting functions cannot plot more than a few coefficients on one graph. This function prepares an index of the coefficients so that the user can more easily identify which ones should appear together in a plot.

**Value**

Index of fixed and random coefficients from forsearch\_lme.

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**

---

identifyFixedCoeffs     *Index To Identify Fixed Coefficients To Appear Together on Plot*

---

**Description**

Runs the defined linear (lm) model. Displays the resulting coefficients. Attaches codes for identifying them to the plotting functions of this package.

**Usage**

```
identifyFixedCoeffs(formula, data, diagnose = FALSE, verbose = TRUE)
```

**Arguments**

formula	2-sided formula for fixed effects
data	Name of file (to be) run by forsearch_lm
diagnose	If TRUE, displays code to help diagnose main function errors
verbose	If TRUE, indicates beginning and end of function

**Details**

Plotting functions cannot plot more than a few coefficients on one graph. This function prepares an index of the coefficients so that the user can more easily identify which ones should appear together in a plot.

**Value**

Index of coefficients from forsearch\_lm.

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**

---

plotdiag.AICX

*Plot Diagnostic AIC Statistics*


---

**Description**

Plot output from `forsearch_glm` to show change in AIC statistics as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.AICX(forn, maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption title here",
  wmf = "Put_plot_file_title_here",
  Cairo=TRUE, printgraph=TRUE, loess = FALSE,
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_glm</code>
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit <code>`.wmf`</code>
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>loess</code>	TRUE causes plot of loess line, otherwise straight line
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot AIC statistics from `forsearch_glm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. *Robust Diagnostic Regression Analysis*, Springer, New York, 2000.

**Examples**

---

plotdiag.Cook

*Plot Diagnostic Statistics of Modified Cook's Distance*


---

### Description

Plot output from `forsearch_lm` or `forsearch_lme` to show change in Modified Cook's distance as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

### Usage

```
plotdiag.Cook(forn, maintitle = "Put main title here", subtitle = "Put subtitle here",
caption = "Put caption here", wmf = "Put_plot_file_title_here",
Cairo=TRUE, printgraph=TRUE, loess = FALSE,
diagnose = FALSE, verbose = TRUE)
```

### Arguments

<code>forn</code>	Name of forward search output file
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>loess</code>	If TRUE, adds loess curve to plot, otherwise, straight line
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

### Value

Process and plot Cook distance statistics from `forsearch_lm` or `forsearch_lme`

### Author(s)

William R. Fairweather

### References

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

### Examples

---

 plotdiag.deviance.residuals

*Plot Diagnostic Statistics Of Deviance Residuals*


---

## Description

Plot output from `forsearch_glm` to show change in deviance residuals or augmented deviance residuals, either of which can be squared, as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

## Usage

```
plotdiag.deviance.residuals(forn, squared = FALSE, augmented=TRUE, hilos = c(1, 0),
  maintitle="Put main title here", subtitle="Put subtitle here", caption="Put caption here",
  wmf= "Put_graph_title_here", Cairo=TRUE, printgraph=TRUE,
  legend = "Dummy legend name", diagnose = FALSE, verbose = TRUE)
```

## Arguments

<code>forn</code>	Name of forward search output file
<code>squared</code>	TRUE causes residuals to be squared before plotting
<code>augmented</code>	TRUE causes graphing of augmented deviance residuals, see Details
<code>hilos</code>	Number of observations having high and number having low values of residuals to identify. No low values are identified for squared residual plot
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Caption of plot
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>legend</code>	Legend title
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

## Details

We reserve the use of the term 'Deviance residuals' to deviance residuals of the observations that were used to create the model fit, and use the term 'Augmented deviance residuals' to refer to deviance residuals of all available observations. The latter are created by predicting the fit of the model to all observations.

## Value

Process and plot changes in deviance residuals or squared deviance residuals from `forsearch_glm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.deviances      *Plot Diagnostic Deviance Statistics*

---

**Description**

Plot output from `forsearch_glm` to show change in deviances as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.deviances(forn, devtype, maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption here",
  wmf = "Put_plot_file_title_here",
  Cairo=TRUE, printgraph=TRUE, loess=FALSE,
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_glm</code>
<code>devtype</code>	Type of deviance: "R" or "N" for Residual deviance or Null deviance
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>loess</code>	If TRUE, loess line is drawn through points, otherwise straight line
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot deviances from `forsearch_glm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.fit3	<i>Plot Diagnostic Statistics of AIC, BIC, and Log Likelihood</i>
---------------	---

---

**Description**

Plot output from `forsearch_lm` to show change in AIC, BIC, and log likelihood as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.fit3(forn, maintitle = "Put main title here", subtitle = "Put subtitle here",
  caption = "Put caption here", wmf = "Put_graph_filename_here",
  Cairo=TRUE, printgraph=TRUE, legend="Dummy legend name",
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_lm</code>
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>legend</code>	Legend name
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot trends of AIC, BIC, and log likelihood statistics from `forsearch_lm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.leverage      *Plot Diagnostic Statistics Of Leverage*

---

**Description**

Plot output from `forsearch_lm` or `forsearch_lme` to show change in leverage of each observation as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.leverage(forn, hilos = c(1, 0), maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption here", wmf = "Put_graph_title_here",
  Cairo=TRUE, printgraph = TRUE, diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of forward search output file
<code>hilos</code>	Vector with number of highest observations and number of lowest observations on graph to identify
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot Cook distance statistics from `forsearch_lm` or `forsearch_lme`



**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.params.fixed *Plot Diagnostic Statistics of Fixed Coefficients*

---

**Description**

Plot output from forsearch\_XXX to show change in random coefficients as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.params.fixed(forn, coeff.codenums=NULL, maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption here", wmf = "Put_stored_name_here",
  Cairo=TRUE, printgraph=TRUE, legend = "Dummy legend name",
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

forn	Name of output file from forsearch_XXX
coeff.codenums	Numeric vector of coefficients to include together on the plot. Codes are output by identifyFixedCoeffs (for lm files) or by identifyCoeffs function (for lme files)
maintitle	Main title of plot
subtitle	Subtitle of plot
caption	Content of caption
wmf	File name of stored plot; omit ".wmf"
Cairo	TRUE causes use of Cairo graphics
printgraph	TRUE causes graph to print to file and closes device
legend	Name of legend
diagnose	If TRUE, displays code to help diagnose main function errors
verbose	If TRUE, indicates beginning and end of function

**Value**

Process and plot fixed coefficient statistics from forsearch\_lm or forsearch\_lme

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

```
plotdiag.params.random
```

*Plot Diagnostic Statistics Of Random Coefficients*

---

**Description**

Plot output from `forsearch_lme` to show change in root mean squares of random coefficients as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.params.random(forn, coeff.codenums=NULL,
  asfacets=FALSE, facetdir=c("h","v"),
  maintitle = "Put maintitle here", subtitle = "Put subtitle here",
  caption = "Put caption here", wmf = "Put_stored_name_here",
  Cairo=TRUE, printgraph = TRUE,
  legend = "Dummy legend name", diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_lme</code>
<code>coeff.codenums</code>	columns of output file to be included in graph
<code>asfacets</code>	TRUE causes printing in facets
<code>facetdir</code>	"v" lays out the facets vertically, "h" lays them out horizontally
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>legend</code>	Name of legend
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot RMS of random coefficients from `forsearch_lm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.phihatx      *Plot Diagnostic PhiHat Statistics*

---

**Description**

Plot output from `forsearch_glm` to show change in phiHat statistics as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.phihatx(forn, maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption here",
  wmf = "Put_plot_file_title_here",
  Cairo=TRUE, printgraph=TRUE, loess = FALSE,
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_glm</code>
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>loess</code>	TRUE causes print of loess line, otherwise straight line
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot phiHat statistics from forsearch\_glm

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.residuals      *Plot Diagnostic Statistics Of Residuals Or Squared Residuals*

---

**Description**

Plot output from forsearch\_lm or forsearch\_lme to show change in residuals or squared residuals as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.residuals(forn, squared = FALSE, hilos = c(1, 0), maintitle, subtitle,
caption, wmf, Cairo=TRUE, printgraph=TRUE,
legend = "Dummy legend name", diagnose = FALSE, verbose = TRUE)
```

**Arguments**

forn	Name of forward search output file
squared	TRUE causes residuals to be squared before plotting
hilos	Number of observations having high and number having low values of residuals to identify. No low values are identified for squared residual plot.
maintitle	Main title of plot
subtitle	Subtitle of plot
caption	Caption of plot
wmf	File name of stored plot; omit ".wmf"
Cairo	TRUE causes use of Cairo graphics
printgraph	TRUE causes graph to print to file and closes device
legend	Legend title
diagnose	If TRUE, displays code to help diagnose main function errors
verbose	If TRUE, indicates beginning and end of function

**Value**

Process and plot changes in residuals or squared residuals from `forsearch_lm` or `forsearch_lme`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.s2                      *Plot Diagnostic Statistics Of Residual Variation*

---

**Description**

Plot output from `forsearch_lm` to show change in residual variation as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.s2(forn, maintitle = "Put main title here", subtitle = "Put subtitle here",
  caption = "Put caption here", wmf = "Put_graph_filename_here",
  Cairo=TRUE, printgraph=TRUE, loess = FALSE,
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_lm</code>
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>loess</code>	If TRUE, adds loess curve to plot, otherwise, straight line
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot residual variation statistics from `forsearch_lm`

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**


---

plotdiag.tstats      *Plot Diagnostic T Statistics*

---

**Description**

Plot output from `forsearch_lm` or `forsearch_lme` to show change in t statistics as the number of observations in the forward search procedure increases. Save plot in folder containing working directory.

**Usage**

```
plotdiag.tstats(forn, coeff.codenums=NULL, maintitle = "Put main title here",
  subtitle = "Put subtitle here", caption="Put caption here", wmf = "Put_stored_name_here",
  Cairo=TRUE, printgraph=TRUE, legend = "Dummy legend name",
  diagnose = FALSE, verbose = TRUE)
```

**Arguments**

<code>forn</code>	Name of output file from <code>forsearch_lm</code> or <code>forsearch_lme</code>
<code>coeff.codenums</code>	Numeric vector of coefficients to include together on the plot. Codes are output by <code>identifyFixedCoeffs</code> (for <code>lm</code> files) or by <code>identifyCoeffs</code> function (for <code>lme</code> files)
<code>maintitle</code>	Main title of plot
<code>subtitle</code>	Subtitle of plot
<code>caption</code>	Content of caption
<code>wmf</code>	File name of stored plot; omit ".wmf"
<code>Cairo</code>	TRUE causes use of Cairo graphics
<code>printgraph</code>	TRUE causes graph to print to file and closes device
<code>legend</code>	Name of legend
<code>diagnose</code>	If TRUE, displays code to help diagnose main function errors
<code>verbose</code>	If TRUE, indicates beginning and end of function

**Value**

Process and plot t statistics of fixed coefficients from forsearch\_lm or forsearch\_lm

**Author(s)**

William R. Fairweather

**References**

Atkinson, A and M Riani. Robust Diagnostic Regression Analysis, Springer, New York, 2000.

**Examples**

---

search.history	<i>Create Tabular History Of Forward Search</i>
----------------	---

---

**Description**

The forward search functions output a list of vectors, each of which indicates which observations are in the model at each stage of the search. This function processes that list to create a more easily understood matrix of the observation numbers that are newly entered into the model and any that were temporarily removed from the model over the course of the search.

**Usage**

```
search.history(list1, diagnose = FALSE, verbose = TRUE)
```

**Arguments**

list1	Name of a forsearch_XXX output file
diagnose	If TRUE, displays code to help diagnose main function errors
verbose	If TRUE, indicates beginning and end of function

**Value**

Printout of matrix showing evolution of observations to enter or leave the model during the course of the forward search

**Author(s)**

William R. Fairweather

**Examples**

---

showme	<i>Display Abbreviated Output Of FORSEARCH_LM Function</i>
--------	--

---

**Description**

Output of forsearch\_lm function can be voluminous. This function displays the output in an abbreviated format. Primarily for programmer use.

**Usage**

```
showme(x, verbose = TRUE)
```

**Arguments**

x	Name of forsearch_lm output file
verbose	If TRUE, indicates the beginning and end of function run

**Value**

Abbreviated printout of output of forsearch\_lm function

**Author(s)**

William R. Fairweather

**Examples**


---

showmegl	<i>Display Abbreviated Output Of FORSEARCH_GLM Function</i>
----------	---

---

**Description**

Output of forsearch\_glm function can be voluminous. This function displays the output in an abbreviated format. Primarily for programmer use.

**Usage**

```
showmegl(x, verbose = TRUE)
```

**Arguments**

x	Name of forsearch_glm output file
verbose	If TRUE, indicates the beginning and end of function run



**Value**

Abbreviated printout of output of forsearch\_glm function

**Author(s)**

William R. Fairweather

**Examples**

---

`showme1me`*Display Abbreviated Output Of FORSEARCH\_LME Function*

---

**Description**

Output of forsearch\_1me function can be voluminous. This function displays the output in an abbreviated format. Primarily for programmer use.

**Usage**

```
showme1me(x, verbose = TRUE)
```

**Arguments**

x	Name of forsearch_1me output file
verbose	If TRUE, indicates the beginning and end of function run

**Value**

Abbreviated printout of output of forsearch\_1me function

**Author(s)**

William R. Fairweather

**Examples**

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