

Package ‘lsmeans’

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Type Package

Title Least-Squares Means

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Depends emmeans (≥ 1.3), methods, R (≥ 3.2)

Suggests

ByteCompile yes

Description Obtain least-squares means for linear, generalized linear, and mixed models. Compute contrasts or linear functions of least-squares means, and comparisons of slopes. Plots and compact letter displays. Least-squares means were proposed in Harvey, W (1960) “Least-squares analysis of data with unequal subclass numbers”, Tech Report ARS-20-8, USDA National Agricultural Library, and discussed further in Searle, Speed, and Milliken (1980) “Population marginal means in the linear model: An alternative to least squares means”, The American Statistician 34(4), 216-221 <doi:10.1080/00031305.1980.10483031>. NOTE: lsmeans now relies primarily on code in the ‘emmeans’ package. ‘lsmeans’ will be archived in the near future.

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NeedsCompilation no

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lsmeans-package	<i>Least-squares means</i>
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Description

This package provides methods for obtaining so-called least-squares means for factor combinations in a variety of fitted linear models. It can also compute contrasts or linear combinations of these least-squares means, (several standard contrast families are provided), and in addition can estimate and contrast slopes of trend lines. Popular adjustments for multiple-comparisons are provided, as well as graphical ways of displaying the results.

Almost the entire codebase for **lsmeans** now resides in the **emmeans** package (named for the more general term, “estimated marginal means”). **lsmeans** exists only as a transitional entity for the few remaining packages that depend on it.

Author(s)

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References

Russell V. Lenth (2016) Least-Squares Means: The R Package lsmeans. *Journal of Statistical Software*, 69(1), 1-33. doi:10.18637/jss.v069.i01

Searle S.R. Speed F.M. Milliken G.A. (1980) Population marginal means in the linear model: An alternative to least squares means. *The American Statistician* **34**(4), 216-221.

auto.noise	<i>Data sets</i>
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Description

The datasets ‘auto.noise’, ‘feedlot’, ‘fiber’, ‘MOats’, ‘nutrition’, and ‘oranges’ are provided in case a user customarily loads the data from **lsmeans**. But the same datasets are provided in the **emmeans** package, and they are documented there.

Usage

auto.noise

Author(s)

Russell V. Lenth

ref.grid	<i>Create a reference grid from a fitted model</i>
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Description

These functions are provided in **lsmeans** because they have been renamed in **emmeans**

Usage

```
ref.grid(object, ...)
```

```
recover.data(object, ...)
```

```
lsm.basis(object, ...)
```

Arguments

`object` A model object in a supported class.

`...` Additional arguments passed to companion functions in the **emmeans** package.

Value

lsmeans now passes all its computations to **emmeans**, and the return values are thus what is returned by the corresponding functions `ref_grid`, `recover_data`, and `emm_basis`, respectively.

Author(s)

Russell V. Lenth

Examples

```
fiber.lm <- lm(strength ~ machine + diameter, data = fiber)
rg <- ref.grid(fiber.lm, at = list(diameter = c(20, 24, 28)))
rg

# Note this is an emmGrid object defined in emmeans. The old "ref.grid"
# class is now an extension of this:
r.g. <- new("ref.grid", rg)
lsmeans(r.g., "machine")
```

ref.grid-class	<i>The ref.grid and lsobj classes</i>
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Description

The codebase for **lsmeans** is now mostly in **emmeans**. These two classes are simple extensions of the `emmGrid` class defined in **emmeans**, and are provided as support for objects created in older versions of **lsmeans**. For details, see [emmGrid-class](#).

Author(s)

Russell V. Lenth

transition	<i>Transition to emmeans</i>
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Description

The **lsmeans** package is being deprecated and further development will take place in its successor, **emmeans**. Users may use **emmeans** in almost exactly the same way as **lsmeans**, but a few function names and internal details are changed.

Details

In transitioning to **emmeans**, users will find that the vignettes are constructed quite differently and that, in those and in the documentation, emphasis is placed on “estimated marginal means” rather than “least-squares means”. The term “estimated marginal means” is broader and more appropriate for use with some models, e.g. ordinal regression, that don’t really involve least-squares methods. That is the reason for the change.

Accordingly, **emmeans** users are encouraged to use the functions `emmeans()`, `emtrends()`, `emmip()`, etc. in lieu of `lsmeans()`, etc. The latter functions *are still available* in **emmeans**; they run the corresponding `emmxxx` function and relabel the results.

The **emmeans** package provides some functions that help convert scripts and R Markdown files containing **lsmeans** code so they will work in **emmeans**. There is also a function to convert `ref.grid` and `lsobj` objects to the `emmGrid` objects used in **emmeans**. More extensive information is given in `vignette("transition-from-lsmeans", package = "emmeans")`.

Author(s)

Russell V. Lenth

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