Package 'lsmeans'

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Type Package

Title Least-Squares Means

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Depends emmeans (>= 1.3), methods, R (>= 3.2)

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

Author Russell Lenth [aut, cre, cph]

Maintainer Russell Lenth <russell-lenth@uiowa.edu>

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Contents

lsmeans-package *Least-squares means*

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)

Russell V. Lenth (author), Maxime Hervé (contributor)

Maintainer: Russ Lenth <russell-lenth@uiowa.edu>

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.

ref.grid *Create a reference grid from a fitted model*

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` *The* `ref.grid` *and* `lsmobj` *classes*

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` *Transition to* **emmeans**

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 `emmxxxx` 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 `lsmobj` 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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