

Special
Thanks
To
OSPO!



<https://tinyurl.com/clubSandwichSlides>

Improving clubSandwich

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Functionality & Compatibility

What is a Sandwich Estimator?

Regular linear regression assumes:

- Errors have constant variance (homoscedasticity)
- Observations are Independent

When these assumptions may not hold, sandwich estimators are used.

- This allows for robust standard errors

ChatGPT's explanation of why it is called a "sandwich" estimator 🙌

Note: all sandwich estimators follow the "bread-meat-bread" structure, but the "meat" varies based on which assumptions are violated.



The "sandwich" structure

The name comes from the structure of the formula:

$$\text{Var}(\hat{\beta})_{\text{robust}} = (X^{\top}X)^{-1} X^{\top}\Omega X (X^{\top}X)^{-1}$$

- X : matrix of predictors
- Ω : a matrix capturing the **variability of the residuals** — this is where the heteroscedasticity or clustering is handled
- The "bread" is $(X^{\top}X)^{-1}$,
- The "meat" (in the middle) is $X^{\top}\Omega X$.

What is **clubSandwich**?

clubSandwich is an R Package that implements sandwich estimators.

As James likes to say, it's like "a sandwich with extra stuff in the middle".

clubSandwich has an object oriented design to allow for its use with lots of statistical models.



<https://tinyurl.com/clubSandwichPackage>

👉 clubSandwich Website 👈

What is **Multiple Comparisons**?

Every statistical test produces a p-value.

When performing multiple tests simultaneously, we have a case of multiple comparisons, where each p-value only applies to each test individually.

If we conduct one test at the 5% level and the null hypothesis is true, there is only a 5% chance of an incorrect rejection of the null hypothesis. If we instead conduct 100 tests, the probability of one or more incorrect rejections is ~99.4%.

To account for this, we can use one of many adjustment methods so that each p-value will be reasonable when all tests are considered simultaneously.



<https://tinyurl.com/multCompWikipedia>

👉 Learn More 👈

Demo Time!!!

I have added an `adjustment_method` option to `Wald_test()` and `linear_contrast()`, which shipped with version 0.6.0.

Feel free to go to the link below or scan the QR code to download the RMD file and follow along!

<https://tinyurl.com/clubSandwichDemo>



Current Work

The `estimatr` R package has the function `lm_robust()`, which functions very similarly to `stats::lm()`, but with additional features.

It is not currently compatible with `clubSandwich`, so I have been writing tests and methods to create this compatibility for about a month now, but as it is currently a WIP, it is not ready for any demos.



<https://tinyurl.com/estimatr>

👉 estimatr Package 👉

Thank you!