

# ANOVA with Random Sample Sizes: An Overview and Applications

Célia Nunes<sup>1,2</sup>

<sup>1</sup>*Departamento de Matemática, Universidade da Beira Interior, Covilhã, Portugal*

<sup>2</sup>*CMA-UBI - Centro de Matemática e Aplicações, Universidade da Beira Interior, Covilhã, Portugal*

## Abstract

Analysis of variance (ANOVA) is one of the most frequently used statistical analyses in practical applications. It is routinely used in several research areas, namely in Medical and Biomedical Sciences, Agriculture, Social Sciences, to name just a few. Despite being widely used on the assumption that sample dimensions are known, there are many relevant situations in which these dimensions are not known in advance. Such situations frequently occur when a fixed time period is established for collecting the observations. In this presentation we show that this may be overcome when we carry out ANOVA assuming the sample sizes as realizations of independent random variables. This approach must be based on an adequate choice of the distribution of these random variables. There are two families of such distributions, according to the existence or non-existence of an upper bound for the sample sizes. Examples with distributions of these two families will be considered, in which their choice is based on practical situations. The applicability of the proposed approach is illustrated through some applications, considering real and simulated data. With this presentation, we intend to give an overview of our latest advances in the field of “ANOVA with random sample sizes”, considering fixed and mixed effects models.

## Keywords

Fixed effects models, Mixed models, F-tests, Random sample sizes, Applications to real data, Simulation studies.

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## References:

- Nunes, C., Ferreira, D., Ferreira, S.S. and Mexia, J.T. (2014). Fixed effects ANOVA: An extension to samples with random size. *Journal of Statistical Computation and Simulation*, 84(11), 2316-2328.
- Nunes, C., Capistrano, G., Ferreira, D., Ferreira, S.S. and Mexia, J. T. (2019). Exact critical values for one-way fixed effects models with random sample sizes. *Journal of Computational and Applied Mathematics*, 354, 112-122.
- Nunes, C., Mário, A., Ferreira, D., Ferreira, S.S. and Mexia, J.T. (2019). Random sample sizes in orthogonal mixed models with stability. *Computational and Mathematics Methods*, 1(5).
- Nunes, C., Mário, A., Ferreira, D., Moreira, E., Ferreira, S.S. and Mexia, J.T. (2022). An algorithm for simulation in mixed models with crossed factors considering the sample sizes as random. *Journal of Computational and Applied Mathematics*, 404, 113463.