

Midterm 1 2005
Practice Problems for Midterm 1 2006

<Your Name>

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1 Instructions

Produce a L^AT_EX document formatted like this one. Include this paragraph as it appears here.

You do not have to copy the rest of these instructions or any of the questions into your document. Just make the sections and subsections with the same names that I have here. Use Sweave to insert your code and output.

Submit your exam by uploading your .Rnw file and your final PDF file into ICON.

2 Vectors, matrices, and data frames in R

2.1 Creating a matrix object

In R, create a matrix named `M` with 4 rows and 2 columns in which the entries are random draws from a beta distribution with parameters 1/2 and 1/2.

Display only row 3 of your matrix.

Embed your R code and output into this subsection.

3 More L^AT_EX

3.1 Math

Typeset the following equation in L^AT_EX:

$$\text{logit}(\pi) = \log\left(\frac{\pi}{1-\pi}\right)$$

3.2 Bibliographic references

Include a bibliography at the end of your L^AT_EX document, as shown below. Put the following sentence in this section, with a reference to the appropriate entry in your bibliography:

The first attempt by statisticians to validate surrogate endpoints was the method for estimating the “proportion of treatment effect captured” (*PTE*) by a surrogate endpoint [1].

4 R functions and the nonparametric bootstrap

Write an R function that will do the following:

1. accept two arguments — a vector `x` and a scalar `B`
2. calculate the median of the values in the vector `x`
3. draw `B` nonparametric bootstrap samples based on the vector `x`
4. calculate the median of each bootstrap sample
5. return a list with two components:
 - (a) `Morig` — a scalar; the median of `x`
 - (b) `Mboot` — a vector containing the medians of all the samples

Create a vector `x` containing 10 draws from a gamma distribution with parameters 4 and 2. Run your bootstrap function with this vector and `B = 5`. Copy the code in your function, and its output, into this section.

References

- [1] L. S. Freedman, B. I. Graubard, A. Schatzkin, Statistical validation of intermediate endpoints for chronic diseases, *Statistics in Medicine* 11 (2) (1992) 167–178.