

Presentation title

**Your name**



**ISEG Lisbon School of Economics & Management**

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- This is a simple beamer template with ISEG's colors
- In the next slides you will see some examples of what you can do with beamer.
- Inspect the underlying code to learn how to make your own frames.



In this presentation you will learn how to:

- create a link to [ISEG's](#) website
- make ordered and unordered lists of items
- include pictures
- make citations
- use mathematical formulas
- display code
- create theorems and definitions



In the last frame you learned how to create a list of items. Now let's create an enumeration of items:

- ① make ordered and unordered lists of items
- ② include pictures
- ③ use mathematical formulas
- ④ display code
- ⑤ create theorems and definitions

# Itemized lists inside itemized lists

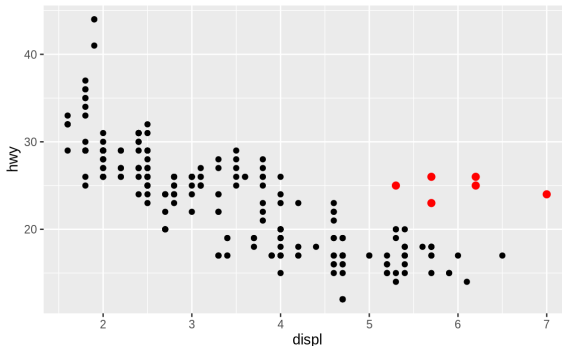
You can have itemized lists inside itemized lists:

- lists of items
  - ▶ ordered
  - ▶ unordered
- include pictures
- use mathematical formulas
- display code
  - ▶ Python code
  - ▶ R code
- create theorems and definitions

# Including pictures



This picture is in the “figures” folder. We also included a caption:



**Figure 1:** Fuel consumption (Hwy) vs engine size (displ)

# Three ways to make citations



- Kass and Raftery, 1995
- (Kass and Raftery, 1995)
- Kass and Raftery (1995)



You can display definitions and theorems:

## Definition (Fibration)

A fibration is a mapping between two topological spaces that has the homotopy lifting property for every space  $X$ .

Latex is very useful to write mathematical expressions:

## Theorem (Bayes)

$$P(\theta|\mathbf{D}) = P(\theta) \frac{P(\mathbf{D}|\theta)}{P(\mathbf{D})}$$



# The block environment



The block environment is more versatile. You can write whatever you want on the red block:

## Pythagorean theorem

This is a theorem about right triangles and can be summarised in the next equation

$$x^2 + y^2 = z^2$$

## Corollary

There's no right rectangle whose sides measure 3cm, 4cm, and 6cm.

# Two part functions



I also included an environment that allows you to easily write two part functions:

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

# Examples of mathematical expressions

- Likelihood:  $\mathbf{x}|\boldsymbol{\theta} \sim \mathcal{M}_k(N, \boldsymbol{\theta})$
- Hypotheses:  $H_0 : \boldsymbol{\theta} = \boldsymbol{\theta}_0$  vs  $H_1 : \boldsymbol{\theta} \neq \boldsymbol{\theta}_0$
- Prior:  $\pi(\boldsymbol{\theta}|H_0) = 1_{\boldsymbol{\theta}_0}(\boldsymbol{\theta}_0)$  and  $\boldsymbol{\theta}|H_1, \boldsymbol{\alpha} \sim \text{Dir}_k(\boldsymbol{\alpha})$
- Marginal density:  $m_i(\mathbf{x}) = \int_{\Theta_i} f(\mathbf{x}|\boldsymbol{\theta})\pi(\boldsymbol{\theta}|H_i) d\boldsymbol{\theta}, \quad i = 0, 1$ 
  - ▶  $m_0(\mathbf{x}) = \frac{N!}{\prod_{i=1}^{k+1} x_i!} \prod_{i=1}^{k+1} \theta_{0i}^{x_i}$
  - ▶  $m_1(\mathbf{x}) = \frac{N!}{\prod_{i=1}^{k+1} x_i!} \frac{B(\boldsymbol{\alpha} + \mathbf{x})}{B(\boldsymbol{\alpha})}$
- Bayes factor:
 
$$B_{01}(\mathbf{x}) = \frac{m_0(\mathbf{x})}{m_1(\mathbf{x})} = \frac{\prod_{i=1}^{k+1} (\theta_{0i}^{x_i}) \prod_{i=1}^{k+1} [\Gamma(\alpha_i)] \Gamma[\sum_{i=1}^{k+1} (\alpha_i + x_i)]}{\Gamma(\sum_{i=1}^{k+1} \alpha_i) \prod_{i=1}^{k+1} \Gamma(\alpha_i + x_i)}$$
- For an interesting applicaton see Pericchi and Torres (2011)



## Python code looks good on verbatim

Code is usually displayed in verbatim. This code prints the Fibonacci sequence:

```
nterms = int(input("How many terms? "))
n1, n2 = 0, 1
count = 0
print("Fibonacci sequence:")
while count < nterms:
    print(n1)
    nth = n1 + n2
    n1 = n2
    n2 = nth
    count += 1
}
```

## R code looks good too



I also included a verbatim environment with background color:

```
getmode <- function(v) {  
  uniqv <- unique(v)  
  uniqv[which.max(tabulate(match(v, uniqv)))]  
}
```

With this R code you can build a function that calculates the mode.



- Kass, RE and AE Raftery (1995). Bayes factors. *Journal of the American Statistical Association* **90**(430), 773–795.
- Pericchi, L and D Torres (2011). Quick anomaly detection by the Newcomb—Benford law, with applications to electoral processes data from the USA, Puerto Rico and Venezuela. *Statistical Science* **26**(4), 502–516.