Title

Subtitle



Authors

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First section

First slide



Wow, this is a slide.

Second slide



The music experience has been cancelled.

This quote is from the Severance TV-show

Animations



Touying equation with pause:

$$f(x) =$$

Touying equation is very simple.

Animations



Touying equation with pause:

$$f(x) = x^2 + 2x + 1 =$$

Touying equation is very simple.

Animations



Touying equation with pause:

$$f(x) = x^2 + 2x + 1 = (x + 1)^2$$

Touying equation is very simple.

Complex Animations



```
At subslide 1, we can
```

use for reserving space,

use for not reserving space,

call #only multiple times on for choosing one of the alternatives.

Complex Animations



At subslide 2, we can

use #uncover function for reserving space,

use #only function for not reserving space,

use #alternatives function
 for choosing one of the alternatives.

Complex Animations



At subslide 3, we can

use #uncover function for reserving space,

use #only function for not reserving space,

use #alternatives function
 for choosing one of the alternatives.

Intermezzo



If you have "animations" in your presentation, you can set "handout" to "true" in the config and only include the last subslide.

```
#import "@preview/ucph-nielsine-touying" as uc
#import "@preview/touying:0.6.1" as ty
show: uc.ucph-metropolis-theme.with(
    // ...
,
ty.config-common(handout: true)
)
```

Slide with columns



First column.

Second column. Schelling (1971)¹

¹a footnote

The OLS estimator



For a multiple linear regression model, the equation can be written in matrix form as:

$$y = X\beta + \varepsilon$$

where:

- \mathbf{y} is an $\mathbf{n} \times \mathbf{1}$ vector of observed dependent variables.
- **X** is an $k \times (k+1)$ matrix of independent variables (including a column of ones for the intercept).
- \cdot β is a vector of unknown coefficients.
- ε is an $n \times 1$ vector of error terms.



Implying we have a vector of residuals given by:

$$\varepsilon = y - X\beta$$

Our objective is to minimize the sum of squared residuals:

$$\min_{\beta} \boldsymbol{\varepsilon}^{\mathsf{T}} \boldsymbol{\varepsilon} = (\boldsymbol{y} - \boldsymbol{X}\boldsymbol{\beta})^{\mathsf{T}} (\boldsymbol{y} - \boldsymbol{X}\boldsymbol{\beta}) \leftrightarrow$$

$$= \underline{\boldsymbol{y}}^{\mathsf{T}} \boldsymbol{y} - \boldsymbol{y}^{\mathsf{T}} \boldsymbol{X}\boldsymbol{\beta} - \boldsymbol{\beta}^{\mathsf{T}} \boldsymbol{X}^{\mathsf{T}} \boldsymbol{y} + \boldsymbol{\beta}^{\mathsf{T}} \boldsymbol{X}^{\mathsf{T}} \boldsymbol{X}\boldsymbol{\beta} \leftrightarrow$$

$$= -2\boldsymbol{\beta}^{\mathsf{T}} \boldsymbol{X}^{\mathsf{T}} \boldsymbol{y} + \boldsymbol{\beta}^{\mathsf{T}} \boldsymbol{X}^{\mathsf{T}} \boldsymbol{X}\boldsymbol{\beta}$$

Note: By multiple a vector with itself transposed with just a scalar, or in this case $\boldsymbol{\varepsilon}^T \boldsymbol{\varepsilon}$ which is the sum of squared error terms.



$$\frac{\partial}{\partial \boldsymbol{\beta}} \left(-2\boldsymbol{\beta}^{\mathsf{T}} \mathbf{X}^{\mathsf{T}} \mathbf{y} + \boldsymbol{\beta}^{\mathsf{T}} \mathbf{X}^{\mathsf{T}} \mathbf{X} \boldsymbol{\beta} \right) = 0 \iff$$

$$2\mathbf{X}^{\mathsf{T}} \mathbf{X} \boldsymbol{\beta} = 2\mathbf{X}^{\mathsf{T}} \mathbf{y} \iff$$

$$\mathbf{X}^{\mathsf{T}} \mathbf{X} \boldsymbol{\beta} = \mathbf{X}^{\mathsf{T}} \mathbf{y} \iff$$

Multiply both sides with $(\mathbf{X}^T\mathbf{X})^{-1}$:

$$\underbrace{(X^{T}X)^{-1}X^{T}X}_{=I})\beta = (X^{T}X)^{-1}X^{T}y \iff$$

$$\hat{\beta} = (X^{T}X)^{-1}X^{T}y$$



The OLS estimator

$$\hat{\boldsymbol{\beta}} = (\boldsymbol{X}^{T}\boldsymbol{X})^{-1}\boldsymbol{X}^{T}\boldsymbol{y}$$

- This is very important.
- · Remember this.

Colors

Let me show you the colors



Dark red #901a1e	Dark blue #122947	Dark petroleum #0a5963	Dark green #39641c	Dark grey #3d3d3d
Red #c73028	Blue #425570	Petroleum #197f8e	Green #4b8325	Grey #666666
Light red #db3b0a	Light blue #bac7d9	Light petroleum #b7d7de	Light green #becaa8	Light grey #e1dfdf

Wake up!

Wake up with a gradient!

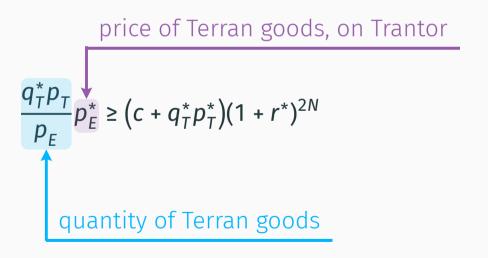
Let me show you the colors



Equation written out directly (for comparison):

$$\frac{q_T^* p_T^{}}{p_F^{}} p_E^* \ge (c + q_T^* p_T^*) (1 + r^*)^{2N}$$

Laid out with pinit:



Paragraph after the equation.

References



Schelling, T.C. (1971) "Dynamic models of segregation," *Journal of mathematical sociology*, 1(2), pp. 143–186.

Appendix

Appendix



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Page layout

Header Margin→ Content

Footer