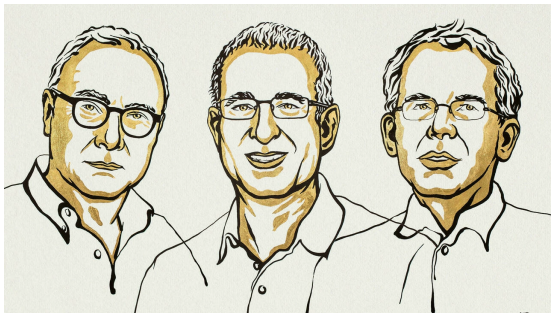
Introduction to Empirical Economics

For Science Students



Léo Zabrocki
leo.zabrocki@psemail.eu
https://lzabrocki.github.io/

École Normale Supérieure

Who Am I?

Léo Zabrocki:

- 27 years old, born in Mulhouse
- B/L → ENS → PPD → Thesis

How I spend my days:

- Research at PSE
- Teaching fellow at ENS

Improving the Design of Studies on the Health Effects of Air Pollution

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What is Economics?

A Definition

The science which studies human behaviour as a relationship between (given) ends and scarce means which have alternative uses.

— Lionel Robbins, English economist (1898-1984)

Another One

Economics is about going into the world and finding puzzles and thinking about how understanding incentives or markets might help us get a better grasp of what's really going on.

— Steven Levitt, University of Chicago

“

One thing that I really like about economics is that it's very policy relevant.

Rather than focusing on just interest rates or GDP, economics is a toolbox that can be used to answer a range of questions that can be very impactful for people's lives.

Molly Schnell
Assistant Professor

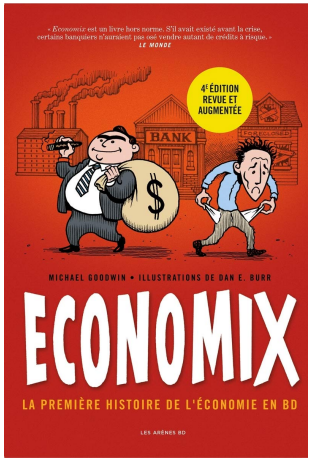
A Rough Division of the field

Macroeconomics: looks at the behavior of economy as a whole.

Microeconomic: focuses on the analysis of specific markets.

Econometrics: the statistics applied to economic issues

Good Books on Economics



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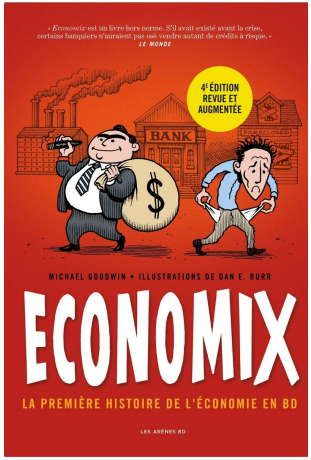

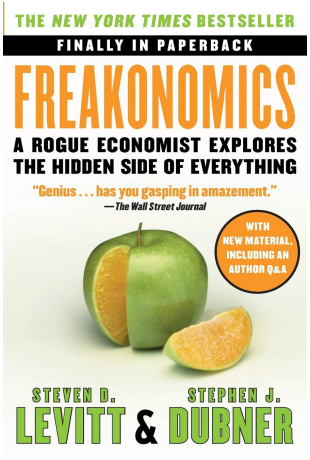

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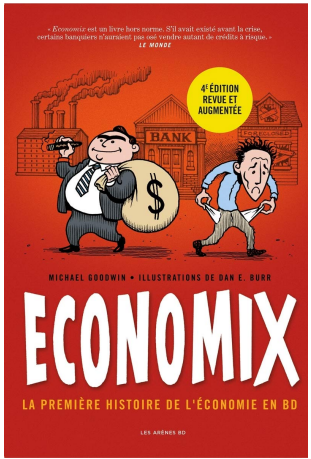
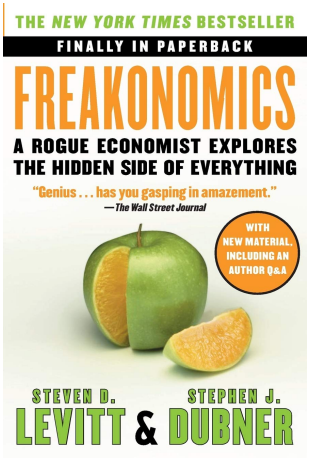
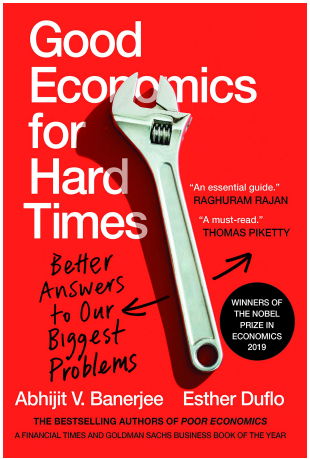


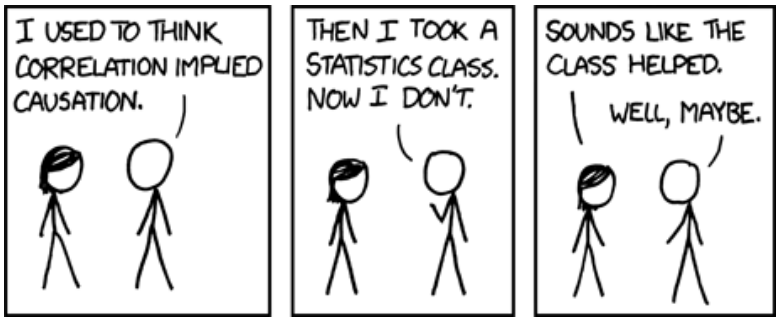




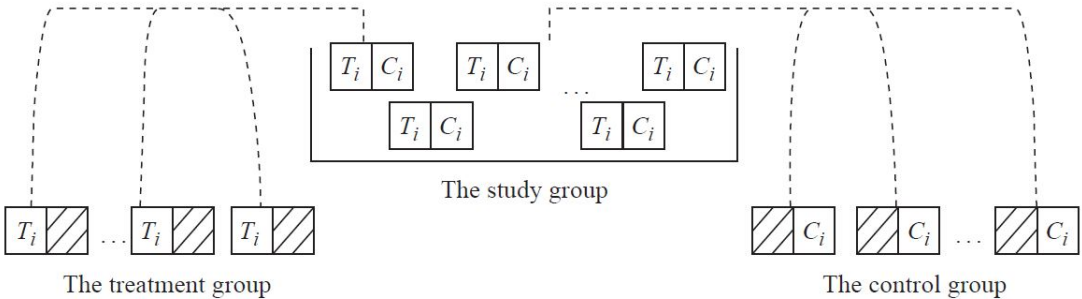
Not a course on the History of Economic Thought, Macroeconomics or Theoretical Economics

A course on the *causal inference* revolution in economics

Causal Inference?



The Concept of Potential Outcomes



The Neyman model.

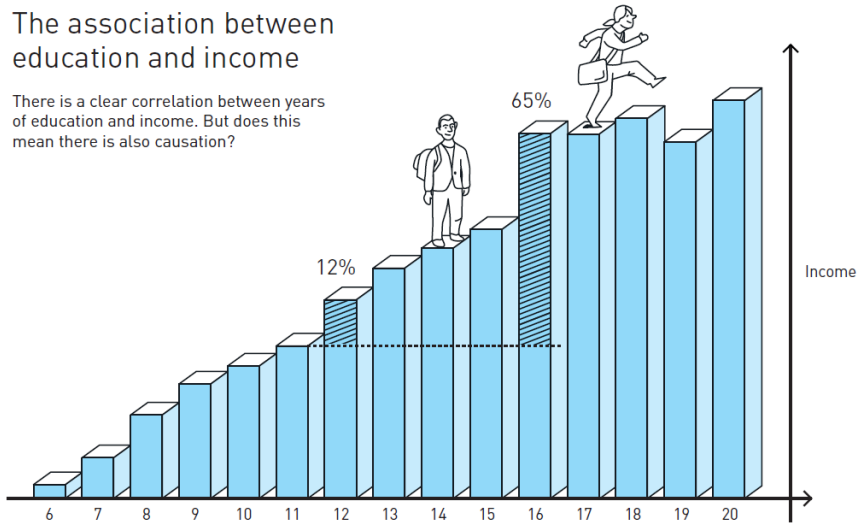
2021 Nobel Prize in Economics

2021 Nobel Prize in Economics

"Card's studies of core questions for society, and Angrist and Imbens' methodological contributions, have shown that ***natural experiments*** *are a rich source of knowledge. Their research has substantially improved our ability to answer key* ***causal*** *questions, which has been of great benefit to society."*

Education & Income

Angrist & Krueger, QJE (1991)

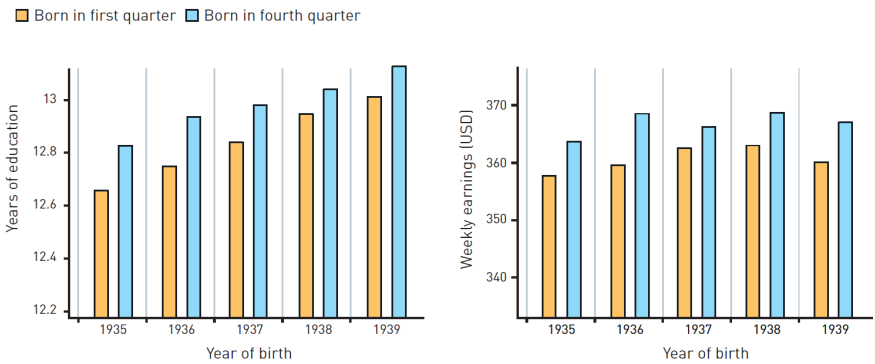


Education & Income

Angrist & Krueger, QJE (1991)

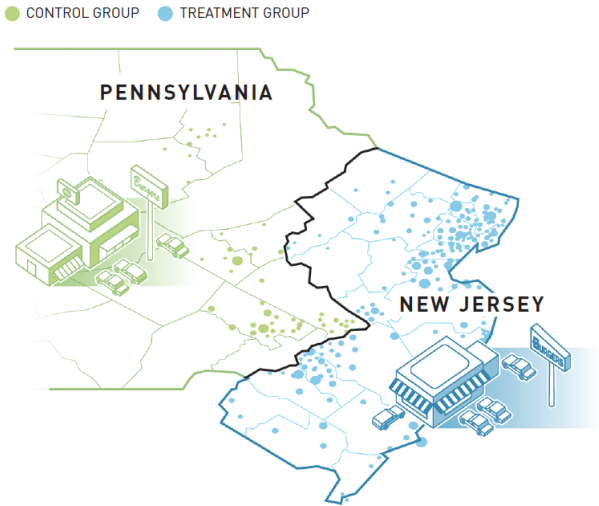
People born late in the year have more years of education and higher incomes

Additional years of education have a positive effect on income. The figure uses data from Angrist and Krueger (1991).



Minimum Wage & Employment

Card & Krueger, AER (1994)



Soap Operas & Fertility

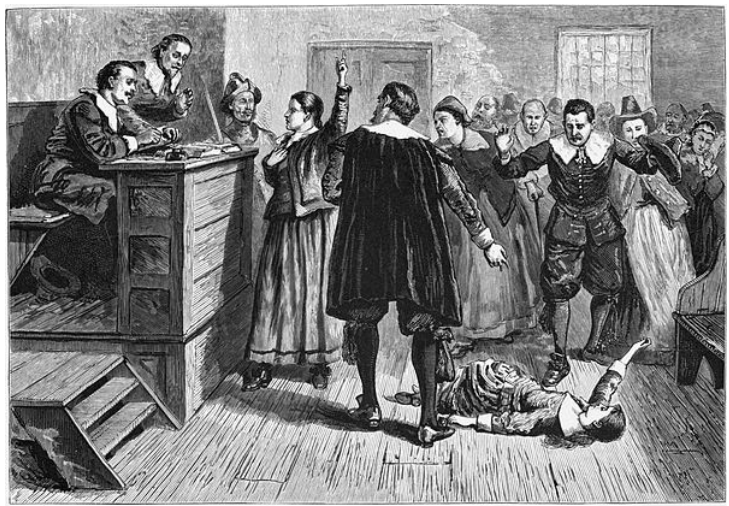
Eliana La Ferrara et al., AEJ: AP (2021)

Women as Policy-Makers

Chattopadhyay & Dulfo, Econometrica (2004)

Witchcraft in Salem

Emily Oster, JEP (2004)



Economists as Vampires

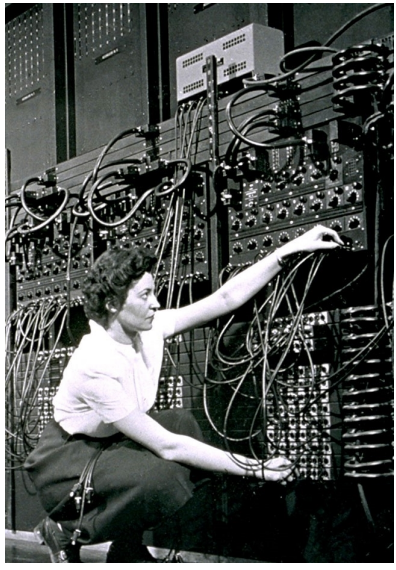
Ein Vampyr überfällt eine schlafende Dame. (S. 584.)

Goals of the Course

Introduction to empirical economcis:

- Understand causal inference methods
- Learn to implement them in **R**
- Explore several research topics

Come study economics!



Program

02/09: introduction
02/16: RMC & RCT
02/23: Matching
03/09: Instrumental Variable
03/09: RDD
03/16: Difference-in-differences
03/16: Replication Crisis
03/23: Labor Economics
03/30: Health Economics
04/06: Political Economics
04/13: Economics of Education
04/20: Environmental Economics
05/11: Gender Economic
05/18: Crime Economics
05/25: Climate Change
06/01: ?

How to Pass the Course?

Three ways:

1. If you are lazy, just write a referee report on a research article.
2. If you are motivated, reproduce the analysis of a paper.
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Materials of the course

https://github.com/lzabrocki/empirical_economics

Mostly Harmless Econometrics by Joshua D. Angrist & Jörn-Steffen Pischke

Mastering Metrics by Joshua D. Angrist & Jörn-Steffen Pischke

Design of observational studies by Paul Rosenbaum

Field Experiments – Design, Analysis, and Interpretation by Alan S. Gerber & Donald Green

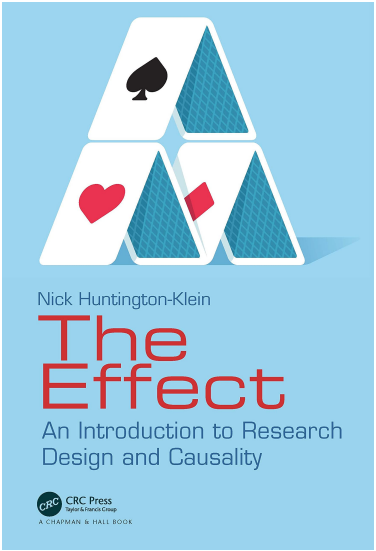
Counterfactuals and Causal Inference: Methods And Principles For Social Research by Stephen L. Morgan & Christopher Winship

Causal Inference for Statistics, Social, and Biomedical Sciences: An Introduction by Guido Imbens & Don Rubin

Causal Inference: The Mixtape by Scott Cunningham

The Effect: An Introduction to Research Design and Causality by Nick Huntington-Klein

Two Great Textbooks



The *Credibility* Revolution

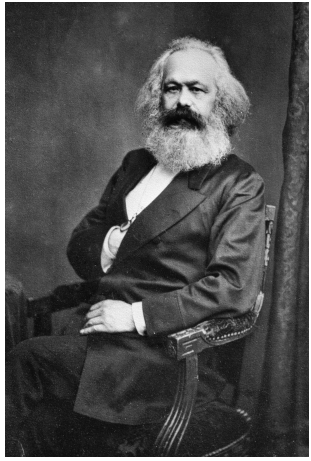
Joshua D. Angrist and Jörn-Steffen Pischke, JEP (2010)

A Literary Science

Adam Smith

A Literary Science

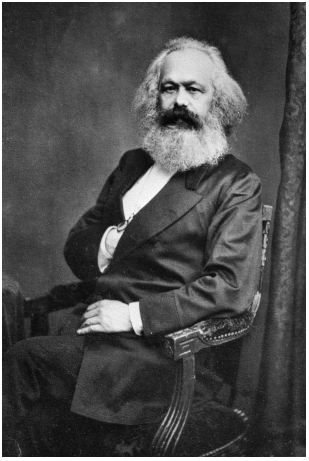
Adam Smith



Karl Marx

A Literary Science

Adam Smith



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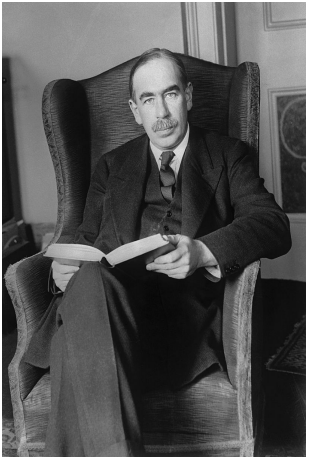
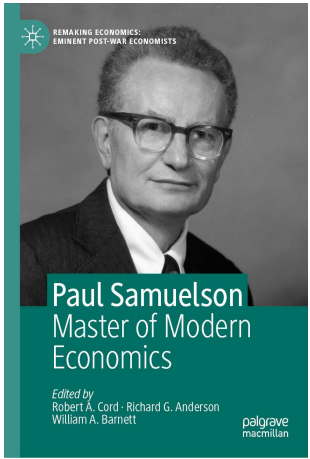


John Maynard Keynes

The Surge of Mathematics



Paul Samuelson

Lawrence Klein

... and Personal Computer

Taking the Con out of Econometrics

> ***The econometric art as it is practiced at the computer terminal involves fitting many, perhaps thousands, of statistical models.*** *One or several that the researcher finds pleasing are selected for reporting purposes. This search for a model is often well intentioned, but there can be no doubt that such a specification search invalidates the traditional theories of inference. . . .[A]ll the concepts of traditional theory. . . utterly lose their meaning by the time an applied researcher pulls from the bramble of computer output the one thorn of a model he likes best, the one he chooses to portray as a rose.*
>
> — Edward Leamer (1983)

Taking the Con out of Econometrics

This is a sad and decidedly unscientific state of affairs we find ourselves in. Hardly anyone takes data analyses seriously. ***Or perhaps more accurately, hardly anyone takes anyone else's data analyses seriously.*** *Like elaborately plumed birds who have long since lost the ability to procreate but not the desire, we preen and strut and display our t-values [which measure statistical significance].*

— Edward Leamer (1983)

What Happened after the 1980s?

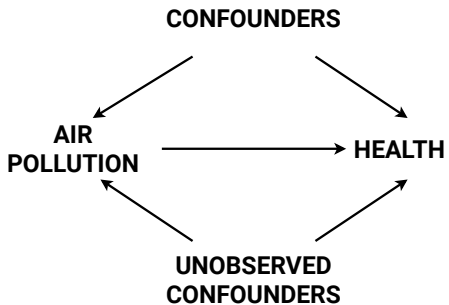
Leamer's proposed remedial was sensitivity analysis

Better research designs

Formalization of causal inference

Don Rubin

The Topic of My Thesis



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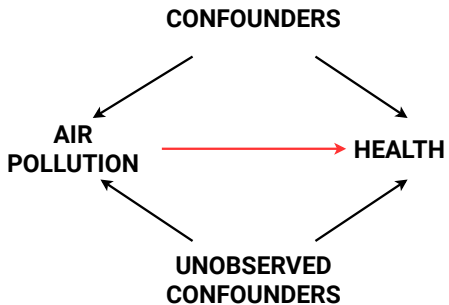

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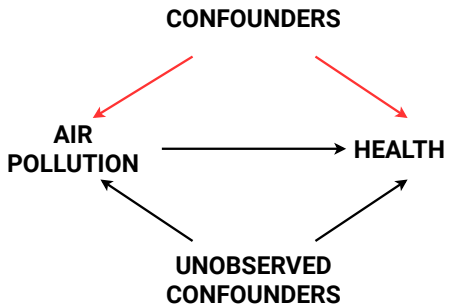

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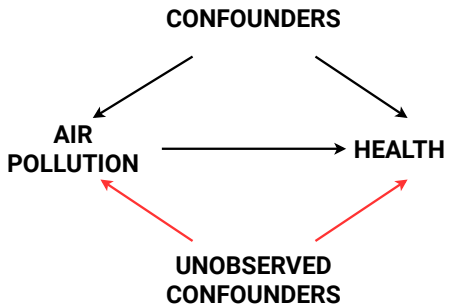

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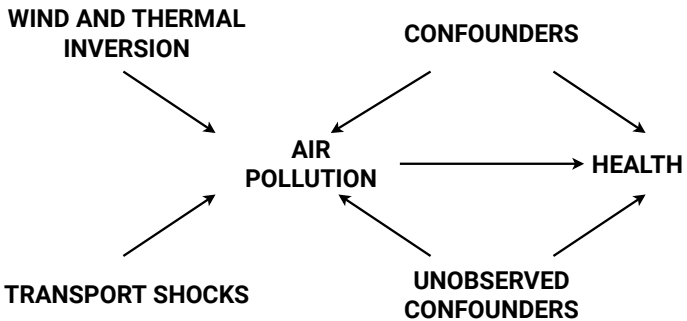

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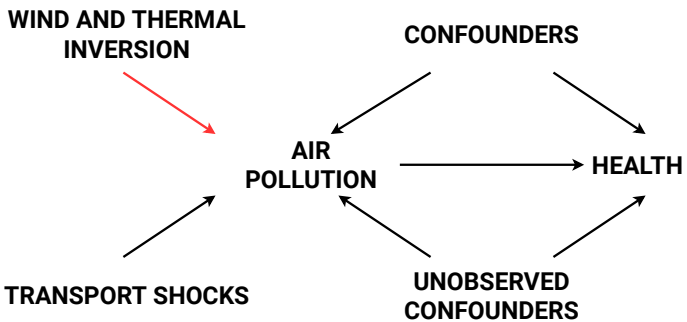

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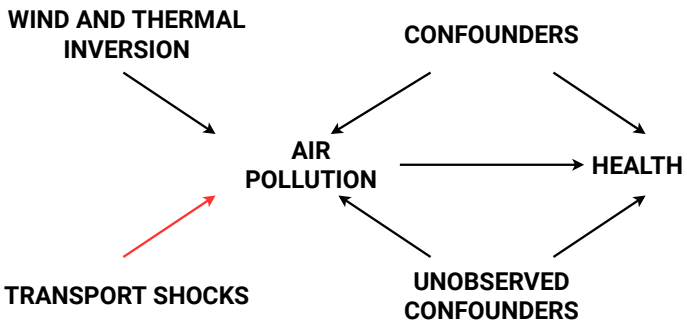
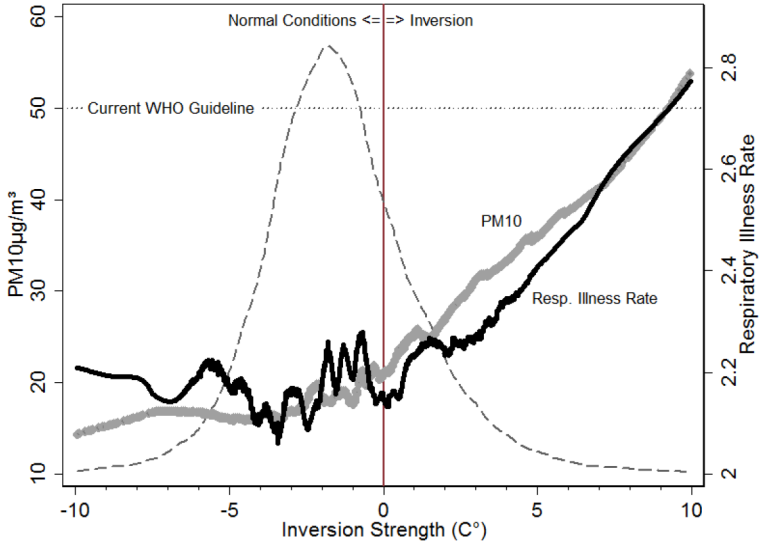


Thermal Inversions

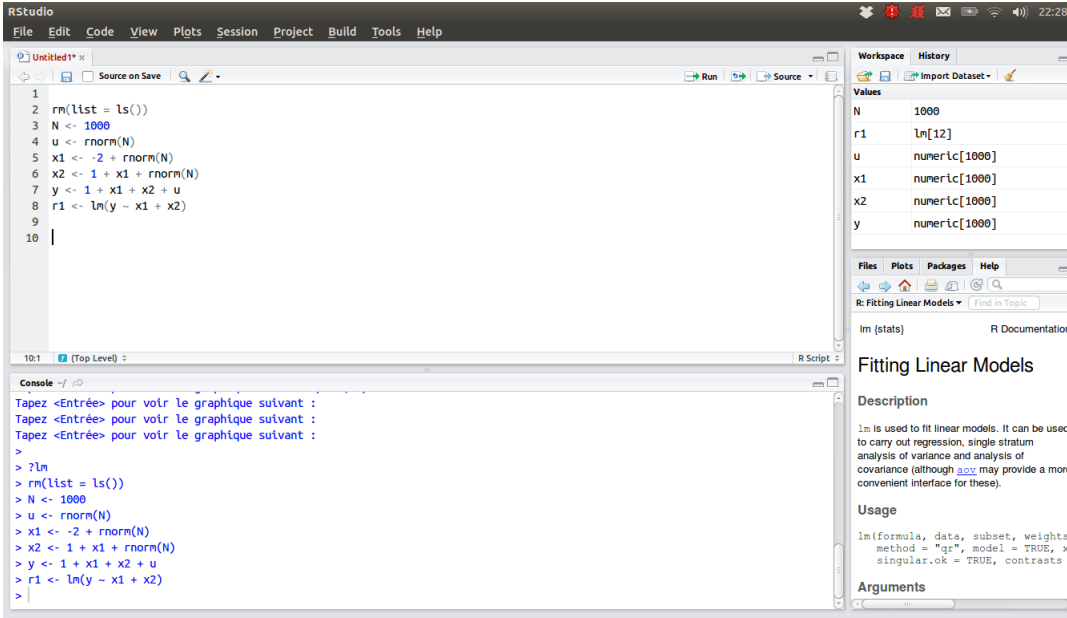
A Thermal Inversion in Seattle

Thermal Inversions



R programming


R Studio®


RStudio
File Edit Code View Plots Session Project Build Tools Help
Untitled1*
Source on Save
Run
Source
1 rm(list = ls())
2 N <- 1000
3 u <- rnorm(N)
4 x1 <- -2 + rnorm(N)
5 x2 <- 1 + x1 + rnorm(N)
6 y <- 1 + x1 + x2 + u
7 r1 <- lm(y ~ x1 + x2)
8
9
10
10:1 (Top Level) R Script
Console ~/
Tapez <Entrée> pour voir le graphique suivant :
Tapez <Entrée> pour voir le graphique suivant :
Tapez <Entrée> pour voir le graphique suivant :
>
> ?lm
> rm(list = ls())
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> y <- 1 + x1 + x2 + u
> r1 <- lm(y ~ x1 + x2)
>
Workspace History
Import Dataset
Values
N 1000
r1 lm[12]
u numeric[1000]
x1 numeric[1000]
x2 numeric[1000]
y numeric[1000]
Files Plots Packages Help
R: Fitting Linear Models
Find in Topic
lm {stats} R Documentation
Fitting Linear Models
Description
lm is used to fit linear models. It can be used to carry out regression, single stratum analysis of variance and analysis of covariance (although aov may provide a more convenient interface for these).
Usage
lm(formula, data, subset, weights,
method = "qr", model = TRUE, x =
singular.ok = TRUE, contrasts =
Arguments

Customization

FiraCode: https://github.com/tonsky/FiraCode

Ayu theme: https://github.com/davidgibsonp/ayu-rstudio

... many resources online!

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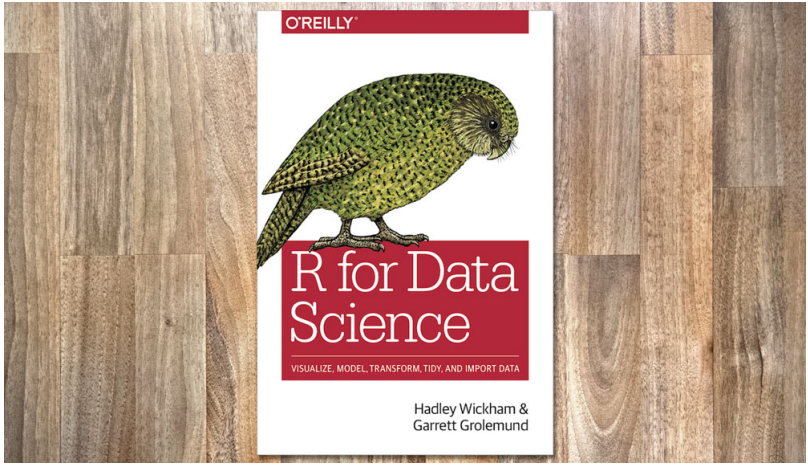
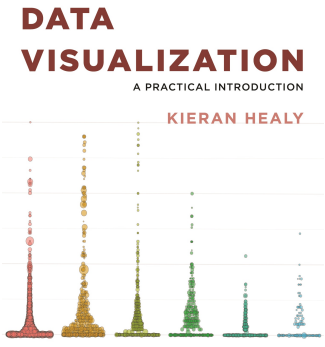
Data Wrangling & Analysis

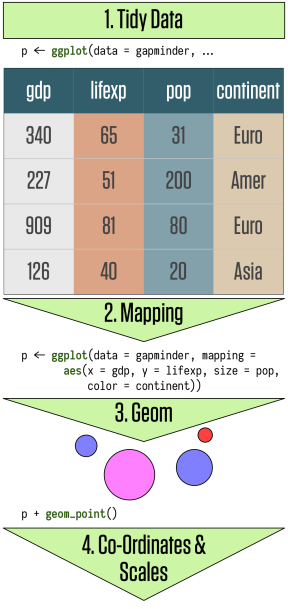


https://r4ds.had.co.nz/

ggplot2



https://socviz.co/



Packages to Install

`here` : use `set_here()` to set the root of your folder.

`tint` : a modern version of Edward Tufte's books template.

`tidyverse` : a collection of R packages designed for data science.

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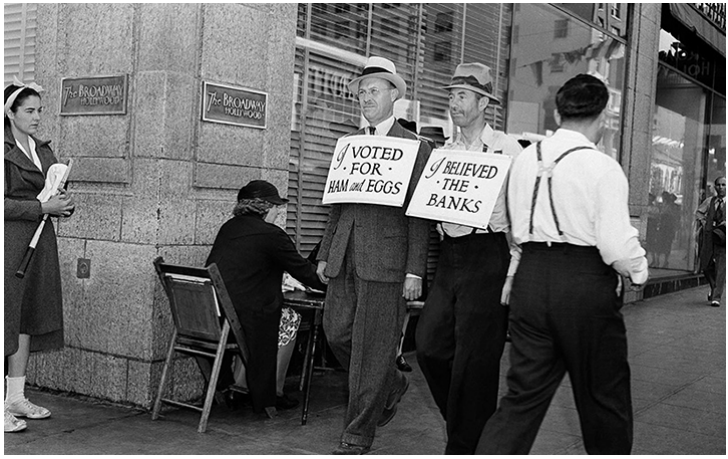
Replication Exercise

The Great Depression



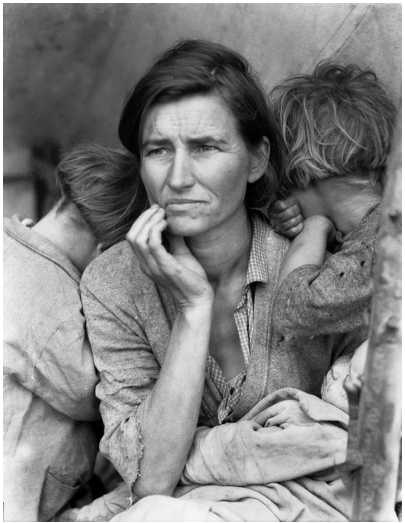
The Great Depression

Wall Street Crash of 1929

1/3 of all banks failed

Unemployment peaked 1933 at 25%

The Grapes of Wrath by J. Steinbeck



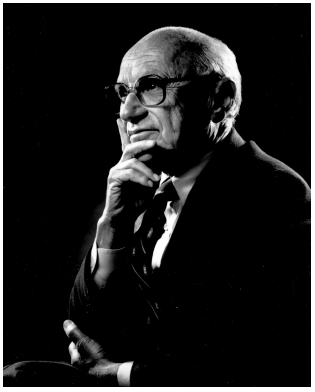
Migrant Mother by Dorothea Lange

The Role of the Federal Reserve

Could the Federal Reserve helped depository institutions?

The Role of the Federal Reserve

The Depression, which started in 1929 was rather mild from 1929 to 1930. And, indeed, in my opinion would have been over in 1931 at the latest had it not been that the Federal Reserve followed a policy which led to bank failures, widespread bank failures, and led to a reduction in the quantity of money.



Milton Friedman

The Role of the Federal Reserve

Can we credibly test Friedman's hypothesis?

The Article We Reproduce

Monetary Intervention Mitigated Banking Panics during the Great Depression: Quasi-Experimental Evidence from a Federal Reserve District Border, 1929–1933

Gary Richardson (University of California, Irvine and NBER)

William Troost (University of Southern California)

Journal of Political Economy, 2009

A Mississippi Experiment

A bank in Tchula (1939)

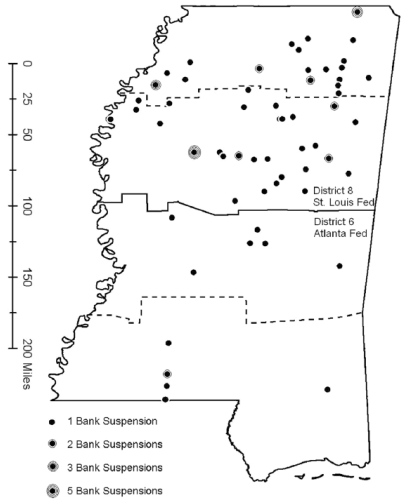
Caldwell crashed down in November 1930.

Mississippi was supervised by two regional Federal Reserve Bank.

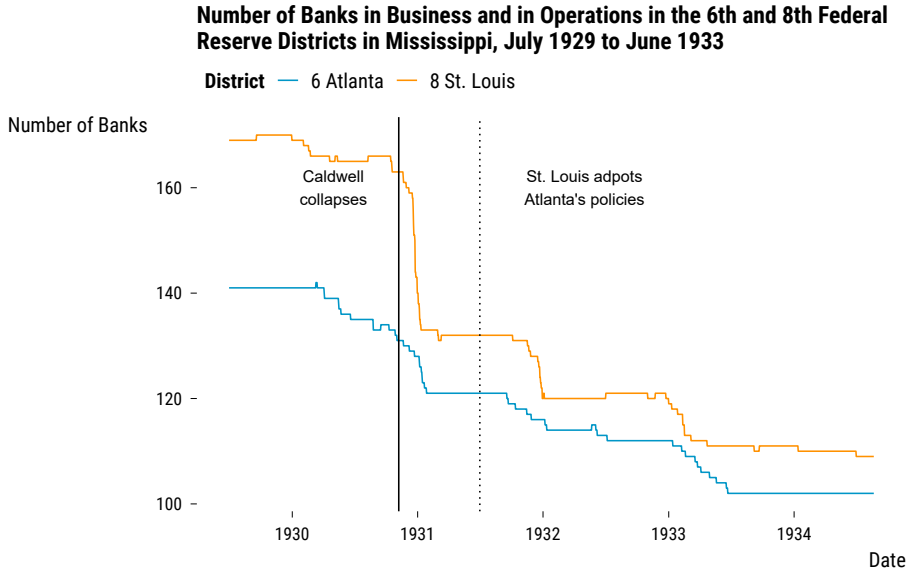
The Atlanta Fed ran the Sixth District and lent money to banks.

The St. Louis Fed ran the Eighth District and restricted credits.

One Mississippi, Two Mississippi



Intuition


Number of Banks in Business and in Operations in the 6th and 8th Federal Reserve Districts in Mississippi, July 1929 to June 1933
District
6 Atlanta
8 St. Louis
Number of Banks
160
140
120
100
Caldwell collapses
St. Louis adpots Atlanta's policies
1930
1931
1932
1933
1934
Date