

# Recitation 1

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Juan Herreño

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Columbia University

# Outline

- Background on macro
- Cause and effect
- Log changes
- Chained GDP

- Macroeconomics as a field is a child of economic depressions
- We began studying the aggregate economy because of recessions
- Keynes *General Theory* is the “foundational book” of the field
  1. Before Keynes, lots of work on what we would call macro today by Hume, Fisher, Wicksell,...
  2. Simon Kuznets (Columbia BA, PhD ) was key to shape the field

## Question 1: Growth



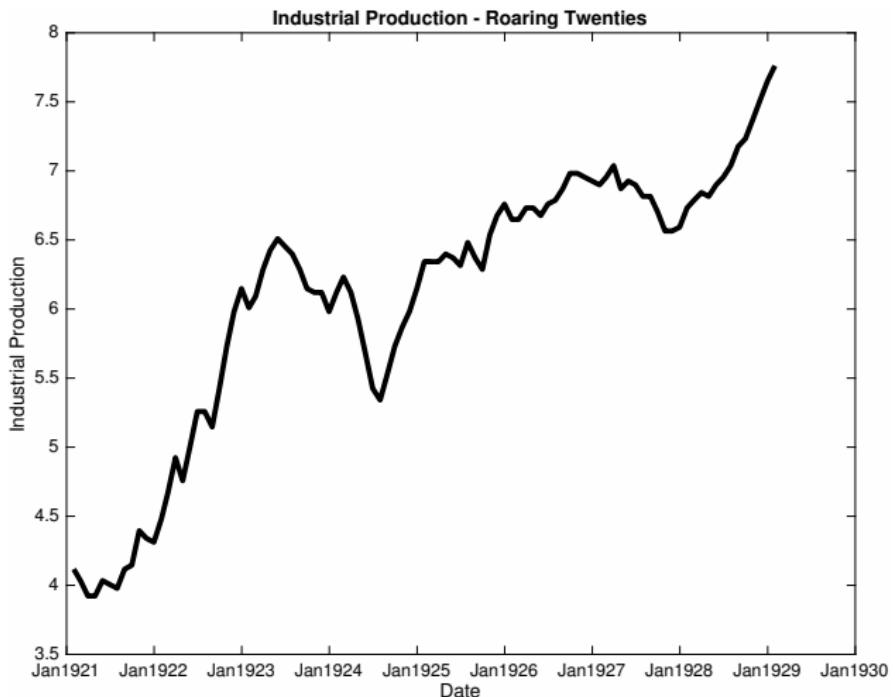
Figure 1: Real Wages of Laborers in England from 1250 to 2000

Note: This series is constructed by splicing together data from Clark (2010) for the period 1250 to 1860 and Clark (2005) for the period 1860 to 2000. The series is plotted on a logarithmic scale (base 2) and is scaled to be equal to 100 in the 1860s.

**Figure 1:** Source: Steinsson (2018)

Growth has not always been there

## Question 2: Fluctuations



**Figure 2:** Source: FRED

## Question 2: Fluctuations



**Figure 3:** Source: FRED

# The tasks of the macroeconomist

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  1. Measure the performance of the economy
  2. Understand the causes of macroeconomic behavior
  3. Design policy to improve that behavior
- Quest for the common good

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  1. Measure the performance of the economy
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- Quest for the common good
- Implies to determine cause and effect!
- That is, to determine causality!

## What is a correlation

- Formally:

$$\rho(X, Y) = \frac{\mathbb{E}(XY) - \mathbb{E}(X)\mathbb{E}(Y)}{\sigma_x\sigma_y}$$

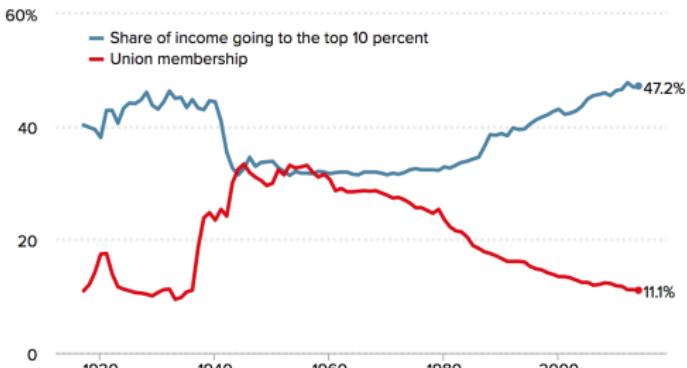
- $\mathbb{E}$  is the expectation.  $\sigma$  is the volatility
- How much the series move together relative to how much they move separately
- Divided by the volatility to ensure the number is between -1 and 1.
- Only for interested readers: the correlation only detects linear patterns.

# Correlations are useful

## ECONOMIC SNAPSHOT

### As union membership has fallen, the top 10 percent have been getting a larger share of income

Union membership and share of income going to the top 10%, 1917–2014

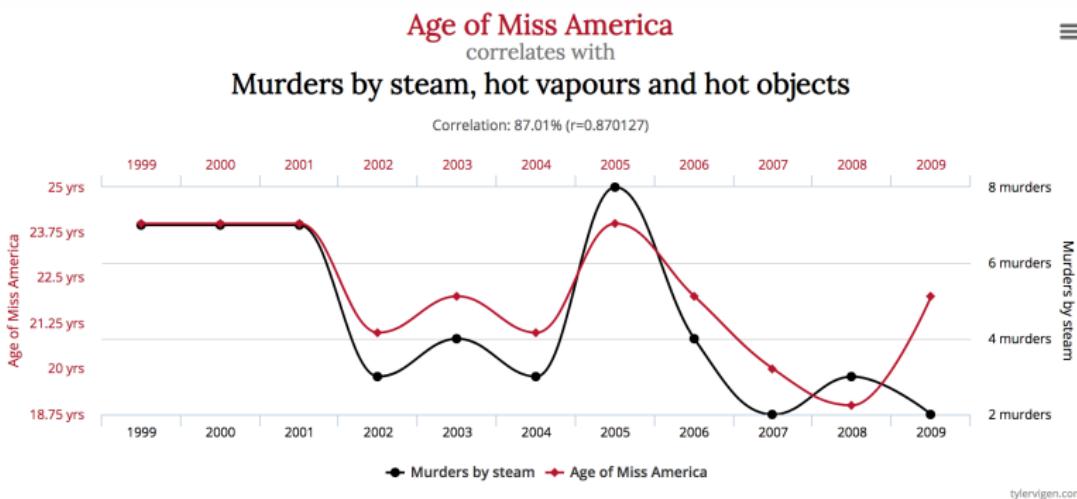


Source: Piketty and Saez (2014), Gordon (2013), and Bureau of Labor Statistics Current Population Survey public data series [...](#)

Economic Policy Institute

Possible mechanism?

# But can mislead you



# Correlation vs. Causation

- Correlations can be spurious (not causal) for two reasons
  - Reverse Causality
  - Ommitted Variables

## Reverse Causality

- You want to identify the effect of X on Y
- But you are identifying the effect of Y on X

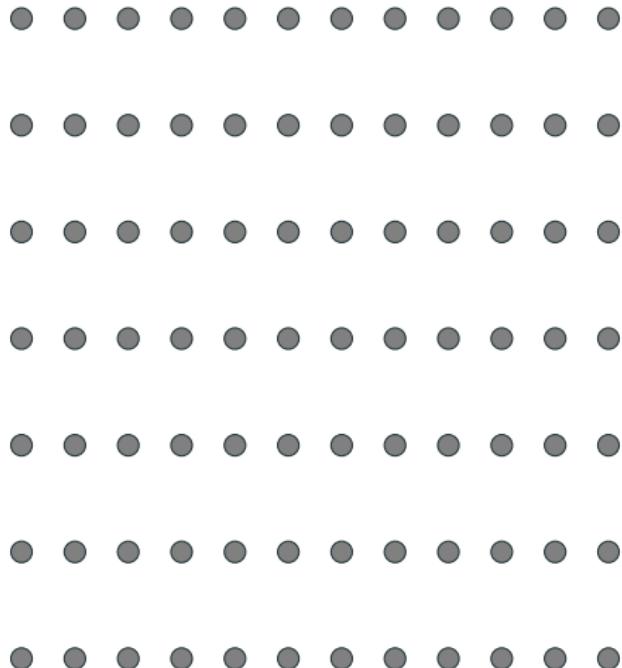
Example:

- The weather forecast correlates with the actual weather
- Claim: When printing that it will rain, the NYT causes rainfall in NYC
- Obviously false. The expectation of rain causes the NYT to print it will probably rain

Temporality is not sufficient for causality

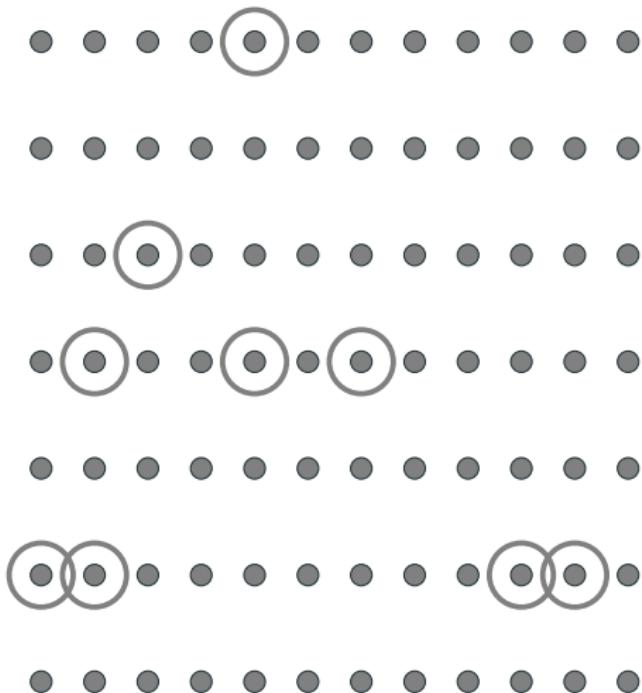
## Ommitted Variables

- 84 people in a town



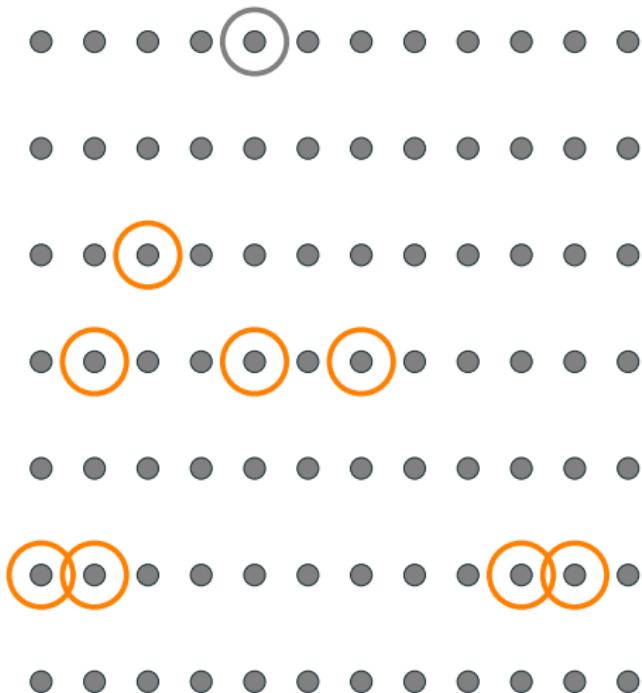
## Omitted Variables

- 9 of them have a high-risk disease



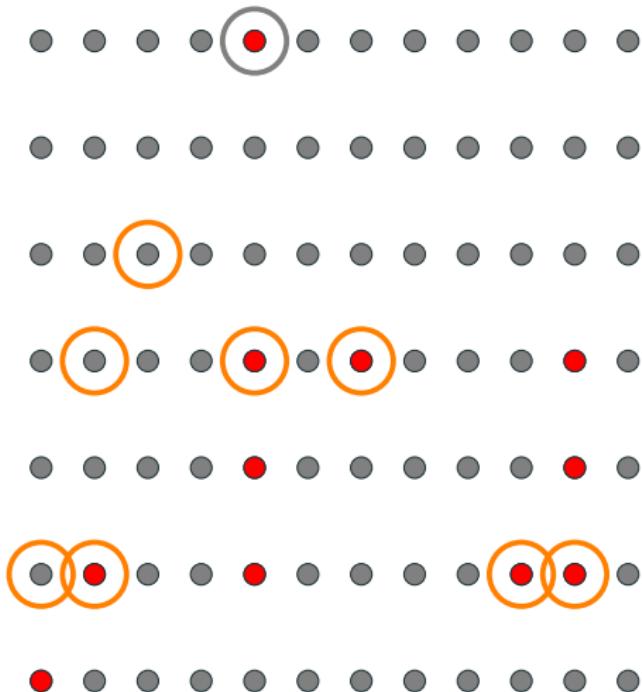
## Omitted Variables

- 8 out of 9 decide to pursue treatment with a cardiologist



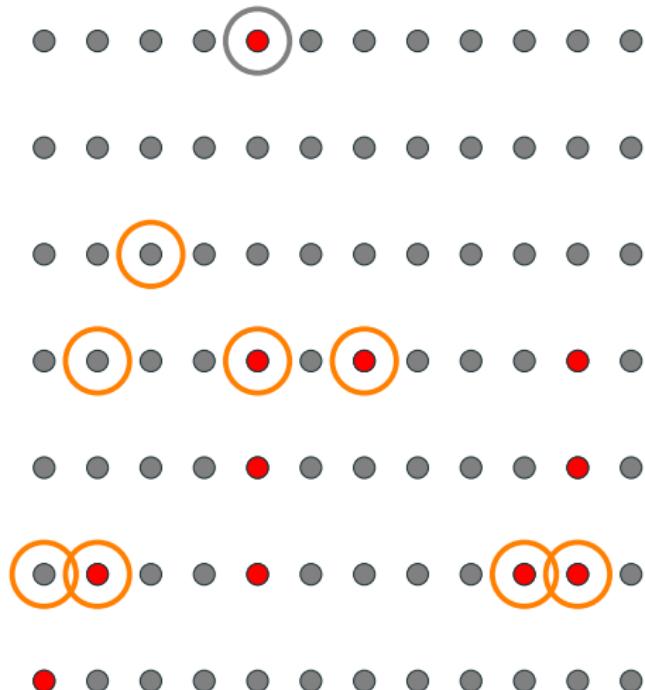
## Ommitted Variables

- 5 patients in cardiology treatment died within 10 years
- 6 non-patients died within 10 years



## Ommitted Variables

- Mortality rates: 62.5% (5/8) vs 7.8% (6/76)
- Is this indicative that medicine is bad for you?



## Ommitted Variables

- No! Of course not!
- Heart condition both:
  1. Increases mortality risk
  2. Makes people more likely to go to a cardiologist
- 1. and 2. imply that seeing a cardiologist **correlates** with high mortality risk
- But the cardiologist **does not cause** high mortality
- The positive correlation in the data is spurious, it is not causal

## Ommitted Variables

- How to determine causal links?
- Need exogenous variation
  - Print a random forecast in the NYT and see if it is a prophecy
  - Test medicines by giving placebos to some people at random

## Examples in Macro

- On the onset of a recession governments create government expenditures  $G \uparrow$
- Because we are in a recession  $\downarrow Y$
- If we are not careful enough we may interpret that higher  $G$  causes lower  $Y$

## Log changes - small note

- GDP  $Y$  grows at net rate  $g$  every year

$$Y_t = Y_{t-1}(1 + g)$$

$$Y_t = Y_0(1 + g)^t$$

- take logs on both sides

$$\log(Y_t) = \log(Y_0) + t \log(1 + g)$$

- Define  $Y_t = \log(y_t)$

$$y_t = y_0 + t \log(1 + g)$$

- When  $g$  is small, then  $\log(1 + g) \approx g$

$$y_t = y_0 + tg$$

- Draw that in the board

## Chain-weighted GDP

- The composition of the economy changes. (C of laptops in 1960 vs. 2000)
- Prices change too
- How to keep updating them? Chain-weighted GDP

$$Y_t = \left( \left( \frac{\sum p_{t-1} q_t}{\sum p_{t-1} q_{t-1}} \right) \left( \frac{\sum p_t q_t}{\sum p_t q_{t-1}} \right) \right)^{1/2} Y_{t-1}$$

- $Y_{t-1}$  times a growth rate
- The growth rate is the geometric average of:
  1. GDP growth using  $t$  as base year
  2. GDP growth using  $t - 1$  as base year