MACROECONOMICS
73-240

Lecture 1

Shu Lin Wee

This version: August 26, 2019

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Preliminaries

- What is expected
- What to expect

The syllabus

- Make sure to read the syllabus
- The syllabus can be found online on Canvas.

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Details about the course

- The class: MW 1:30-2:50, 3:00-4:20
- TAs:
  - Xuege Zhang
  - Bill Bednar
- Office Hours:
  - Wee: Tu 3:30pm-5:30pm, TPR 5102
  - Bednar: Th 5:00 - 6:00pm, TPR 3803
  - Zhang: W: 5:00- 6:00pm, TPR 3803
- The textbook:
  - Macroeconomics - S. Williamson 5/E

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Details about the course

Piazza

- Find our Piazza class page on the left sidebar of Canvas and enroll yourself!
- We will use Piazza for both posting announcements about class
- and also as a forum for you to ask questions about course material
- Please keep up with the posts on Piazza:
  - Queries that have already been answered in a previous post will only have the reply "see previous post"

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Hw, grading and exams

- 5 HW - 35% of grade
- 2 Midterms (tentative: Oct 7th; Nov 6th) - 40% of grade
- 1 Final - 25% of grade (check CMU website for dates)

- No midterm dropped
- No mercy for cheating!
- No late assignments accepted
- Re-grading of assignments/midterms not allowed after 2 weeks of receipt of assignment/midterm

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Impt change in schedule!

- Take note that on Oct 9th, there will be **NO** class!
- Instead we will have a make-up lecture scheduled for Sep 6th (Friday) during recitation hours.
  - Section 1: TQ 3801 from 1:30-2:50 p.m on Sep 6th
  - Section 2: TQ 2611 from 3:00-420 p.m on Sep 6th

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Expectations

- **Email:** for regrading, email your TA first!
- **Data Analysis**
  - Computer, Excel
- **Principles of Economics!**
- **Math**
  - Linear Algebra (How to solve simultaneous equations)
  - Calculus (How to take a derivative)

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Let's Start!

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What do we do?

What is Economics?

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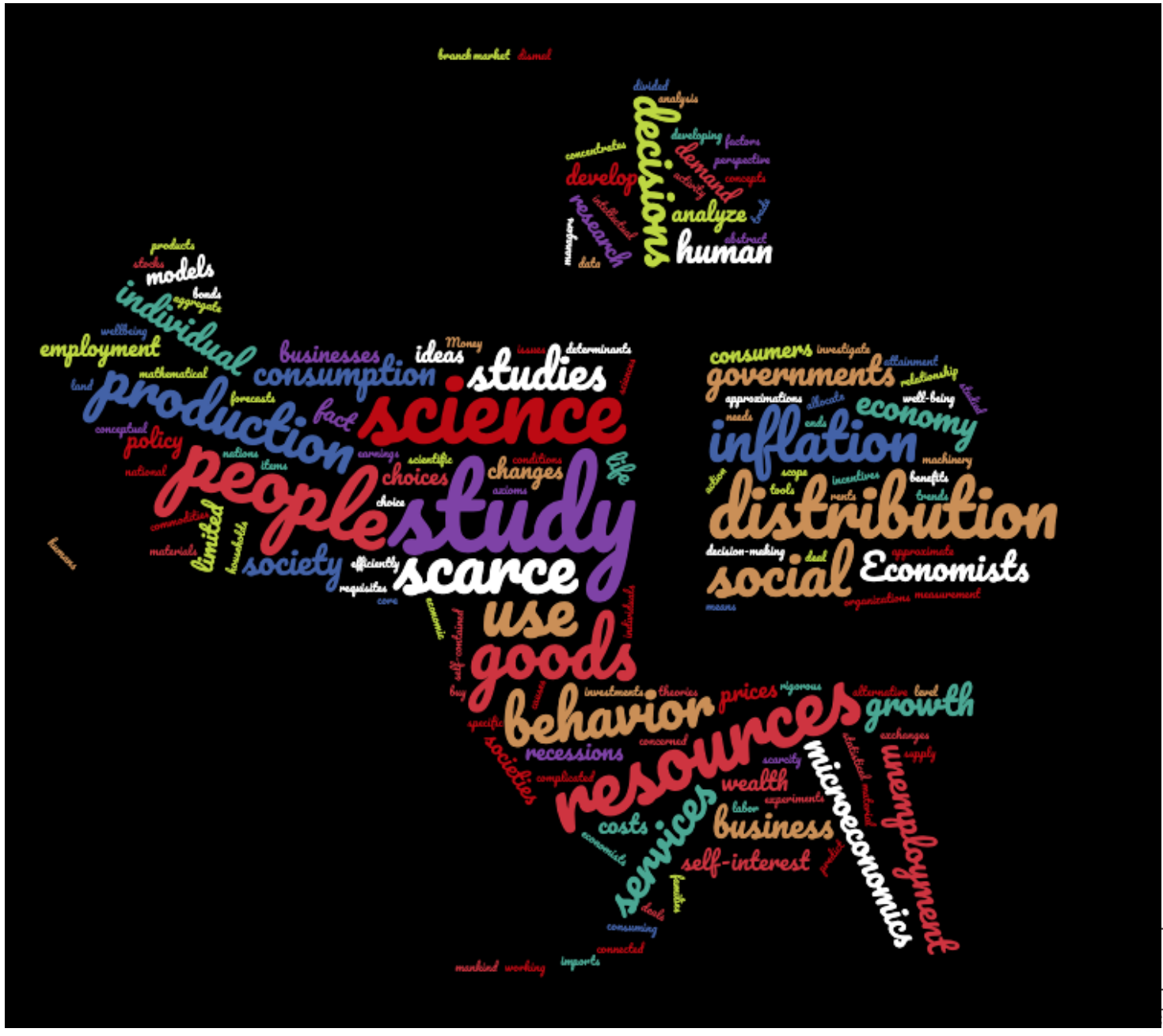

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What is Economics?

Economics is ...

- the study of scarcity or the study of how people use finite resources
- about making choices or the study of decision-making.

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What is Economics?

Given scarce (not infinite!) resources

- We make decisions on what to produce (what to consume)
- We make decisions on how to produce the goods and services
- We make decisions on whom to produce the goods and services for

What questions will we try to answer?

But what is Macroeconomics?

What questions will we try to answer? (cont.)

- What does Macroeconomics study?
  - (Hoover) *Is the study of the economy taken as a whole; whereas Microeconomics is the study of a part of the economy, taking the remainder as given.*
- In other words, macroeconomics looks at how the decisions of individuals add up to affect the economy

Your Questions

What topics do you think macroeconomists are interested in?

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The FOMC Statement, Jul. 31, 2019

Information received since the Federal Open Market Committee met in June indicates that the ***labor market remains strong*** *and that* ***economic activity has been rising*** *at a moderate rate.* ***Job gains*** *have been solid, on average, in recent months, and the* ***unemployment rate*** *has remained low. Although* ***growth of household spending*** *has picked up from earlier in the year,* ***growth of business fixed investment*** *has been soft. On a 12-month basis, overall* ***inflation*** *and inflation for items other than food and energy are running below 2 percent. Market-based measures of inflation compensation remain low; survey-based measures of longer-term inflation expectations are little changed.*

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The FOMC Statement, Jul. 31, 2019

Consistent with its statutory mandate, the Committee seeks to foster ***maximum employment and price stability****. In light of the implications of global developments for the economic outlook as well as muted inflation pressures, the Committee decided to* ***lower the target range for the federal funds rate to 2 to 2-1/4 percent****. This action supports the Committee's view that* ***sustained expansion of economic activity, strong labor market conditions, and inflation*** *near the Committee's symmetric* ***2 percent objective*** *are the most likely outcomes, but* ***uncertainties about this outlook remain****...*

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The FOMC Statement, Jul. 31, 2019

- Statement actually has 1 more paragraphs(!)
  - *Forward guidance* (how policy will evolve in the near future)

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Parsing the Fed Statement

- What does the Federal Reserve care about?
  - Economic Activity/Growth
  - Employment Stability
  - Price Stability
- What indicators does the Federal Reserve look at?
  - Household spending
  - Business Fixed Investment
  - Job Growth and Unemployment rate
  - Inflation rate

What questions will we try to answer?

Some questions we will try to answer

- What drives long-run growth?
  - Why are some developed countries richer than others?
  - Why do some countries catch up to the US and others don't?
- How do economic fluctuations (booms and recessions) come about?
- What causes inflation?
- What causes unemployment?

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Key Microfoundations

In this class, we focus on a few key micro decisions and equilibrium restrictions, and see how these add up to affect the aggregate economy.

- Should I consume today or save and consume tomorrow?
  - will help us understand determinants of savings (and investment!)
  - will help us understand how shocks affect the economy
- Should I accept a job or not?
  - will help us understand unemployment
- How much cash (money) should I hold?
  - will help us understand inflation

How do we get to the answers?

- We need to: Establish a methodology (economists are social-scientists!)
- Scientific method based on experiments is not socially very desirable:

How do we get to the answers?

General Approach in Macroeconomics:

- Ask a question
  - Positive: Why is some feature of the world the way it is?
  - Normative: What should some feature of the world be?
- Document the facts
  - Need to determine quantities of interest and how to measure them
- Develop a model
  - We use the model to tell a story about the facts
- Use the model to make predictions

Building a model

- What is a model: A simple virtual representation of a real environment
  - Google maps $\Longleftrightarrow$ The world
  - $F = g(m_1 \cdot m_2)/d^2 \Longleftrightarrow$ An apple falling from a tree
  - A macroeconomic model $\Longleftrightarrow$ The US economy
- What makes a good model:
  - Depends on the question: shouldn't model market for apples if question is about market for health insurance
  - Has to be simple: we have to be able to learn from it
  - Cannot be too simple:
    Has to successfully replicate quantities of interest

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Building a model

What makes a good model?

- Suppose we wanted to know how to get from Tepper to Gates. Is this a good representation?

Enough detail to inform us how to get there.

Typical Macro Model Ingredients

- Actors:
  - Households
  - Firms
  - Government
  - Markets
- Quantities:
  - Households: Consumption, Savings, Hours worked
  - Firm: Output, Vacancies
  - Government: Taxes, Debt, Expenditures
  - Markets: Prices, Inflation

Different parts of a model

- Parameter
  - An input that is fixed over time, except when the model builder changes it for an experiment.
- **Exogenous variable**
  - An input that can change over time, but determined ahead of time by the model builder.
  - exogenous = outside of the model
- **Endogenous variable**
  - An outcome of the model – something that is explained by the model.
  - endogenous = within the model

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What's exogenous vs. endogenous?

- **Exogenous variable**
  - Usually treat productivity and productivity shocks as exogenous.
  - Examples
    - Weather-induced contractions: poor Q1 growth (2013 - 2015) due to harsh winter
    - 2011: An earthquake in Japan shuttered factories there and cut off supplies to U.S. manufacturers
- **Endogenous variable**
  - Examples
    - Given the wage rate and other income, individuals choose whether to work or not
    - Given productivity, firm chooses how many jobs to create/ how equipment to invest in

Making decisions on the margin

- Endogenous variables are choice variables
- How do agents make their decisions or choices?
- In Economics, we think of agents making decisions on the *margin*
  - Example: a firm is considering hiring an additional worker
  - Is the additional (marginal) benefit of hiring a worker more or less than the additional (marginal) cost of that worker.

Some Motivating Observations about the U.S. (and the world) Economy

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Gross Domestic Product

Gross domestic product (GDP): is the market value of all final goods and services produced in a country (or region) in a given period of time (for example one year)

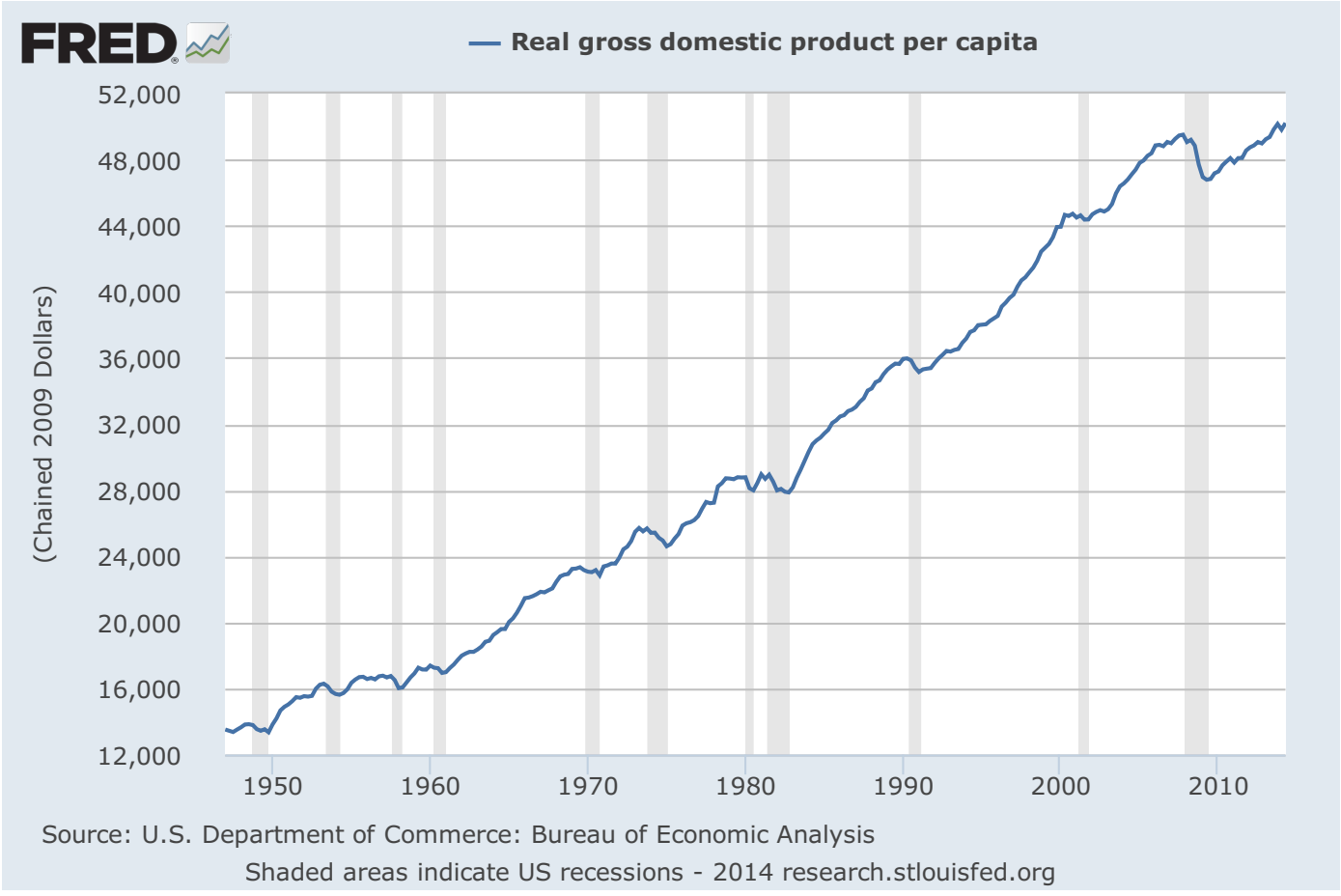
Today we look at:

- GDP over time for the US
- GDP across countries

When comparing GDP across time

- We need to be careful about changes in prices
  - We choose a year (say 2009) and evaluate GDP with prices in that year
  - This is called **real GDP**
- We need to be careful about changes in population
  - We divide GDP by population
  - This is called **GDP per capita**

US Real GDP per capita (in 2009 dollars)



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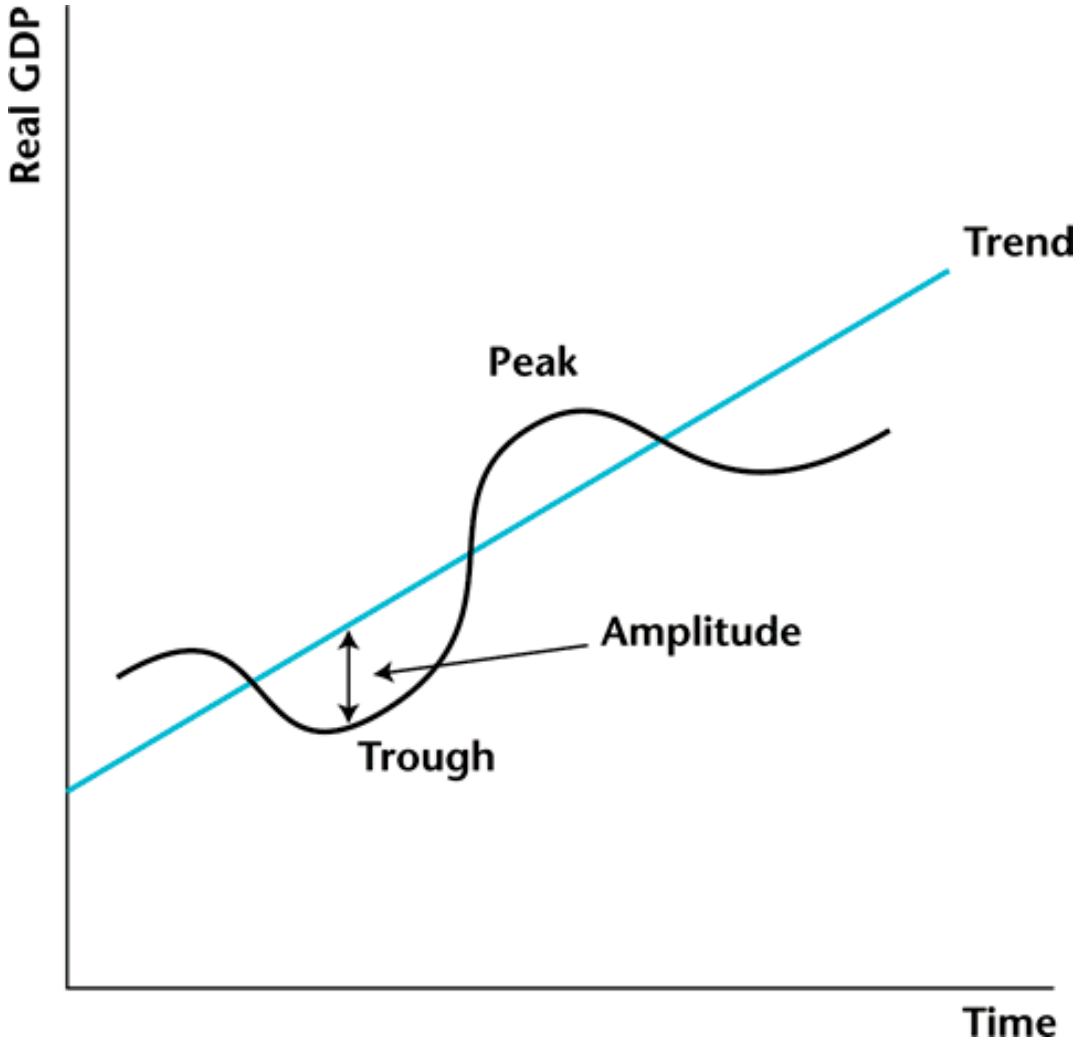
US GDP over time: observations

1. It grows (at roughly 2 percent per year)
2. There are wiggles around the long run trend.
   - Some of the wiggles are large.
   - In particular at the time of great recession.

Questions:

- Why do economies grow?
- Why there are fluctuations around trend?

Business Cycle Fluctuations



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Productivity shocks and business cycles

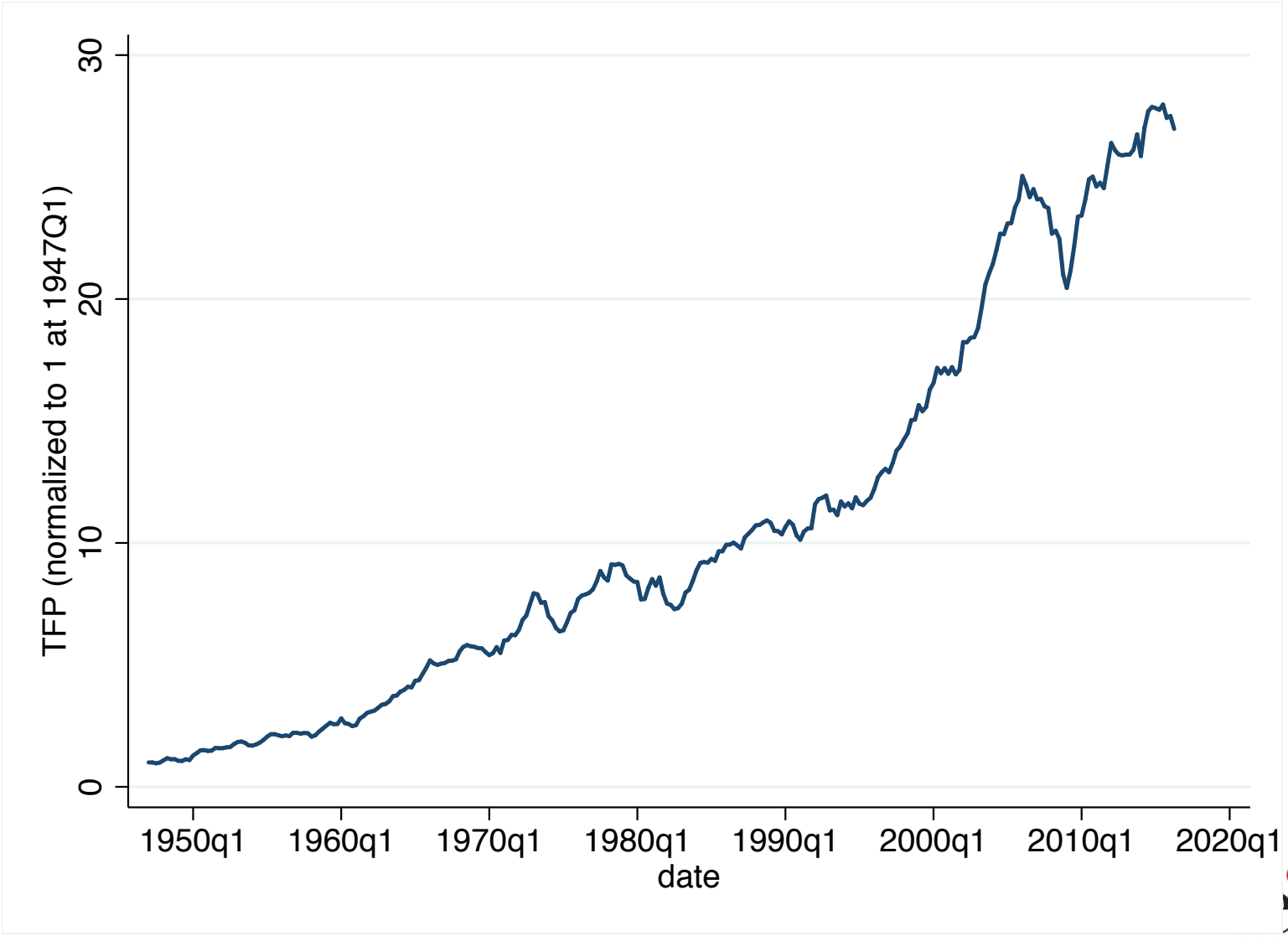
Common view in macro: productivity shocks are one of the drivers of business cycles.

1. Productivity (catch-all term):
    - any change that leads to an economy producing more (or less) output with the same inputs

Examples:

- The internet and IT
- Weather

Total Factor Productivity in the US



Source: FRBSF

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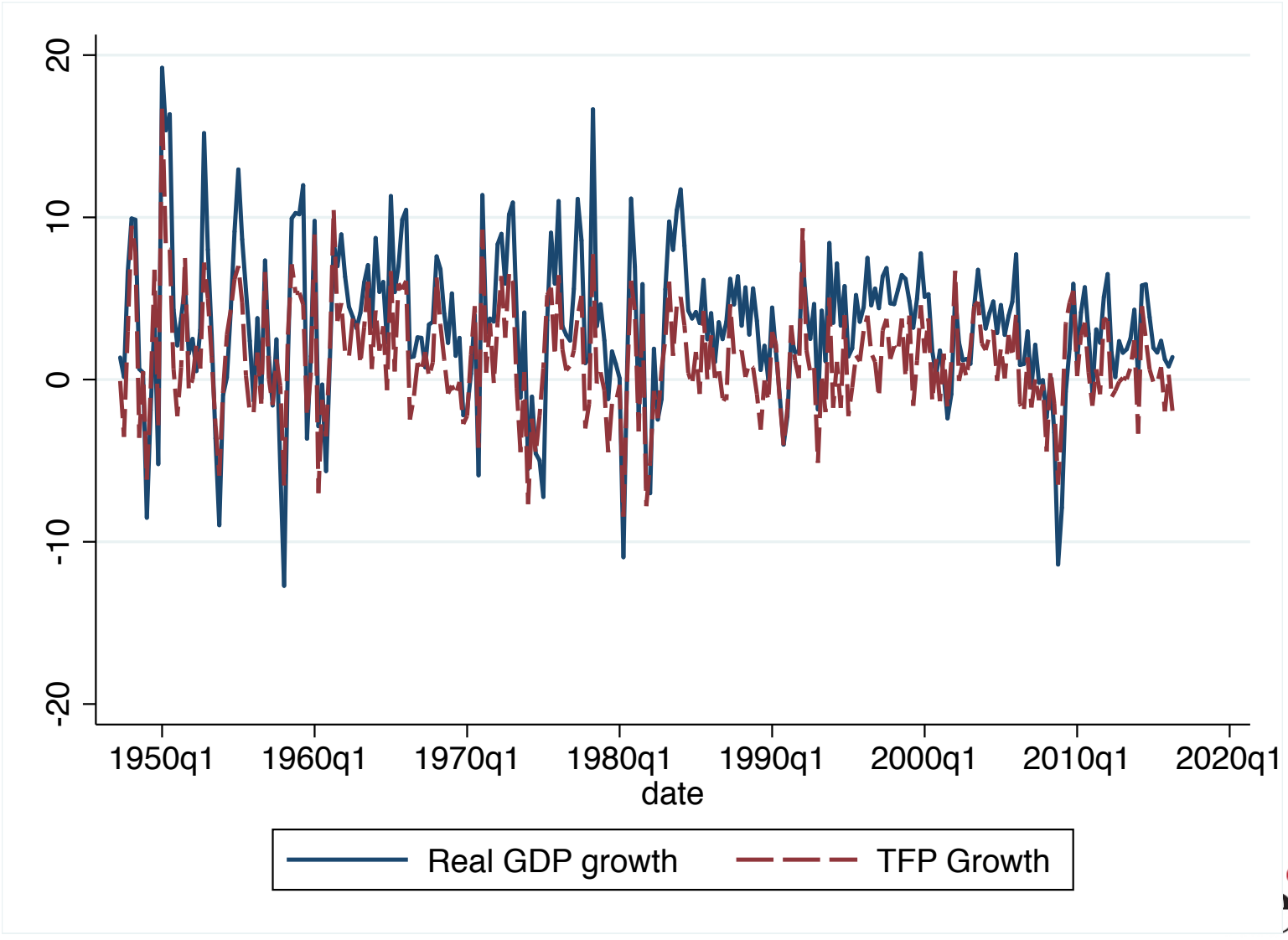
Business Cycle: Growth in Real US GDP and TFP



Source: FRBSF and BEA

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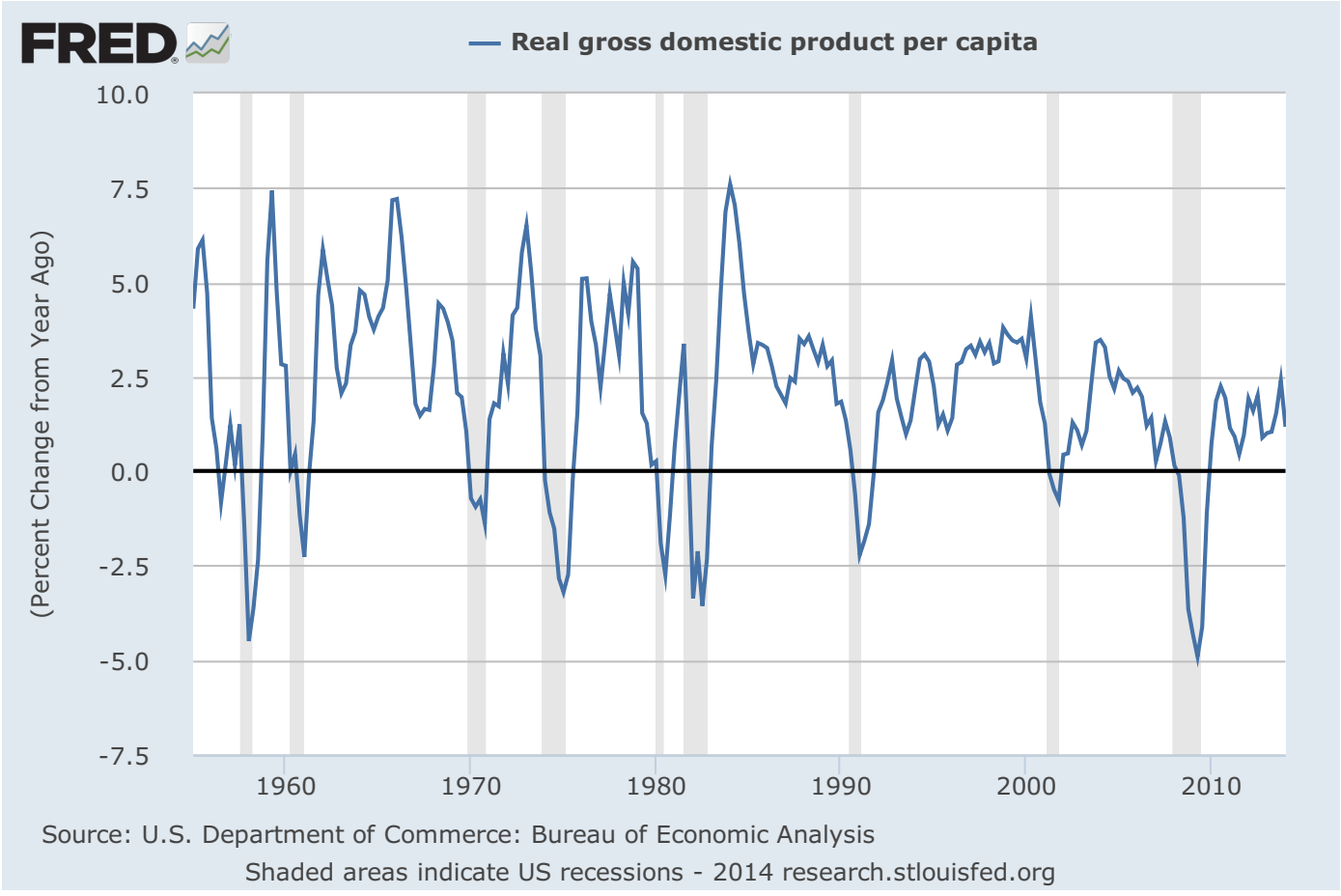
Business Cycle: Growth in Real US GDP



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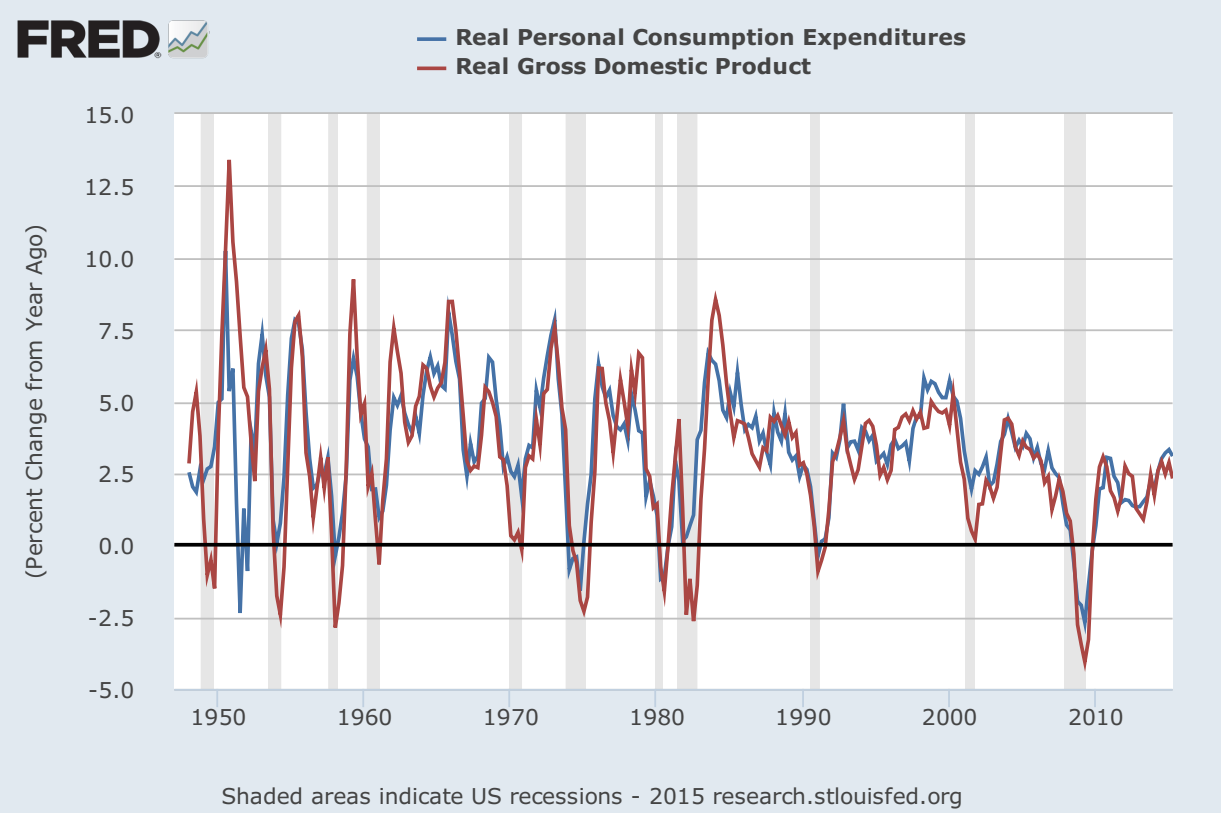
Business Cycle: Growth in Real US GDP

1. **Business Cycles** are fluctuations of aggregate economic activity around a long term trend
    - Expansions and Recessions
    - Sectoral Co-movement
    - Recurrent but not periodic

Some Definitions

1. A variable is called **procyclical** (to GDP) if, on average, it co-moves positively with GDP along the business cycle.
2. A variable is called **countercyclical** (to GDP) if, on average, it co-moves negatively with GDP long the business cycle.
3. A variable is **acyclical** (to GDP) if it moves independent of GDP along the business cycle

Some Key Macrovariables: GDP and Consumption growth rates



- Is consumption procyclical, countercyclical or acyclical?
- Is consumption a leading,coincident or lagging indicator?

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Consumption: Observations

- Procyclical, rises during booms
- Fluctuations in consumption growth less volatile than GDP growth
- Consumption expenditure is about 70% of the US GDP

Questions:

- A consumer's ability to pay strongly affects consumption spending.
- How does high unemployment affect consumption spending?
- How does inflation affect consumption spending?

Unemployment

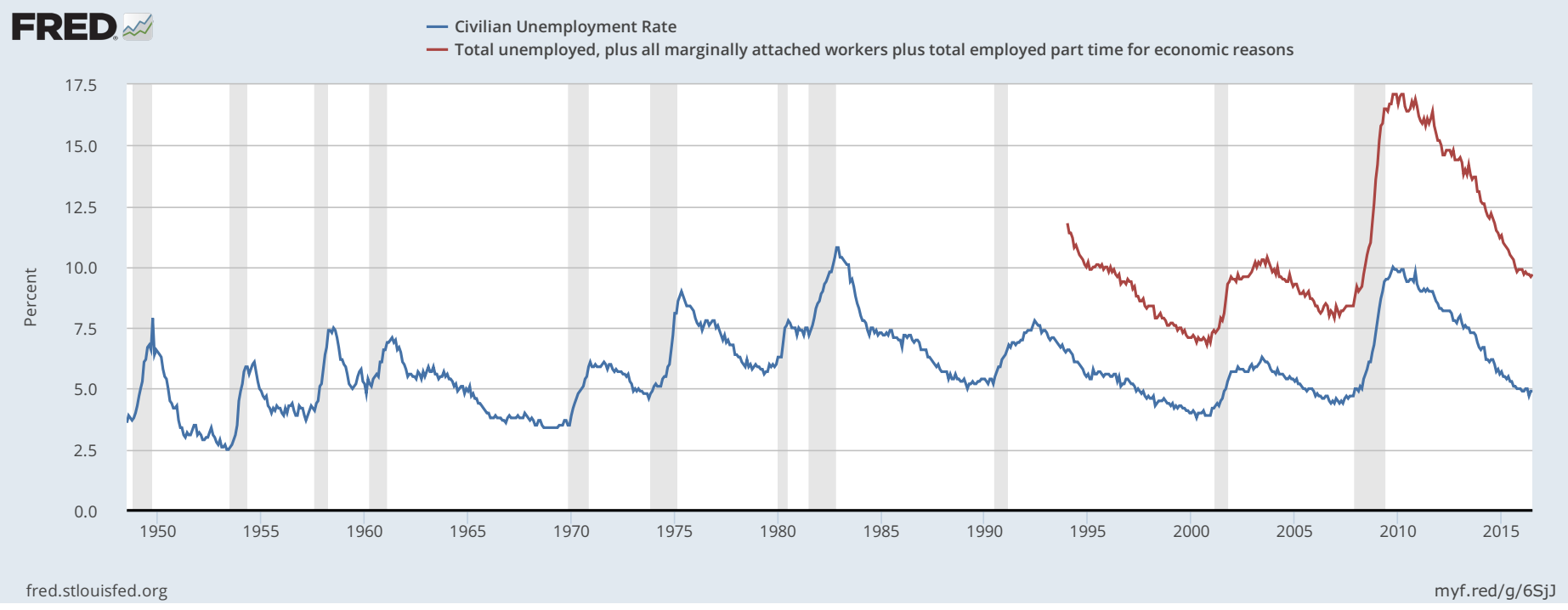
- **Unemployed (U)**: Individuals who are actively seeking a job but cannot find one.
- **Labor Force (LF)**: Sum of employed and unemployed individuals
- **Unemployment rate ($\frac{U}{LF}$):** is the fraction of the labor force in an economy who are actively seeking a job, but cannot find one

Unemployment

"It's not 6. It's not 5.2 and 5.5. Our real unemployment rate – in fact, I saw a chart the other day, our real unemployment – because you have ninety million people that aren't working. Ninety-three million to be exact. If you start adding it up, our real unemployment rate is 42%." - Donald Trump on Unemployment Rates

- What's wrong with this calculation?

Some Key Macrovariables: Unemployment



- Is unemployment procyclical, countercyclical or acyclical?

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Unemployment: Observations

- Countercyclical, rises during recessions
- Unemployment rate above 10% seen in 1980s recession and the recent Great Recession
- Note: Great Depression (not in graph) saw unemployment rates above 20%
- Since the 1990s, decline in unemployment rate has lagged the recovery in GDP.

Questions:

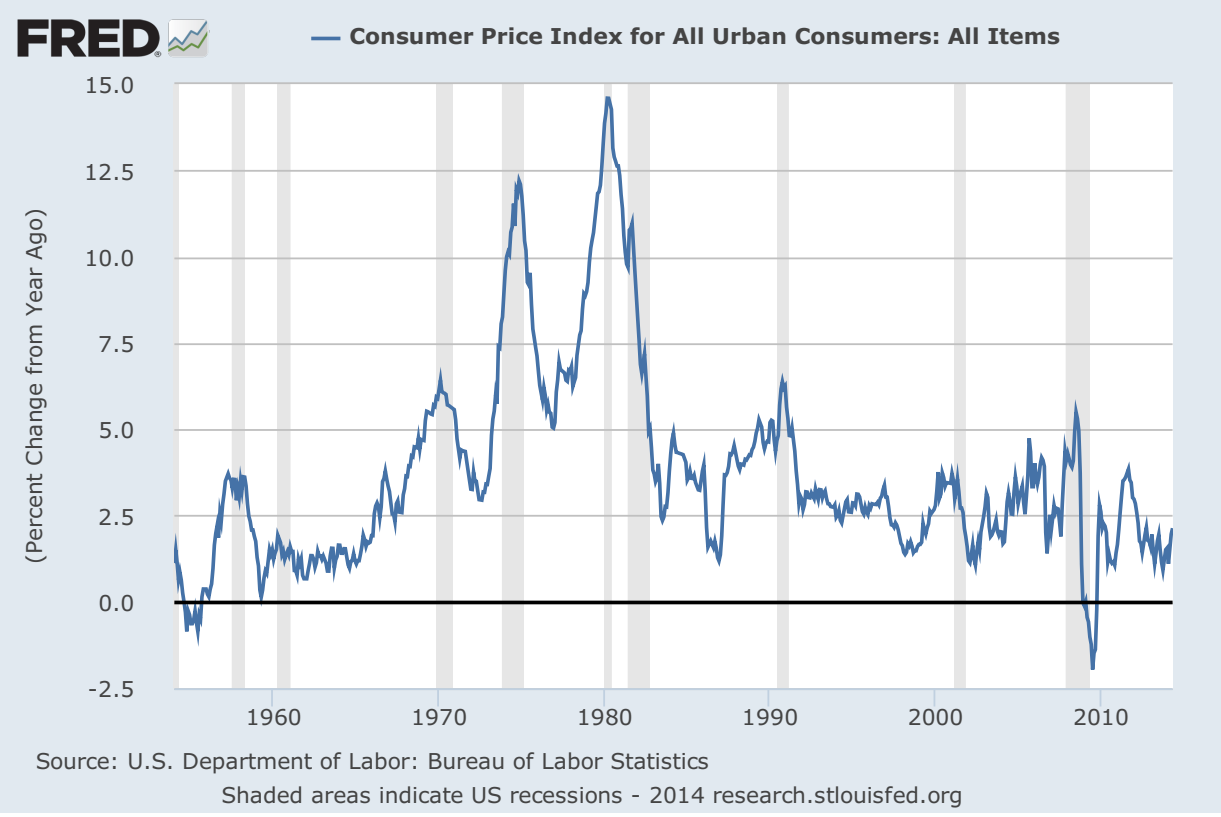
- Why is there unemployment?
- Should government reduce unemployment?
- Can government reduce unemployment? How?

Inflation

- Inflation: is the percentage changes in price levels
- It is a rough measure of changes in the cost of living
- If overall price level in year t is P_t, then

$$\text{Inflation in year } t = \left(\frac{P_t}{P_{t-1}} - 1 \right) \times 100$$

Some Key Macrovariables: Inflation



The inflation rate is acyclical. Sometimes rises during a recession (e.g. 1970s stagflation episode). Sometimes falls in a recession.

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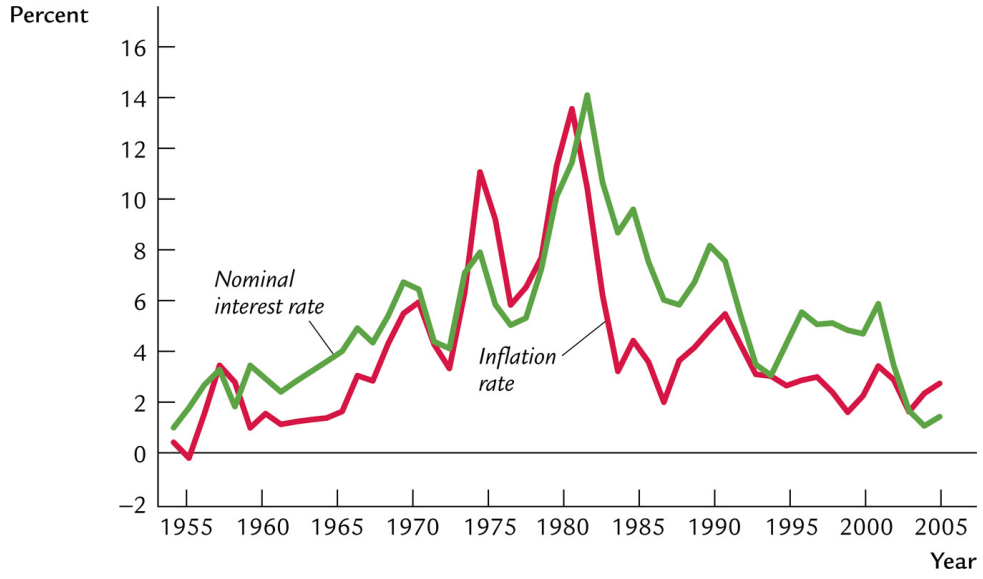
Inflation Rate and The Nominal Interest Rate



- The nominal interest rate and inflation rate are closely tied.
- Fisher equation demonstrates how nominal interest rates may move in tandem with *expected* inflation

$$(1+i) = (1+\pi^e)(1+r)$$

where i is the nominal interest rate, π^e is expected inflation rate and r is the real interest rate

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Inflation Rate and The Nominal Interest Rate

Where does the Fisher equation come from?

- You buy a one-period bond at time t which promises to pay nominal interest rate i_{t+1} in period $t+1$
- From point of view in period t: real gross return of bond in $t+1$ is given by:

$$\frac{1+i_{t+1}}{1+\pi^e_{t+1}} = 1 + r_{t+1}$$

- (Omitting time subscripts), Fisher equation:

$$(1+i) = (1+\pi^e)(1+r)$$

- A close approximation if r and π^e are small such that $r \times \pi^e \approx 0$ is:

$$i \approx \pi^e + r$$

Inflation Rate and The Nominal Interest Rate

The Federal Reserve targets a 2% inflation rate. Why?

Inflation Rate and The Nominal Interest Rate

- Federal Reserve Chairman Ben Bernanke announced an *explicit* 2% target for the US inflation rate in January 2012
- At that time: high unemployment, low growth stemming from 2008 financial crisis
- Further stimulus required but nominal interest rate already close to zero.
- Solution: Raise expected inflation as a way to stimulate economic activity.

$$r \approx i - \pi^e$$

- Real interest rates are lower if expected inflation is higher.

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Inflation Rate and The Nominal Interest Rate

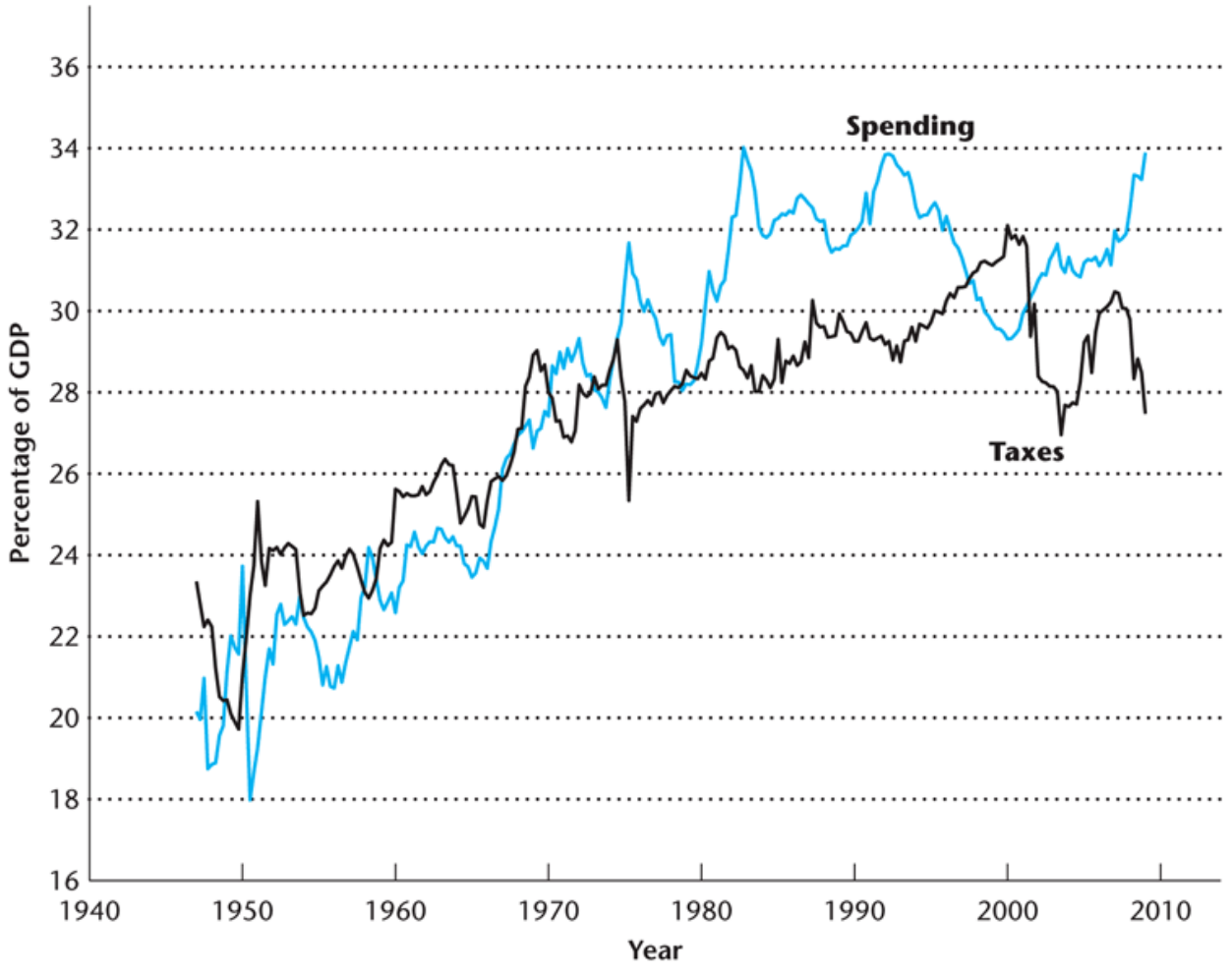
The Federal Reserve targets a 2% inflation rate.

- Real interest rates are lower if expected inflation is higher.

$$r = i - \pi^e$$

- When real interest rates are low, cheaper for households and firms to borrow and spend
- Fed announces (and commits to) an objective to raise inflation to 2%, or higher
- Encourage borrowing and spending by being sincere about monetary accommodation to achieve target inflation.

Total Taxes and Total Government Spending



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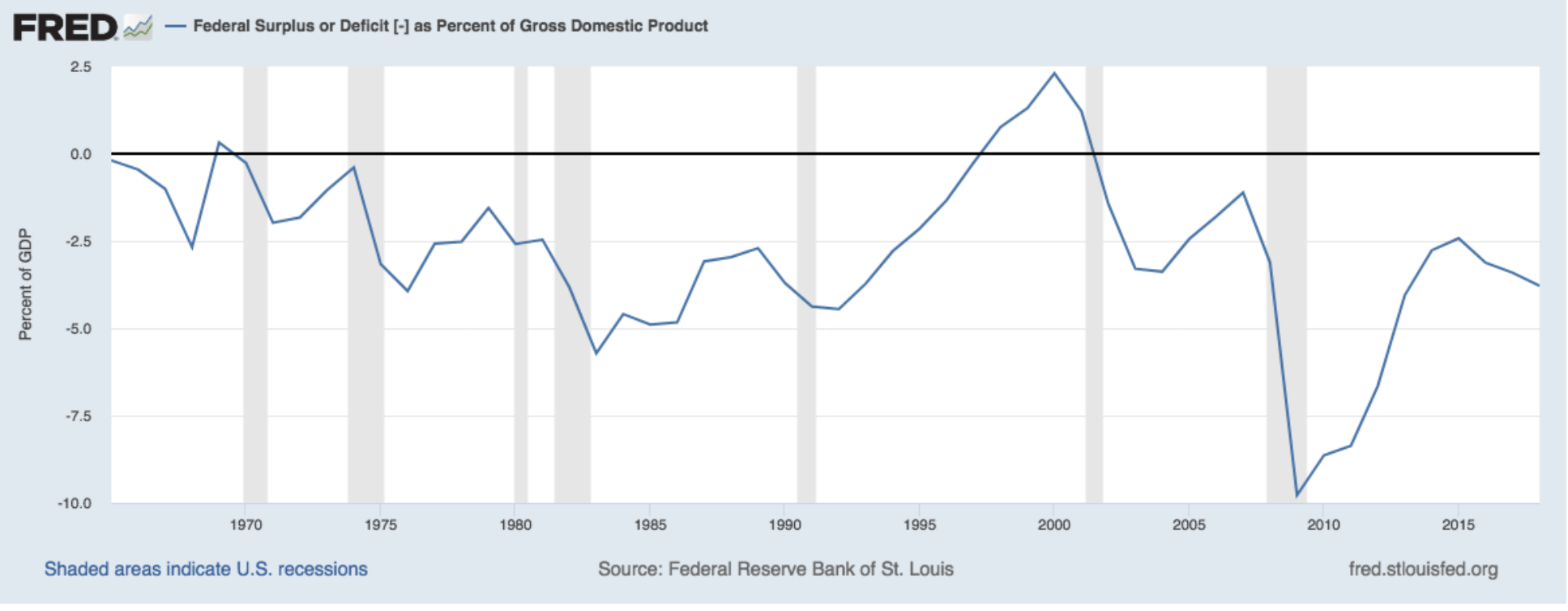
Government Surplus in the U.S. as % of GDP



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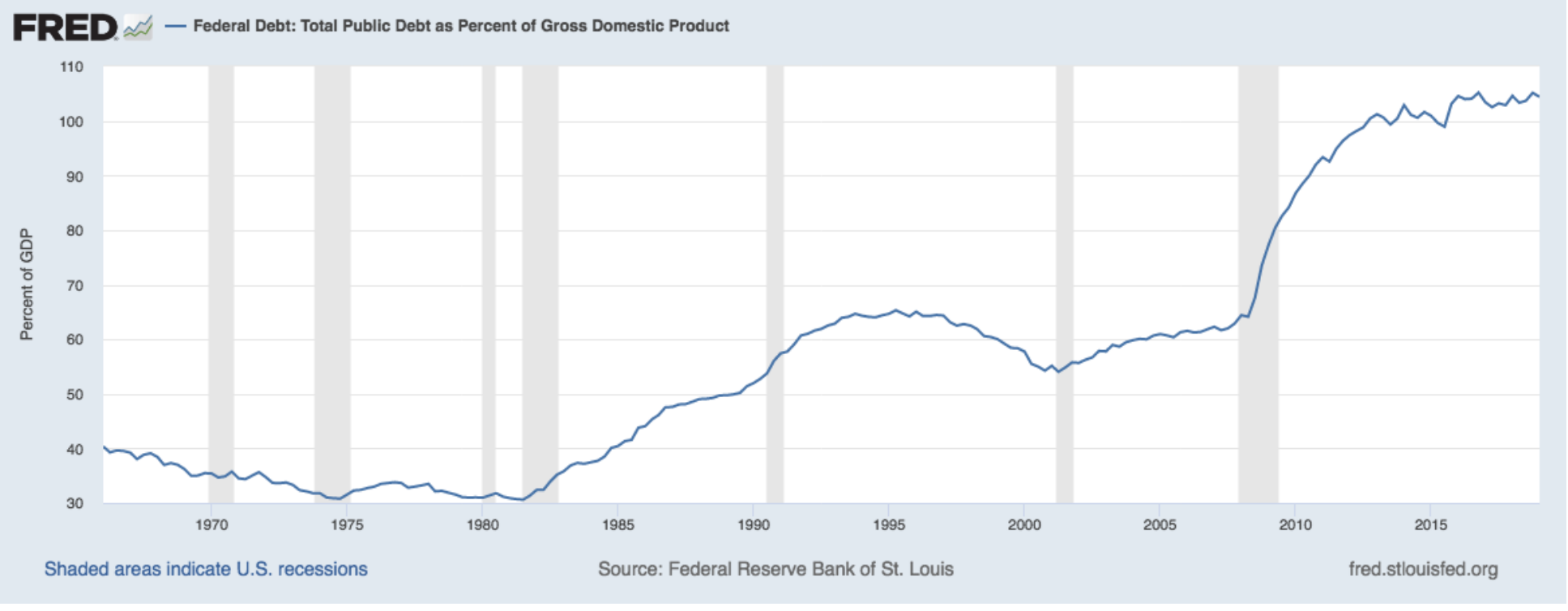
U.S. Public Debt as % of GDP



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Government: Observations

- Size of government (as fraction of GDP) has been increasing.
  - Both in terms of expenditure and revenue
- There are prolonged periods when the government is running deficit

A question we will ask later in the year

- What are the effects of government expenditure?

Co-movement

- Generally, **consumption and investment** spending as well as **employment** are very pro-cyclical
  - C, I, N co-move positively with output
- The real wage tends to be mildly pro-cyclical (why?)
- Government spending tend to be acyclical

GDP across countries

What are potential issues in comparing GDP across countries:

1. We need to be careful about unit of measurement
   - Choose US dollar
2. We need to be careful about size differences
   - Look at per capita GDP
3. We need to adjust for relative cost of living:
   - Use purchasing power parity (PPP)
     - Big Mac Index vs. Iphone5 index ?
     - links: http://www.economist.com/content/big-mac-index http://www.forbes.com/sites/timworstall/2013/12/04/the-global-price-map-for-apples-iphone-5-s/

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GDP per capita across countries

Data taken from the World Bank (2005):

Country	Amount
Ireland	40,087$
US	39,319$
Canada	30,272$
Italy	27,905$
Mexico	9,552$
Nigeria	1,208$
Ethiopia	778$

HUGE cross country differences: Rich/Poor $\approx$ 40 !!

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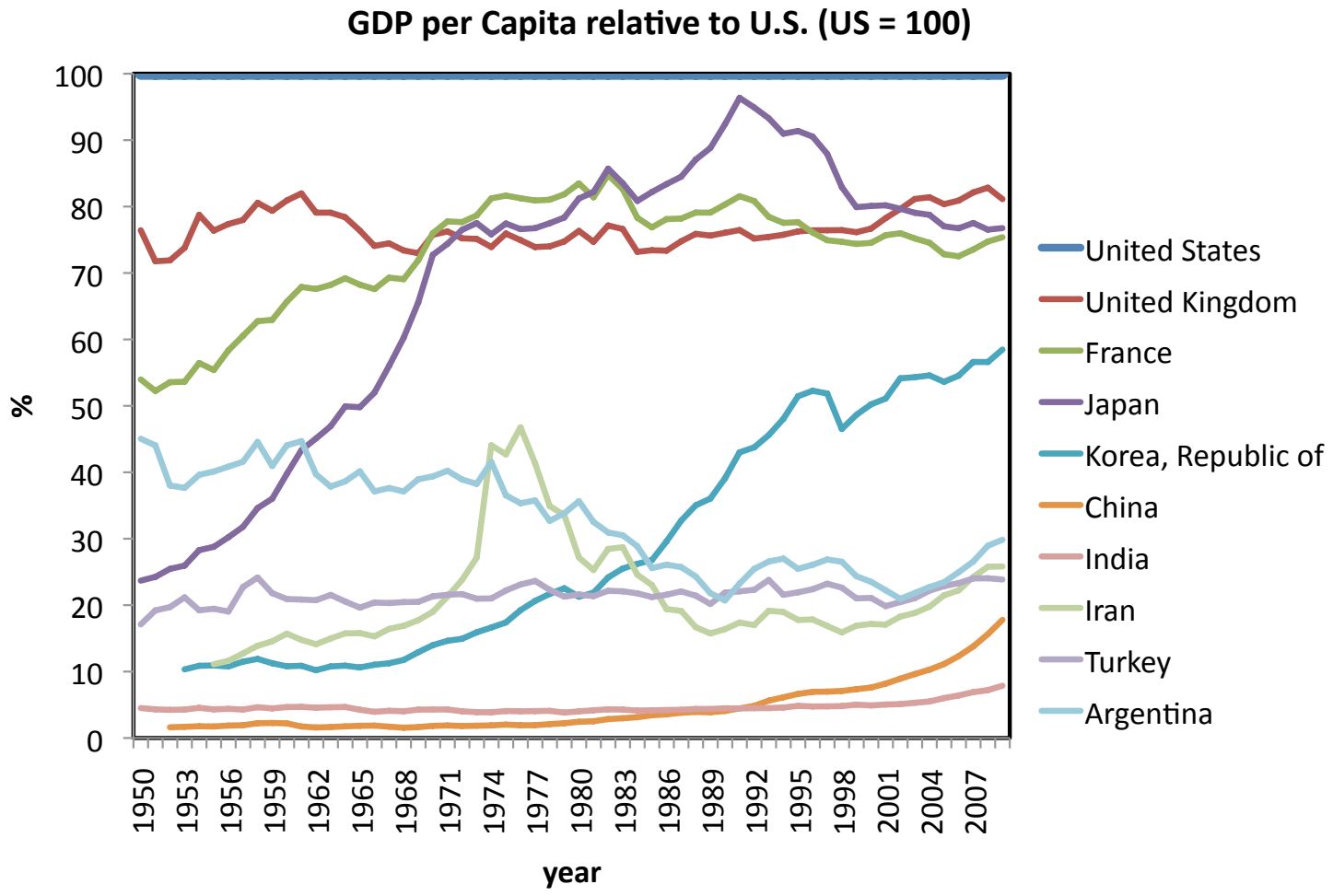
GDP per capita relative to the U.S.



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GDP relative to the U.S.: Observations

1. Some countries relative position have not changed
   - Some of them are rich (United Kingdom)
   - Some of them are poor (Iran, Turkey and India)
2. Some countries are catching up (France, Japan, Korea and China)
3. Some countries grow slower than the U.S. (Argentina)

Roadmap

This week $\Rightarrow$ Study quantities: GDP, Consumption...

Next week $\Rightarrow$ Study prices in the data

After that... $\Rightarrow$ Modeling: household, firm and government