1. Introduction to economic indicators

I. Exercise Questions

Readings:
Lecture slide set: #1, 3
The Economy: *Nominal GDP (1.1), real GDP (1.1)*
https://fred.stlouisfed.org/series/INDPRO: *Industrial Production Index (IPI)*

Problem 1 (*Nominal GDP versus real GDP*)

The Gross Domestic Product (GDP) is a measure of the market value of total production of goods and services in an economy for a given period of time. Nominal GDP is calculated by multiplying the quantities of the vast array of different goods and services by their prices.
It can be written like this:

(price of a book × number of books) + (price of a yoga lesson × number of yoga lessons) + … + (price × quantity) for all other goods and services

$$\text{Nominal GDP} \equiv \sum_i p_i q_i,$$

where p_i is the price of good i, q_i is the quantity of good i and $\sum$ indicates the sum of price times quantity for all goods and services in the economy.

GDP typically follows a trend, but also shows short-term fluctuations. We refer to these two issues as economic growth and business cycles, respectively. We can look at absolute values of GDP over time or GDP growth. Suppose we want to compare a fictive GDP in 2017 to GDP in 2018 from the Table 1. The numbers indicate billions €:

	Nominal GDP	**Real GDP**
2016	4539.9	4539.9
2017	6020.2	4979.3
2018	6343.3	5134.5

Table 1

(a) Calculate the growth rate of nominal GDP in 2018 in this model economy.

$(6343.3 - 6020.2)/6020.2 = 0.053 \Rightarrow 5.3$

(b) What is meant by *real* GDP? How do the GDP growth rates (nominal and real) compare? What is the change between price levels compared to the base year?

> The real GDP is the price change corrected nominal GDP. The real GDP is calculated with constant prices and is thus not biased by price changes. For example, the growth rate of real GDP in 2018 was:
>
> $$(5134.5 - 4979.3)/4979.3 = 0.031 \Rightarrow 3.1\%$$
>
> Approximately, the gap of 2.2 percentage points (5.3% - 3.1%) between nominal and real GDP is due to a rise of the price level (inflation) of goods and services.
> The base year provides the constant prices, which other reporting years refer to. In the table, 2016 is the base year, since real and nominal GDP are the same.

(c) How was nominal GDP adjusted to obtain real GDP?

> The GDP deflator indicates the ratio of nominal to real GDP:
>
> $$\text{GDP deflator} = \frac{\text{GDP in prices of the reporting year}}{\text{GDP in prices of the base year}}$$
>
> $$\rightarrow P_t = \frac{\text{nominal GDP}_t}{\text{real GDP}_t}$$
>
> $$\Leftrightarrow \text{real GDP}_t = \frac{\text{nominal GDP}_t}{\text{GDP deflator}}$$

Problem 2 (*GDP calculation*)

Consider an economy with only three producers: a farm, a mill, and a bakery. The farm buys seeds worth €100 from abroad in order to grow grain, which it sells to the mill for €400. The farm's wage costs are €100, its capital costs are €150.

The mill processes the grain to flour worth €1000, of which it sells 90% to the bakery and 10% to domestic consumers. The mill's wage costs are €200, its capital costs are €400.

The bakery processes the flour to bread worth €2000, of which it sells 75% to domestic consumers and 25% to foreign consumers. The bakery's wage costs are €300, its capital costs are €400.

Calculate the economy's GDP via

(a) production.

(b) spending.

(c) income.

(a) Production:
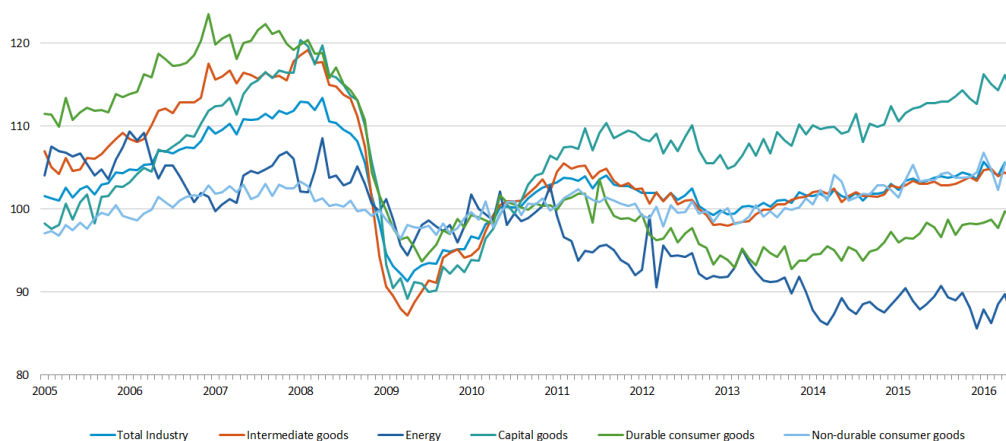GDP = (400-100) +(1000-400) +(2000-900) = 2000

(b) Spending:
GDP = 100+ 2000 - 100 = 2000

(c) Income:
GDP = (100+150+50) + (200+400+0) + (300+400+400) = 2000

Problem 3

Figure 1 shows a graph of the industrial production index (IPI).

Source: Eurostat

Figure 1: EU-28 Industrial production for total industry and the main industrial groupings, monthly data, seasonally adjusted, 2005-2016.

The IPI is a monthly business cycle indicator which represents output in the manufacturing, mining, electric and gas industries, relative to a base year. Thus, it does not express absolute production volumes or values, but the percentage change in production relative to a base year.

How do the GDP and the IPI compare conceptually?

> The IPI is an index of physical output - tons of steel, kilowatts of electricity, number of light vehicles, etc. - while (real) GDP is a measure of the value of output. Comparing industrial production and real GDP is like comparing apples and oranges, but in most economies, IPI correlates with GDP.

Problem 4

Look at the indicator overview in Figure 2. How do you read the different indicators?

	OUTPUT, PRICES AND UNEMPLOYMENT					TRADE, EXCHANGE RATES, BUDGET BALANCES AND INTEREST RATES				
ALL	Gross domestic product, % change on a year ago				Industrial production, % change on a year ago	Consumer prices % change on a year ago			Unemployment rate, %
Country	latest	quarter*	2017*	2018*	latest	latest	year ago	2017*	latest
United States	+2.0 Q4	+2.1	+2.3	+2.5	+0.5 Feb	+2.7 Feb	+1.0	+2.4	4.5 Mar
China	+6.8 Q4	+7.0	+6.5	+6.2	+6.3 Feb	+0.8 Feb	+2.3	+2.3	4.0 Q4*
Japan	+1.6 Q4	+1.2	+1.2	+1.0	+4.8 Feb	+0.2 Feb	+0.2	+0.7	2.8 Feb
Britain	+1.9 Q4	+2.7	+1.7	+1.2	+2.8 Feb	+2.3 Feb	+0.3	+2.7	4.7 Dec*
Canada	+1.9 Q4	+2.6	+2.0	+2.0	+3.5 Jan	+2.0 Feb	+1.4	+1.9	6.7 Mar
Euro area	+1.8 Q4	+1.9	+1.6	+1.5	+0.6 Jan	+1.5 Mar	+0.0	+1.6	9.5 Feb
Austria	+1.7 Q4	+2.0	+1.6	+1.5	-1.1 Jan	+2.2 Feb	+1.0	+1.7	5.7 Feb
Belgium	+1.2 Q4	+2.0	+1.4	+1.5	-1.6 Jan	+2.3 Mar	+2.2	+2.0	7.0 Feb
Estonia	+2.7 Q4	+7.8	+2.3	+2.7	+9.0 Feb	+2.8 Mar	-0.2	+3.1	6.6 Q4*
Finland	+1.0 Q4	+0.5	+0.9	+1.3	*nil* Jan	+1.2 Feb	-0.1	+1.3	9.2 Feb*
France	+1.1 Q4	+1.7	+1.3	+1.5	-0.7 Feb	+1.1 Mar	-0.1	+1.3	10.0 Feb
Germany	+1.8 Q4	+1.7	+1.6	+1.6	+2.3 Feb	+1.6 Mar	+0.3	+1.8	3.9 Feb*
Greece	-1.4 Q4	-4.8	+1.2	+1.7	+7.3 Jan	+1.3 Feb	-0.5	+0.8	23.5 Jan
Ireland	+7.2 Q4	+10.2	+3.0	+3.2	-10.6 Feb	+0.5 Feb	-0.1	+0.6	6.4 Mar
Italy	+1.0 Q4	+0.7	+0.9	+0.9	-0.5 Jan	+1.4 Mar	-0.2	+1.4	11.5 Feb
Latvia	+2.6 Q4	+8.1	+3.0	+3.2	+10.6 Feb	+3.2 Feb	-0.5	+2.6	9.3 Q4*
Lithuania	+3.2 Q4	+5.6	+2.9	+3.1	+3.7 Feb	+3.0 Feb	+0.9	+2.0	8.8 Feb*
Luxembourg	+3.8 Q4	+5.5	+3.7	+	-11.8 Jan	+1.7 Mar	+0.1	+	6.4 Feb*
Netherlands	+2.5 Q4	+2.5	+2.0	+1.7	+5.1 Feb	+1.1 Mar	+0.6	+1.2	6.3 Feb
Portugal	+2.0 Q4	+2.7	+1.7	+1.6	+2.1 Feb	+1.6 Feb	+0.4	+1.3	10.5 Q4*

Source: The Economist 04/2017

Figure 2

- Time horizon: monthly, quarterly, yearly

- Point in time: backward/predictive

- Changes: % indicative of a relative change or a rate (last column: unemployment rate)

- Correlations between indicators (in GDP & IP change, Germany ++ versus Greece -+)

II. Multiple Choice

Select one answer.

1. The GDP per capita of Greece was $22,494 in 2012 and $21,966 in 2013 (Source: eurostat). Based on these figures, the growth rate of GDP between 2012 and 2013 (rounded to two decimal places) was in%:

   (A) -24.4

   (B) 2.35

   (C) $\boxed{-2.35}$

   (D) 0.24

2. Table 2 shows the real GDP (in constant prices using 2015 US dollars) and the population of Japan in 2013 and 2014. Based on this information, which of the following statements is correct?

Year	2013	2014
GDP	$ 4,919,563,108,372.50	$ 4,601,461,206,888.10
Population	127,338,621	127,131,800

   Source: The World Bank

   Table 2

   (A) The GDP per capita in 2013 was $ 36,194.40.

   (B) The GDP per capita fell by 6.74% between 2013 and 2014.

   (C) The fall in the population was enough to offset the fall in the GDP for an overall growth in GDP per capita between 2013 and 2014.

   (D) $\boxed{\text{The GDP per capita fell by 6.31\% between 2013 and 2014.}}$

3. If the GDP per capita of a country doubles every 100 years, the shape of its graph on a linear scale is:

   (A) a downward sloping curve with increasing slope

   (B) an upward sloping curve with decreasing slope

   (C) $\boxed{\text{an upward sloping curve with increasing slope}}$

   (D) an upward sloping straight line

4. Figure 4 shows a graph of GDP per capita for West and East Germany, Japan and Spain between 1950 and 1990. Which of the following statements is correct?
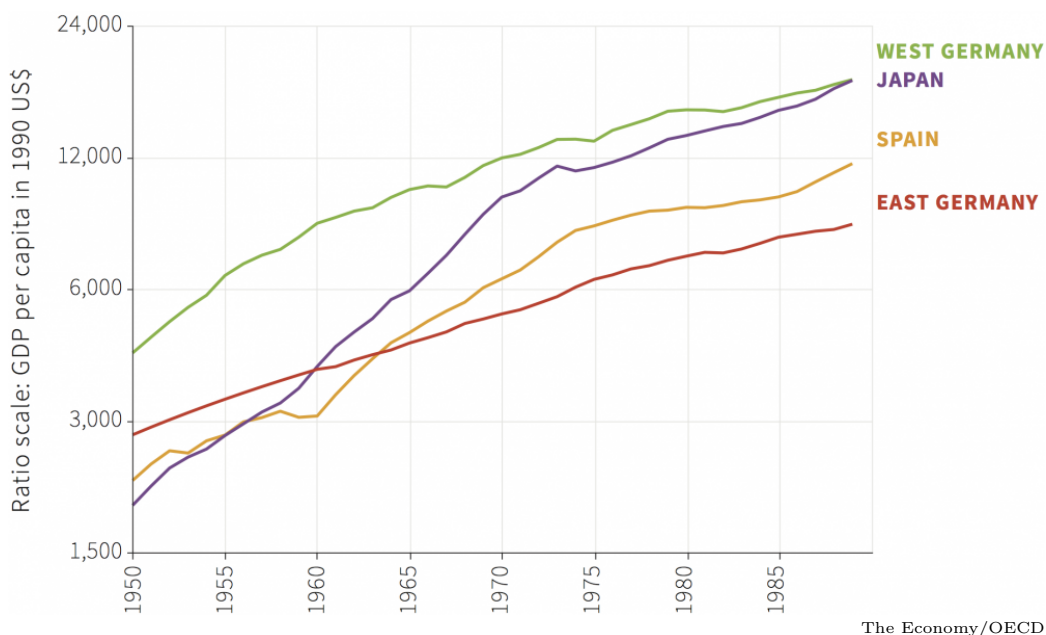

Figure 3

(A) Having a much lower starting point than West Germany was the only reason for East Germany's lower performance.

(B) The fact that West Germany and Japan have the highest GDP per capita in this graph means that they found the optimal economic system.

(C) Spain was able to grow at a higher growth rate than Germany between 1950 and 1990.

(D) The difference between East and West Germany implies that capitalism always promotes rapid growth while central planning is a recipe for stagnation.