EPA143A – Macroeconomics for Policy Analysis
Week One

THE CORONA-LOCKDOWN RECESSION

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LECTURE NOTE W-1

The required reading for Week 1 consists of:

- Lecture Note EPA143A Week 1.

Supporting videos:

- Wolf, Martin. 2020. 'Coronavirus: The world economy is now collapsing.' *The Financial Times*, April 16. Video: https://www.ft.com/video/fbaaa133-c94d-4e35-844b-bfde5f6a0635?playlist-name= latest&playlist-offset=1
- Sandbu, Martin. 2020. 'Coronavirus: how to tackle the economic crisis.' Video: https://www.youtube.com/watch?v=CwsTebQQAB8
- Measuring GDP using the Income Approach and the Expenditure Approach. Video: https://www.youtube.com/watch?v=ZdGnhusKnRU

This Lecture Note W-1 and the exercises are part of the exam materials.

Lecture Note W-1

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1. What is Gross Domestic Product or GDP? How is GDP defined and measured?

The Gross Domestic Product (GDP) of a country is a measure of the aggregate income (or value added) earned by all inhabitants of that country in a particular year. GDP is a flow variable (income earned per year). GDP is often called 'output' or 'production', but that is incorrect: GDP is a measure of income.

GDP is defined within the system of national accounts (SNA) of a country. These national accounts are the macroeconomic depiction of the national 'circular flow of income', using the double-entry bookkeeping principle and a sequence of accounts to show the relationship between the various economic variables. The starting point of these national accounts is the following accounting identity:

(1) total supply of goods and services = total demand for goods and services

This identity holds true for each particular good or service. Consider the following accounting table for Germany (in 2015). Table 1 is called an input-output matrix. The table distinguishes 10 sectors or industries: agriculture, mining, manufacturing, *etc*. In each row, one can read the demand for that particular industry and the row sum gives total demand for goods and services produced in that industry (as in eq. (1)). The columns give the total cost of production of each industry; the column sum is called 'gross output', which is the same as total supply in eq. (1). Note that equation (1) holds true for each industry: the column sum (the value of total supply) = the row sum (the value of total demand). Let us consider the input-output table in more detail.

Let us first look at supply or gross output – in the columns. Consider the third column, the column for manufacturing. The value of gross manufacturing output is equal to €1798 billion; manufacturing is Germany's largest industry in terms of gross output. The value of gross output is equal to the total cost of production. Using Table 1, we can write:

(2) value of gross output = cost of intermediate inputs + value added

In the case of German manufacturing, the cost of intermediate inputs is €1089, or the sum total of all intermediate inputs used by manufacturing = €34 billion inputs from agriculture + €37 billion inputs from mining + €632 inputs from manufacturing itself + ….. + €34 billion inputs from services. What Table 1 shows is that each industry is buying and using intermediate goods and services produced by the other industries and by itself. The entries on the diagonal of the input-output table constitute within-industry intermediate goods transactions. From eq. (2), it follows that:

(3) value added = value of gross output – cost of intermediate inputs.

TABLE 1
Input-Output Table: Germany (2015)
(billion Euros)

	Ag	Mi	Man	EGW	Con	WRT	Info	FIRE	Govt	Serv	FD	Demand
Ag	6	0	34	0	0	1	1	0	1	2	5	51
Mi	0	0	37	13	1	1	1	0	0	1	-43	12
Man	14	2	632	21	69	62	51	17	42	48	841	1798
EGW	1	1	33	28	3	9	14	9	10	10	70	187
Con	0	0	7	4	24	7	18	15	9	4	187	275
WRT	7	1	182	14	17	134	36	14	30	26	310	772
Info	2	1	90	16	22	78	187	58	124	42	526	1144
FIRE	1	0	38	7	8	51	70	103	38	26	307	650
Govt	0	0	1	0	0	0	1	0	1	0	751	755
Serv	1	0	34	5	2	18	36	23	32	48	495	695
VA	18	6	710	80	130	411	730	410	468	488	0	3451
GO	51	12	1798	187	275	772	1144	650	755	695	3451	9790

Source: OECD statistics.
Notes: Ag = agriculture; Mi = mining; Man = manufacturing; EGW = electricity, gas & water supply; Con = construction; WRT = wholesale trade, retail trade and transportation and storage; Info = ICT and information; FIRE = finance, insurance & real estate; Govt = public administration and defense; Serv = other services including education, health care, arts & entertainment and food and accommodation. VA = gross value added; GO = gross output or supply. FD = final demand.

Value added in German manufacturing equals €1789 billion - €1089 billion = €710 billion. If gross output is the value of the total supply of finished goods and if the cost of intermediate inputs is the value of components, raw materials, energy, services (such as insurance and transportation) and other inputs, then value added is the value added by labour and capital to these intermediate inputs (in the production process). Value added, therefore, is income, or:

(4) value added = wages and salaries + profits = gross domestic product

We are now in a position to calculate Germany's GDP (in 2015) as the sum of value added generated in each of the 10 industries (i = 1, …, 10) in Table 1:

(5) GDP = $\sum_{i=1}^{10} va_i$ =
= 18+6+710 +80+130 +411+730+ 410+468+488 = €3451 billion

Now we can answer the question: how do we define and measure GDP? The answer is: GDP is income or value added (created in the process of production) and we measure it as the sum of all value added created in all industries in a country in one particular year. We can see that GDP

is related to gross output, but not the same as gross output. Gross output is the value of total production; in Germany, gross output in 2015 was equal to €6339 billion. GDP is included in this number, but GDP (at €3451 billion) is only a proportion (54% in this example) of gross output; the other part of gross output is cost of intermediate inputs. The is the first method to measure GDP, *i.e*. GDP is measured from the side of supply, as the sum of all value added generated in production.

There is another method to measure GDP, however.

Let us go back to Table 1 and consider the rows – or the demand side of equation (1). Consider the row for manufacturing. The row sum is €1798 billion, which the value of total demand for manufacturing output (which equals gross output, as we did see above). Total demand for manufacturing goods consists of two parts:

(6) value of total demand = value of demand for intermediate inputs + value of final demand (FD)

Final demand for manufactured goods is the demand for finished goods by end-users; end-users include consumers (households), government and firms (when they purchase machines, or capital goods). Final demand for manufacturing goods in Germany in 2015 equaled €841 billion; this means that less than 50% of the demand for manufacturing goods came from end-users. More than half of the demand for manufactured goods is demand for intermediate inputs, coming from (other) industries. We can see in the input-output Table 1 that the agricultural sector (row 3, column 1) is demanding €14 billion of intermediate inputs (for example, fertilisers, plastics, chemicals) produced by the manufacturing industry; the wholesale/retail/transportation industry is demanding €62 billion of manufactured goods (row 3, column 6). It can also be seen that the manufacturing sector is demanding €632 billion of goods produced by the manufacturing sector itself; these are industrial components and intermediates produced by (say) a plastics manufacturer and demanded by a car manufacturer.

If eq. (1) holds true, then the value of gross output (in eq. (2)) must be equal to the value of total demand in eq. (6):

value of gross output = value of total demand

and therefore:

cost of intermediate inputs + value added =
value of demand for intermediate inputs + value of final demand (FD)

For the economy as a whole, the cost of intermediate inputs is equal to the value of the demand for intermediate inputs. This can be seen best when we aggregrate the 10 industries in Table 1 into just one single industry (the macro-economy), as was done in Table 2. The cost of

intermediate inputs is €2888 billion, which is – as follows from the double-entry accounting – equal to the demand for intermediate inputs of €2888 billion.

This implies that we can write:

(7) total value added = value of total final demand (FD)

And because value added is GDP, it follows that

(8) GDP = value of total final demand (FD)

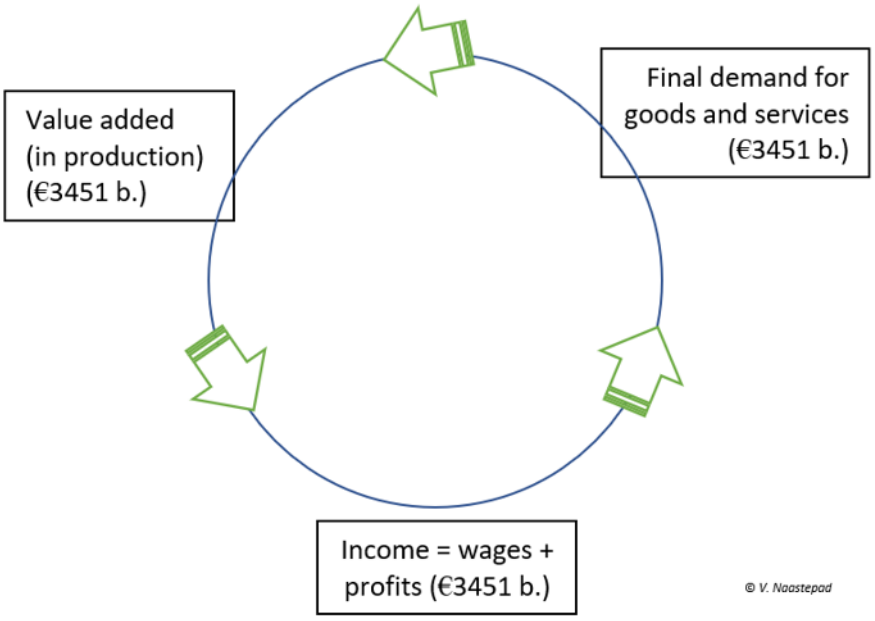
This is the second method to measure GDP, i.e. to measure GDP from the side of (final) demand.

TABLE 2
The Macro-Economy of Germany (2015)
(billion Euros)

	demand for intermediate inputs	final demand	total demand
all industries together	2888	3451	6339
value added	3451	0	3451
gross output	6339	3451	9790

The two approaches to measuring GDP are mutually consistent. This can be seen by looking at the circular flow of income in the macro-economy. The circular flow of income is at the heart of any macro-economic model; it describes the process of production of goods & services → employment → income generation (and income distribution and redistribution) → demand for goods & services (based on income) → production *etc*. The circular flow of income can be visualized in the following graph (Figure 1).

FIGURE 1
The circular flow of income: Germany (2015)



Finally, we have to discuss the concept of 'final demand'. We have already seen that final demand is the demand for finished goods (either consumption goods or capital goods) by end-users (who could be households or firms). The definition of aggregate final demand (FD) in the system of national accounts is:

(9) $FD = C + G + I + E - M$

where FD = total final demand (for all industries together); C = private consumption demand (by households); G = government consumption demand (or public current spending); I = investment demand (or demand for capital goods = machines); E = export demand (the demand for goods and services produced in our economy by households and firms in the rest of the world); and M = import demand (= the demand for goods and services produced in the rest of the world by households and firms in our economy).

If we combine equations (8) and (9), we obtain:

$GDP = FD = C + G + I + E - M$

This equation states that "value added (generated in production)" must be equal to the sum of C + G + I + E – M (= FD). This follows from the circular flow of income.

Table 3 presents final demand – for each industry and for the economy as a whole – in Germany (in 2015). Total final demand is €3451 billion. Around 60% of total final demand is consumption demand (€2024 billion), and around 16% is investment demand (€561 billion).

Exports are 33% of final demand (€1132 b.) and imports almost 25% (€846 b.). This means that the German economy is selling (exporting) more to the rest of the world than it is importing. The difference between value of exports and value of imports is called the trade balance:

(10) Trade balance = E – M = €1132 - €846 = €286 billion (in Table 3)

Germany has a trade surplus, because E > M. Germany's trade surplus of €286 billion is equal to 8.3% of its GDP (in 2015) – which is a very large surplus in the international context. Clearly, not all economies in the world can have a trade surplus at the same time. Since Germany has a large trade surplus, other countries in the world economy must have a trade deficit, which means E < M.

TABLE 3
Final Demand in Germany (2015)
(billion Euros)

	C	G	I	E	*minus* M	FD
Ag	21	0	1	7	-23	5
Mi	14	0	0	2	-59	-43
Man	313	35	177	790	-474	841
EGW	41	20	8	6	-4	70
Con	-12	0	200	1	-1	187
WRT	196	59	29	160	-135	310
Info	369	28	132	106	-109	526
FIRE	282	14	11	37	-37	307
Govt	507	243	1	0	-1	751
Serv	293	180	2	23	-3	495
Total	*2024*	*580*	*561*	*1132*	*-846*	*3451*

Source: OECD statistics.
Notes: see TABLE 1.

2. By how much might GDP in the European Union decline due to the lockdown according to the IMF?

Macro-economists are finding it hard to give a reasonable forecast of GDP growth in the next few years, because they have no experience of a macro-crisis caused by both supply-side disruptions (the breakdown of global production chains, the closure of restaurants, hotels, museums, etc., the sudden stop of international trade and transportation due the lock-down) and demand deficiency (which is caused by higher unemployment, lower incomes and massive uncertainties). As a result, the IMF (2020) writes that there is

> "extreme uncertainty around the global growth forecast. The economic fallout depends on factors that interact in ways that are hard to predict, including the pathway of the pandemic, the intensity and efficacy of containment efforts, the extent of supply disruptions, the repercussions of the dramatic tightening in global financial market conditions, shifts in spending patterns, behavioural changes (such as people avoiding shopping malls and public transportation), confidence effects …."

The IMF (2020) predicts a decline in global GDP by 3% in 2020, which is much worse than during the 2008–09 financial crisis. GDP of the European Union is projected to decline by 7.1% and in the Eurozone by 7.5% in 2020 (Table 6). The economies of Greece and Italy are hurt most: their GDP is projected to fall by 10% and 9.1%, respectively (Table 6).

TABLE 6
IMF (2020) Forecast of real GDP growth in 2020 and 2021 (%)

	IMF (2020) World Economic Outlook		
	actual 2019	2020	2021
European Union	**1.7**	**-7.1**	**4.8**
Eurozone	**1.2**	**-7.5**	**4.7**
Belgium	1.4	-6.9	4.6
Germany	0.6	-7.0	5.2
Ireland	5.5	-6.8	6.3
Greece	1.9	-10.0	5.1
Spain	2.0	-8.0	4.3
France	1.3	-7.2	4.5
Italy	0.3	-9.1	4.8
Netherlands	1.8	-7.5	3.0
Austria	1.6	-7.0	4.5
Portugal	2.2	-8.0	5.0
Finland	1.0	-6.0	3.1

Source: Based on IMF (2020), *World Economic Outlook*, April.

The IMF forecasts are, as Martin Wolf explains (in the video), most likely too optimistic. In its baseline scenario, the IMF assumes that the pandemic fades in the second half of 2020 and containment efforts can be gradually unwound. Global GDP is then projected to grow by 5.8% in 2021 as economic activity normalizes, helped by macro-economic policy support. We have underlined two crucial assumptions underlying the IMF scenario:

- the corona-virus spreading is contained in the 2nd half of 2020; and
- governments can and do use macro-economic policy to support the recovery process.

Both assumptions may prove to be too optimistic – as is explained by Martin Wolf (2020).

3. How does the Office for Budget Responsibility estimate the impact on the GDP of the U.K.?

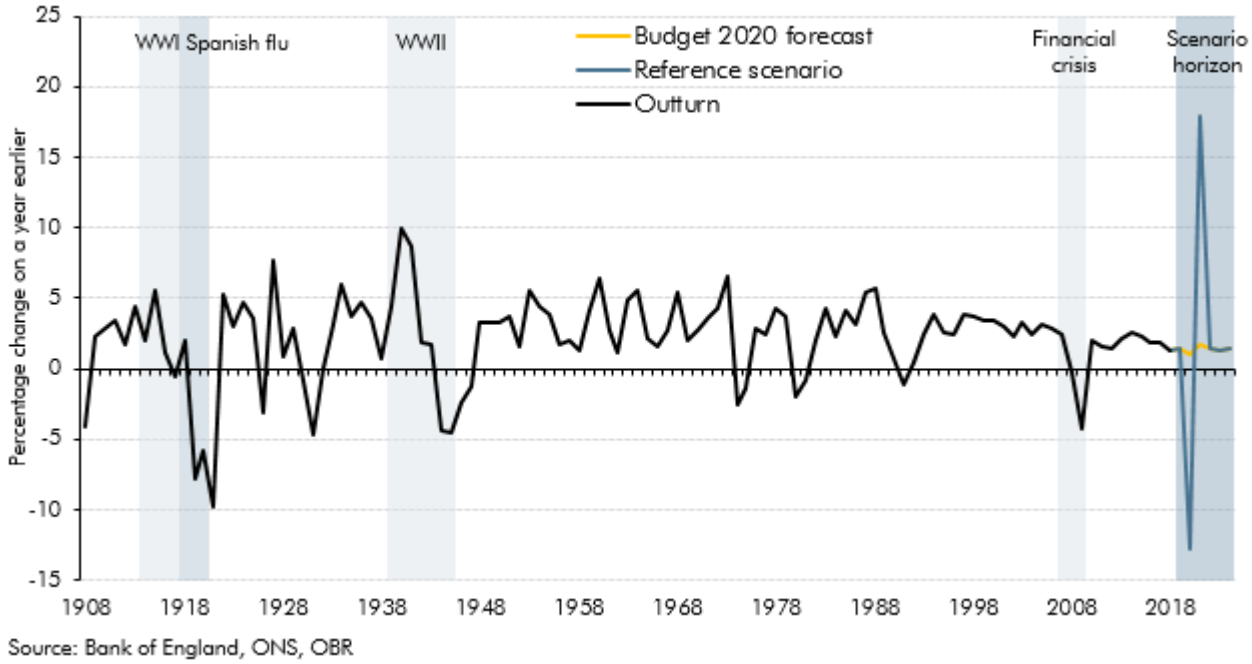
The Office for Budget Responsibility (OBR) first estimates the decline in British GDP in Quarter 2 of 2020 by estimating the GDP decreases by industry. This is done in their Table 1.2. For instance, the OBR 'predicts' that Q2 GDP in the U.K. will decline by 70% in construction, 85% in accommodation and food services, *etc*. Each industry specific decline is then multiplied (weighted) by the share of that industry in total GDP. The share of construction in British GDP is 6.1% and of accommodation and food services 2.8%. Multiplying the industry-specific decline for construction (-70%) by the share of that industry in GDP (0.061) gives -4.27%; that means, the 70% decline in construction activity will reduce aggregate GDP by 4.27%. The impact of the 85% in activity levels in accommodation and food services will lower aggregate GDP by 2.38%. Taken all industry-specific impacts together, U.K. GDP is projected to decline by 35% - see Table 1.2 below.

To estimate the decline in GDP for the whole year (2020) the OBR assume that the 35% decline in Q2 is halved in Q3 (GDP in Q3 is 17.5% lower than GDP in Q1) and activity returns to pre-outbreak levels in the fourth quarter (so the scenario assumes that it is not necessary to reimpose the restrictions to deal with a new outbreak in the autumn). Some longer-term economic 'scarring' is of course possible, even if restrictions are not reintroduced, but the OBR has not attempted to quantify such effects. The scenario is quite optimistic, because the recovery is rapid. Nevertheless, British GDP in 2020 is projected to decline by 13%, which is much more than the IMF (2020) forecast of -6.5%. As Chart 1.2 (below) shows, this would be the largest drop in British GDP since 1908.

Table 1.2: Output losses by sector in the second quarter of 2020

Sector	Per cent		
	Weight in whole economy value added	Effect on output relative to baseline	Impact on GDP growth
Agriculture	0,7	0	0,00
Mining, energy and water supply	3,4	-20	-0,68
Manufacturing	10,2	-55	-5,61
Construction	6,1	-70	-4,27
Wholesale, retail and motor trades	10,5	-50	-5,25
Transport and storage	4,2	-35	-1,47
Accommodation and food services	2,8	-85	-2,38
Information and communication	6,6	-45	-2,97
Financial and insurance services	7,2	-5	-0,36
Real estate	14,0	-20	-2,80
Professional, scientific and technical activities	7,6	-40	-3,04
Administrative and support activities	5,1	-40	-2,04
Public administration and defence	4,9	-20	-0,98
Education	5,8	-90	-5,22
Human health and social activities	7,5	50	3,75
Other services	3,5	-60	-2,10
Whole economy	**100,0**	**-35**	-35,42

Chart 1.2: GDP decline in historical perspective



Source: Bank of England, ONS, OBR

4. What is the difference between nominal GDP (or GDP at current prices) and real GDP (or GDP at constant prices)?

Macro-economists generally use the symbol *Y* for nominal GDP; let us use lower-case '*y*' for real GDP and the symbol '*p*' for (the index of) the general price level (in the base year $p = 1$).

We define nominal GDP as the product of real GDP and the general price index (for example, the GDP deflator):

(11) $$Y = p \times y$$

or, alternatively, we define real GDP as:

(12) $$y = Y/p$$

If we express equation (11) in (instantaneous) growth rates (see the Appendix on how to do this), where the growth rate of nominal GDP $\hat{Y} = \Delta\log(Y) = \Delta\log(P) + \Delta\log(y)$, we can write:

(13) $$\hat{Y} = \hat{p} + \hat{y}$$

Hence, the growth rate of nominal GDP = inflation + the growth rate of real GDP; note that inflation = the growth rate of the general price level. Using (13), it follows that the growth rate of real GDP is:

(14) $$\hat{y} = \hat{Y} - \hat{p}$$

Let us look at the historical data on nominal GDP growth, inflation and real GDP growth. The data base is the AMECO database of the European Commission (link: https://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm); this is an easy-to-use and very relevant database.

Here you can find GDP at current prices (= nominal GDP = Y), GDP at constant prices (= real GDP = y) and the GDP deflator (= the general price index = p). We have collected data on Y, y and p for Italy, Spain, the Netherlands and the U.K. (1960-2019). The results appear in Table 7.

TABLE 7
Nominal and real GDP growth: selected countries 1960-2019

Italy:	1960-2000	2000-2019
nominal GDP growth	12.1%	1.9%
rate of inflation	8.4%	1.7%
real GDP growth	3.7%	0.2%
Spain:	1960-2000	2000-2019
nominal GDP growth	13.2%	3.5%
rate of inflation	A	1.8%
real GDP growth	4.5%	1.7%
The Netherlands:	1960-2000	2000-2019
nominal GDP growth	7.7%	B
rate of inflation	4.2%	1.7%
real GDP growth	3.5%	1.7%
United Kingdom:	1960-2000	2000-2019
nominal GDP growth	9.8%	3.8%
rate of inflation	6.9%	2.0%
real GDP growth	2.9%	C

Nominal GDP (or *Y*) is determined as the sum of all value added created in the economy on one year (eq. (7)), or alternatively as the sum of C + G + I + E – M (= FD) in eq. (8). The general price index *p* is constructed by the Central Statistical Office, based on actual data on prices and spending. If *Y* and *p* are known, we can calculate real GDP as follows: *y* = *Y* / *p*. Let us finally look more closely at the general price index.

Let us assume that *p* = the GDP deflator. The GDP deflator is calculated in the following steps:

- for each industry in the input-output table, nominal value added is defined as follows: $Y_j = p_j\, x_j - [\, p_1\, a_{1j} + p_2\, a_{2j} + \cdots .. + p_n\, a_{nj}]$, where $Y_j =$ nominal value added in industry *j*; $p_j =$ the price of the goods produced by industry *j* (in the base year $p_j = 1$); $x_j =$ gross output of industry *j*; and $a_{ij} =$ the quantity of intermediate inputs produced by industry *i* and demanded by industry *j*.

- next, we can derive real value added as follows: $y_j = Y_j/p_j = x_j - [\, p_1\, a_{1j} + p_2\, a_{2j} + \cdots .. + p_n\, a_{nj}]/p_j$. This approach is called the 'single -deflation' method.

- if we sum all the value added (by industry) across all industries, we get real GDP = y = $\sum_{i=1}^{n} y_i$.

- finally, the (aggregate) GDP deflator $p = Y/y$.

- N.B. an alternative (more precise) method, called the 'double-deflation' method, calculates <u>real value added</u> as follows: $y_j = x_j - \frac{[\,p_1\, a_{1j}]}{p_1} - \frac{[p_2\, a_{2j}]}{p_2} - \cdots .. - \frac{[p_n\, a_{nj}]}{p_n}$.

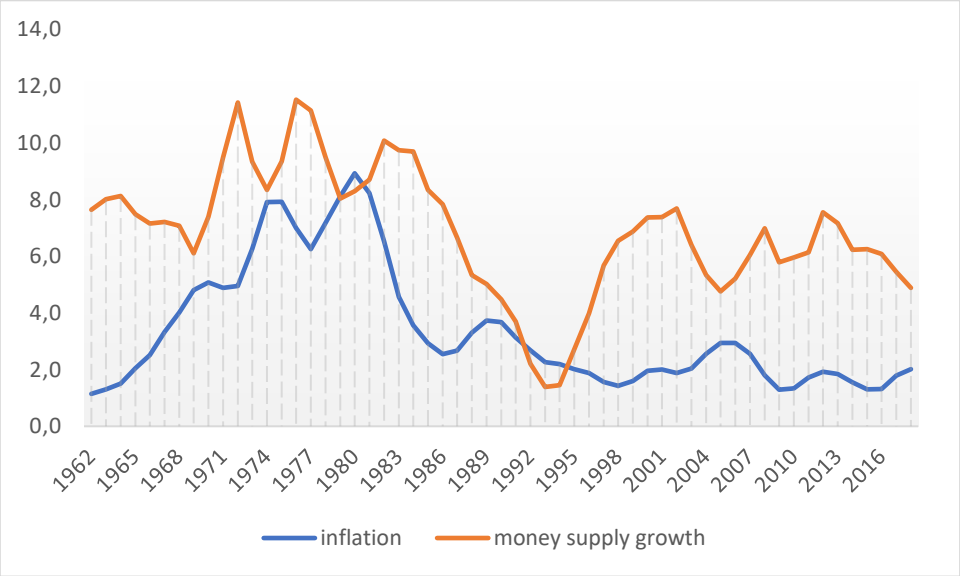
Growth of the GDP deflator means that the general price level increases, or that there is inflation. In Figure 2, the inflation rate of the U.S.A during 1961-2019 (calculated as a three-year moving average) has been plotted. It can be seen that inflation was high and rising in the 1970s; U.S. inflation peaked in 1980 (at 8.9%) and then declined to below 2% per year in the 1990s. U.S. inflation during the years 2010-2019 has hovered around 1.5% per year.

There is a widespread belief that inflation is closely related to (increases in) money supply. Many economists claim that if central banks like the ECB or the Federal Reserve raise money supply (M^S), for instance by a policy of 'quantitative easing', inflation must increase. In response to the corona-virus recession, central banks are providing the banks and government with extra 'liquidity', which will 'cause' higher inflation in the future.

We will discuss the process of money creation, the role of banks and central banks, and theories of exogenous versus endogenous money in Week 7 (of this course EPA143A) – but let us already now dispel the validity of this widespread claim that higher $M^S \rightarrow$ higher inflation.

Consider Figure 2 which includes the growth of money supply (measured as M3, three-year moving averages) for the U.S.A during 1961-2019. It can be seen that as inflation rises in the 1970s, M^S is also growing; this is consistent with claim that higher money supply leads to higher inflation (it is not proof). But then inflation starts to decline (from 1980 onwards), while M^S continues to grow – the blue line declines, the orange line stays up, and only begins to decline after 1984. This is inconsistent with the claim that higher $M^S \rightarrow$ higher inflation, because what we can see is the opposite: lower inflation $\rightarrow$ lower M^S. Finally, the growth rate of M^S increases considerably after 1995 and stays high, but inflation remains (very) low, below 2%. Hence, higher M^S did not lead to any increase in inflation during 1995-2019. The conventional wisdom (higher $M^S \rightarrow$ higher inflation) is wrong, as so often.

FIGURE 2
Inflation and money supply growth: U.S. economy (1961-2019)
(%; three-year moving averages)



Source: AMECO database and OECD Main Economic Indicators database.

5. What is unemployment? How is the rate of unemployment defined? What will most likely happen to unemployment in this economic crisis?

The official definition of an unemployed person is a person aged at least 16, who is without work during the reference week, available to start work within the next two weeks (*i.e.* was available for paid employment or self-employment) and is actively seeking work (*i.e.* has actively sought employment at some time during the previous four weeks) or has already found a job to start later, *i.e.* within a period of at most three months.

The official unemployment rate (known as U3) is defined as the number of unemployed persons as a share (or a percentage) of the total active population (= the labour force). The labour force is the number of people (in the age bracket 16-65 years) employed and unemployed. Persons in employment are those who during the reference week did any work for pay, or were not working but had jobs from which they were temporarily absent.

This means that people younger than 16 and (retired) people older than 65 are not included in the labour force. It also means that people who are not actively looking for a job are not part of the labour force. And students (who are supposed to be studying 40 hours per week) are not available for paid employment and hence are excluded from the labour force.

It also means that people who after becoming unemployed do not actively search for a new job, are not counted as being unemployed. These unemployed workers are called discouraged

workers and/or persons marginally attached to the labour force. The number of discouraged workers can be millions of people – as in the U.S.A. during 2009-2015 (see below).

Table 8 presents the number of unemployed workers, the unemployment rates and the number of people in the labour force in the Eurozone (12 countries) and the U.S.A. during 2010-2019. The Eurozone labour force consists of around 155 million persons; in 2010, 15.1 million workers were without a job; the number of unemployed workers in the Eurozone declined to 12 million in 2019. The U.S. labour force is around 160 million workers. In 2010, 9.6 million U.S. workers were unemployed; the number of unemployed declined to 6 million workers in 2019. The U.S. unemployment rate in 2019 (3.7%) was less than half as large as the Eurozone rate of unemployment (7.7%) in the same year. This concerns six million more unemployed persons in the Eurozone.

We must note that the number of discouraged workers, who are unemployed but not counted as such, has been very high during these years. Consider the U.S.A. in 2019: the 'official' rate of unemployment was 3.7% (or 6 million jobless workers). The number of discouraged workers in 2019 was around 5 million persons. That would mean that the real number of unemployed workers was 11 million persons. If we add these 5 million discouraged workers to the labour force (of 162.8 million workers), we can calculate the 'real' unemployment rate as follows: $u = \frac{11\ million\ unemployed}{162.8\ million + 5\ million} \times 100\% = 6.6\%$ (instead of 3.7%). The 'narrowly defined' unemployment rate of 3.7% is called U3; the 'broader' definition of the unemployment rate (which includes discouraged workers) is called U6.

TABLE 8
Unemployment (U), unemployment rates (Ur) and labour force (Lf):
the Eurozone and the USA (2010-19)

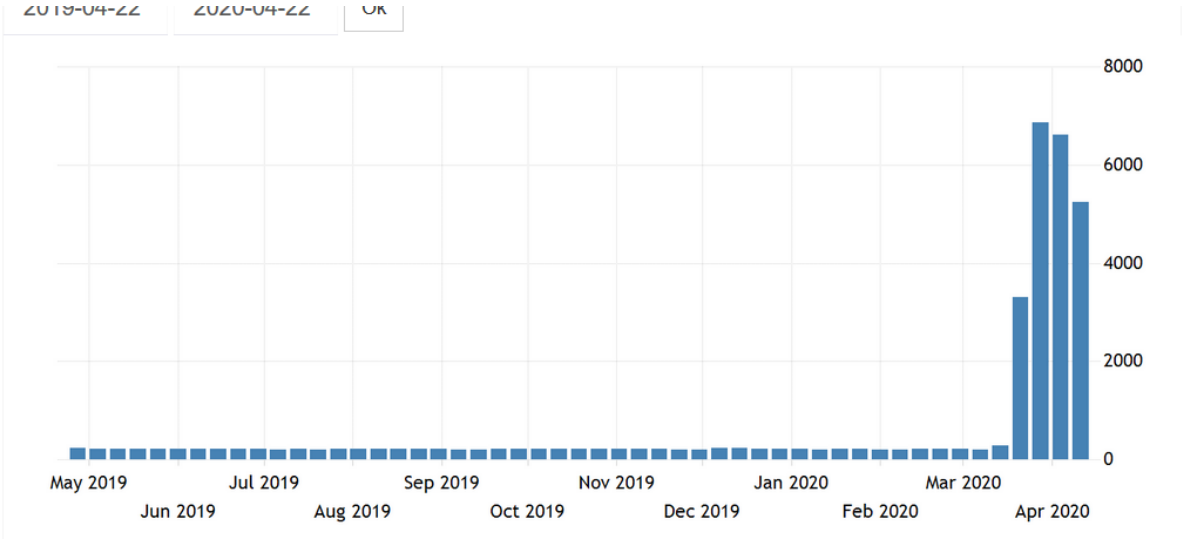
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
EU U	15.1	15.2	17.3	18.4	17.8	16.7	15.6	14.2	12.9	12.0
EU Ur	10	10.1	11.3	12	11.6	10.9	10.1	9.2	8.3	7.7
EU Lf	150.9	150.9	152.8	152.9	153.5	153.4	154.3	154.1	155.5	155.3
USA U	14.8	13.7	12.5	11.5	9.6	8.3	7.8	7.0	6.3	6.0
USA Ur	9.6	8.9	8.1	7.4	6.2	5.3	4.9	4.4	3.9	3.7
USA Lf	154.4	154.5	154.4	154.9	155.1	156.5	158.2	158.7	161.9	162.8

Note: Unemployment and labour force are in millions of persons.
Source: AMECO database.

The corona-virus lockdown is leading to huge increases in unemployment. In the U.S.A., the number of workers filling for unemployment benefits was 5.245 million in the week ending April 11, down from the increase of 6.615 million workers in the week of April ending April 5.

Over the past one month, as the corona-virus pandemic swept across the U.S. economy, more than 22 million registered as newly unemployed. Figure 3 presents the enormous increase in unemployment registrations in the U.S.A. during March and April 2020. U.S. unemployment has increased to more than 25 million unemployed workers, or more than 15% of the labour force. Some economists fear that the U.S. unemployment rate will increase to more than 25% of the labour force. This would mean that more than 40 million U.S. workers will become jobless.

FIGURE 3
Increase in unemployment registrations: the U.S. economy
(March & April 2020; in thousands)



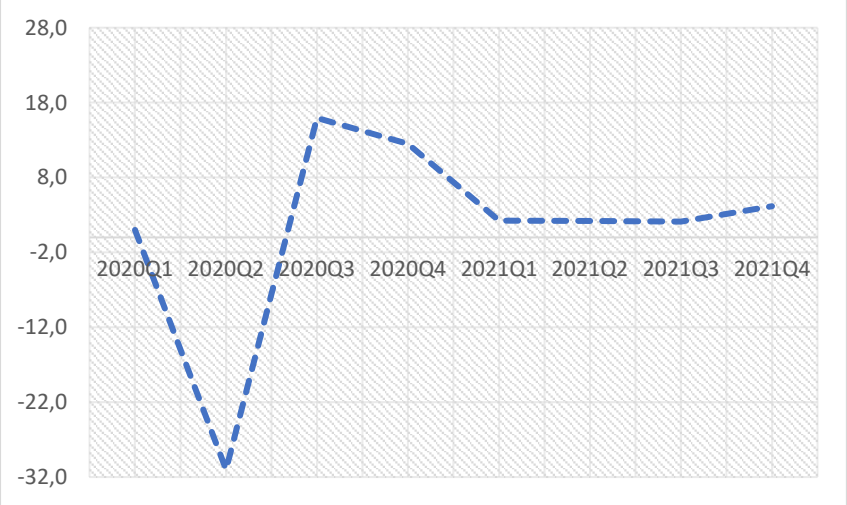
Unemployment rates in Europe are rising quickly as well. Unemployment in Europe could nearly double in the coming months, with up to 59 million jobs at risk from permanent cutbacks as well as reductions in pay and hours because of the coronavirus pandemic (according to McKinsey consultants). If the unemployment rate in the Eurozone-12 doubles – from 7.7% on average in 2019 to 15.4% in 2020 – this will mean that an additional 12 million workers will lose their jobs.

6. What is the official definition of a recession?

Recessions are generally defined as two consecutive quarters of negative economic growth. as measured by the quarter-on-quarter figures for real GDP (after seasonal adjustment). This definition is used in the E.U., the U.K., the U.S.A. and the OECD.

Real GDP will decline (by 30% or more) in Quarter 2 of 2020. but if the economy recovers in Quarter 3 (see Figure 4) and real GDP grows (relative to Quarter 2). we cannot call the current crisis a 'recession' – even if real GDP growth on an annualized basis is negative (-7% or more).

FIGURE 4
Forecast of real GDP growth:
Eurozone (12 countries). 2020Q1 – 2021Q4



Source: This is the pattern of recovery of real GDP assumed by the OBR, but applied to the Eurozone-12.

7. What is meant by the term 'fiscal policy'? Why and how can governments help to contain or prevent an economic crisis due to the COVID-19 crisis? What is monetary policy?

Fiscal policy is the means by which a government adjusts its spending levels (public current expenditure G in equation (9) and public investment (which is part of investment I in eq. (9)) and tax rates in order to influence the level of activity in a nation's economy. The level of economic activity is expressed by the level of GDP.

The simplest way to understand how fiscal policy works is to look at the income-expenditure identity:

$$GDP = Y = FD = C + G + I + E - M$$

Now suppose that consumers decide to reduce their spending in a recession, which means C declines; assume that firms reduce investment, *i.e*. I goes down as well. Even if we do not yet know how all this is supposed to work, from the identity it is clear that if both C and I decline, Y (= the level of economic activity) must decline as well – keeping all other factors constant.

Governments can use fiscal policy to counter the recession (i.e. the decline in GDP) by raising G (= public current expenditure), by raising public investment (which is part of investment I), or by lowering taxation – this will raise disposable (post-tax) incomes of households and probably raise C (again). This is expansionary fiscal policy, because governments deliberately act to offset the decline in real GDP. We also call this fiscal stimulus.

The government can also use fiscal policy to slow down economic growth. Suppose GDP is rising fast and the economy becomes 'overheated': inflation will start to increase, imports increase and the balance of trade may turn negative. To stabilize the economy, government can reduce G, reduce public investment, or raise taxes. This is called contractionary fiscal policy or fiscal austerity. We will return to fiscal policy when we work on the neoclassical macro model, the Keynesian macro model and the IS-LM model.

Fiscal policy (by the government) the sister strategy to monetary policy through which a central bank attempts to influence inflation and GDP. These two policies are used in various combinations to achieve a country's economic goals (including a low rate of unemployment, a certain rate of real GDP growth, and low inflation). Central banks have (in theory) two instruments of monetary policy:

- the interest rate: the central bank can increase the interest rate to reduce demand (especially investment by firms); if investment I goes down, real GDP will go down. *Vice versa*, if the central reduces the interest rate, it become cheaper for firms to borrow money, hence firm investment I will go and GDP will grow. There is one problem in the latter case: suppose central banks did already lower their interest rates to zero, and

suppose the economies are not growing, then what more can central banks do? This is called the problem of the 'Zero-Lower Bound' and it is exactly the situation right now: most central banks cannot further lower the interest rate (in order to promote investment and recovery), because the interest rate = 0%.

- Money supply: in some theories, it is assumed that central banks can control money supply in a direct manner, and through this, they can influence inflation. We will look at these theories and models (this is the money-multiplier model) in greater detail in Week 7.

8. What will happen to government deficits and public debts due to this crisis? Why is the Italian economy in a worse position to cushion the negative impacts of this crisis than Germany?

Real GDP in the Eurozone is expected to decline by 7.5%, according to IMF estimates (see Table 6). Due to this, government tax revenues will decline by around 7.5% as well (*i.e.* a proportional decline). Tax revenues are around 37.5% of GDP in the Eurozone. This means that tax revenues will decline by 0,375 x 7.5% = - 2.8 percentage points of GDP; we call this the non-discretionary (or 'automatic') decrease in tax revenue – which leads to an increase in the fiscal deficit of +2.8 percentage points (see Table 9). We have estimated the non-discretionary increase in the fiscal deficit for 11 Eurozone countries. The non-discretionary increase in the fiscal deficit is estimated to be largest in France: + 5.7 percentage points of GDP. The higher fiscal deficit means that governments have to borrow more; as a result, public indebtedness will increase.

In addition to the 'automatic' increase in the fiscal deficit, there will also be a discretionary increase in the deficit, because government spending will increase. Governments raise spending to support firms, to support jobs and wages, and for the health crisis. In Table 9 appear estimates of government rescue packages for the Eurozone countries. The data on fiscal policy responses are from the IMF (2020). The numbers reflect discretionary fiscal policy actions and might not fully reflect the policies taken by countries in response to COVID-19, such as automatic insurance mechanisms and existing social safety nets which differ across countries in their breadth and scope. The data do not include the monetary policy support provided by the ECB through: (i) additional asset purchases of €120 billion until end-2020 under the existing programme; (ii) providing temporarily additional auctions of the full-allotment, fixed rate temporary liquidity facility at the deposit facility rate and more favourable terms on existing targeted longer-term refinancing operations (TLTRO-III) between June 2020 and June 2021; and an additional €750 billion asset purchase program of private and public sector securities (Pandemic Emergency Purchase Program, PEPP) until end-2020.

TABLE 9
Our own estimates of the increase in fiscal deficit (% of GDP)
and the increase public debt (% of GDP)

	Discretionary fiscal response						
	billions of euros	% of GDP	euros per citizen	debt to GDP (%) in 2019	non-discretionary increase in deficit (% of GDP)	increase in debt-to-GDP ratio	debt to GDP (%) in 2020
Eurozone	**516**	**4.4**	**1579**	**87**	**2.8**	**15**	**102**
Belgium	12	2.5	1021	100	3.4	15	114
Germany	204	6.0	2455	59	1.3	10	69
Ireland	9	2.5	1758	59	0.1	8	67
Greece	15	7.9	1406	175	0.3	24	200
Spain	28	2.2	593	97	3.4	16	112
France	100	4.1	1484	99	5.7	20	119
Italy	28	1.6	464	136	3.2	19	156
Netherlands	55	6.8	3173	49	1.1	10	59
Austria	38	9.5	4281	70	1.6	16	86
Portugal	9	4.4	895	120	0.5	14	134
Finland	19	7.8	3380	59	3.6	16	75

Source: Based on IMF (2020), *World Economic Outlook*, April.
The data on fiscal policy responses are from the IMF (2020).

Let us consider Table 9 more carefully. First, it can be seen that discretionary fiscal policy responses by Italy and Spain are much smaller than those by Germany, Austria and the Netherlands. The per person fiscal support offered by the Spanish and the Italian states is €593 and €464, which is only a fraction of German (€2455), Austrian (€4281) and Dutch (€3173) support per person. The reason for these differences is that the government debts in Germany, Austria and the Netherlands are relatively small (% of GDP); these governments can easily borrow from banks and financial markets at relatively low interest rates; public debts in Spain and Italy are much higher and banks and financial markets are reluctant to lend to the Spanish and Italian states. In addition, the fiscal support by the governments of Italy and Spain is more significantly constrained by the fiscal policy rules of the Eurozone (which state that public debts have to kept lower than 60% of GDP and fiscal deficits should not exceed 3% of GDP).

A second point to note is that the increase in the public debt-to-GDP ratio can be estimated using the following equation:

(13) $\Delta debt = fiscal\ deficit + (i - g) \times debt$

where $\Delta debt =$ the change in the public debt-to-GDP ratio; the fiscal deficit (as a percentage of GDP) does not include interest payments; *i* = the nominal rate of interest; *g* = the growth of nominal GDP; and debt = the initial public debt-to-GDP ratio. Let us look at the case of Italy (Table 9). Italy's deficit is projected to increase by 1.6% of GDP (discretionary increase) and 3.2% of GDP (automatic increase) = 4.8% of GDP. The higher deficit means that the state has to borrow more – and hence the public debt will go up.

In addition, Italy's government has to pay interest on its debt. The average interest rate paid by Italy's state is 1.34%. The public debt-to-GDP ratio of Italy in 2019 is 136%. This means that the Italian government is paying 1.36 x 1.34% = 1.8% of GDP as interest to banks and financial investors. To do so, Italy will have to borrow – and its public debt will go up by (circa) 1.8%. Italy's public debt-to-GDP ratio will also increase, because the denominator (nominal GDP) will decline due to the recession. The IMF predicts that Italy's GDP will fall by 9.1% in 2020.
Now we can use these pieces of information in eq. (13):

(14) $$\Delta debt = fisc.def + (i - g)debt$$
$$= 4.8\% + (1.34\% - -9.1\%) \times 1.36 = +19\%$$

This is the estimate for Italy appearing in Table 9.

9. What might be the longer-run impacts of an economic crisis due to the corona-virus lockdown on the economy – in terms of public and private debts, bankruptcies and unemployment?

It is clear from Table 9 that the corona-lockdown crisis will lead to drastic increases in fiscal deficits and public debts – in all Eurozone countries and in Greece, Italy, Portugal, but also France in particular. The longer-run impacts of the economic crisis will depend on how these public debts will be repaid. In principle, governments can finance their debts in the following manners:

- Governments may decide to <u>roll over their debts</u>. This means that they are not repaying their debts, but instead borrow (*i.e.* take new loans) to pay back the old (outstanding) debts. As long as the economy grows (*i.e.* nominal GDP increases) and the total debt does not grow (as fast), the ratio public debt-to-GDP will decline. This option is risky, however, especially for highly-indebted governments (such as those of Greece and Italy), because to be able to roll-over debts, governments must find banks and bond investors willing to lend them more money. If banks and bond buyers think that there is a risk that a government loan will not be repaid (but default), they may refuse to lend to this government, or charge a much higher interest rate to this government. This could lead to a debt crisis. It will most likely mean that such governments will have to spend a higher and higher proportion of their tax revenues as interest payments to banks. Quite likely, governments will reduce public

expenditure – on health care, education, infrastructure, and social security – in order to 'free up' money to pay the interest rate bill. Fiscal austerity becomes structural – and health and educational systems become weakened. Such nations will be ill prepared for the next pandemic.

- Governments may decide to borrow from their central banks. This is called monetary financing. It would mean that a central bank buys newly issued (primary) government bonds; the government receives newly created money from the central bank. In most countries (including the E.U.), monetary financing is in conflict with the law. Central banks (of the U.S.A., the U.K., and the E.U.) have found ways to circumvent this law, by announcing that holders of government bonds can always sell these bonds (at the nominal value, without a loss) to central banks. Mr. Mario Draghi, the former president of the European Central Bank, stated (in 2012) that the ECB will do "whatever it takes to protect the euro" – which means that the ECB is willing to buy whatever Eurozone bonds banks and other bond owners would want to sell. What it means is that you can safely buy an Italian government bond, because you can always sell it without a loss. Financial investors and banks are – because of this insurance – prepared to buy government bonds (and give governments loans). Government debt is still increasing – which is difficult for Greece, Italy *etc*. Most likely, this option will also lead to fiscal austerity.

- One specific proposal for the Eurozone is that the Eurozone members create so-called 'perpetual bonds' (or consols, *i.e.* bonds which do not need to repaid) and that the ECB buys these bonds. This would amount to direct monetary financing (as described above). The ECB would keep these bonds (as an asset or claim) on its balance sheet forever; the perpetual bonds are in the nature of a grant: governments issuing these bonds would get money from the ECB, which never has to be repaid. The Eurozone member countries do not agree on this proposal and it is very unlikely that consols will be used.

- The healthiest option is that governments raise taxes in order to repay the debts and reduce the debt burden over time. It is not advisable that government raise tax rates in the midst of the crisis, but it will be extremely important for governments to set up plans for higher taxation in the (near) future; the higher tax income must be used to lower public debts. It will be best to increase taxation on exactly those actors who can carry the heaviest burden, and on those activities, which contribute the least to societal welfare. Let us provide three examples. First, people with higher incomes save a larger proportion of their incomes; they will pay higher income-taxes partly out of their savings; this does not damage the level of economic activity. Second, increasing or imposing taxes on wealth will not directly damage the level of economic activity. Third, there is some $8-35 trillion of wealth kept in offshore tax havens, depending on how broadly this is measured, which can certainly be tapped and taxed with stronger political will. Increasing taxation is the only viable solution to the debt crisis. It cannot be done immediately and requires long-term co-ordination and co-operation.

APPENDIX – How to calculate growth rates?

The (simple) annual growth rate of real GDP *y* is defined as follows:

(A.1) $$\hat{y} = \frac{y_{t+1} - y_t}{y_t} \times 100\%$$

Example: real GDP of the Netherlands (in constant 2015 prices) was €744.5 billion in 2018 and €757.2 billion in 2019. The growth rate of Dutch real GDP in 2019 is:

(A.2) $$\hat{y} = \frac{757.2 \quad -744.5}{744.5} \times 100\% = 1.7\%$$

The average annual growth rate of real GDP *y* over a period of time can be calculated as a compound rate of growth; assume that the period is *n* number of years and the starting year is year "zero", then the average annual growth rate of *y* is defined as:

(A.3) $$\hat{y} = \left(\left[\frac{y_n}{y_0}\right]^{1/n} - 1 \right) \times 100\%$$

Example: real GDP of the Netherlands (in constant 2015 prices) was €152.6 billion in 1960 and €757.2 billion in 2019. The average annual growth rate of Dutch real GDP during the 59-year period 1960-2019 is:

(A.4) $$\hat{y} = \left(\left[\frac{757.2}{152.6}\right]^{\frac{1}{59}} - 1 \right) \times 100\% = 2.75\%$$

Finally, macro-economists often log-linearize equations, *i.e.* rewrite, a multiplicative equation in terms of (instantaneous) growth rates. Consider the equation for nominal GDP *Y*:

(A.5) $$Y = p \times y$$

Taking the natural log of the left-hand-side and the right-hand-side of (A.5), we obtain the following – linearized – expression:

(A.6) $$\ln\ (Y) = \ln\ (p) + \ln\ (y)$$

Writing (A.6) in terms of first differences, we get:

(A.7) $$\Delta \ln\ (Y) = \ln\ (Y_{t+1}) - \ln\ (Y_t) = \Delta \ln\ (p) + \Delta \ln\ (y)$$

The difference $\Delta \ln\ (Y)$ can be interpreted as a growth rate. This means that eq. (A.7) can be read as follows:

(A.8) $$\hat{Y} = \hat{p} + \hat{y} =$$ inflation + real GDP growth

Example: Consider the following data for Spain:

	2018	2019	$\Delta \ln(.)$	growth rate (%)
Y	€1202.2 b.	€1241.9 b.		
Ln (*Y*)	7.091903	7.124378	0.032475	3.25%
y	€1169.2 b.	€1191.1 b.		
Ln (*y*)	7.06409	7.082618	0.018528	1.86%
p	102.8	104.3		
Ln (*p*)	4.632982	4.64693	0.013947	1.39%

According to the table, nominal GDP growth in Spain in 2019 is:

(A.9) $$\hat{Y} = 3.25\% = \hat{p} + \hat{y} = 1.39\% + 1.86\%$$

Spanish nominal GDP growth can be decomposed into: inflation (1.39%) and real GDP growth (1.86%).

Review questions

1. What is Gross Domestic Product or GDP? How is GDP defined and measured?
2. What is the difference between finished goods and intermediate inputs?
3. What is meant by final demand?
4. How does the Office for Budget Responsibility estimate the impact on the GDP of the U.K.? (see Table 1.2 in the OBR report)
5. What is the difference between nominal GDP (or GDP at current prices) and real GDP (or GDP at constant prices)?
6. What is the GDP deflator?
7. What is unemployment? How is the rate of unemployment defined?
8. What is the difference between unemployment rate U3 and unemployment rate U6?
9. What will most likely happen to unemployment in this economic crisis?
10. What is the official definition of a recession?
11. What is meant by the term 'fiscal policy'? Why and how can governments help to contain or prevent an economic crisis due to the COVID-19 crisis?

12. What is expansionary fiscal policy or fiscal stimulus? What is meant by (fiscal) austerity?
13. What is monetary policy? Discuss two instruments of monetary policy?
14. Explain the debt-dynamics equation: $\Delta debt = fiscal\ deficit + (i - g) \times debt$.
15. What will happen to government deficits and public debts due to this crisis? Why is the Italian economy in a worse position to cushion the negative impacts of this crisis than Germany?
16. What does it mean when a government 'rolls over' its debt?

The answers to these questions can be found in the Lecture Note 😊