BASICS

# TOOLS IN APPLIED ECONOMICS

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# Contents

# Chapter 1

# Introduction

The purpose of this material is to introduce some notions for solving assignments or simple exercises in basic courses in economics.

This material has been thought to provide support for a few topics discussed in selected courses at Universitat Autònoma de Barcelona. In particular, it is a recomended reading for students coursing International Economics (code 102387), External Trade (code 102324) and Economics of European and International Integration (Master in European Integration, code 40889). The material has been compiled by referring to books or other sources cited in the references but it also includes original contributions.

Nevertheless, these notes are not exhaustive and students are encouraged to refer to other official sources to complement their background.

This document has been circulating since 2011, but this revised version includes more empirical evidence, some activities giving *food for thoughts* and two templates (with solutions) of the midterm exams of the course 102387.

I am grateful to Ana Larrea for reviewing the previous editions and providing valuable suggestions. Once more, any suggestion is welcome to improve the content and make it ready to use.

Of course, any error is my unique responsability.

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# Chapter 2

# Some basic indicators

In this section we are introducing some basic indicators that are helpful in measuring economic activity. Serrano Pérez (2004) and Serrano Pérez et al. (2009) discuss the importance of measuring economic activity in order to be able to formulate some comments or provide interpretations of the trend and tendency of the evaluation of macroeconomics aggregates.

The best way to address this issue is to focus on the changes that a few selected variables experiences over time.

## 2.1 Rate of change and index of variation

This index measures the relative change of the magnitude of a variable between two moments in time. It is often expressed as a percentage.

Let us define $A_0$ the value of a variable at time $t = 0$ and $A_1$ the value of a variable at time $t = 1$, **the rate of change** of the variable $A$ passing from time 0 to time 1 is:

$$RC = \left( \frac{A_1 - A_0}{A_0} \right) 100.$$

Therefore, if someone knows the rate of exchange and knows the initial value of variable $A$, it is easy to compute the value at time 1 by adopting the previous rule:

$$A_1 = A_0(1 + \frac{RC}{100}).$$

As a simple extension of the rate of change, it is possible to compute the **variation index (IV)**. This index represents the direct relationship between the magnitude of a variable at the current time and the value of the same variable at a precise moment in time that has been chosen as reference (and whose value is 100). Let us define it by considering the previous variables $A_0$ and $A_1$ when we select as reference period $t = 1$ :

$$IV = \left( \frac{A_1}{A_0} \right) 100.$$

When we are referring to a change that takes place between two moments in time, it could be from one year to another year or one quarter versus another. We are talking about "*year-on-year*" changes when we are referring to two different moments in time in two different years. We are referring to "*interannual*" changes when we are comparing two periods (for instance, weeks or quarters) in a same year.[1]

**Example 1** *(Serrano, 2004) Let us define $A_0 = 550$ and $A_1 = 500$ and let us define t=1 as the period of reference:*

$$RC = \left( \frac{500 - 550}{550} \right) 100 = -9.09\%$$

$$IV = (\frac{500}{550})100 = 90.09.$$

## 2.2 Average cumulative rate

Another interesting exerecise is to compute the rate of variation of an economic variable for more than two periods. We may also want to compute a synthetic measure of this value to provide some economic interpretations of the general evolutionary trend. A very easy way to provide such an indicator is to compute a simple arithmetic average of the differen per-year variations, but this may be difficult. Instead, the average cumulative rate indicator allows to achieve this result in a very direct way.

The average cumulative rate basically smooths the annual differences in growth and provides a general results by taking into account the first and the last value of a series. The idea is to capture the average growth by focusing on the progressive increase (or decrease) of the magnitude of a variable as a results of the growth rate. However, this indicator has a major drawback: it has true economic meaning when the series of the variable we are referring to follow a monotonic evolution for the period we are considering. Again, let us consider $A_0$ as the initial magnitude of a variable $A_n$ the final value of this variable after $n$ time-periods (years, months, quarters....). The average cumulative rate (AVR) can be obtained as:

$$AVR = \left[ \left( \frac{A_n}{A_0} \right)^{\frac{1}{n}} - 1 \right] 100;$$

knowing that:

$$A_n = A_0 \left( 1 + \frac{AVR}{100} \right)^n.$$

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[1]In this respect, an interesting glossary it is available on the OECD website at this URL: http://stats.oecd.org/glossary/index.htm.

It may also be the case that we interested in knowing how long a variable would take to achive a specific value. Rearranging the previous expression it is possible to obtain such a missing parameter:

$$N = \left[ \frac{\ln\left(\frac{A_n}{A_0}\right)}{\ln\left(1 + \frac{AVR}{100}\right)} \right].$$

**Exercise 2** *(Serrano, 2004) The value of A in 1997 is 99,200. This variable records a positive AVR=2.729% per-year. What is the value A could achieve in 2005 ?*
  *NB: n=2005-1997=8.*

$$A_{2005} = A_{1997}\left(1 + \frac{AVR}{100}\right)^n;$$

$$A_{2005} = 99,200\left(1 + \frac{2.729}{100}\right)^8 = 123,042.$$

# Chapter 3

# Price index

We define **the price level as a weighted average of several different prices**.The reason for using different weights is that some prices are more important than others for the economy. The price of oil, for example, is much more important than the price of apples. By using different weights we allow for changes in some prices to have a larger effect on the price level than changes in other prices.Different choices give rise to different measures of the price level. To visualize the prices and weights that are included, we use the concept **"basket"** of goods and services. We may, for example, create a basket that contains all the goods sold by a particular store on a particular day. The price of this basket is then a price level - it will be a weighted average of the prices of the goods sold that day and the weights will be equal to the number of each good sold. Perhaps the basket contains 100 litres of regular milk but only one frozen cake. The price of regular milk will then have a weight of 100 while the price of frozen cake will have a weight of 1. Changes in the price of milk will then have a greater influence on the price level than changes in the price of frozen cake (Jochumzen, 2010).

In economics we are not just interested in the value of price livels at a given moment in time: we are often interested in the percentage change in the price level between two points in time. We calculate the percentage change by first creating a basket of goods and services. At regular intervals (usually once a month on the first day of the month) we measure all the prices of the contents of the basket (typically as an average of the market) and calculate the price level. Exactly how much it would rise would depend on the weight of the changed price.

Imagine that we have created a particular basket of goods and services. We calculate the price level at four different points in time during 2008 without changing the content of the basket (the weights are unchanged). Suppose that we find the following time series for the price level (Jochumzen, 2010):

| Point in time | Jan 1, 2008 | Feb 1, 2008 | March 1, 2008 | April 1, 2008 |
|---|---|---|---|---|
| Price level | 60770 | 62400 | 62850 | 62850 |

## 3.1 Price index

Since we are only interested in the percentage change of the price level and not the particular value, we can divide each price level by a given constant so that the numbers are easier to deal with. When we divide a series of price levels by a constant we end up with what is called a time series of price indexes.

Using the same basket as above, if we divide the entire series by 60770 we get the following time series of price indexes:

| Point in time | Jan 1, 2008 | Feb 1, 2008 | March 1, 2008 | April 1, 2008 |
| --- | --- | --- | --- | --- |
| Price index | *100* | *102.68* | *103.42* | *103.42* |

The reason for choosing 60770 is that we want the index to be equal to 100 for the first point in time. The advantage of having an index that starts with 100 is that we will have a clearer picture of the evolution of prices. We may, for example, immediately conclude that prices rose by 2.68% on average in January and by 3.42% during the three months from January to March. Note that the percentage change of the original price level and the percentage change of the price index is the same. The percentage change will not depend on which point in time we select as our "base" (giving the price index a value of 100). Using the price index, the percentage change during January is (62400 - 60770)/60770 = 2,68% which is exactly the same as the percentage change of the price index (Jochumzen, 2010).

## 3.2 Consumer Price Index (CPI)

CPI is a price index of a particular basket called the CPI-basket. The CPI-basket contains basically all the goods and services consumed in a country - food, gas, medicine, haircuts, transportation, house rent and so on. The composition of the CPI basket is determined by the value of what is consumed in the country - the larger the value of total consumption of a good or service, the larger the weight in the basket. For example, if we spend twice as much on apples as on pears, apples will have twice the weight in the basket. The exact details of the composition of the basket and how the CPI is calculated are complicated and vary somewhat between countries (Jochumzen, 2010).

## 3.3 Inflation rate

The inflation between two points in time is defined as the percentage increase of the price index between these two points in time.

It is very important to pay attention to the following aspects:

- Price index is calculated at a particular point in time, inflation over a time period, typically one year.

- Inflation may just as well be defined as the percentage change in the price level.
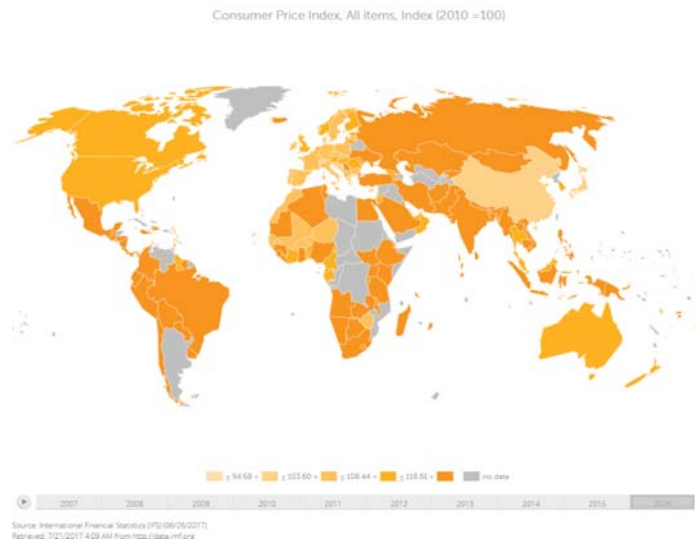
Figure 3.1: Consumer price index (2016). Source IMF

- Inflation is independent of which year we use as our base year for our price index.

- **If the price index decreases between two points in time we say that the inflation is negative or that we have deflation**.

The inflation rate is computed as any other rate of change being exactly the rate of change of prices (Jochumzen, 2010).

## 3.4 Empirical Evidence & Activity

International organizations as the International Monetary Fund (IMF) or the Wordbank (WB) made available interesting time-series statistics about the most relevant macro (and sometimes micro) indicators at country level or at world-regional level.

Figure (3.1) picture of the spatial distribution of the **consumer price index** (CPI) in 2016 all around the world. Grey areas suffer from hypergrowth of the index. The ones painted in dark brown record sustained level of CPI growth whereas the light brown are the ones with the lowest rate of CPI growth.

When turning to the evolution of the inflation rate, another interesting evidence appears. One of them is the Argentinian case: the country suffered from a progressive sustained inflation growth after the economic crisis in 2000 -Figure (3.2)-.

Instead, in the case of the EURO countries (above all, Germany) the inflation trend is much more under control (3.3). An interesting information one can deduce from Figure 3.3 is the timing mismatch of the economic recovery in Germany and the rest of the EURO countries. Germany acts as a frontrunner in the recovery path after 2008 crisis. German
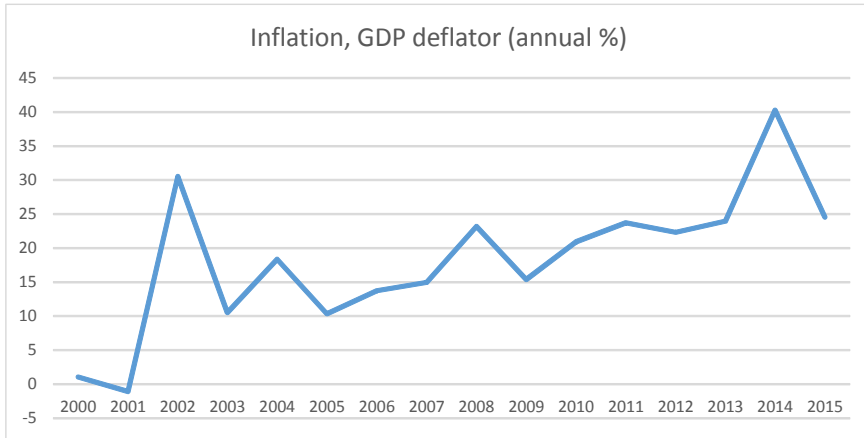
Figure 3.2: Inflation trend in Argentina (Source WB)
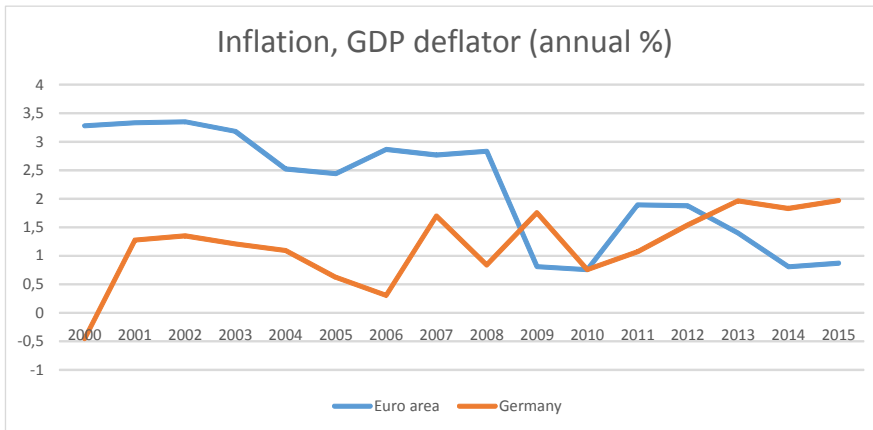


Figure 3.3: Inflation rate in EURO countries (Source WB)

inflation rates are larger than the rest of EURO countries meaning that the local economy experiences a dynamic evolution both from demand and the supply side.

**Questions:**

- Is there any connection between the CPI and the GDP deflator?

- Looking at figure (3.3), could one deduce that EURO countries share the same economic fundamentals with Germany ? Why?

Data for replicating (and extending) the previous results can be find at:
http://databank.worldbank.org/data/home.aspx.

# Chapter 4

# The Balance of Payments

The Balance of Payments records all the economic transactions of a country with the rest of the world during a specific period (usually one year but it can be also one month or one quarter).

As in the standard account practice:

- Each payment **received from foreign** firms, institutions or citizens is a **credit,**

- Each payment **done to foreign firms**, institutions or citizens is a **debt**.

A complete balance of payments is composed by three sections:

- The **Current Account (CA)** records all transactions from and to foreign countries. These transactions principally include imports and exports of goods and services, payment of interests rate (on dividends) on some investments,rents, insurances, transport costs/incomes, and commissions paid for services. In this chapter we also include immigrant remittances and pensions.

- The **Capital Account (K)** records short and long term capital inflow and outflows.In particular, it includes institutional donations for development and transactions associated to assets as lands or other resources. We also include in this section all bank deposits held by foreign residents in the country and by citizens abroad.

- The **Financial Account (FA)** records operations such as foreign direct investment (FDI) inflows and outflows and all credit or debit leftovers for transactions that took place at a specific moment during the period we are considering, but without being completed with the entire monetary compensation. Investment in foreign treasury bonds (or other assets that guarantee a return) are recorded as well.

- **Variation of Official Reserve Assets (R)** corresponds to the entry or exit of official reserve assets as a consequence of a physical transactions.

- The **Statistical discrepances (SD)** is minor section including measurement errors in the definition of the value of each transaction due, for example, to the different values of the exchanges rates.

The Balance of Payments clears as follows:

$$CA + K + FA + R + SD = 0.$$

The fulfilment of this conditions implies that the results of each sections can be positive or negative, but the total value has to sum up to zero. For instance, it may occur that our economy gets negative values of the CA because of more imports than exports. The condition of the parity of the balance of payments implies that to a deficit of the CA has to correspond a surplus of K or FC, namely the debt of the current account section is financed by the inflow of foreign capital in our country.

The best way to elaborate the Balance of Payments of a country is to represent each single section as shown in the following table:

|    | **Credit** | **Debit** |
|----|-----------|-----------|
| **CA** | Export of goods and services | Import of goods and services |
|    | Investment returns from abroad | Investment returns to abroad |
|    | Remittances, pensions etc..from abroad | Remittances and pensions to abroad |
|    | **Balance of the CA: Credit - Debit** | |
| **K** | Foreign capital inflow as donations from abroad | National capital outflow as donations from abroad |
|    | Foreign investments in lands and intangible assets | Investment abroad in land and intangible assets |
|    | **Balance of the K: Credit - Debit** | |
| **FA** | FDI Inflows | FDI Outflows |
|    | Credits grant by foreign institutions | Credits grants to foreign institutions |
|    | **Balance of the K: Credit - Debit** | |
| **R** | Increase of the reserves of foreign currencies | Decrease of the reserves of foreign currencies |
| **SD** | | |

**Remark**: The Balance of Payments is based on the notion of double-entry book keeping.

# Chapter 5

# Gross Domestic Product (GDP)

**Gross Domestic Product (GDP) is defined as the market value of all finished goods and services produced in a country during a certain period of time.** As discussed in Serrano (2004) data about GDP are taken from the information of the national account and these data are not always a true picture of the economic situation of a country at a specific moment in time. For instace, national account does not provide information about the rate of activity of informal economics. According to some official statistics, informal economics account for (about) 15-20% Spanish GDP, while, for instance, in USA or Germany this value is around 8-10% of GDP. Others categories of activities not included in the national account are the barter exchanges, the self-consumption production as well as other important costs (or revenues) that are associated to the environmental maintenance and to an extent the quality of personal services.

We only include finished goods and services - that is, anything that is sold directly to the consumer. Electric power sold to a steel mill is not included while all the electric power sold directly to consumers is included. The reason is simply that we want to avoid "double counting". Consider for example the production of cars. Car producers have parts produced by other firms which in turn have to be delivered by other firms and so on. If we were to count the value of everything produced by a firm, then most parts of a car would be counted several times. This is why only the value of the finished car is used in the calculation of GDP. Note, however, that if a firm buys a robot that it uses in the production of cars, then this robot is counted (if it is produced in the same country). The car producer is then the "final consumer" of the robot - no value is added to it and it is not resold to another firm (Jochumzen, 2010).

GDP is a flow variable and not a stock variable. By a flow variable we mean a variable that is measured in something per unit of time. Being a flow, **it is not a measure of the total wealth of a country but a measure of the "income" of the country during a certain period of time.** So, if GDP is high, it is quite likely that the total wealth of the country is increasing over time (some wealth is lost to depreciation). Therefore, there is often a connection between what we perceive as a "rich" country and a high GDP per capita.

In addition, in countries with large immigration and emigration flows, the GDP is not the best measure of the true income produced by "citizens". In this case the **GNI (Gross National Income)** is a more suitable measure of the income of those countries. For instance, in countries like the United States statistics about GNI are the most referred to in statistics for measuring the annual "income" of the country.The GNI is obtained as:

$$GNI = GDP \ \pm \ remittances.$$

## 5.1 Real GDP

**In order to be able to make reasonable comparisons of GDP over time, we must adjust for inflation.** For example, if prices are doubled over one year, then GDP will double even though exactly the same goods and services are produced as the year before. **To eliminate the effect of inflation we divide GDP by a price index and we define real GDP as GDP divided by a price index**.

It is not very common to use CPI in the construction of real GDP. The reason is that CPI measures the price evolution of consumer goods while GDP includes investment goods as well as consumer goods. Instead, it is common **to use a GDP deflator as a price index**.

$$GDP \ deflator = \left(\frac{\text{nominal GDP}}{\text{real GDP}}\right) 100$$

The GDP deflator measures the price evolution of a basket whose composition is close to the composition of GDP. The difference between the CPI and the GDP deflator is fairly small however. In economic analysis, it is also quite common to approximate the the GDP deflator with the CPI: the CPI series are always available for any territorial unit while GDP deflator is more complicated to compute. This easy data availability makes of the CPI a good approximation of the GDP deflator (Jochumzen, 2010 and Burda, 2005).

**Example 3** *(Serrano, 2004). Let us consider the following values of GDP:*

|  | *1999* | *2000* | *2001* |
|---|---|---|---|
| *Nominal GDP* | *590* | *609* | *646* |
| *GDP deflator* | *147* | *153* | *159* |

*1. Determine the value of real GDP*
*2  Calculate the GDP deflator for 2001=100.*

*Answers:*
*1. Real GDP: it is the ratio between nominal GDP and the GDP deflator*

$$\mathbf{1999}: \left(\frac{590}{147}\right) 100 = 401.36; \ \mathbf{2000}: \left(\frac{609}{153}\right) 100 = 398.03; \ \mathbf{2001}: \left(\frac{646}{159}\right) 100 = 406.28;$$

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*2. In order to calculate the GDP deflator taking as a reference 2001, we need to compute a variation index:*

$$\textbf{1999}: \left(\frac{147}{159}\right) 100 = 92.45; \ \textbf{2000}: \left(\frac{153}{159}\right) 100 = 96.23; \ \textbf{2001}: \left(\frac{159}{159}\right) 100 = 100;$$

Finally, **remind that GDP that is not adjusted for inflation is often called nominal GDP**.

It is also very important to pay special attention when making international comparisons to assess the level of income of a country (or any other territorial units). First, when comparing GDP across countries to state their level of income, it is very important to get rid of any size effects (namely, the total Chinese GDP is orders of magnitude larger than total Swedish GDP, but this does not mean that the Swedish income is lower than the Chinese one). In order to overcome this problem we must compare **GDP per capita between countries.**

Since the GDP value is a nominal one, it may happens that the value of the comparisons may fluctuate a lot because of the effect of a high volatile exchange rate. Once more, we have to control for this volatility. A way of avoiding dependence on the exchange rate is to compute the GDP per capital at country level by using the **purchasing power indicators** (refer subsection 7.1).

## 5.2   Economic growth

By (nominal) GDP-growth we mean the percentage change in (nominal) GDP over a specific period of time. **Real GDP growth is defined as the percentage change in real GDP**. The **real growth** tells us how much the economy has grown during a particular period when the effect of inflation is removed. The measure of real growth is the most common indicators adopted to draw insights about the economic perspective of a country or any other territory.

**Exercise 4** *(Serrano, 2004) Let us consider the following data:*

|  | *2000* | *2001* | *2002* |
|---|---|---|---|
| *GDP in current prices* | *609* | *646* | *697* |
| *GDP in constant prices 1997* | *510* | *521* | *536* |

*Questions:*
*1. Determine the GDP deflator,*
*2. Inflation rate,*
*3. Real GDP growth rate in 2001 and 2002,*
*4. GDP 2002 at constant-2000 prices.*

*Answers:*
*1. GDP deflator (1997=100):*

**2000** : $\left(\dfrac{609}{510}\right) 100 = 119,41$; **2001** : $\left(\dfrac{646}{521}\right) 100 = 123,9$; **2002** : $\left(\dfrac{697}{536}\right) 100 = 130,00$.

*2. Inflation rate: here we do not possess any information about the ICP, therefore we compute the inflation rate by using the GDP deflator:*

$$\textbf{2001} = \left(\dfrac{123,9 - 119,41}{119,41}\right) 100 = 3,76\%; \quad \textbf{2002} = \left(\dfrac{130 - 123,9}{123,9}\right) 100 = 4,92\%.$$

*3. Real GDP growth rate: we consider the GDP at constant prices*

$$\textbf{2001} = \left(\dfrac{521 - 510}{510}\right) 100 = 2,1\%; \quad \textbf{2002} = \left(\dfrac{536 - 521}{521}\right) 100 = 2,88\%.$$

*4. GDP 2002 at costant-2000 prices. This new condition implies that the GDP deflator in 2000 is 100. Therefore*

$$GDP_{2002}(00 = 100) = \left(\dfrac{697}{\frac{130,0}{119,4}}\right) 100 = 640,17.$$

## 5.3  Empirical Evidence & Activity

Policy makers are always concerned about their own countries rates of growth. A positive and sustained country-growth rate means that a country is an economic expansion phase which usually involves job creation and, overall, the increase of citizens' welfare.

However, it is interesting to learn about the recent growth evolution all around the world.

First, let us concentrate on the trend of the rate of growth of selected countries and regions: Figures 5.1-5.4.

All the previous pictures allow to draw some general, but important conclusions:

**a** The economic cycle is different across the world economies.

**b** The economic recession that took place in the EU in 2008-2009 did not produce the same economic effects in Asian or Latin American countries.

**c** Economic crisis can occur at world scale, but also local scale.

Another interesting evidence to investigate is the GNP versus the GDP variation. Remind that the difference between the two values stands in the presence (or absence) of remittances of/from immigrants. One interesting case study is Spain. In the 2000s, Spain hosted an impressive number of immigrants (more than 10% of native population): a big part of them
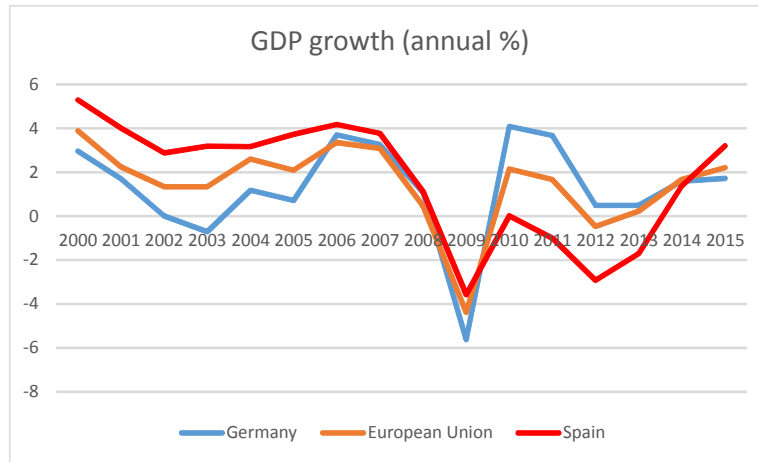
Figure 5.1: Growth rate in the EU (2000-2016). Source WB.



Figure 5.2: Growth rate in China and Asia (2000-2016). Source WB
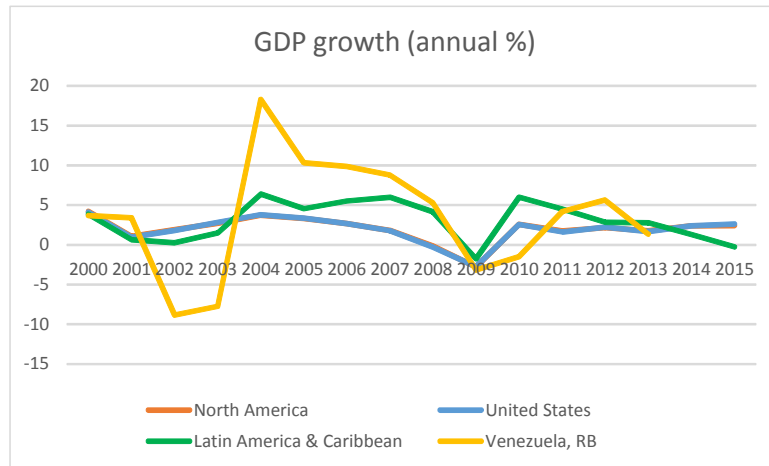
Figure 5.3: Growth rate in North and Latin America (2000-2016). Source WB
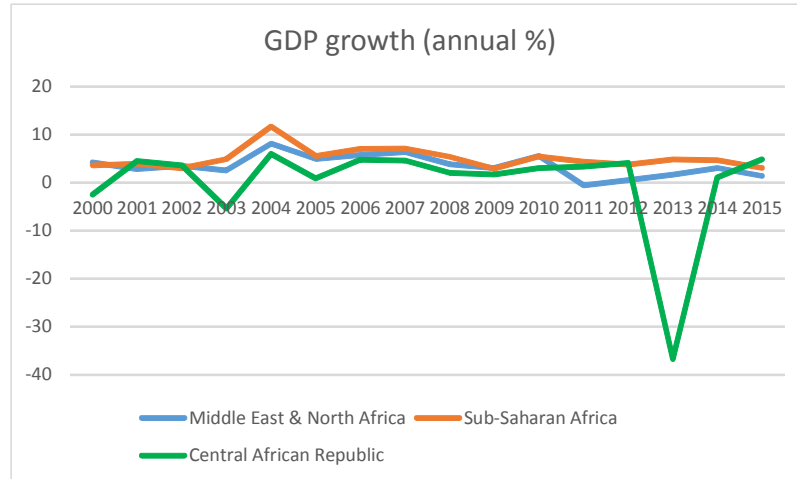


Figure 5.4: Growth rate in selected world regions (2000-2016). Source WB
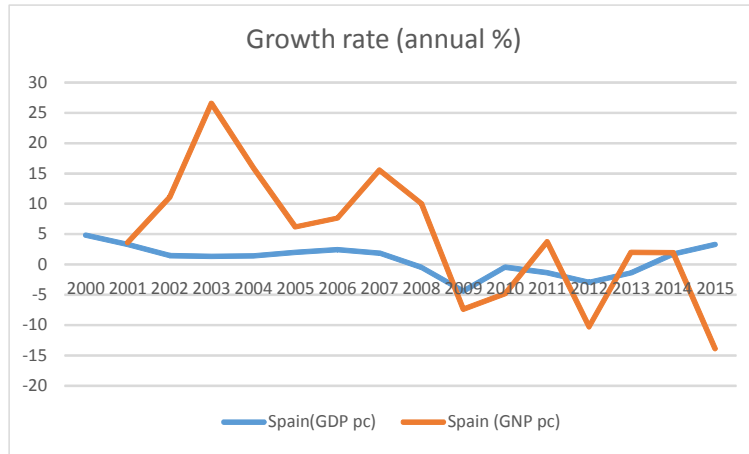
Figure 5.5: The Spanish case. Source WB

regularly sent remittances at their families in their home countries. In Figure (5.5), we picture the comparsion between the GDP-per capita growth rate and GNP-per capita growth rate.

One may appreciate that during the Spanish *golden age period* (2003-2008) the economic expansion and the important immigrants inflow made a difference between the two growth rates. Then, after the crisis in 2008, the situation is blurred: foreign immigrants returned to their home countries and Spanish workers start emigrating.

**Questions:**

- In which way a demographic boom can influence GDP growth rate ? And GDP-per capita growth rate ?

- Controlled-low inflation rates: are they healthy for economies ?

- Incoming and outcoming immigration flows: how do they affect GDP and GNP at country level ?

# Chapter 6

# The components of GDP

GDP is defined as as the market value of all finished goods and service produced in a country during a specific period of time. We will now look closer at the definition and the components of GDP

The composition of the GDP is given by the following elements:

- Firms deliver finished goods to the goods market (semi-manufactured goods circulate within the box firms). Firms are compensated for the goods and this compensation is equal to GDP.

- Consumers receive goods from the goods market where prices are determined through supply and demand.

- In order to pay for the goods, the consumers deliver factors of production (labor and capital) to the factor markets.

- Firms buy factors of production using the income they receive from the goods market.

Note that the flow of money from firms to the factor markets is exactly the same as the flow of money from the goods market to the firms. If this was not the case, firms as a group would make a profit or a loss. But since all firms are owned by individuals (directly or indirectly through pension funds and other funds), all profits or losses must eventually fall on the consumers (Jochumzen, 2010).

## 6.1   GDP from the supply side

A firm in our model is a unit which adds value to products. These products may be raw material, semi-manufactured goods, final goods and services. By adding value, we mean that the firm acquires the good, adds value to it and then sells it. Firms add value by using factors of production (mostly various forms of labor and capital). **We define value added (*va*)**

**as the difference between the revenue and the cost of the goods**. If a supermarket buys a fish for 4 euro and sells it for 5 euro, it has added 1 euro of value to the fish.

**Since the value added in each firm is equal to the return to the factors of production, the total return to the factor market must be equal to the sum of value added from all firms, which is equal to the GDP** (Jochumzen, 2010)**.**

The total return to the factor market =

$$\text{Sum of all value added}=\sum_{i=1}^{n} va_i + TAX = \ GDP,$$

with $n$ the total numer of sectors and $TAX$ **the net taxes on the production (and products)**. **TAX is obtained as the difference between the taxes less and subsidies or transfers to the production (and products)**.

## 6.2   GDP from the demand side

Since the private sector receives the entire return from the factors of production, the national income is equal to the GDP and we can use the symbol Y for national income as well. The private sector pays taxes to the government. Here we must include all taxes, income taxes, value added taxes, selective purchase taxes and payroll taxes (which are ultimately paid by the private sector since it owns the firms). Part of these taxes will be returned to the private sector in the form of pensions, child allowances, sickness benefit, unemployment benefits and so on (Jochumzen, 2010). All these are examples of transfers from the government. We denote government expenditure by **G**. Total consumption by the private sector is denoted by **C**. Consumption needs not be equal to disposable income as the private sector can save and borrow. We define the private sectors savings as SH = YDisp - C (H for household). If C > YDisp then SH < 0, which implies that the private sector (in the aggregate) is borrowing money. The total value of all exports to the rest of the world is denoted by **X**, while the total value of all imports from the rest of the world is denoted by **M**. If M > X then the value of all goods and services received from the rest of the world is larger than the value of goods and services that we send to them. The difference, SR = M - X is rest of the world savings and this is also the amount we borrow from the rest of the world, which must eventually be paid back by exporting more than we import.

Finally, we have to take into account investments. When we use the word investment, we typically mean "gross investment". Basically, gross investment consists of all finished goods that we have produced but not consumed. **The gross investment (I) is composed by gross fixed investment and changes in inventories.** Gross fixed investment is the total amount of investment in fixed capital. If a firm produces more than it sells in a particular period of time, its inventory will increase. This will be counted as a positive investment. In the same way, we will have a negative inventory investment whenever inventories decrease (Jochumzen, 2010).

By correctly summing up properly the previous components we get to the expression of the total nominal GDP (at current prices) from the demand side as follows:

$$GDP = Y = C + I + G + X - M$$

**Example 5** *Let us consider the following values:*
*Private consumption (C): 1 283*
*Gross investment (I): 456*
*Public consumption (G):728*
*Import (M): 1 093*
*Export (X):1 299*
*GDP= 1283+456+728+1299-1093= 2673*

## 6.3 GDP from the income side

As the sum of all returns from the factor markets, the total GDP can be also obtained as the sum of wages, return on capital and so on.

In this respect, the value of the GDP includes wages of the employees, rents (for land or real estates), interests and other returns on financial activites, taxes (on production, consumption and import) minus subsidies or public transfer to the production or trade activity. Therefore, the nominal GDP at current prices can be obtained as:

$$GDP = wages + other\ incomes + tax(prod + import) - subsidies(prod. + import).$$

**Exercise 6** *These are data refer to the Catalan GDP in 2007 (mill. €)*

| | |
|---|---|
| Exports | 64.977 |
| Gross investment (capital formation) | 58.059 |
| Final consumption (families | 135.673 |
| Imports | 78.869 |
| Wages of employees | 97.807 |
| Value added agriculture | 1.786 |
| Value added energy | 3.432 |
| Value added industry | 36.821 |
| Value added construction | 20.149 |
| Other incomes and revenues | 89.169 |
| Public expenditure | 28.840 |
| Value added market services | 107.265 |
| Value added no market services | 18.658 |
| Net taxes on production | 20.569 |
| Net taxes on production and imports | 21.704 |

a. 1) GDP: demand side

| | |
|---|---:|
| Export | 64.977 |
| Gross investment (capital formation) | 58.059 |
| Private consumption | 135.673 |
| Import | -78.869 |
| Public expenditure | 28.840 |
| **GDP 2007 market prices (€)** | **208.680** |

a.2) PIB: supply side

| VA Agriculture | 1.786 |
|---|---|
| VA Energy | 3.432 |
| VA Industry | 36.821 |
| VA Construction | 20.149 |
| VA Market Services | 107.265 |
| VA No market services | 18.658 |
| Net taxes on production | 20.569 |
| **GDP 2007 market prices (€)** | **208.680** |

a.3) GDP: revenue and income side

| Wages | 97.807 |
|---|---|
| Others incomes and revenues | 89.169 |
| Net taxes on production and import | 21.704 |
| **GDP 2007 market prices (€)** | **208.680** |

# Chapter 7

# Indicators of competitiveness

The information we compile to compute the GDP from the demand side allows for getting some complementary insights about the evolution of the competitiveness of a country.

The most natural (and intuitive) indicator refers to the trade account, namely the difference between exports and imports (X-M). A positive trade accounts implies that a country is quite competitive in the international markets. This situation entails some positive benefits: the GDP (hence the available income) increases and the exchange rate of the country is expected to apreciate. Another easy way to check the status of competitivenes is by looking at the **terms of trade** of a country. The terms of trade is the ratio between the prices of exports and the price of imports. It measures the quantity of foreign goods can be purchased with one unit of domestic output (Burda, 2005).

On the trading side, the competitiveness of a country identifies with the share of export in in the international countries.

## 7.1   Prices and trade

The level of prices across countries affects the trade directions. A country usually records high export flows when the price of the good and services it offers on the international markets is lower than that of the direct competitors. When talking about prices in the international markets, we are not only referring to the nominal value of a good (or service) but also the exchange rate that allows it to pass from a currency or another. The relationship between prices, exchange rates and international trade is quite complex. A country whose currency is particularly depreciated on the international markets can enjoy some technical benefits to be able to export at quite constant rates even if the internal prices (namely inflation) are increasing. Of course, the same country would be in serious trouble on the import side given that the price of imported goods and services is progressively increasing too.

In economics, one usually refers to the concept of **purchasing power parity** when asserting that the real exchange rate is constant. This idea implies that the price level of a same good (in different) countries is equalized across these countries when converted into the same currency. Let us consider the price of a worldwide good (the BIG-MAC, for instance);

the PPP would be expressed as follows:

$$\text{Absolute } PPP_{\text{€/\$}} \implies e = \frac{P(\text{€})}{P(\$)};$$

where $e$ is the spot exchange rate between \$/€; $P(\text{€})$ is the price of the BIG-MAC in € and $P(\$)$ is the price of the BIG-MAC in \$.

As a consequence of the PPP, we are able to compute the **real exchange rate** (between two currencies): it is the cost of foreign goods in terms of domestic goods:

$$e_{\text{real}} = e \frac{P_{abroad}}{P_{\hom e}}.$$

To the same extent, if we want to use an index to express the potential competitiveness of a country with respect to a group of countries as an area (for instance, a US company looking at the competitiveness in the EURO zone) we need to compute the **effective exchange rate.** This rate is an index consisting of a weighted average of a country's exchange rate with respect to a selected sample of trading partners.

The *nominal effective exchange rate* (**TCE**) is a weighted average of a sample of bilateral exchange rates selected according to a specific criteria, once we transformed the individual exchange rate values into an index $(e_I)$ :

$$TCE = \sum_{i=1}^{j} w_i e_{Ii};$$

where $w_i$ is the relative weight of currency $i$ in the group of $j$ currencies $\left( \sum_{i=1}^{j} w_i = 1 \right)$.

In the same vein, the **real effective exchange rate (TCER)** (still referred to the previous sample of $j$ countries) is obtained as a TCE corrected by the difference between the home and foreign prices:

$$TCER = \frac{TCE * P^*}{P};$$

where $P$ is the price index of the home country while $P^*$ is the price index for the group of $j$-countries we take as reference. If the value of TCER increases, the competitiveness of the country betters because either the currency depreciates or the inflation is lower than abroad. Similarly, a decrease of TCER implies an appreciation of the currency (or an inflation higher than that of the partners) and, therefore, the competitiveness of the country drops (Serrano, 2004).

## 7.2   Other indicators of trade competitiveness

There is a quite aboundant bunch of indicators to study the international competitiveness of a country. Among them the most common ones are:

- Contribution of exports to GDP: it is the quota of exports in the national GDP

$$Exp\_part = \frac{X}{GDP}.$$

- Export (import) share: it measures the relative position of a country as a client and a provider in international trade for a $i-$sector:

$$Exp\_share_i = \left(\frac{X_i}{M_i}\right) 100; \ \ Imp\_share_i = \left(\frac{M_i}{X_i}\right) 100.$$

- Degree of openness to trade: it measures the importance of international trade in the GDP formation

$$OpTrade = \left(\frac{M + X}{GDP}\right) 100.$$

This index can take value greater than 100 when we are considering the so called *small open economies.* These economies are particularly active in the trading activities; trade is one of the principal source of revenue of the local population.

- Quota of export in the national trade flows at country level: it measures the importance of exports of in the total national trade flows:

$$Quo\_Exp = \left(\frac{X}{M + X}\right) 100.$$

This indicator allows to depict the main features of the trade composition of a country: when the value of this index is larger than 50, the export flows from this country $i$ are bigger than the import ones.

## 7.3 Empirical Evidence & Activity

Data from WTO statistics provide interesting evidence about international trade flows. Let us focus on a selected sample of countries in 2015. The following table includes some indicators:

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| | $\left(\dfrac{Export_i}{WorldExport}\right)$ | $\left(\dfrac{Import_i}{WorldImport}\right)$ | $\dfrac{100X_i}{(X_i+M_i)}$ | $Trade\ Balance\ (mill\$)$ | $\dfrac{Trade\ Balance_i}{GDP_i}$ |
|---|---|---|---|---|---|
| EU (28) | 32.7% | 31.8% | 50.3 | 71,225 | |
| China | 13.8% | 10.0% | 57.5 | 592,998 | 8,5 % |
| USA | 9.1% | 13.8% | 39.5 | -803,031 | -4.5%* |
| Germany | 8.1% | 6.3% | 55.9 | 279,444 | 9.2% |
| World (mil. \$) | 16,482,000 | 16,725,000 | | | |
| | | | | | |
| Source: WTO | | | | | *estimated |

A few comments:

- EU countries are the most involved in the international trade flows because of the dynamics of the intercomunitarian flows,

- China records an importan trade surplus due to the large size of export flows,

- Germany records the highest level of trade balance over national GDP.

**Questions:**
- The total value of world export is different from the total value of world imports: why?
- Does any of the previous countries qualifies as *small open economy?*

If you feel like to replicate the previous results or discuss new findings, raw data are available at: http://stat.wto.org/StatisticalProgram/WSDBStatProgramHome.aspx?Language=E

# Chapter 8

# Previous exams

## 8.1 Exam type A

### 8.1.1 Exercises

**Exercise 1** Consider the information about the Luxembourg trade exchange data -in billions of €- (Source: STATEC).

|  | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Export | 57616,7 | 65955,5 | 70737,1 | 63773,9 |
| Import | 47173,4 | 53846,9 | 57839,2 | 51260,3 |
|  |  |  |  |  |
| GDP at current prices | 39141,7 | 43030,7 | 45527,4 | 44415,3 |

- Calculate the trade balance for each year and discuss the results.

- Calculate the rate of growth of exports and imports in 2009.

- Calculate two indicators of openness to trade and discuss the results. How could this economy be defined? What do exports represent for the growth process of this country?

**Exercise 2** Consider the following data about Mexican GDP (current prices) in 2009 (in 1000 billions of pesos) (Source: INEG)

| | |
|---|---:|
| Exports of goods and services | 2710 |
| Gross capital formation | 2051 |
| Final consumption of households | 6220 |
| Imports of goods and services | 3058 |
| Gross income of employees | 2499 |
| Gross value added agriculture | 771 |
| Changes in inventories | 75 |
| Gross value added energy | 115 |
| Gross value added industry | 1549 |
| Gross value added construction | 596 |
| Gross rents from other activities | 5490 |
| Expenditure of public administration | 930 |
| Gross value added market services | 3956 |
| Gross value added no-market services | 1475 |
| Tax on production and imports | 1143 |
| Subsidies on production and imports | 204 |
| Net tax on production | 466 |

- Calculate the GDP according to the 3 sides.

- Calculate one of the trade-openness indicators and discuss the result.

- Calculate the share of agriculture, industry and market services in the GDP. Discuss the results: Could Mexico be considered as a developed or developing country?

**Exercise 3** In 2009, México registered the following transactions with foreign citizens (in 1000 billions of pesos):

- Freight costs paid to EU firms for a value of 20.

- Remittances from (abroad) emigrants for a value of 21.

- Investments in productive activities by foreign citizens for a value of 7.5.

- Exports of oil products for a value of 31.

- A few foreign tourists that visited Mexico bought goods and services for a value of 11.

- Exports of manufacturing products for a value of 190.

- FDI in Mexico by foreign corporations for a value of 14.5.

- Imports of goods and services for a value of 234.

- A few Mexican tourists bought goods and services abroad for a value of 7.1.

- Transport services commissioned to Mexican firms by international corporations for a value of 4.5.

- Interests on Mexican treasury bonds paid to international investors for a value of 4.

- Capital transfers from international institutions for humanitarian scopes for a value of 14.

- Interests paid by foreign citizen on credit granted by Mexican banks for a value of 4.

- Credits granted by Mexican banks to foreign firms or citizens for a value of 18.5.

Write the Mexican balance of payments and discuss the net result of the current account.

**Exercise 4** Consider the US and Mexican GDP at current prices (in 1000 billions $) as displayed in the following table for the period 2007-2009 (Source: World Bank):

| US | 2007 | 2008 | 2009 |
|---|---|---|---|
| GDP deflator (IP) | 120,5 | 123,1 | 124,2 |
| GDP at current prices | 14062 | 14369 | 14119 |
| **México** | **2007** | **2008** | **2009** |
| GDP deflator (IP) | 127,4 | 135,8 | 141,7 |
| GDP at current prices | 1026 | 1090 | 1025 |

- Is GDP a representative indicator of the US economy? Why?

- Compute the real Mexican and US GDP.

- Compute the Mexican and US growth rate per-year and discuss the results.

- When could Mexico achieve a nominal GDP equivalent to 10% of the US nominal GDP in 2009 if we assume that the nominal growth rate of the Mexican GDP will be 3% in the near future?

## 8.1.2 Solutions

**Exercise 1**

Data in billions €

| | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Trade balance | 10443.3 | 12108.6 | 12897.9 | 12513.6 |
| Openess rate $\frac{(X+M)}{GDP}$ | 267.7 | 278.4 | 282.4 | 259 |
| Export quota $\frac{X}{(X+M)}$ | 55.0 | 55.1 | 55.0 | 55.4 |

**Growth rate in 2009**
- Exports: -9.84%
- Imports: -11.37%

Comments:
- Luxembourg always records a surplus in the trade balance
- Trade has a positive impact on GDP formation

- Luxembourg is a small open economy
- Export are more relevant than import in the trade-flow composition.

**Exercise 2**
GDP for Mexico (in 1000 billions of pesos)

**Demand side:**

| | |
|---|---:|
| Import | -3058 |
| Final consumption households | 6220 |
| Expenditure public administration | 930 |
| Gross capital formation | 2051 |
| Changes in inventories | 75 |
| Export | |
| **Total** | **8928** |

**Supply side:**

| | |
|---|---:|
| GVA agriculture | 771 |
| GVA energy | 115 |
| GVA construction | 596 |
| GVA industry | 1549 |
| GVA market services | 3956 |
| GVA no-market services | 1475 |
| Net tax on production | 466 |
| **Total** | **8928** |

**Rent side:**

| | |
|---|---:|
| Gross income employees | 2499 |
| Gross rent from others | 5490 |
| Tax on production and import | 1143 |
| Subsidies | -204 |
| **Total** | **8928** |

**Indicator for trade openess** $\left(\frac{X+M}{GDP}\right)$=64.6%: Mexico is an open economy and trade is a relevant part of GDP formation.

**GDP composition(%):**

| | |
|---|---|
| Agriculture | 8.64 |
| Industry | 17.35 |
| Market Services | 44.31 |

**Comments:** we detect

- A relatively large proportion of agriculture in GDP formation if compared to industrialized countries,

- Quite limited participation of industrial activity in GDP formation,

- Large proportion of market services, but no-market services are quite relevant as well (almost 30% GDP)

Overall, Mexico can be considered as an emerging market moving towards industrialized countries.

**Exercise 3**

Balance of payments and net current account. Year: 2009. In 1000 billions pesos

|  | Credit | Debit | |
|---|---|---|---|
| **Current Account** | | | |
| Export of oil products | 31 | | |
| Export of manufacturing | 190 | | |
| Import of goods and services | | 234 | |
| Expendit. tourists in Mexico | 11 | | |
| Expendit. tourists abroad | | 7.1 | |
| Transport services | 4.5 | | |
| Freight costs | | 20 | |
| Remittances from immigrants | 21 | | |
| Interests paid to intern invest | | 4 | |
| Interests paid by foreign citz | 4 | | |
| | 261.5 | 265.1 | -3.6 |
| **Capital Account** | | | |
| Trasfers from int'l institutions | 14 | | |
| Investment in product activity[1] | 7.5 | | |
| | 21.5 | | 21.5 |
| **Financial Account** | | | |
| FDI in Mexico | 14.5 | | |
| Credits granted by Mexican banks | | 18.5 | |
| | 14.5 | 18.5 | -4 |

| **Changes in Reserves** | (+) | (-) |
|---|---|---|
| | 31 | 234 |
| | 190 | 7.1 |
| | 11 | 20 |
| | 4.5 | 4 |
| | 21 | 18.5 |
| | 4 | |
| | 14 | |
| | 7.5 | |
| | 14.5 | |
| | 297.5 | 283.6 | 13.9 |

$$\textit{Balance of Payments} = -3.6 + 21.5 - 4 - 13.9 = 0$$

---

[1] It was not well specified in the main text. Hence, it could be classified in the Capital Account or Financial Account sections.

Comments:

- A negative balance of current account implies a fair level of external debt.

- FDI and public transfers make monetary reserves increase.

**Exercise 4**

GDP is not representative of US economy because of the importance of remittances sent home by immigrants.

GNP would be a better indicator.

|  | **2007** | **2008** | **2009** |
|---|---|---|---|
| Real GDP US | 11671.49 | 11671.40 | 11364.20 |
| Real GDP MEX | 805.10 | 802.31 | 723.47 |
| Growth rate US (%) |  | 0.0 | -2.63 |
| Growth rate MEX (%) |  | -0.35 | -9.83 |

Comments: Mexican economy suffers from a more severe recession than the US. The difference is quite important in 2009.

Mexico vs US GDP:

$$
\begin{aligned}
GDP_{2009}^{US} * 10\% &= GDP_{2009}^{MEX} * (3\%AVR)^{Years} \\
14119 * 0.1 &= 1024.8 * (1 + 0.03)^{X} \\
\log(1412) &= \log(1024.8) + X * \log(1.03) \\
X &= \frac{\log(1412) - \log(1024.8)}{\log(1.03)} \\
X &= 10.84
\end{aligned}
$$

It would take more than 10 years and it will be between 2019 and 2020.

# 8.2   Exam type B

## 8.2.1   Exercises

**Exercise 1**

Consider the information about the US trade exchange data series (in millions \$)
(Source: US Bureau Census).

|  | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Exports** | 25940 | 35285 | 56640 | 132585 | 271834 | 289070 | 535233 | 794387 | 1072783 | 1287441 | 1842485 |
| **Imports** | 22432 | 30621 | 54386 | 120181 | 291241 | 410950 | 616097 | 890771 | 1449532 | 1996065 | 2337222 |

- Calculate the trade balance for each year and discuss the results.

- Calculate the rate of growth of exports in 1965 and 2005.

- Calculate two indicators of export quota and discuss the results. What do exports represent for the growth process of this country?

- Can the US economy be defined as a *small open economy*?

**Exercise 2**

In 2010, Switzerland registered the following transactions (Thousand CHF):

- A domestic firm imports 1000 of foreign merchandise,

- Foreign costumers withdraw 100 from their bank accounts to pay for Swiss products,

- Domestic firms sell chocolate abroad for 30,

- A Swiss landlord rents his several properties in Lausanne to French tourists for 200,

- A group of Swiss families organizes a trip across Switzerland and spend about 10 for their trip,

- A Swiss resource trading firm makes extra-profits of 1000 and donate them to a Bolivian charity,

- A German firm pays interests on a credit granted by UBS of 10,

- A US corporation buys Nestlé shares for 50000: it pays 20% cash and it gets a credit from Credit Suisse for the remaining part,

- After 3 months, the Nestlé's shares lost 2% of their value,

- Immigrants from Spain send remittances at home for 200,

- A Swiss landlord buys a property to rent in London for 10000,

- A Portuguese retired person gets a pension from the Swiss government of 10,

- An Italian family buys a flat for summer holidays in Lugano for 1000.

Write the Swiss balance of payments and discuss the net result of the current account and financial account.

**Exercise 3**

a) Consider the following data about Australian GDP (current prices) in 2011 (in mill $)

| | |
|---|---:|
| Exports of goods and services | 316221 |
| Gross capital formation | 310714 |
| Final consumption of households | 640732 |
| Imports of goods and services | 213784 |
| Gross income of employees | 563158 |
| Gross value added agriculture | 28078 |
| Gross value added industry | 236976 |
| Gross value added mining | 119330 |
| Gross rents from other activities | 720720 |
| Expenditure of public administration | 350005 |
| Gross value added services | 920810 |
| NetTax on production and imports | 120010 |
| Net tax on production | 98694 |

Calculate the GDP according to the 3 sides.

b) Now consider the following time series on Australian key aggregated (Mill\$, source Australian Bureau of Statistics):

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|
| GDP current prices | 1153355 | 1190111 | 1226323 | 1272776 | 1320746 | 1342514 | 1370540 | |
| GDP deflator | 79 | 82 | 86 | 90 | 94 | 99 | 100 | 106 |
| Gross National Income | 835305 | 886913 | 956338 | 1034912 | 1126750 | 1210015 | 1242245 | 1350250 |

- Which is the difference between the GDP and the Gross National Product (here approximated by the Gross National Income)? How could we interpret the difference that appears for Australia?

- Compute the real GDP with the data provided in the table.

- Compute also the real GDP at 2004-constant prices.

- Compute the average cumulative growth rate between 2004 and 2009. Does this value have an economic meaning? How could we interpret it?

## 8.2.2 Solutions

**Exercise 1**

| | 1960 | 1965 | 1970 | 1975 | 1980 | 1985 | 1990 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exports (X) | 25.940 | 35.285 | 56.640 | 132.585 | 271.834 | 289.070 | 535.233 | 794.387 | 1.072.783 | 1.287.441 | 1.842.485 |
| Imports (M) | 22.432 | 30.621 | 54.386 | 120.181 | 291.241 | 410.950 | 616.097 | 890.771 | 1.449.532 | 1.996.065 | 2.337.222 |
| Trade Balance (X-M) | 3.508 | 4.664 | 2.254 | 12.404 | -19.407 | -121.880 | -80.864 | -96.384 | -376.749 | -708.624 | -494.737 |
| **Export quota** | | | | | | | | | | | |
| X/(X+M) | 53,6 | 53,5 | 51,0 | 52,5 | 48,3 | 41,3 | 46,5 | 47,1 | 42,5 | 39,2 | 44,1 |
| X/M | 115,6 | 115,2 | 104,1 | 110,3 | 93,3 | 70,3 | 86,9 | 89,2 | 74,0 | 64,5 | 78,8 |
| Growth rate "X"(%) | | 36,03 | | | | | | | | 20,01 | |
| $(X_{n-1}-X_n)*100/(X_n)$ | | | | | | | | | | | |

Comments:

- US trade deficit begins in the 80s and it is mostly driven by the huge increase of imports. The US seem loosing competitiveness in the international markets.

- Export quota: up to the 80s the total exports were the biggest component of the US trade flow; then they started declining. A recovery process seems taking place between 2005 and 2010.

- We do not dispose of GDP data to assess if US are a small open economy. However, current indicators seem excluding this possibility.

**Exercise 2**

Balance of payments

| | Credit | Debt | Net result | | Variation of reserves | |
|---|---|---|---|---|---|---|
| **Current Account** | | | | a) | -1000 | |
| a) | | 1000 | | b) | 100 | |
| b) | 100 | | | c) | 30 | |
| c) | 30 | | | d) | 200 | |
| d) | 200 | | | e) | - | This entry involves only residents |
| g) | 10 | | | f) | -1000 | |
| j) | | 200 | | g) | 10 | |
| l) | | 10 | | h) | 10000 | |
| Total | 340 | 1210 | -870 | i) | - | This entry involves only residents |
| | | | | j) | -200 | |
| **Capital Account** | | | | k) | 10000 | |
| f) | | 1000 | | l) | -10 | |
| m) | 1000 | | | m) | 1000 | |
| Total | 1000 | 1000 | 0 | Total | -870 | |
| **Financial Account** | | | | | | |
| h) | 50000 | 40000 | | | | |
| k) | | 10000 | | | | |
| Total | 50000 | 50000 | 0 | | | |

BoP= CA+KA+FA-Var_Res=0
BoP=-870+0+0-(-870)=0

Comments:

- Entries e) and i) have not to be taken into account.

- Current account (CA): the net result is negative. Therefore, Switzerland holds a passive position versus the rest of the world.

- Financial account (FA): it displays a null result. Credits and debts are equivalent.

## Exercise 3

### a) Australian GDP year 2011:

**Demand side:**

| | |
|---|---|
| GCF | 310714 |
| Domestic consumption | 640732 |
| Import | (-213784) |
| Export | 316221 |
| Govern. spending | 350005 |
| **Total** | **1403888** |

**Supply side:**

| | |
|---|---|
| VA agriculture | 28078 |
| VA industry | 236976 |
| VA services | 920810 |
| VA mining | 119330 |
| Net tax on production | 98694 |
| **Total** | **1403888** |

**Rent side:**

| | |
|---|---|
| Wages | 563158 |
| Other sources of income | 720720 |
| Net tax on production and import | 120010 |
| **Total** | **1403888** |

### b)

- GNP (here proxied by GNI) differs from GDP when the country is hosting a number of migrants or natives move abroad. Remittances make the different between the two indicators. In the case of Australian data, GNP< GDP: it implies that Australia is hosting immigrants.

- **Real GDP**

| | GDP | GDP deflator | Real GDP | GDP Deflator (2004) | Real GDP_2004 |
|---|---|---|---|---|---|
| 2004 | 1153355 | 79 | 1461267 | 100 | 1153355 |
| 2005 | 1190111 | 82 | 1452128 | 104 | 1146142 |
| 2006 | 1226323 | 86 | 1427233 | 109 | 1126493 |
| 2007 | 1272776 | 90 | 1412037 | 114 | 1114498 |
| 2008 | 1320746 | 94 | 1400432 | 119 | 1105339 |
| 2009 | 1342514 | 99 | 1355075 | 126 | 1069539 |
| 2010 | 1370540 | 100 | 1370540 | 127 | 1081745 |
| 2011 | 1403888 | 106 | 1322578 | 134 | 1043890 |
| | | | From: GDP*100/ (GDP Deflator) | From: GDP deflator* 100/ (GDPdeflator2004) | From: GDP*100/ (GDP Deflator 2004) |

- **Average growth 2009-2005:**

$$\left[\left(\frac{1069539}{1153355}\right)^{\frac{1}{5}} - 1\right] = -1.49\%.$$

This result confirm that the Australian economy is experiencing a recession period.

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