1 Principles of Macroeconomic, macroeconomic indicators, base & chain indexes

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2011

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1.2 Macroeconomics vs. Microeconomics

Macroeconomics

Macroeconomists study aggregated indicators such as GDP, unemployment rates, and price indices to understand how the whole economy functions. Macroeconomists develop models that explain the relationship between such factors as national income, output, consumption, unemployment, inflation, savings, investment, international trade and international finance.

In contrast, microeconomics is primarily focused on the actions of individual agents, such as firms and consumers, and how their behavior determines prices and quantities in specific markets.

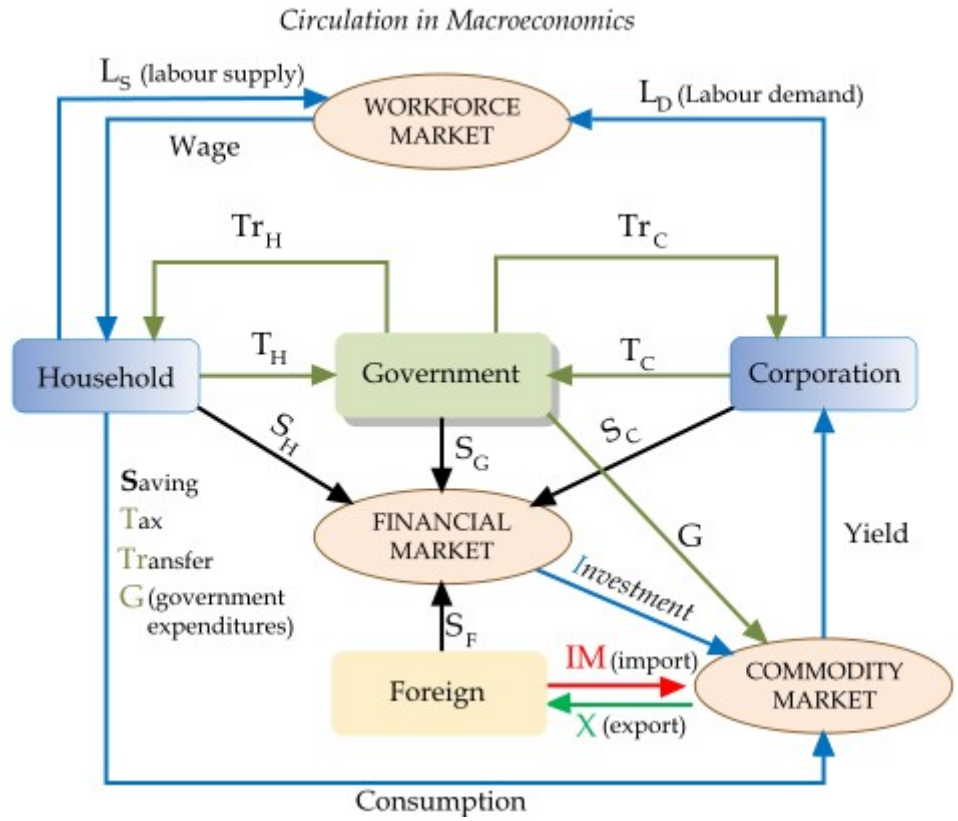
Total aggregate supply of goods and services (Y) vs. individual (firm's) production (Q)
Price level (P) or inflation rate (π) vs. price of individual product (P)
Total employment (L) vs No. of employees in a firm
National income (NI) vs. individual income
Average nominal wage (W) vs. individual wage

Macroeconomics studies the causes and consequences of short-run fluctuations in national income (the business cycle); it attempts to understand the determinants of long-run economic growth (increases in national income); it tries to understand the relationships and links among macroeconomic variables and how the macroeconomic balance is rebuild; it studies ways how to stabilize the economy through macroeconomic policies and how these policies might and should work.

Graph 1 Business Environment

Adopted from PASS, Ch. (1995) B*usiness and macroeconomics*.

Graph 2 Circulation in Macroeconomics



Source: Wikipedia.org. Feb 2011.

1.3 Macroeconomic indicators

Macroeconomic indicators describe the stance and development of the economy. They help us to understand the economic development, economic rules and economic laws. In other words, the macroeconomic indicator is a figure about the economy. Macroeconomic indicators allow analysis of economic performance and predictions of future performance.

Macroeconomic indicators may describe the stock or the flow. A ***stock variable*** is measured at one specific time, and represents a quantity existing at that point in time (say by the end of 2010). A ***flow variable*** is measured over an interval of time. Therefore a flow would be measured per unit of time (say a year). For example, gross domestic product is a total final output of all goods and services produced in a single year within country's boundaries. It is a flow variable, and has units of currency/year. In contrast, the nominal capital stock is the total value of equipment, buildings, inventories, and other real assets and has units of currency.

Generally, a stock (or "level variable") is some entity that is accumulated over time by inflows and/or depleted by outflows. Stocks can only be changed via flows. Stocks typically have a certain value at each moment of time - e.g. the number of population at a certain moment.
Examples: population, housing stock, bank balance, number of unemployed, public debt, average price level,…

A flow (or "rate") changes a stock over time. Usually we can clearly distinguish inflows (adding to the stock) and outflows (subtracting from the stock). Flows typically are measured over a certain interval of time - eg. the number of births over a day or month. For example, if the capital stock is increased gradually over time by a flow of gross investment and decreased gradually over time by a flow of depreciation.
Examples: GDP, industrial output, inflation, capital inflow, public finance deficit.

In discrete time, the change in a stock variable from one point in time to another point in time one time unit later is equal to the corresponding flow variable per unit of time.

In continuous time, the time derivative of a stock variable is a flow variable.

1.3.2 Key macroeconomic indicators

- Growth Indicator: ***Gross Domestic Product (GDP)*** - is a total final output of all goods and services produced in a single year within country's boundaries measured in market prices.
- Price Indicator: ***Inflation*** - is a rise in the general level of prices of goods and services in an economy over a period of time.
- Indicator of labor market: ***Unemployment rate*** – is a number of unemployed workers divided by total labour force.
- Indicator of external balance: ***Trade Balance***: is the difference between the nominal value of exports and imports of goods in an economy over a certain period or ***Net Export*** which is the difference between the nominal value of exports and imports of goods and services in an economy over a certain period.
- Indicator of public finance: annual ***General Government Budget Balance*** refers to the difference between government receipts and spending in a single year. ***Public Debt*** is a total accumulated debt (credit) owed by any level of government; either central government, federal government, municipal government or local government.
- Indicators of financial market: ***level of interest rates*** (short- or long-term).

GDP, inflation, unemployment, general budget deficit, interest rates are the ***indicators of internal balance***. While trade balance or net export are ***indicators of external balance***.

Graph 3 Key Macroeconomic Indicators

	2005	2006	2007
Real GDP growth			
United States	3.5	3.6	3.1
Japan	2.7	2.8	2.2
Euro area	1.4	2.2	2.1
Total OECD	2.8	3.1	2.9
Inflation			
United States	2.8	3.0	2.3
Japan	-1.3	-0.6	0.5
Euro area	1.7	1.6	2.0
Total OECD	2.0	2.2	2.0
Unemployment rate			
United States	5.1	4.7	4.7
Japan	4.4	4.0	3.5
Euro area	8.6	8.2	7.9
Total OECD	6.5	6.2	6.0
World trade growth	7.5	9.3	9.1
Current account balance			
United States	-6.4	-7.2	-7.6
Japan	3.6	4.3	5.5
Euro area	-0.2	-0.4	-0.3
Total OECD	-1.9	-2.1	-2.1
Cyclically-adjusted fiscal balance			
United States	-3.7	-3.7	-3.9
Japan	-4.9	-5.3	-5.2
Euro area	-1.6	-1.6	-1.5
Total OECD	-2.7	-2.8	-2.8
Short-term interest rate			
United States	3.5	5.1	5.1
Japan	0.0	0.1	0.7
Euro area	2.2	2.7	3.4

Note: Real GDP growth, inflation (measured by the increase in the GDP deflator) and world trade growth (the arithmetic average of world merchandise import and export volumes) are seasonally and working-day-adjusted annual rates. The "fourth quarter" columns are expressed in year-on-year growth rates where appropriate and in levels otherwise. The unemployment rate is in per cent of the labour force while the current account balance is in per cent of GDP. The cyclically-adjusted fiscal balance is in per cent of potential GDP. Interest rates are for the United States: 3-month eurodollar deposit; Japan: 3-month certificate of deposits; euro area: 3-month interbank rate.

Assumptions underlying the projections include:
- no change in actual and announced fiscal policies;
- unchanged exchange rates as from 4 May 2006; in particular 1$ = 113.50 yen and 0.79 euros.

The cut-off date for other information used in the compilation of the projections is 17 May 2006.

Source: OECD Economic Outlook 79 database.

1.3.3 Combined Macroeconomic Indicators

Table 1 Combined MACRO Indicators

Czech Republic:Selected Combined Macroeconomic Indicators

Sources: CZSO, Ministry of Labour and Social Affairs of the CR, CNB, Ministry of Finance of the CR.

Indicator		2006	2007	2008	2009
Real economy indicators					
GDP per capita	CZK/cap, curr. p.	313 868	342 494	353 701	345 601
GDP per capita in PPS	PPS/capita, curr.p.	18 215	19 947	20 167	19 266
Domestic effectiv demand	%, y/y, real terms	4,5	5,6	1,7	-1,5
GDP deflator	%, y/y	1,1	3,4	1,8	2,5
Gross disposable income	CZK bn, current p.	3 044,2	3 267,9	3 490,9	3 380,2
Gross national saving	CZK bn, current p.	795,4	863,4	903,5	744,3
Gross national saving rate	%	26,1	26,4	25,9	22,0
Gross household saving rate	%	9,6	10,9	10,3	9,5
Aggregate labour productivity	%, y/y	4,9	3,3	0,8	-2,4
Unit labour costs	%, y/y	0,7	2,8	5,3	1,1
Avrg. old-age pension/avrg. Wage	%	40,8	40,6	40,2	41,6
Monetary indicators					
CZK/EUR	avrg.	28,343	27,762	24,942	26,445
CZK/USD	avrg.	22,609	20,308	17,035	19,057
Nominal effective exchange rate	%, y/y	5,2	2,6	11,6	-4,2
Real effective exchange rate	%, y/y	2,5	2,8	9,6	-5,3
Current Account/GDP	%	-2,4	-3,2	-0,6	-1,0
Financial Account/GDP	%	2,9	3,6	1,6	2,6
CNB Internat. Reserves/GDP	%	20,4	17,8	19,4	21,1
Coverage of imports by CNB IR	month	3,4	2,9	3,2	4,0
Fiscal indicators					
General government deficit (surplus)/GDP	%	-2,6	-0,7	-2,7	-5,8
State budget balance/GDP	%	-3,0	-1,9	-0,5	-5,3
General government debt/GDP	%	29,4	29,0	30,0	35,3
State debt/GDP	%	24,9	25,2	27,1	32,5

Notes:
y/y = year-on-year change; . = not available; * = end of period
1) full time equivalent, entire national economy

1.4 Macroeconomic Indicators in Detail

Indicators of Internal Balance

- Indicators of Economic Growth
  - Real GDP
  - Industrial Output
  - Construction Output
  - Agriculture Output
  - Services
  - Tourism
- Indicators of price stability
  - Deflator of GDP
  - CPI
  - PPI
  - Agriculture Producer Price Index
  - Market Service Price Index
  - Construction Work Price Index
  - House Price Index
  - Import and Export Price Index
  - World Price Index of Commodities
- Indicators of labour market:
  - No. of Employees
  - Rate of Employment
  - ILO General Rate of Unemployment or Registered Rate of Unemployment
  - Participation Rate
  - Average Gross Wage

Indicators of External Balance

- Foreign Trade Balance
- Net Export
- Current Account and Financial Account within Balance of Payment

Other Indicators

- Indicators of Living Standard (household income and consumption, household living conditions)
- Regional Indicators incl. regional GDP, industrial output, average nominal wage, unemployment rate,…

1.5 Macroeconomic Indicators – their information value

Economic indicators can be classified into three categories according to their usual timing in relation to the business cycle: leading indicators, lagging indicators, and coincident indicators.

Lagging Indicators describe the past. They usually change after the economy as a whole does. Typically the lag is a few quarters of a year. The unemployment rate is a lagging indicator: employment tends to increase two or three quarters after an upturn in the general economy. They are able to indicate the duration of a recession / expansion.
Examples: unemployment rate, unit labour costs, credit volume, banking interest rates, inventory to sales ratio.

Coincident Indicators: Coincident indicators change at approximately the same time as the whole economy, thereby providing information about the current state of the economy. There are many coincident economic indicators, such as Gross Domestic Product, industrial production, personal income and retail sales. A coincident index may be used to identify, after the fact, the dates of peaks and troughs in the business cycle.
Examples: GDP, industrial output, retail sales,…

Leading Indicators: Leading indicators are indicators that usually change before the economy as a whole changes. They are therefore useful as short-term predictors of the economy. Stock market returns are a leading indicator: the stock market usually begins to decline before the economy as a whole declines and usually begins to improve before the general economy begins to recover from a slump. Other leading

indicators include the index of consumer expectations, building permits, and the money supply.

Examples: economic survey, confidence indicators, equity markets, construction output, factory orders, agriculture prices, production and import of investment, world prices of commodities, payrolls, spread between short- and long-term interest rates.

1.6 Where to find Macroeconomic Indicators?

- National Statistical Offices
- National Central Banks
- Government, Ministries and other government institutions
- Trade unions, different associations and unions
- Eurostat, European Central Bank
- International Institutions such as World Bank, IIF, IMF, OECD, EBRD,…
- Other economic institutions such as NBER

1.7 Basic index theory and usage of indexes in macroeconomics

In economics and finance, an index is a statistical measure of changes in data. The index is an irrational number so it enables to compare data in time and space (or among geographical areas), and according the subject.

While the index can be expressed in percent, the difference between two indexes is expressed in percentage or base points (*pp or bp*).

The annual growth of average real wages in CR accelerated from 4% in 2007 to 5% in 2008, or the annual rate of average real wages growth was in 2007 by 1 percentage points (pp) or 100 basis points (bp) higher than in 2007.

Base Index is an index number reflecting price or quantity compared with a base value. The base usually equals 100 and the index number is usually expressed as 100 times the ratio to the base value. For example, if a commodity costs twice as much in 1970 as it did in 1960, its index number would be 200 relative to 1960.

$$I_b = \frac{X_t}{X_z}, t = 2,3,...,n \qquad (1.1)$$

Chain-type Index is an index number reflecting price or quantity compared with a previous value *(t-1)*. The most famous chain-type index is annual inflation rate that compared the current price level with previous year.

$$I_{\check{r}} = \frac{X_t}{X_{t-1}}, t = 2, 3, \ldots, n, \qquad (1.2)$$

1.8 How to work with indexes?

The relations between chain-type indexes and base indexes:

- we get base index when we multiply chain-type indexes in the raw:

$$I_{01/00} \cdot I_{02/01} \cdot I_{03/02} \cdot I_{04/03} \cdot I_{05/04} = I_{05/00} \qquad (1.3)$$

- we get chain-type index when we divide two neighboring base indexes with the same base year:

$$\frac{I_{05/00}}{I_{04/00}} = I_{05/04} \qquad (1.4)$$

- We can change the base year in the index when we divide the appropriate base indexes:

$$\frac{I_{01/00}}{I_{95/00}} = I_{01/95} \qquad (1.5)$$

- or we can easily switch from one base year to another one

$$I_{00/95} = \frac{1}{I_{95/00}} \ . \qquad (1.6)$$

When we need to precisely calculate the average value of indexes in a time span, we have to use ***the geometric mean*** instead of arithmetic mean. The arithmetic mean gives us in the case of indexes only approximate estimation and one can accept it only for values below 10%.

In cases where the geometric mean (GM) is being used to determine the average growth rate of some quantity, and the initial and final values I_t and I_{t+n} of that quantity are known, the product of the measured growth rate at every step need not be taken. Instead, the geometric mean is simply calculated from appropriate base index:

$$GM = \sqrt[n-1]{I_{t+n/t}}, t = 1,2,...,n. \quad (1.7)$$

The root of GM (*n-1*) reflects the number of time periods. If we need to calculate the average growth in 2000-2010, we use ninth root.

The geometric mean is also more appropriate than the arithmetic mean for describing proportional growth, both exponential growth (constant proportional growth) and varying growth; in business this is known as the compound annual growth rate (CAGR). The geometric mean of growth over periods yields the equivalent constant growth rate that would yield the same final amount.

$$GM = \sqrt[n-1]{I_{t+1/t} \cdot I_{t+2/t+1},.... \cdot I_{t+n/t+n-1}}, t = 1,2,...,n \quad (1.8)$$

Here, the n-th root is easily the number of chain-type indexes below root.

Suppose industrial output reached 100% level in 2005 and then 115, 126 and 130 the following years, so the growth is 15%, 9.6% and 3.2% for each year respectively. Using the arithmetic mean calculates a (linear) average growth of 9.3% (15% + 9.6% + 3.2% divided by 3). However, if we start with 100 level and let it grow 9.3% each year, the result is 130.6, not 130, so the linear average over-states the year-on-year growth. Instead, we can use the geometric mean. Growing with 15% corresponds to multiplying with 1.15, so we take the geometric mean of the final product: 130%, i.e. $\sqrt[3]{}(1.30) = 1.091$ (or $\sqrt[3]{}(1.15 \cdot 1.096 \cdot 1.032) = 1.091$), thus the "average" growth per

year is 9.1%. If we start with 100 production level in 2005 and let the output grow with 9.1% each year, the result is $100 \cdot (1.091)^3 = 130$.

1.8.2 Exercises - Solutions

1. Finish the time series of the GDP base indexes below. Choose the base year 1995 and than 2000.

GDP (bn CZK) constant prices 2000

1994	1995	1999	2000	2001
	2033,7	2112,1	2189,2	2242,9
98,40	100			

1A) Base year 1995:
a) 100 = 2033,7 bn CZK
b) I = HDPt / HDP95

1994	1995	1999	2000	2001
I94/95 98,4	I95/95 100	HDP99 / HDP95 103,9	HDP00 / HDP95 107,6	HDP01 / HDP95 110,3

1B) Base year 2000
I = HDPt / HDP00
or I = It/95 / I00/95

1994	1995	1999	2000	2001
	HDP95 / HDP 00 92,9	HDP99 / HDP00 96,5	 100,0	HDP01 / HDP00 102,5
I94/95 / I00/95 91,4	1 / I00/95 92,9	I99/95 / I00/95 96,5	 100,0	I01/95 / I00/95 102,5

2. Use inputs from Exercise 1 and calculate annual GDP growth rate in 2000 and 2001.

Solution:

2000	2001
HDP00 / HDP 99	HDP 01 / HDP 00
3,7%	2,5%
1/ I99/00	I01/00

3. Calculate the average GDP growth rate in 1995-2001 period. Use data from Exercise 1 and 2.

Solution:
6th-root from base index in 2001 with base year 1995:
Base index in 2001= 1,103
Avg GDP growth rate 95-01 = 1,01647 or 1,65% annually.

4. From base indexes calculate chain-type indexes of annual growth rate of industrial production.

2001	2002	2003	2004	2005
100	101,9	107,5	117,8	125,7

Solution:

2001	2002	2003	2004	2005
	I02/01	I03/01 / I02/01	I04/01 / I03/01	I05/01/ I04/01
in %	1,9	5,5	9,6	6,7

5. Based on quarter-on-quarter indexes calculate annual GDP growth rate in Q1 of 'Z' year.

q/q	1q	2q	3q	4q
X	98	101	99	101,5
Y	101,0	102,0	101,5	102,2
Z	102,0			

Solution:
q-o-q index from Q1 Z = 102 can be written as Index 1qZ/4qY and others similar to this
We need Index 1qZ/1qY and we get it as a result of multiplication of the last four q-o-q indexes:
Index 1qZ/1qY = Index 2qY/1qY * Index 3qY/2qY * Index 4qY/3qY * Index 1qZ/4qY

Index1qZ/1qY = 1,02 * 1,015 * 1,022 * 1,02 = 1,079
or 7,9 %

1.8.3 Price indexes

Nominal values are values expressed in terms of units of a currency which may itself change in purchasing power over time, whereas real values have been corrected for inflation. Changes in the nominal value of some commodity bundle over time can happen because of a change in prices and/or changes in the quantities in the bundle, whereas changes in real values reflect only changes in the quantities.

A single real value has no meaning. Real values always express a quantity existing at some point in time relative to a quantity existing at some other point in time — for example, the output of an industry this year relative to its output last year. Frequently, a series of real values is given, with all members of the series expressing their quantity relative to one chosen point, which is called the base period of the series. For example, gross domestic product figures for a succession of years might all be expressed in terms of the prices in one base year.

Nominal values—such as nominal wages or (nominal) gross domestic product—refer to amounts that are paid or earned in money terms. ***Real values*** (such as real wages or real gross domestic product) can be derived by dividing the relevant nominal value (money wages or nominal GDP) by the appropriate price index. Or the price "deflates" (divides) the nominal value to derive a real value, the quantity itself:

$$\text{real value} = \text{nominal value} / \text{price index}. \tag{1.9}$$

For consumers, a relevant bundle of goods is that used to compute the Consumer Price Index. So, for wage earners as consumers a relevant real wage is the nominal wage (after-tax) divided by the CPI. A relevant divisor of nominal GDP is the ***GDP price index or GDP deflator***. Unlike the Consumer price index, which measures inflation (or deflation–rarely!) in the price of household consumer goods, the GDP deflator measures changes in the prices of all domestically produced goods and services in an economy–including investment goods and government services, as well as household consumption goods.

$$\text{GDP deflator} = \text{nominal GDP} / \text{real GDP}. \quad (1.10)$$

It is usually constructed to equal 1.00 or 100 in the base year.

The nominal value of the GDP would then be nominal GDP (quantity) times GDP deflator (price index):

$$\text{nominal GDP} = \text{real GDP} \cdot \text{GDP deflator}. \quad (1.11)$$

The nominal/real value distinction can apply not only to time-series data, as above, but to cross-section data varying by region or householder characteristics. The GDP adjusted for changes in money-value in this way is called the real, or constant, GDP.

Examples:

- *GDP deflator = nominal GDP (2 970.3 bn CZK) / real GDP in constant prices 2000 (2617.6 bn CZK) = 1.13. Price level increased by 1.13 times or by 13%.*
- *Consumer Price Index (CPI) reached 117,7 in 2005 compared to the price level in December 1999. Price level of consumption increased by 117.7 – 100 = 17.7 %.*

  (to buy the consumption basket of the 100 CZK value we need in 2005 117.7 CZK while in Dec 1999 only 100 CZK, it means that 1 CZK in Dec 1999 had a real value (or purchasing power) of 1.177 CZK in 2005; 1 CZK in 2005 represented real value of 1/1.177 = 0.85 CZK from Dec 1999.)

6. Calculate the average annual growth rate of consumer prices in the period of 2000-2005.

CPI	2000	2001	2002	2003	2004	2005
Annual avg.	100	104,7	106,6	106,7	109,7	111,7

Solution: geometric average of base index from 2005:
5-th root of index I05/00 = 2,2%

7. Calculate the purchasing power or real value of 1 CZK from 2000 year till 2005. Than recalculate the real value of 1 CZK from 2005 for previous years.

Solution:
1. Real value of 1 CZK from 2000 is equal to 1 CZK in 2000 and in 2005 year is equal to a reverse value of the base CPI index from 2005 (1/111,7)
2. The real value of 1 CZK in 2005 year is equal to a reverse value of the base index of CPI 03/05; to get this index we have to divide the base index CPI 05/00 and the base index CPI 03/00

CPI	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Annual avg.	100	104,7	106,6	106,7	109,7	111,7
	100 / 100	100 / 104,7	100 / 106,6			
	1,00	0,96	0,94	0,94	0,91	0,90
				111,7 / 106,7	111,7 / 109,7	111,7 / 111,7
	1,117	1,07	1,05	1,05	1,02	1,00

8. Calculate year-on-year change of CPI in 2005 and the average inflation rate in 2005.

Month-on/month changes

year / month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2004	1,8	0,2	0,1	0	0,4	0,2	0,4	0	-0,8	0,5	-0,1	0,1
2005	0,7	0,2	-0,1	0,1	0,2	0,6	0,3	0	-0,3	0,9	-0,3	-0,1

Year-on-year changes

2004	2,3	2,3	2,5	2,3	2,7	2,9	3,2	3,4	3	3,5	2,9	2,8

Solution:
y-o-y CPI in Jan 05 = y-o-y CPI in Dec 04 * m-o-m CPI in Jan 05 / m-o-m CPI v Jan 04

Proof: Index (Dec 04 / Dec 03) * Index (Jan 05 / Dec 04) / Index (Jan 04 / Dec 03)
Another method: multiply 12 m-o-m CPI

year / month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	1,028*1,007/1,018	1,0169*1,002/1,002										
2005 (index)	1,0169	1,0169	1,015	1,016	1,014	1,018	1,017	1,017	1,022	1,026	1,024	1,022
2005 v %	1,69%	1,69%	1,49%	1,59%	1,39%	1,79%	1,69%	1,69%	2,20%	2,61%	2,40%	2,20%

Avg. annual inflation rate is equal to the moving 12-month average of annual CPI.
In this case we calculate 12-th root of the 12 mutliplied y-o-y CPI: 1,0187
or 1,87%

9. Calculate Japan's GDP deflator, when nominal GDP (in current prices) in 2005 was 101.3 a real GDP (in constant prices) totaled 102.6.

Deflator = 1,013 / 1,026 0,98733
Deflator of Japan's GDP totaled -1,3% ; since it is a negative number, it is deflation

10. Calculate the nominal value of GDP in the period of 2001-2005 and the annual nominal GDP growth rate, when you know that the nominal value of GDP was 2189.2 bn in 2000.

	2000	2001	2002	2003	2004	2005
Real GDP (2000 = 100)	100	102,5	104,4	108,2	112,7	119,6
GDP's Deflator (y-o-y %)	1,5	4,9	2,8	0,9	3,5	0,7
Nominal GDP in bn	2189,2					

Solution:
Nominal Index = Real Index * Deflator
Be carefull! Real index is base index (2000 = 100) - we have to recalculated into chain-type index (y-o-y).

	2000	2001	2002	2003	2004	2005
	100	I01/00	I02/00 / I01/00	I03/00 / I02/00		
Real GDP, y-o-y	100	102,5000	101,8537	103,6398	104,1590	106,1224
	real GDP (y-o-y) * deflator (y-o-y)					
Nominal GDP, y-o-y	101,5	107,5	104,7	104,6	107,8	106,9

	2189,2	Nom. GDP in the past year * index of real GDP in the respective year				
Nominal GDP		2353,9	2464,6	2577,3	2778,5	2969,2

11. Forecast the real and nominal GDP as of 31.12. 2010 using data from previous exercise covering the time period of 2000-2005. Consider the price level from 2000.

Solution:
we forecast for n-year ahead using the avg. rate of growth raised to the power of n-years

Avg. Real GDP growth rate in 00-05 =	1,196 ^ (1/5)	3,6%	
Real GDP in 2000 =	Index of nom. GDP / deflator	2156,8	
Real GDP in 2010 =	2156,8 * (1 + 0,036) ^ 10 =	3085,2	bn
Avg. nom. GDP growth rate in 00-05 =	(1,075 * 1,047 * 1,046 * 1,078 * 1,069)^(1/5) =	6,3%	
Nom. GDP in 2010 =	2189,2 * (1+ 0,063) ^ 10 =	4032,9	bn

Self-study

- Get to know the structure and content of Czech Statistical Office's web site (www.czso.cz) and Eurostat's web site (http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/themes)
- Look for key macroeconomic indicators for Czech Republic and other country and compare them.

Sources

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