Quarterly Gross Domestic Product
Methodological notes

I. QGDP estimation methods

The quarterly Gross Domestic Product at market prices (QGDP), the main macroeconomic aggregate of national accountancy, represents the final result of production activities carried out by resident productive units, during a defined period, namely a quarter. The quarterly Gross Domestic Product at market prices is estimated based on three approaches:

a) production approach:

QGDP=GVA+TP-SP

where: GVA=gross value added at basic prices;
TP=taxes on products;
SP=subsidies on products.

b) expenditure approach:

QGDP=FC+GCF+E-I

where: FC= actual final consumption;
GCF=gross capital formation;
E=exports of goods and services;
I=imports of goods and services.

c) income approach:

QGDP=CO+GOS+TPI-SPI

where: CO= compensation of employees;
GOS=gross operating surplus;
TPI=taxes on production and imports;
SPI=subsidies on production and imports.

The main data sources used for the estimation of quarterly Gross Domestic Product:

- **statistical sources**: infra-annual surveys on industrial production, construction, services, trade; the agricultural production account; infra-annual surveys on earnings and employees number;
- **financial-bookkeeping sources**: balance sheets of financial institutions;
- **administrative sources**: execution of state budget and of local budgets, as well as of state social insurance budget; balance of payments.

Estimation of production in current prices:

- for non-financial companies (enterprises), population households and non-profit institutions it was estimated by activity branches, extrapolating the production level of the same quarter of the previous year, using the volume, price and value indices available from statistical data sources;
- for financial companies and public administrations it was directly determined based on administrative data sources (balance sheets and budgets execution).

Estimation of intermediate consumption:

- for non-financial companies (enterprises), population households and non-profit institutions it was estimated by activity branches applying the weight of intermediate consumption in output

for the same quarter of the previous year, for which more complete and reliable data sources were available, based on the assumption that the technological coefficient are unchanged;
- for financial companies and public administrations it was directly determined based on administrative data sources (balance sheets and budgets).

Estimation of Gross Value Added:

The Gross Value Added was calculated as the difference between production and intermediate consumption.

Calculation of taxes and subsidies on product: based on the data from the consolidated budget.

Data on Quarterly Gross Domestic Product are estimated and disseminated starting T+45 days ("flash" estimates), followed by the provisional (1) estimates within T+70 days for which there are used the available data up to that moment, together with the above presented estimates. Beginning with Q I 2012, the policy related to Quarterly Gross Domestic Product estimation and dissemination was changed, by introducing a third estimate called "provisional data (2)" that is to be published, according to the Press release calendar posted on INS web-site, within 95 days after the end of the reference quarter. The main objectives of this revision relate to:

- the integration of statistical, financial-banking and administrative information which became available or were rectified after the publication of first provisional estimates, within 65 days after the end of the reference quarter;
- ensuring the consistency between the aggregates on which quarterly GDP is based and the aggregates from quarterly accounts of institutional sectors, particularly those of "Public administration" sector, the dissemination deadline being 90 days after the end of the reference quarter.

The additional information used for the estimation of Gross Domestic Product – provisional data (2) refers to:

- rectified statistical data for the last month of the quarter, regarding: industrial production indices, industrial production price indices, construction works indices, construction cost indices, indices of turnover volume for retail, excepting motor-vehicles and motorcycles, indices of turnover volume for wholesale and retail, maintenance and repairs of motor-vehicles and motorcycles, value indices of turnover for wholesale, indices of turnover volume for market services rendered to population, value indices of turnover for market services mainly rendered to enterprises;
- additional statistical data on passengers and freight transport;
- administrative data on budgetary execution;
- rectified data the Balance of external payments.

The quarterly Gross Domestic Product is estimated at current prices, at the prices of the previous year corresponding period and in chain-link volumes.

II. The chain-linked volume technique with reference year

According to the Eurostat requirements, EU regulations on national accounts, OECD and IMF handbooks and recommendations, in order to ensure the comparability among Member States data and to align the annual data with quarterly data of national accounts, NIS proceeded to the change of the reference (base) year used for compiling the chain-link volume data, with year 2020.

Changing the reference year of national accounts series is desirable for several reasons, mainly for capturing the structural changes in the economy and thus for illustrating better the economic reality, closer to present.

National accounts aggregates at constant prices provide important indicators for measuring growth in each activity or for economy as whole. All EU Member States countries are compiling national accounts aggregates at current and constant prices. They also update the base year periodically. Constant price estimates use the prices relative of a particular year to weight together the volume components. Each reference year gives a different perspective resulting from their corresponding weights. While current price data have the advantage of being additive, the pattern of relative prices in the base period tends to become progressively less relevant over time. Therefore, it is necessary to update the base period to adopt weights that are more consistent with current conditions.

According to Eurostat's point of view, the use of the annual overlap method as common method for all Member States would be preferred. As response to Eurostat recommendations, NIS Romania applies the **annual overlap technique** (overlap with the annual average of the previous year) in compiling the chain linked quarterly data in national accounts.

The technique of using annual overlaps for volume measures implies compiling estimates for each quarter at the weighted annual average prices of the previous year. Subsequent linking is made using the corresponding annual data to provide linking factors to scale the quarterly data upward or downward. In this way, the annually chain-linked quarterly Laspeyres index aggregates to the corresponding direct annual index:

$CLt,q = \sum wi,t-1 * Ii,t,q / \sum wi,t-1 * Ii,t-1$

The index for year t and quarter q is produced by multiplying the chain link (CL) with the corresponding quarterly index of the previous year: $It,q = CLt,q * It-1$

The change of reference year for constant price estimates with fixed year for Romania implies the re-calculation of the chain-linked volume series based on annual overlap technique, starting year 1995. This technique is based on the existing national accounts raw series in current prices and in prices of the corresponding period of previous year, which are not changed. The re-calculated series for quarterly Gross domestic product and components using base year 2020 and chain linked volume technique imply the loss of additivity (by example, GDP ≠ sum of components)

Establishing year 2020 as base year and using annual overlap technique for chain-linking are considered important improvements for national accounts, required and approved by Eurostat.

III. Seasonal adjustments

Beside the raw estimates of quarterly Gross Domestic Product, seasonally adjusted estimates are also compiled through the regressive method, this being the method recommended by the European regulations.

Seasonal adjustment envisages the removal of seasonal effects from the data series in view to point out the real economic evolution during consecutive periods[1].

For the adjustment of main aggregate series, based on which the GDP is estimated through the three methods, the **JDemetra+ software package** is used (X-13ARIMA-SEATS method). This leads to the estimation of seasonal effect (events occurring at the same moment, with the same scale and direction each year, such as: seasons, holidays, etc., the working days number different from

1 *GDP – seasonally adjusted series, is used in view to compare the reference quarter with the previous quarter, while the GDP – unadjusted series is preponderantly used for the comparison with the corresponding period of previous year.*

one month to another and the calendar effect (Orthodox Easter, leap year and other national holidays) as well as to the identification and correction of outliers (additive outlier, transitory change, level shift) and the interpolation of missing values.

The quarterly national accounts of Romania present, in general, strong seasonality. The seasonally adjusted series was obtained by removing the seasonal effect from the unadjusted series, by means of correction coefficients, established depending on the regression model used (additive or multiplicative). The additive or the multiplicative model used for regression is automatically identified by JDemetra, depending on the nature of series subject to adjustments.

The seasonally adjusted QGDP is obtained through the direct method. For QGDP in current prices, this practice leads to a statistical discrepancy between the QGDP and the sum of its components, which are independently seasonally adjusted. The gross series in chain-linked volumes are not additive, in consequence the additivity is not applied for seasonally adjusted series in chain-linked volumes too.

The seasonally adjusted series for the last years and the available quarters of the reference year are re-estimated every quarter as a consequence of the revision of unadjusted annual and quarterly series when more comprehensive and accurate statistical and administrative data sources become available, of including in the series of new observation, of the chages of the models used and regression parameters. The new chain-linked volume series în base year 2020 are seasonally adjusted with JDemetra+ software. The obtained seasonally adjusted series are used to compile the growth rates quarter-on-quarter and year-over-year for QGDP and its components. The differences between the resulted growth rates comparing to the previously published ones are mainly due to the change of models and parameters in the seasonal adjustment techniques and are in general limited in amplitude.

IV. Stages of the seasonal adjustment process

Seasonal adjustment of quarterly data is a 3-step process:

First stage:

Obtaining the unadjusted series expressed in nominal terms, in current prices and the average prices of the previous year (previous year prices, PYP)

Second stage

- the unadjusted series expressed in nominal terms, in current prices and previous year prices are converted in chain-linked series expressed in prices of the reference year 2020 obtained from chain-linked volumes (CLV) with the annual overlap method.
- Chain-linked with a reference year a purely statistical technique that does not affect the unadjusted series of national accounts expressed in current prices.

Third stage

• Seasonal adjustment is performed using the JDemetra+ software and is applied only to the raw series converted to chained series with reference year 2020.