METHODOLOGY FOR ESTIMATING QUARTERLY GDP

QUARTERLY ESTIMATES OF GDP BY PRODUCTION APPROACH

1. Introduction

1.1 The Central Statistical Organisation (CSO) introduced the quarterly estimates of Gross Domestic Product (GDP) on 30.6.1999. The estimates released in June 1999 were the estimates for the fourth quarter-Q4 (January-March) of financial year 1998-99, both at constant and current prices. The Quarterly Gross Domestic Product (QGDP) estimates are now released by the CSO on the last working day after two months of the end of a quarter.

1.2 The production approach used for compiling the QGVA estimates is broadly based on the benchmark-indicator method. In this method, for each of the industry-groups, namely, agriculture, forestry, fishing, mining, manufacturing, electricity, gas and water supply, trade, hotels and restaurants, transport, storage and communication, banking and insurance, real estate, ownership of dwellings and business services and public administration, a key indicator or a set of key indicators for which data in volume or quantity terms is available on quarterly basis, are used to extrapolate the value of output/value added estimates of the previous year. For example, in the case of agriculture sector, the set of key indicators are the quarterly estimates of agriculture production (at individual crop level) and in the case of manufacturing sector, the key indicators are the index of industrial production (at 2-digit industry group level). The estimates of GVA by industry are compiled by extrapolating value of output or value added with relevant indicators. In this method, annual forecasts of GVA estimates and corresponding estimates for all quarters of the current year are prepared all the time (even while preparing Q1 estimates, projections for Q2, Q3, and Q4 are made, based on available data on forecasts, targets, and other auxiliary information) for the current year and make them consistent with the annual forecasts of GDP made on this information. In general terms, quarterly estimates of Gross Value Added (GVA) are extrapolations of annual series of GVA. Therefore, for the first two quarters, the QGVA are extrapolations of annual series of revised estimates of GVA of the previous year released on 31st May every year and for the last two quarters the QGVA is based on the Quick estimates of the previous year released on 31st January. Estimates of GDP are obtained by adding the taxes on products less subsidies on products to the estimated GVA.

1.3 The quarterly GVA estimates of different sectors at constant prices are compiled according to two methods – (i) Estimating value of output and material inputs and then deriving gross value added (ii) Estimating GVA using some physical indicators. In the case of industries, agriculture, forestry, fishing and mining, value of output and material inputs are estimated and then gross value added is obtained. Commodity-level value of output at constant prices of the previous year is extrapolated with the growth in production of the particular commodity during the reference quarter. In these industries, for those commodities for which quarterly production data is not available, their values of output are first estimated for the entire year using the trend available from the past years' data, and the annual estimate is apportioned equally among the four quarters of the year. The quarterly value of output of each of these four industries is the sum of value of output of individual commodities within these four industries. For estimating the quarterly value of inputs in these four industries, the previous year's input-output ratio (based on quick estimates) is applied on the quarterly estimated value of output, separately for each of these four industries.

1.4 In the case of all other industries, the gross value added estimate for the reference quarter is directly estimated at different disaggregated levels (for example, in the case of manufacturing at 2-digit National Industries Classification (NIC) level) by extrapolating the estimated GVA of the same quarter of the previous year with the growth rate observed in the physical indicator during the reference quarter

1.5 The quarterly GVA estimates for different industries of the economy were prepared in the first instance at constant prices for the year, 1996-97 (which is the starting year for the QGVA data), by apportioning the annual output/input/GVA estimates of 1996-97 of various industries into the four quarters of the year, 1996-97 on the basis of the quarterly performance of identified physical indicators of the respective sectors. For the few industry groups for which no quarterly data is available on the physical indicators, the annual output/ GVA was apportioned equally among the four quarters of the year.

1.6 For compiling the estimates at current prices, firstly the implicit price deflators are estimated using the data on prices available from the wholesale and consumer price indexes of the respective industry groups. These industry-wise implicit price deflators are then super-imposed on the QGVA estimates compiled at constant prices, to obtain the industry-wise estimates at current prices.

2. Estimates at constant Prices

The industry-wise details of the methodology of estimating the QGVA estimates at constant prices is described in the following paragraphs.

2.1 Agriculture including livestock

For estimating the quarterly value of output of this industry, commodity-wise quarterly agriculture production data is required. However, agriculture production data is available only by two seasons (kharif or summer and rabi or winter). In order to compile estimated quarterly agriculture production from the season-wise production data, the India Crop Calendar (ICC), 1998 is used. The ICC presents the calendar of harvesting operations. This document gives the periods of harvesting of crops in different seasons/states. Using the season-wise production data and the ICC1998, the Ministry of Agriculture prepares the estimates of quarterly agriculture production of different crops.

The above method of compiling quarterly agriculture crop production estimates assumes that the entire production of a particular state/season/crop occurs in the harvesting period. By adopting this method, the total estimated agriculture production during the four quarters of a financial year (April to March) will be different from the one relating to the agriculture year (July to June). However, for annual national accounting purposes, the CSO has been adopting the total crop production in an agriculture year as that in the financial year. The two estimates of annual crop production differ to the extent of the difference in production during April-June period of the two successive years. Therefore, in order to

ensure consistency between the quarterly GVA estimates and the annual GVA estimates, the agriculture production estimates in the four quarters of a financial year are adjusted on a prorata basis to that of the total production in the agriculture year.

The crops for which the quarterly production data is available are rice, wheat, jowar, bajra, barley, maize, ragi, small millets, gram, tur, urad, moong, other kharif pulses, other rabi pulses, groundnut, sesamum, rapeseed and mustard, linseed, castorseed, safflower, niger seed, coconut, sunflower, soyabean, cotton, jute, mesta, sanhemp, blackpepper, dry chillies, dry ginger, turmeric, arecanut, cardamom, coriander, potato, tapioca, garlic, sweet potato, banana, onion, sugarcane, tobacco and guarseed.

QGVA is estimated separately for (a) Principal Crops for which quarterly production data is available. (b) Other crops for which production data is available with a time lag. When production data is not available at the time of compilation of quarterly estimates, the annual estimate is first prepared by log-linear estimation, targets, or likely estimates announced by the Ministry of Agriculture. The annual estimated production of such crops is apportioned among quarters on the basis of pattern observed in last few years. The commodity-level value of output for the reference quarter is then estimated by extrapolating the estimated commodity-level value of output at constant prices of the same quarter of the previous year with the growth in production of particular commodity during reference quarter.

In the case of livestock products, quarterly estimates of production are available for the three major items, namely, milk, egg and wool, from the Department of Animal Husbandry and Dairying, Ministry of Agriculture. These estimates are compiled through special tabulations of the questionnaires on annual Integrated Sample Survey. This survey is conducted in three seasons, namely, summer, rainy and winter, primarily to estimate the yield rates of production per different categories/ages/breeds of animals. As quarterly data is available with a time lag, the annual production data is apportioned among quarters on the basis of previous year's distribution. Annual estimates of milk, egg and wool production for the current year are provided by the Department of Animal Husbandry and Dairying. Using this quarterly production growth, the value of output for the reference quarter is estimated. In the case of other livestock products, the annual estimates for the current year are prepared using log-linear estimation techniques. The annual estimate is apportioned among quarters on the basis of previous year's distribution. The quarterly value of output of agriculture is the sum of the value of output of individual commodities in the agriculture and livestock sector.

Quarterly data on inputs of agriculture sector are not separately available, as the cost of cultivation studies have an annual periodicity. Therefore, for estimating the value of inputs of agriculture and livestock sector for the reference quarter, the annual input-output ratios of the previous year are adopted. The quarterly GVA estimate for the agriculture sector is obtained as the difference between quarterly estimates of value of output and material inputs.

Government operated irrigation activity GVA is accounted for by first estimating the activity for the year and then apportioned equally in the quarters

2.2 Forestry

In the absence of quarterly production data on major and minor forest products, the annual estimates of the current year are first prepared, separately for the three items, namely industrial wood, fuelwood and minor forest products, by using the log-linear estimation

techniques. The estimated value of output of forestry products during the reference quarter is taken as 1/4th one-fourth of the annual forecast of value of output of forestry products. The inputs of forestry sector are taken to be 10 per cent of value of output, both for the annual estimates and the quarterly estimates.

2.3 Fishing

The quarterly estimates of production of inland and marine fish are available from the Ministry of Agriculture. Using this quarterly production data, quarterly estimates of value of output of inland and marine fish are compiled. As the quarterly production of inland and marine fish are generally available with a time lag, the, annual production is estimated on the basis of average growth observed in the last few years. The annual estimated production is apportioned among quarters on the basis of proportions worked out from the quarterly data of the previous year. Using this quarterly production data, quarterly estimates of value of output of inland and marine fish are compiled. The estimate of value of input is derived on the basis of previous year's input-output ratio.

2.4 Mining

The data on production of coal, crude petroleum and the Index of Mining, are available on monthly basis. These data were used to apportion annual values of output of crude petroleum, coal and other major and minor minerals, respectively of the year 1996-97 into the four quarters of 1996-97. The estimates of inputs in the mining sector for the four quarters of 1996-97 were derived separately for fuel minerals and all others, based on the annual input-output ratios (taken from National Accounts statistics) for these minerals for the year 1996-97.

For the reference quarter, the quarterly production data on crude petroleum, coal and the IIP of Mining are used to estimate the values of output of crude petroleum, coal and other major and minor minerals, respectively. The commodity-level value of output for the reference quarter is estimated by extrapolating the estimated commodity-level value of output at constant prices of the same quarter of the previous year with the growth in production of particular commodity during reference quarter. The quarterly value of output is the sum of the value of output of crude petroleum, coal and other major and minor minerals. The quarterly values of inputs are estimated separately for fuel minerals and all others by applying previous year's input-output ratios on the quarterly estimated values of output of these minerals.

2.5 Manufacturing

GVA estimates for the initial year for both manufacturing registered and unregistered sector were prepared by apportioning the annual GVA estimates at 2-digit level into the four quarters of the initial year with the help of corresponding quarterly Industrial production data at 2-digit level.

The gross value added at 2-digit level (NIC) for the reference quarter is estimated by extrapolating the estimated gross value added at 2-digit level at constant prices of the same quarter of the previous year with the growth observed in IIP at 2-digit level during reference quarter. The quarterly value added is the sum of value added estimated at 2-digit level.

2.6 Electricity, Gas and Water Supply

The indicator for the electricity is taken to be the monthly IIP of Electricity. The quarterly index data was used to apportion the annual GVA of the industry for the year 1996-97. The value added for the reference quarter is estimated by extrapolating the estimated value added at constant prices of the same quarter of the previous year with the growth observed in IIP of Electricity during reference quarter. For gas and water supply industry groups, the annual forecast is first made using the past trends and the same is apportioned equally among the four quarters of the year.

2.7 Construction

The key indicators of the *pucca*(modern type*)* construction are taken to be the production of cement, steel, bricks and tiles and the Index of Industrial Production (IIP) relating to fixtures and fittings, monthly data on which is available. Utilising this quarterly data, the annual GVA estimate of pucca construction was apportioned to four quarters for the year 1996-97. For the *kutcha*(with locally available materials*)* construction part of GVA of construction sector, the annual GVA estimate, 1996-97 was apportioned equally into the four quarters of 1996-97.

For the quarterly GVA estimates, the *pucca* construction part is compiled using the growth observed in the production of cement and cement products (using the indicator cement production), iron and steel (using the indicator steel consumption), bricks and tiles (using the indicator coal production) and timber and round wood (using the indicator IIP-wooden fixtures). For the *kutcha* construction part of GVA of construction sector, the annual forecast is first made using the past trends (which are based on actual data) and the same is apportioned equally among the four quarters of the year.

2.8 Trade, Hotels and Restaurants

The annual GVA estimate of the initial year was apportioned into the four quarters based on Quarterly index of gross trading income (QGTI). The QGTI was compiled using information on quarterly output of agriculture, livestock, forestry, fishing, mining, registered manufacturing, unregistered manufacturing and imports separately.

The GVA for the reference quarter is estimated by extrapolating the estimated value added at constant prices of the same quarter of the previous year with the growth observed in Quarterly Index of GTI during reference quarter. QGTI for the reference quarter is computed, using the quarterly growth in value of output of commodity producing sectors (agriculture, livestock, forestry, fishing, mining, registered manufacturing, unregistered manufacturing and imports)

2.9 Railways

Quarterly data on the two key indicators of this sector, namely, passenger kilometers and net tonne kilometers are available. Using this data, a single weighted average quantum figure is computed, with the earnings from passengers and freight as weights. The annual

GVA estimate of 1996-97 was apportioned into the four quarters of 1996-97, using this indicator.

With the help of quarterly data on the two key indicators of this sector, namely, passenger kilometres and net tonne kilometres, a weighted average quantum figures is computed for the reference quarter. Using the growth rate observed in this indicator for the reference quarter, the quarterly GVA of the reference quarter is estimated for the railways.

2.10 Transport Other Than Railways

The data on indicators of this sector, namely, stock of commercial vehicles (estimated from sales of commercial vehicles), and passenger kilometres flown and freight tonne kilometres flown, in the case of civil aviation, are available on quarterly basis. Cargo handled at major ports is available on a monthly basis. The quarterly data on production of commercial vehicles, cargo handled at major ports, passenger kilometres flown and freight tonne kilometres flown, in the case of civil aviation are used to compile the GVA estimates for the reference quarter of the sub-sectors, transport by road, water and air. For the sub-sector, services incidental to transport, the annual forecast is first made using the past trends and the same is apportioned equally among the four quarters of the year.

Using the respective quarterly data of these indicators for the year 1996-97, the annual GVA estimates of 1996-97 for the three components of this sector, namely, road, water and air, was apportioned into the four quarters of 1996-97. In the case of services incidental to transport, on which no quarterly data is available, the GVA estimate of this sub-sector for the year 1996-97, was apportioned equally into the four quarters of 1996-97

2.11 Communication

The data on postal and telecommunication revenue was previously available on monthly basis. Using this data and in conjunction with the wholesale price index, the annual GVA estimate of this industry for the year 1996-97, was apportioned into the four quarters of the year 1996-97.

Due to non-availability of postal and telecommunication revenue data on a timely basis at present, for the quarterly estimates, the indicator used is the total stock of telephone connections (including wire line and wireless) in the country. Monthly data on stock of telephones is available. The growth observed in this indicator is used to estimate the GVA of the industry.The stock of telephones include wireless and land line connections.

2.12 Banking And Insurance

For the banking industry, the physical indicator is the sum of aggregate deposits and bank credits (deflated by the wholesale price index). The data on these items is available on monthly basis. With the help of this quarterly data, the annual GVA estimate of banking for the year 1996-97, was apportioned into the four quarters of the year 1996-97. For insurance, the physical indicator for the life insurance component is the quarterly net insurance premiums (deflated by the wholesale price index). The data on these items is available on quarterly basis. Using this quarterly data, the annual GVA estimate of the life insurance component for the year 1996-97, was apportioned into the four quarters of the year 1996-97. For the non-life insurance component, the indicator taken is the non-life fund (gross less claims) deflated by the wholesale price index. This data is available on quarterly basis.

Using this quarterly data, the annual GVA estimate of the non-life insurance component for the year 1996-97, was apportioned into the four quarters of the year 1996-97. The value added of the respective sub-groups of the banking and insurance industry for the reference quarter is estimated by extrapolating the estimated value added at constant prices of the same quarter of the previous year with the growth observed in physical indicators of this sector during reference quarter.

2.13 Real estate, Ownership of Dwellings and Business Services

Annual estimates are first compiled on the basis of average of the growth observed in the past few years in the case of unorganised sector. For private organised sector of Real estate and computer relating services, growth in GVA as derived from quarterly financial results of companies are used. The annual figure so compiled is equally apportioned between quarters.

2.14 Public Administration and Defence

The indicator for deriving the quarterly GVA estimate is the revenue expenditure of the government net of interest payments. Government expenditure is estimated for each quarter for compiling current price estimates. Monthly expenditure of central government is available from CGA website. Data pertaining to State government expenditure is provided by the State Government. But as there is a time lag in receipt of quarterly expenditure from states, the annual expenditure is quarterised on the basis of quarterly proportions derived from central government expenditure. This quarterly data on deflated (with CPI-IW) revenue expenditure of central government was used to estimate the quarterly GVA of the industry for the year 1996-97.The value added at current prices for the reference quarter is first estimated by extrapolating the estimated value added at current prices of the same quarter of the previous year with the growth observed in government expenditure net of interest payments during reference quarter. The current price estimate so obtained is then deflated with CPI(IW) to obtain estimates at constant prices.

2.15 Other Services

The estimates of GVA of "other services" consist of two components, namely, the public sector component and the private sector component. For the quarterly estimates, the indicator used for the public sector part is the same as that used in the public administration and defence. For the private sector part, the annual forecast is first made using the past trends and the same is apportioned equally among the four quarters of the year.

2.16 QGDP estimates at market prices

The sum of all industry-wise GVA at constant prices plus taxes on products less subsidies on products at constant prices is the QGDP at constant prices which is at market prices. Quarterly current price estimates of taxes on products are compiled using monthly data on tax revenue. Subsidies for the reference year is first compiled by applying the growth observed in explicit subsidies on the previous year's subsidy figure worked out on the basis of actual analysis of central and state budgets. This annual data on subsidies are distributed among quarters on the basis of government expenditure. Constant price estimates of taxes on products are compiled by volume extrapolation (weighted average growth in volume of

output of manufacturing, services and imports) and in the case of subsidies, GDP deflator is used.

3. Estimates at current prices

The QGDP estimates at current prices are compiled by superimposing the Wholesale Price Index/CPIs on the QGVA estimates at constant prices, at major industry group level. This is done by estimating the industry wise implicit price deflators (IPDs) for each quarter, using the relevant price indexes, for the reference quarter. The IPDs are worked out as ratio of GVA at current prices and GVA at constant prices. The QGVA estimate at current prices for each industry equals the product of QGVA for the quarter at constant prices and the IPD for the quarter of that industry.

4. QGDP at current market prices

The sum of all industry-wise QGVA plus taxes on products less subsidies on products is the QGDP at current market prices. Quarterly current price estimates of taxes on products are compiled using monthly data on tax revenue. Annual data on subsidies available from government budgets are distributed among quarters on the basis of government expenditure net of interest payments.

QUARTERLY ESTIMATES OF GDP BY EXPENDITURE APPROACH

1. Introduction

1.1 The Quarterly estimates of GDP were released for the first time on 30.6.1999 for the quarter Jan-March, 1999 compiled through production approach. However, the Quarterly estimates of GDP compiled through expenditure approach were released for the first time on 31.5.2007 and the estimates were as per the new series of national accounts from 2004-05 (the new base year) onwards.

1.2 In expenditure approach the GDP is estimated as the sum of final consumption expenditures (of Households, NPISH and Government), Gross Fixed Capital Formation, Change in Stocks, Valuables and net exports. In this context, the quarterly estimates of GDP are estimated separately for each quarter for different final expenditure categories viz. Government Final Consumption Expenditure (GFCE), Private (assumed to be Households and NPISH together) Final Consumption Expenditure (PFCE), Gross Fixed Capital Formation (GFCF), Change in stocks, Valuables and Net exports. These estimates are first estimated at current market prices. Thereafter, constant price estimates are obtained by using appropriate deflators.

2. Methodology for estimating QGDP Estimates

2.1 The procedure for arriving at quarterly estimates for different final expenditure categories are explained in the succeeding paragraphs.

Government Final consumption expenditure (GFCE)

2.2 Annual current price estimate for the reference year is first compiled using the growth rate observed in combined revenue expenditure of centre and states on the annual GFCE estimate compiled for the previous year. Quarterly estimates of GFCE for the reference quarter are then obtained by using growth rate observed in the combined quarterly expenditure of Central and State governments net of interest payments. Monthly data on central government expenditure net of interest payments available from the website of Controller General of Accounts (CGA), Department of Expenditure, Ministry of Finance is used for working out quarterly expenditure of Central Government. Data pertaining to State government expenditure is provided by the State Government. But as there is a time lag in receipt of quarterly expenditure from states, the annual budget expenditure (BE) is quarterised on the basis of quarterly proportions derived from previous years' state expenditure. For constant price estimates, a weighted average of CPI and WPI is used as deflator. The ratio of CPI and WPI is based on the proportion of Compensation of employees and Purchases of commodities and services in total Government expenditure. This is done for each quarter.

Private Final Consumption Expenditure

2.3 First, the annual estimates of the reference year at current prices are compiled. For the commodity-wise estimates of PFCE, physical indicators are used for each commodity of expenditure. These indicators in respect of agricultural commodities are the trend growth in consumption of food items. For the manufactured goods the indicators used are the IIP. For the services, indicator used is the output of services, as estimated for compiling Gross value added (GVA) of services using production approach. The annual current price estimates so obtained are apportioned to quarters on the basis of proportions derived from bench mark estimates in the case of food items. (Quarterised PFCE data for the year in which the consumer expenditure survey was conducted, forms the benchmark estimates.) For other items, the distribution is on the basis of quarterly proportion of output of relevant groups. For compiling constant price estimates, a weighted average of CPI and WPI is used as a deflator.

Gross Fixed Capital Formation

2.4 Estimates of GFCF are compiled separately for (a) Construction, (b) Machinery and Equipment (c) Software.

2.5 GFCF for construction is estimated by the following method.

(i) Annual estimates of value of output of construction is estimated by multiplying the GVO to GVA ratio of the previous year to the GVA compiled for the current year by using production approach.
(ii) Value of repair and maintenance (RM) is obtained by multiplying the RM to GVO ratio of the previous year to value of output of construction in (i) above.
(iii) By subtracting RM obtained in (ii) above from the value of output obtained in (i) above, GFCF in respect of construction component is obtained.
(iv) Quarterly estimates are obtained by applying quarterly proportion of GVA available from production side.

2.6 Annual estimates of GFCF in respect of machinery and equipment at current prices is compiled by using two indicators,viz., (a) IIP for capital goods available from the use-based classification superimposed by WPI of appropriate group and (b) data on imports/exports of machinery and equipment. The growth rate observed in these indicators is applied on the annual estimates of the previous year to obtain the current price estimates.

2.7 For estimating the GFCF in respect of software, growth in GVA in Software services as obtained from RBI company finance studies is used as an indicator.

2.8 Annual estimates of GFCF in respect of machinery and equipment at constant prices is compiled by deflating with appropriate price index. This price index is obtained by

multiplying the WPI growth of appropriate group on the implicit price deflator of the previous year.

Change in stocks

2.8 Average growth of agriculture, manufacturing and mining (at current and constant prices) industry is used to extrapolate the annual figure of the previous year. This annual estimate is apportioned into quarters on the basis of estimated output of manufacturing sector. Private corporate stock and food stocks figures are also examined separately for checking the consistency.

Valuables

2.9 Net imports of valuables mainly covering gold and silver, and gems and jewellery available from DGCIS and Growth in relevant IIP available from MOSPI are the indicators used for estimating Valuables. Annual estimate of Valuables (mainly covering gold and silver, and gems and jewellery) is compiled by adding value of net imports (after adjusting for value addition done in India on the imported valuables) and domestic production. The constant price estimates is compiled by using GDP deflator.

2.10 However, when commodity-wise details of imports data is not available at desired level of dis-aggregation, growth in the relevant IIP is used as an indicator. Current price estimates is compiled by superimposing the GDP deflator growth on the IIP growth.

Net Exports

2.11 For estimating Exports and Imports at current prices, data on Invisibles from Balance of Payments data released by RBI and quarterly data on merchandise trade from Ministry of Commerce (DGCIS) are used. For estimating exports and imports at constant prices weighted GDP deflators are used. As the Unit value indices of imports and exports are available only with a time lag, they are not used for estimation purposes.