

Improvement in Real GDP Estimation by Production Approach

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1. Summarize

As GDP estimation at current price, production approach for China GDP estimation at constant price which based on National Income estimation at constant price under MPS¹ established in 1985. At the beginning of the establishment, production estimation approach at constant price is based on National Income estimation at constant price, and complemented with the data at constant price of Service Industry. And in order to make the data comparable with history data, NBS calculated GDP at constant price of 1952-1984 to complement time series of GDP.

After 1985, GDP estimation method at constant price improved a lot along with the improvement of National Accounts estimation system and statistics methodology. It has been more and more close to 1993 SNA standard instead of MPS standard and finally formed normative GDP estimation method.

In 2005, China carried out the first economic census. Thereby, we revised exist GDP estimation scheme, widened the estimation content, and standardized industry classification, to make the GDP estimation approach at constant price link up further with 1993 SNA.

China GDP estimation at constant price is calculated with fixed price. It means that fix the price at one year (usually named as base year) first and then scale the product value or expenditure value of other year with is price. Once the base year is chosen, it will be fixed in one period. Actually, the base year is changed every 5 years or 10years.

There are 6 base years in China GDP estimation history. The base year of 1952-1956

¹ The main difference between National Income under MPS and GDP is estimation content. The estimation content of National Income includes five branches of material production. GDP estimation includes product activity of foods and services in each industry.

is 1952; the base year of 1957-1970 is 1957; the base year of 1980-1990 is 1980; the base year of 1990-2000 is 1990; the base year of 2000-2005 is 2000. After 2006, the base year is 2005. And will be changed every 5 years.

There are 4 channels to collect fundamental data for China GDP estimation at constant price: first, regular statistics data include complete survey and sample survey; second, accounting data; third, administration data; fourth, economics census data.

2. Fundamental method of production approach for China GDP estimation at constant price

i. Estimation method for China GDP at constant price

Production estimation for China GDP at constant price is processed by sectors. When calculate value added of each industry, we adopt price index deflation method or volume indicator extrapolation method according to the situation of each industry. Price index deflation method means to deflate value added at current price with price index to get the value added at constant price. And volume indicator extrapolation method means to extrapolate value added in estimation period with value added in base period and volume indicators. Each calculation formula as follow:

Value added at constant price of some industry = Value added at current price of this industry ÷ price index of this industry;

Value added at constant price of some industry = Value added at current price of this industry in previous year $\times \sum(\text{volume indicator} \times \text{proportion})$

The single deflation is used to calculate value added at constant price of agriculture, forestry, animal husbandry, and fishing, industry, construction, information transmission, computer service, and software, wholesale and retail trade, hotel and catering service, financial intermediation, real estate, leasing and business service. The estimation method for value added at constant price of transport, storage and post

is volume indicator extrapolation.

There are two reasons for adopting single deflation. One is having no product price system which can reflect all production result, and lacking of price index which can reflect situation of intermediate input and economic activities. On the other hand, at present, estimation method is not pure production approach, but combines with production approach and income approach. So it is impossible to adopt double deflation method.

In theory, appropriate price index is the weighted mean of index for good price and service price. But in fact, this ideal situation does not exist at all. For this reason, we have to combine the relative price index and complement some price information to calculate the deflation index of each industry for GDP estimation.

The basic price indexes to construct deflation index of production GDP estimation include indices of producer's price for farm products, ex-factory price indices of industrial products, price indices of investment in fixed assets, price indices of construction and installation, price indices of purchase of equipment tools and instrument, consumer price indices, price indices of service, price indices of in city traffic fare, price indices of hotel and accommodation , price indices of other accommodation, selling price indices of houses, transaction price indices of land, renting price indices of houses, property management price indices, price indices of health care and personal articles, price indices of recreation, education and culture and so on.

When base year has been changed, time series of GDP which calculated by price deflation method need to be reconnected, because the different prices in two base years make the time series in two base periods incomparable. So we need link the time series of different base periods with “base period conversion factor” . The main process as follow:

In new base period (t), we calculate value of new base period ($\sum p_{ti}q_{ti}$) with price of new base period (P_{ti}), and calculate value of new base period ($\sum p_{0i}q_{ti}$) with price of old base period (0) (P_{0i}). And then, calculate conversion factor(r) with $r = \sum p_{ti}q_{ti} / \sum p_{0i}q_{ti}$. With this conversion factor we can do bilateral conversion, e.g. multiply the data in time series expressed by price old base period by conversion factor to get time series expressed by price of new base period. Similarly, dividing the data in time series expressed by price old base period by conversion factor can get time series expressed by price of old base period.

ii. Calculation method of production approach for China GDP estimation at constant price

Production approach for China GDP estimation is the sum of value added of each industry. According to industry classification standard in national accounts (GB/T 4754-2002) and china's situation, in routine years GDP estimation is operated with four levels classification: the first level is dividing national account into primary industry, secondary industry, and tertiary industry. And tertiary industry excludes National organization. The second level is section. The third level is division. Real estate is classified by group, and private housing is added. The fourth level is similar to the third level, but has more details information of mining, and manufacturing, production and supply of electricity, gas and water.

At present, production approach for GDP estimation methods is different from industries for deficiency of basic information. Basically, there are four main methods.

a) Estimation method for value added at current price by production approach

Only value added at current price of agriculture, forestry, animal husbandry, and fishing taking production approach. Value added at current price of agriculture,

forestry, animal husbandry, and fishing equal to deduct intermediate input from gross output. The gross output is calculated with operating income by production method for service activities of agriculture, forestry, animal husbandry, and fishing. Production method means to calculated gross output with product output and relevant product price. Gross output of some products that are not sold in the market is equal to gross cost in producing process. For some agricultural possessing activities, the gross output is equal to process expenditure. The intermediate input of agriculture, forestry, animal husbandry, and fishing is equal to value of all kinds of consuming goods and services. The deflation index to deflate value added at current price to value added at constant price is indices of producer's price for farm products.

b) Combined method with production approach and income approach for value added of industry

Value added at current price of industry is calculated by four parts. First, for industrial enterprises above designated size, value added is equal to mean of that calculated by product approach and income approach. Second, value of industrial enterprises below designated size is calculated by income approach. Third, value added of producing active units is calculated by information of enterprises below designated size. Fourth, value added of privately-owned industrial business is calculated by production approach. In practice, each part will be adjusted with information of economic census to make up insufficient routine information. The value added at constant price is deflated with ex-factory price indices of industrial products.

c) Estimation method for value added at current price by income approach

Value added at current price of construction and service industry is calculated by income approach. Service industry can be divided into market activities and non-market activities. The estimation methods are different for them.

For industry of market activities, as construction, computer services and software, wholesale and retail trade, hotel and catering service, services to household, leasing

and business service, entertainment, gross output is extrapolated with incremental rate firstly. And then calculated value added at current price with financial documents by income approach, and adjust it with information of economic census. Value added at constant price is deflated with relevant price indices.

For industry of non-market activities, as management of water conservancy, environment, and public facilities, education, health, social security and social welfare, public management and social organization, gross output is equal to regular operation expenditure plus virtual depreciation of fixed asset. Value added at current price is calculated according to financial document and administrative information, and complement with information of economic census. Value added at constant price is deflated with relevant price indices.

d) Estimation method for value added at current price by volume indicator extrapolation

Value added at constant price of transport and post is extrapolated by volume indicators. The volume indicators include turnover of passenger transport and freight and gross volume of post. Proportion coefficient is ratio of turnover of passenger transport and freight and gross volume of post to incremental rate of this industry's value added at constant price.

3. Some problems in production approach for GDP estimation at constant price

The main problems in production approach for GDP estimation at constant price as below:

i. Value added estimation at current is imperfect

Veracity of value added at current price affect the quality of value added at constant price directly. The main problems in estimation at current piece as below:

a) Basic information is incomplete and jumbling.

GDP estimation is based on a mass of basic information. But in practice, the stable and dependable basic information is very insufficient. For example, there big gap exist in the information of wholesale and retail trade enterprises below designated size, hotel and catering service enterprises below designated size, real estate enterprises, leasing and business service enterprises. And some enterprises have insufficient financial statistics. Some small scale economic activities have both market feature and non-market feature, and attach to activities of other industry, so that value added of these economic activities is usually brought into value added of other industries.

b) Estimation for value added at constant price is incomplete.

As basic information is insufficient, intermediate input can not be calculated by production approach directly. Instead of that, we calculate intermediate input by deducting value added based income approach from gross output. So it makes the verification result between value added based production approach and income approach not reflect the truth. As value added at current price is calculated by income approach, it will not be a standard method to calculate value added at constant price by income approach.

ii. Problems of price indices

The main problem of value added estimation at constant price is price indices' lack and mismatching. It makes the calculation of value added at constant price a little bit rough.

a) Price indexes are incomplete and not matching with industry category.

In practice, there isn't price index for some production activities of some industries. And for some other production activities, there isn't matching price index. Lacking price index makes estimation at constant price difficult. This problem is very obvious in estimation for value added of service industry at constant price.

So when we do deflation for value added of service industry, we use the price indices

that are consisted of price indices of investment in fixed asset, consumer price indices, and some price indices included in consumer price indices. But if consider for expenditure side estimation, all of these service activities have different expenditure flow. Some of them flow to final consumption, some of them flow to intermediate use of enterprises, and some flow to public service of final use. Different expenditure flow makes service prices different. The price of service provided to household shows similar tendency with the price of consumer, but the price of service provided to household shows different tendency with the price of consumer. So the deflation price of service industry can not reflect it real tendency.

For example, when estimate value added at constant price of wholesale trade, we use retail price index in stead of wholesale price index. The retail price index only can reflect tendency of price at the final expenditure side, but can not reflect the situation in wholesale link. In addition, when estimate value added at constant price of financial intermediate, as financial intermediate service does not charge service fee directly, there is no price for these services. So we substitute with the weighted mean of consumer price indices and price indices of investment in fixed asset. Furthermore, in existing price statistical system, consumer price indices can reflect household consumption on transport and post. But there isn't any price index which can reflect production consumption on transport and post. The gap that exists in the price indices system can not be neglected.

b) Problems of volume indicators

Estimation method for value added at constant price of transport, storage, and post is volume indicator extrapolation. But there are some problems of volume indicator. For example, gross volume of post is calculated with a fixed base period, and one base period will last very long period, so gross volume of post in one certain year only can be calculated with operating income. For this reason, gross volume of post has included price factor already. It makes the value added at constant price of this industry overestimated.

In the mean time, because of incompleteness of price indices and deflection of volume indicators, the implicit price indices in value added are not comparable with relevant price indices.

iii. Value added estimation at current is imperfect

Although we have already made a difference between market service and non-market service when calculate value added at current price, e.g. gross output of the former activities is calculated with operating income, while gross output of the latter activities is calculated with production cost, we use the same price indices to calculate value added at constant price, so the changes of their price has been concealed.

4. Improving direction for production approach for GDP estimation at constant price

In the long run we must establish price indices system and price statistical system that can meet the GDP estimation's need to solve the problem in production estimation for GDP at constant price. It will take long time and sustained effort. In the near future, we will do some effort on following aspects:

i. Improving estimation method for GDP at current price

The first economic census in 2004 provided abundant information for GDP estimation. It filled the gap in routine year statistics. According to the new information from economic census and 1993 SNA, we will revise estimation method at current price with the census information to make the estimation method in routine year comparable with census year.

ii. Detailed breakdowns of industrial classification

Classify gross output and intermediate input, market output and non-market output, output of different quality and property, labor input and fixed asset input in production cost. Only in this way, we can consider all the respect of price changes when calculate value added at constant price. We should prevent to consider one industry to be a

collectivity, and also avoid calculating value added at constant price of one industry with one colligated deflation index.

iii. Establish and complement production price index system

Establish and complement production price index of wholesale, transport, storage, and post to reflect price tendency of each industry exactly.

Improve estimation method for value added at constant price of agriculture, forestry, animal husbandry, and fishing. Break down the this industry's structure, and then based on this step, complement price indices for farm products and compile price indices that are classified by sections to prepare for double deflation method for value added at constant price of agriculture, forestry, animal husbandry, and fishing.