

# Seasonal Products and Their Treatments in Korean Quarterly National Accounts

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In compiling quarterly GDP, one of the issues to be considered is how to adjust the discrepancies arising from the time gap between the production and consumption of commodities. The time gap affects on the figures of production side and expenditure side of quarterly GDP. The typical example is treatment of seasonal products. These products are seasonally produced by producers or seasonally demanded by consumers. These products need time-gap adjustments in compiling the quarterly GDP between the production side and the expenditure side. Especially, when statistical institutions do not adopt multiple approaches, (that is, they adopt only one of the production approach and the expenditure approach,) there will be some possibility to cause a wide discrepancy of figures between the production and expenditure side of the quarterly GDP.

This paper deals with the characteristics of seasonal products as a representative of the commodities to cause the time-gap problem, and illustrate examples of their accounting treatments in the quarterly GDP. Secondly, this paper refers the merits and demerits of the production approach and the expenditure approach in relation to the treatment of seasonal products. Lastly, it explains how seasonal products in Korean SNA are adjusted from the production and the expenditure side.

## Seasonal products

When referring to time-gaps between the production and the consumption of products, most of the consumption goods are applied, more or less, to this category except for the service. In the case of service, normally, there is no inventory, and the production and consumption on service is assumed to occur simultaneously.<sup>1</sup>

Time gaps occur typically in the seasonal products. There are two types of seasonal products to be taken into consideration. One is the seasonally demanded product, and the other is the seasonally produced product. In the former case, (the seasonally demanded product such as air-conditioners and winter clothes) the demand for these products occur normally in particular seasons. The production for these goods is performed one or two quarters ahead. In the latter case, (the seasonally produced product such as crops) the production for these goods occurs during particular quarters. However, the demand for them occurs throughout the year. In the method to compile quarterly GDP, these two cases are treated the same in practice. That is, during the quarters between the production and consumption, the portion of goods produced which are not sold yet to buyers is recorded as **changes in inventories**. And when the goods are sold to or consumed by buyers at the following quarters, final consumption occurs and changes in inventories decrease at the same amounts.(refer to table 1- 3)

In both cases, the amounts of value added from the production side equal those from the expenditure side in each quarter. Particularly, in the case of seasonally produced products, 93 SNA makes different treatments from 68 SNA. 93 SNA treats the growth of agricultural crops as **work-in-progress** while 68 SNA recognize it as output only when the crops are harvested.

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<sup>1</sup> In 93 SNA, certain kinds of services such as architectural design and software development are recognised as changes in inventories for the work-in-progress of the service.

**Table 1 seasonally demanded products**

Quarters	Production side	Expenditure side	
T	+100	+100	changes in inventories +80, export +20
T+1	-	-	final consumption +80, changes in inventories -80
Total	+100	+100	

**Table 2 seasonally produced products (68 SNA)**

Quarters	Production side	Expenditure side	
T	-	-	final consumption +25, changes in inventories -25
T+1	-	-	final consumption +25, changes in inventories -25
T+2	+100 (harvest)	+100	final consumption +25, changes in inventories +75(=100-25)
T+3	-	-	final consumption +25, changes in inventories -25
Total	+100	+100	

\* Assumption: final consumption occurs equally every quarter (+25).

**Table 3 Seasonally produced products (93 SNA)**

Quarters	Production side	Expenditure side	
T	+20	+20	final consumption +25, changes in inventories -5 (work-in-progress +20, finished goods -25)
T+1	+35	+35	final consumption +25, changes in inventories +10 (work-in-progress +35, finished goods -25)
T+2	+45 (harvest)	+45	final consumption +25, changes in inventories +20 {work-in-progress -55(=-20-35), finished goods +75(=100-25)}
T+3	-	-	final consumption +25, changes in inventories -25 (finished goods -25)
Total	+100	+100	

\* Assumption: final consumption occurs equally every quarter (+25).

### **The production approach and the expenditure approach for the seasonal products**

From above examples, the following results are drawn.

- The figures on the production side and the expenditure side are the same.

- In order to compile the data on both of the production side and the expenditure side, it is necessary to know 1) the figures of production side and at least one item of expenditure side (final consumption, or changes in inventories), or 2) the figures of all items of the expenditure side.

In other words, the countries which adopt the production approach should collect some data from the expenditure side, and the countries which adopt the expenditure approach need all the items of expenditure side.

For countries adopting the production approach such as Korea, it is necessary to collect the data of both of the production side and the expenditure side in order to adjust time gaps between production and consumption in the quarterly GDP. Collection of data from both of the supply side and the demand side will make the quarterly figures more reliable than collecting only from one side.

However, due to difficulties of timely and accurate data collection for the quarterly GDP, some countries adopt only one approach as a main method and the other approach as a supplementary one.

As is well understood, the production approach and the expenditure approach have their own merits and demerits for the quarterly GDP. In the case of **expenditure approach**, statistical agencies obtain data on the consumption relatively fast and in detailed levels. Through retail sales survey or household expenditure survey, demand-side data are collected directly. However, this approach depends heavily on the credibility of surveys. If the surveys from respondents are incorrect, or survey methods have critical mistakes, the results will be unreliable. Especially, it is more difficult to perform surveys about changes in inventories from wholesalers and retailers. In that case, it is necessary to acquire the control totals for the products from the production side to make the expenditure data more reliable.

In the case of **production approach**, compiled data make it available to analyse industrial structures, and to study the productivity of industries. The demerit of this approach is that quarterly data from the expenditure side may not sufficiently reflect time gaps between production and consumption. The expenditure data are derived through **commodity flow method**<sup>2</sup> from the supply-side statistics. The framework of this method is based on the assumption that the input structure and the distribution structure are stable for an expected period. However, for seasonal products, this framework does not reflect time gaps. In order to adjust the discrepancies adequately, the statistical agencies needs to collect consumption data for each quarter.

### **Treatment of seasonal products in Korean SNA**

The method of compiling quarterly GDP in Korea is principally the production approach. The most of source data are collected from producers, and GDP figures from the production side are produced first.(Table 4) GDP figures from the expenditure side are derived, in some part, by the direct collection of the expenditure data, and in the rest part, by applying the commodity flow method.(Table 5).

For the expenditure side of the quarterly GDP, source data collected directly are the followings. For the final consumption, consumption on food and energy-related products, and automobiles are collected from government agencies and individual research institutions. For the changes in inventories, producers'

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<sup>2</sup> Commodity flow method has the following formula. It is assumed that relative shares among the components of the equation are stable for the time being. If some components in the equation have data and the other components do not, the latter unknown data could be derived through this equation.

$$\text{Output} + \text{Import} = \text{Intermediate consumption} + \text{Final consumption} + \text{Gross fixed capital formation} + \text{Changes in inventories} + \text{Export}$$

inventories in factories are available from the index of industrial production data at the National Statistical Office. Data on petroleum and ship building are collected from the producers and importers. The other inventories such as 1) inventories on imports, 2) inventories on agricultural products and 3) trade inventories from wholesalers and retailers are derived residually by using the commodity flow method.

In order to reconcile the time gap between the production and the expenditure of seasonal products in the quarterly GDP, Korea adjusts both of the production and the expenditure side. Based on the data of production side principally, data on the expenditure side are produced from the direct collection or through the commodity flow method as indicated previously.

For **the seasonally demanded products** (it is also applied to most other products), the quarterly consumption data on them are obtained from the “indexes of whole sale and retail sale” at the National Statistical Office. These indexes are used as references for estimating expenditure figures of the commodities when the commodity flow method is applied. “Quarterly Household Income and Expenditure Survey” at the National Statistical Office and other monitoring data are also used as complementary ones.

For **the seasonally produced products**, consumption data on them are acquired directly from the government agencies and the research institutions. In the case of grains, for example, the production data are provided from the Ministry of Agriculture, and the quarterly consumption data are acquired from the National Statistical Office. The gap between the production data and the consumption data is adjusted by adding or subtracting the changes in inventories. In particular, concerning the implementation of 93 SNA which introduced the growth of agricultural crop or timber as work-in-progress, Korean SNA has reflected only the growth of cultivated trees as output and changes in inventories.

Even though the Korean SNA adopts the production approach in quarterly GDP, a large part of the expenditure side data are collected independently and reflected in the adjustment between the production side and the expenditure side of the quarterly GDP. It makes quarterly GDP more balanced in the figures between the production side and the expenditure side. Therefore, the production and consumption of seasonal products are well adjusted among quarters through matching the production data with the data on consumption and changes in inventories.

**Table 4 Estimation method on the production side in Korea**

<b>Industry classification</b>	<b>Output</b>	<b>Value added</b>	<b>Order of estimation (current price ↔ constant price)</b>
Agriculture, forestry & fishing	Output <sub>t-1</sub> × growth of plant area <sub>t</sub> (or volume of products <sub>t</sub> )	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Constant → current
Mining	Output <sub>t-1</sub> × Index of Industrial Production <sub>t</sub>	Output <sub>t</sub> × Value added ratio <sub>base year</sub>	Constant → current
Manufacturing	Output <sub>t-1</sub> × Index of Industrial Production <sub>t</sub>	Output <sub>t</sub> × Value added ratio <sub>base year</sub>	Constant → current
Electricity, gas & water supply	Direct estimation (from financial statements)	Direct estimation (from financial statements)	Current → constant
Construction	Output <sub>t-1</sub> × growth of construction area <sub>t</sub>	Output <sub>t</sub> × Value added ratio <sub>base year</sub>	Constant → current
Wholesale & retail trade	Volume of trade <sub>t</sub> × mark-up ratio <sub>t</sub>	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Estimating both constant and current data
Hotels and restaurants	Direct estimation (from tax office data)	Output <sub>t</sub> × Value added ratio <sub>t</sub>	Current → constant
Transport, storage & communications	Output <sub>t-1</sub> × growth of output <sub>t</sub>	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Current → constant
Financial intermediation	Direct estimation (from financial statements)	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Current → constant
Owner occupied dwelling services	Direct estimation	Output <sub>t</sub> × Value added ratio <sub>base year</sub>	Estimating both constant and current data
Business services	Output <sub>t-1</sub> × Index of service activities <sub>t</sub>	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Current → constant
Health, education, & other social services	Output <sub>t-1</sub> × Index of service activities <sub>t</sub>	Output <sub>t</sub> – Intermediate consumption <sub>t</sub>	Current → constant
Government service	Value added <sub>t</sub> + Intermediate consumption <sub>t</sub>	Σ Component of value added <sub>t</sub> (from budget books)	Current → constant

**Table 5 Estimation method on the expenditure side in Korea**

Components of expenditure		Estimation methods
Final consumption	Household & NPISH	<ul style="list-style-type: none"> <li>Commodity flow method: (expenditure amount <math>t_{-1} \times</math> growth of commodities <math>t</math> derived through CFM)</li> <li>Exceptions:               <ol style="list-style-type: none"> <li><b>Grain, meat, tobacco, automobile, electricity and gas</b> are estimated through the direct collection of data. (expenditure amount <math>t_{-1} \times</math> growth of commodities<math>_t</math>)</li> <li><b>Service</b> expenditures are estimated directly through the production data.</li> </ol> </li> </ul>
	Government	Direct estimation
	External transactions	Direct estimation
Gross fixed capital formation	Corporations	<ul style="list-style-type: none"> <li>Constructions : Direct estimation (from production data)</li> <li>Equipments : Commodity flow method (exception: ships and airplanes are estimated through the direct collection of data)</li> </ul>
	Government	Direct estimation (from budget books)
Changes in inventories	Agricultural goods	Commodity flow method
	Producers goods	Direct estimation (from industrial production data)
	Imported goods	Commodity flow method
	Petroleum & ships	Direct estimation
	Trade goods	Commodity flow method
Exports and imports(-)		Direct estimation (from balance of payment data)