Methodology for Calculating Contributions to Percent Change in Real GDP

The contribution of the i-th component to percent change in real GDP is calculated as follows.

Notation:

$\%\Delta_{i,a\to b}$: contribution of the i-th component to percent change from period a to b

$p_{i,t}$: deflator of the i-th component for calendar year t

$q_{i,t}^{(k)}$: volume of the i-th component for the k-th quarter of calendar year t

T : fiscal year T, which begins at the beginning of the second quarter of calendar year t and ends at the end of the first quarter of calendar year $t+1$ in Japan.

(a) Contributions to annual percent change from previous calendar year

$$\%\Delta_{i,(t-1)\to t} = 100 \cdot \frac{p_{i,t-1}q_{i,t-1}}{\sum_i p_{i,t-1}q_{i,t-1}} \cdot \left(\frac{q_{i,t}}{q_{i,t-1}} - 1 \right).$$

(b) Contributions to quarter-to-quarter percent change

$$\%\Delta_{i,(k-1)\to k} = 100 \cdot \frac{p_{i,t-1}q_i^{k-1}}{\sum_i p_{i,t-1}q_i^{k-1}} \cdot \left(\frac{q_i^k}{q_i^{k-1}} - 1 \right).$$

1. The discrepancy between the sum of the contributions and the percent change of real GDP (benchmarked by proportional Denton method) is proportionally distributed over all components.

2. For annualized series, contributions are calculated by multiplying the quarterly contributions by four and proportionally distributing the discrepancy between the sum of the annualized contributions and the annualized percent change of real GDP over all components.

(c) Contributions to year-over-year percent change

$$\%\Delta_{i,(t-1,k)\to(t,k)} \doteqdot 100 \cdot \frac{p_{i,t-1}q_{i,t-1}^k}{\sum_i p_{i,t-1}q_{i,t-1}^k} \cdot \left(\frac{q_{i,t}^k}{q_{i,t-1}^k} - 1 \right) \quad \text{(Approximation)}.$$

The discrepancy between the sum of the contributions and the percent change of real GDP is proportionally distributed over all components.

(d) Contributions to annual percent change from previous fiscal year

$$\%\Delta_{i,(T-1)\to T} \doteqdot 100 \cdot \frac{p_{i,T-1}q_{i,T-1}}{\sum_i p_{i,T-1}q_{i,T-1}} \cdot \left(\frac{q_{i,T}}{q_{i,T-1}} - 1 \right) \quad \text{(Approximation)},$$

$$\text{where} \quad p_{i,T-1} = \frac{p_{i,t-1}\sum_{k=2}^{4}Q_{i,t}^k + \dfrac{\sum_i p_{i,t-1}q_{i,t}^4}{\sum_i p_{i,t}q_{i,t}^4} \cdot p_{i,t}Q_{i,t+1}^1}{\sum_{k=2}^{4}Q_{i,t}^k + \dfrac{\sum_i p_{i,t-1}q_{i,t}^4}{\sum_i p_{i,t}q_{i,t}^4} \cdot Q_{i,t+1}^1}.$$

1. To calculate the contribution of the change in inventories, Q stands for the real stock value of inventories.

2. The discrepancy between the sum of the contributions and the percent change of real GDP is proportionally distributed over all components.

(Notes)

1. The contribution for Real Net Exports of Goods & Services may take an opposite sign to the difference of Real Net Exports of Goods & Services from previous period, since Real Net Exports of Goods & Services is estimated by subtracting Real Imports of Goods & Services from Real Exports of Goods & Services. In such a case, the sign of the contribution conveys the correct implication.
2. The contributions of Domestic Demand, Private Demand, Public Demand, Gross Fixed Capital Formation and Final Sales of Domestic Product may not equal to the sum of the contributions of their own components.