How to Calculate Contributions to Percent Change in real GDP

The contribution of the ith component to percent change in real GDP is calculated as follows:

$p_{i,t}$: the deflator of the ith component for year t

$q_{i,t}^{(k)}$: the volume of the ith component for the kth quarter of year t

T : fiscal year T, which starts at the 2nd quarter of year t and ends at the 1st quarter of year $t+1$

(a) Annual data on a calendar year basis (year-on-year rates of change)

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

(b) Quarterly data (quarter-on-previous-quarter rates of change)

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

* The discrepancy between the growth of the aggregate—benchmarked using the proportional Denton technique—and the sum of its components' initial contributions is distributed proportionally over every component.

(c) Quarterly data (year-on-year rates of changes)

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

* The discrepancy between the growth of the aggregate and the sum of its components' initial contributions is distributed proportionally over every component.

(d) Annual data on a fiscal year basis (year-on-year rates of change)

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

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

(For change in inventories, Q is the real stock value of inventories.)

* The discrepancy between the growth of the aggregate and the sum of its components' initial contributions is distributed proportionally over every component.

(Notes)

(1) For net exports, the sign of the contribution may be reverse to that of the change in values, since the real value of net exports is calculated as the real value of exports minus that of imports. In these cases, the contributions show correct signs.

(2) The contributions of domestic demand, private demand, public demand, and gross fixed capital formation are not equal to the sum of their components' contributions.