

Calculating aggregate inflation à la Shapiro

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Shapiro (2024) appears to calculate aggregate inflation in an odd way, but there is a reason for this. The product-level VARs are estimated on monthly data and therefore identify monthly supply and demand shocks, and these are then assumed to be reflected in month-over-month inflation, $\pi_{i,t,t-1}$, where i is the specific product and t is a month. These product i monthly inflation variables are then added up using expenditure weights to get month-over-month supply- and demand-driven inflation at time t ($\pi_{t,t-1}^{dem}$) and ($\pi_{t,t-1}^{sup}$, respectively). Below, equations (1) to (4) can be used as steps for calculating the inflation decomposition.

Let the month-over-month product-specific inflation rates be calculated as:

$$\pi_{i,t,t-1} = \frac{p_{i,t} - p_{i,t-1}}{p_{i,t-1}} \quad (1)$$

Then, from equation (15) in this version of Shapiro 2024—if we focus only on the supply-driven component to start—aggregate monthly supply-driven inflation is:

$$\pi_{t,t-1}^{sup} = \sum_i 1_{i \in sup,t} \omega_{i,t-1} \pi_{i,t-1} \quad (2)$$

where $1_{i \in sup,t}$ is an indicator function indicating that product i was hit by a supply shock in period t . So, after calculating the product-specific monthly inflation rates, you add them up using the expenditure weights, $\omega_{i,t-1}$, to get the monthly supply driven inflation. You then also do the same for demand-driven inflation, $\pi_{t,t-1}^{dem}$.

The next step is to separately calculate the annual supply- and demand-driven inflation. Again, let's focus first on the supply-driven inflation which is calculated as the sum of monthly inflation over the previous year:

$$\pi_{t,t-12}^{sup} = \prod_{k=0}^{11} (1 + \pi_{t-k,t-k-1}^{sup}) - 1. \quad (3)$$

Again, you also calculate this for demand-driven inflation ($\pi_{t,t-12}^{dem}$), too. Then total inflation will be the sum of these two inflation rates:

$$\pi_{t,t-12}^{total} = \pi_{t,t-12}^{sup} + \pi_{t,t-12}^{dem} \quad (4)$$

It is this last equation which is used to plot the inflation supply and demand decomposition.