

The Value Added and Operating Surplus Deflators for Industries: The Right Price Indicators That Should Be Used to Calculate the Real Interest Rates

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Summary

- They derive formulas for the value added deflators for each of n industries. They split the value added deflators into output price, domestic intermediate price and imported input components.
- They also derive a deflator for Gross Operating Surplus (GOS).
- They apply these formulas to Japan, broken down into 24 sectors over 2001-2013.

Framework

- Input-output approach: symmetric (one industry-one product), combined use table. I.e. no imports row in their table.
- Two sets of prices:
 1. Domestic output: $p_{di}, i=1, \dots, n$
 2. Imports: $p_{mi}, i=1, \dots, n$
- Fixed base approach (either Lowe or chain-linked): Laspeyres quantity index and Paasche implicit deflator.

Motivation

- They argue that either the value added deflator or the GOS deflator is appropriate for calculating the real interest rate, and so assessing the incentive to invest. An important issue in Japan.
- I disagree. I think their contribution is really to issues surrounding *double deflation*. More on this later.

In more detail ...

Basic accounting identity for output in current prices:

$$T_i = \sum_{k=1}^n X_{ik} + D_i + E_i - M_i, \quad i = 1, \dots, n$$

T_i : Total domestic (gross) output of product i

X_{ik} : Intermediate use by industry k of product i

D_i : Final domestic use of product i

E_i : Exports of product i

M_i : Imports of product i

Note that the X_{ik} and the D_i include imports.

By definition the real balance is written:

$$t_i = \sum_{k=1}^n x_{ik} + d_i + e_i - m_i, \quad i = 1, \dots, n$$

(Lower case symbols are deflated counterparts of upper case ones).

But how can we be sure that the balance still holds after deflation? We certainly can be sure if we removed imports from the nominal and real balance:

$$T_i = \sum_{k=1}^n \tilde{X}_{ik} + \tilde{D}_i + \tilde{E}_i \quad (\text{the tilde } \sim \text{ denotes "net of imports"})$$

$$t_i = \sum_{k=1}^n \tilde{x}_{ik} + \tilde{d}_i + \tilde{e}_i$$

Now the real balance must hold since each element on the LHS and RHS is deflated by the same price index (p_{di})

Sakuma et al take a different path ...

- They deflate intermediate inputs (X_{ik}) and domestic final uses (D_i) by a weighted average of domestic and import prices. But the weights are the *same*, i.e. they assume that the import content of *the X_{ik} is the same as that of the D_i* .
- This is a strong assumption which needs to be spelled out. It could affect later results.

Value added deflator

Nominal:

$$V_i = T_i - \sum_{j=1}^n X_{ji}$$

Real

$$v_i = t_i - \sum_{j=1}^n x_{ji}$$

Deflator

$$P_{vi} = \frac{V_i}{v_i}$$

GOS deflator

Nominal GOS (O):

$$O_i = V_i - L_i - A_i - B_i \quad A_i, B_i : \text{taxes on products and production}$$

Real GOS (o):

$$o_i = v_i - l_i - a_i - b_i$$

Deflator:

$$P_{oi} = \frac{O_i}{o_i}$$

Empirics

- 24 sectors, covering whole Japanese economy, 2001-2013
- Main findings:
 - ❖ Correlation coefficient between output price and value added deflator is quite low or even negative in some industries (e.g. quarrying, fabricated metal products). In general high in services, lower in manufacturing: Table 3.
 - ❖ Overall correlation is 0.47.

Comments

- They argue that we need the VA deflator or the GOS deflator to measure the real interest rate.
- But the neo-classical theory of capital says: equate the MP of k th type of capital in i th industry to its rental price:

$$MP_{ik} = p_k^K$$
$$= (r + \delta - \dot{p}_k^A / p_k^A) p_k^A \quad k = 1, \dots, C$$

r : Required nominal rate of return

MP_{ik} : Marginal product of k th asset

p_k^K : k th rental price

p_k^A : k th asset price

So the relevant real interest rates are

$$r - (\dot{p}_k^A / p_k^A) \quad k = 1, \dots, C$$

So only *capital goods* prices play a role, not prices in general. Of course without changing anything we could write this as:

$$(r - \dot{p}_{vi} / p_{vi}) - (\dot{p}_k^A / p_k^A - \dot{p}_{vi} / p_{vi})$$

A suggestion for the GOS deflator

- They derive this as a residual from

$$O_i = V_i - L_i - A_i - B_i \quad i = 1, \dots, n$$

- But they could derive it directly since

$$O_i = \sum_{k=1}^C p_k^K K_{ik} \quad i = 1, \dots, n$$

in the spirit of the 2008 SNA. And all the elements on the RHS can be calculated from a PIM.

Of course, the two ways would not necessarily yield the same answer.

Comments on VA deflators

- In my view the main contribution of this paper is to the empirical implementation of double deflation.
- Their VA deflators often have quite different paths to those of the output deflators. So in many industries the path of double deflated value added will (a) look quite different to that of single deflated value added and (b) be more volatile: see their charts.
- Is this to be expected? Should we be worried? To what extent is either phenomenon due to errors in the input-output coefficients? Or to the use of the exchange rate to measure import prices? These issues need more discussion.