The Right Price? Deflators in a Dynamic Input Output Model

Topic: Dynamic Systems
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The two fundamental input-output identities suggest a method to calculate quantities and prices, and both incorporate the interrelationships between commodities embodied in the direct requirements matrix A. The price equation is often written simply:
p^'=p^' A+ v^' (1)
where pâ€™ is a row vector of commodity prices, and vâ€™ is a row vector of unit value added (total value added divided by real output) by commodity. The concept is an old and valuable one in economics, tying factor incomes to the formation of prices, with causality flowing in both directions.

The relationship is useful not only for understanding, but also for multisectoral modeling. However, the modeler is immediately faced with several concrete problems that are hidden by the elegance of the fundamental price identity. In this abstract, I frame these problems as questions, but they will be treated as sections in the paper.

a. The A matrix is a constant price table, though not necessarily constant across time. How should the coefficients of this table be interpreted? The most obvious interpretation is to pick some year as a base year, where prices are unity, and then form the coefficients in other years as deflated input divided by deflated output. A natural choice for the output deflator is the domestic producer price index. What deflator should be used for inputs?

b. In an open economy, the prices of imports must also be considered. How should these import prices be incorporated into the equation? In some tables, separate price indexes are also available for exports? How should this be handled?

c. Time series of value added data are normally available by industry. If working with a commodity-by-commodity table, how should one convert industry value added to commodity value added? Does this derived commodity value added have a clear meaning? In the USA, the national accounts value added by industry does not sum to GDP, but rather to GDI (gross domestic income), which differs from GDP by the statistical discrepancy. How should this discrepancy be distributed?

d. In several countries, consumption and investment bridges are available, which relate consumption by category, or investment by purchasing industry to commodity final demand. Such a bridge can be used to form weighted deflators. However, these usually differ substantially from the consumption or investment deflators published by the statistical agency. What might be the sources of this inconsistency, and how should they be handled?

e. Producer prices for some commodities are constructed as hedonic indexes, which may decline rapidly. What should this imply for IO column coefficients and or value added? One possibility is to scale all coefficients in a column down in proportion to the decline in the hedonic price.
How should the prices for the wholesale and retail trade commodities be defined? Many statistical agencies use the weighted average of the cost of goods sold, but this seems like an unsatisfactory method. I will discuss some of the alternatives.

f. Some commodities, such as coal and electricity, are sold for a different price to different users. How should this be handled in the IO framework? Should sales to each market be defined as a different commodity?