



Alternative measures of output in global economic-environmental models: Purchasing power parity or market exchange rates?

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Abstract

The study examines the question of the use of purchasing power parity versus market exchange rates in constructing global economic models. It compares three approaches: MER accounts, world-price PPP accounts, and superlative PPP accounts. It concludes that the best approach is to use superlative PPP accounts. This approach uses cross-sectional PPP measures for relative incomes and outputs and relies on national accounts price and quantity indexes for time-series extrapolations. Under ideal circumstances, this approach will provide accurate and consistent cross-sections and time series. This approach will require relatively little change in model structure from ones using MER accounts. The main concern would be to ensure that behavioral and reduced-form relationships in the models have been correctly estimated.
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Most global energy-economic-environment models constructed over the last three decades have relied on market exchange rates (MER) to put countries in a common metric for estimation and calibration. This approach has been the subject of considerable discussion in recent years, and the alternative of purchasing power parity (PPP) exchange rates has been proposed. The present analysis reviews the issues and describes a reconciliation of the debate.

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Alternative Accounting Systems

	Market exchange rates (MER)	Purchasing-power parity exchange rates (PPP)
Actual prices for all goods and services	A. MER accounts: incorrect estimates of income and output	C. Superlative PPP accounts: correct income and price behavior
World prices for all goods and services	No sense.	B. World-price PPP accounts: correct incomes but inconsistent with market behavior

Fig. 1. Alternative approaches to constructing international economic models.

The plan of this report is the following. After an overview, the first section reviews the merits of different systems for measuring real income and output. The second section reviews current practice in constructing comparative economic accounts, with particular attention to construction of PPP accounts. The third section discusses the quality of the data in different systems. The fourth analyzes the relative merits of different price measures in model construction, after which issues of convergence are addressed. The sixth section then surveys the principal arguments regarding different accounting approaches to constructing global models. The last section summarizes the paper. Three appendices provide further detail on estimates of growth rates in different databases, concepts of superlative index numbers, and issues of aggregation of regions into larger aggregates.

Before beginning, we need to settle on some linguistic conventions. First, “PPP accounts” refer to accounts that estimate aggregate incomes, outputs, and expenditures correcting for differences in national price levels. The major obstacle to such accounts is accurate measures of prices of goods and services in different countries. Second, “world prices” refers to the synthetic average prices that are estimated in some PPP systems of accounts to estimate different national incomes or costs of living. “Actual market prices” are the local or national prices faced by market participants.

There are four different approaches to constructing comparative national accounts, as shown in Fig. 1. This matrix shows a two by two combination of the exchange rate convention and the disaggregated price convention. There are two possible approaches to converting incomes of different countries: purchasing power parity exchange rates (PPP) or market exchange rates (MER). Similarly, there are two different sets of relative prices: actual market prices or uniform world prices for individual goods and services. From this table, we see three serious candidates for accounting systems:²

MER accounts. The usual approach, shown in the upper left, uses actual market prices and market exchange rates.

² In an earlier draft, “superlative PPP accounts” were called hybrid accounts and “world-price PPP accounts” were called full PPP accounts. The terminology was changed to make the names more reflective of the actual designs.

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