What Are Real Exchange Rates?

What is the value of a country's goods against those of another country, a group of countries, or the rest of the world, at the prevailing exchange rate?

Luis A. V. Catão

HOW DOES ONE DETERMINE whether a currency is fundamentally undervalued or overvalued? This question lies at the core of international economics and many trade disputes.

George Soros had the answer once—in a famous episode back in 1992—when he successfully bet $1 billion against the British pound, in what turned out to be the beginning of a new era in large-scale currency speculation. Under assault by Soros and other speculators, who believed that the pound was overvalued, the British currency crashed, in turn forcing the United Kingdom's dramatic exit from the European Exchange Rate Mechanism, the precursor to the common European currency, the euro. The United Kingdom never adopted the common currency nor has it since attempted to peg its currency.

But in the ensuing years, neither Soros nor fellow speculators have repeated the feat consistently. Indeed, there is some consensus that the economics profession itself lacks a foolproof method of establishing when a currency is properly valued. This failure is striking given that the exchange rate is a central price in economics and that there is a measure potentially capable of delivering the answer and for which plenty of data exist: the real exchange rate (RER).

What things really cost

Most people are familiar with the nominal exchange rate, the price of one currency in terms of another. It's usually expressed as the domestic price of the foreign currency. So if it costs a US dollar holder $1.18 to buy one euro, from a euro holder's perspective the nominal rate is €0.85 per dollar (that is, 1/1.18). But the nominal exchange rate isn't the whole story. The person or firm buying another currency is interested in what can be bought with it. Are they better off with dollars or euros? That's where the RER comes in. It seeks to measure the value of a country's goods against those of another country, a group of countries, or the rest of the world at the prevailing nominal exchange rate.

The real exchange rate between two countries can be measured in terms of a single representative good—say a Big Mac, the McDonald's burger sold in many countries in virtually identical versions. If the real exchange rate for that good is 1, the burger would cost the same in the United States as in, say, Germany, when the price is expressed in a common currency. That would be the case if the Big Mac costs $5.30 in the United States and €4.50 in Germany. In this one-product world (in which prices equal exchange rates) the purchasing power parity of the dollar and the euro is the same, and the RER is 1 (see box).

But suppose the burger sells for €5.40 in Germany. That would mean it costs 20 percent more in the euro area than in the United States, suggesting that the euro is thus 20 percent overvalued relative to the dollar. If the real exchange rate becomes that overvalued, there should be pressure on the nominal exchange rate to adjust, because the same good can be purchased more cheaply in one country than in the other. Indeed, it would make economic sense to buy dollars, use them to buy Big Macs in the United States at the equivalent of about 1 euro, and sell them in Germany for 1.2 euros. Taking advantage of such price differentials is called arbitrage. As arbitrageurs buy dollars to purchase Big Macs to sell in Germany, demand for dollars rises, as does the nominal exchange rate, until the price in Germany and the United States is the same—the RER returns to 1. In the real world there are many costs that get in the way of a straight price comparison—such as transportation, trade barriers, and consumption preferences.

But the fundamental notion is that when RERs diverge, the currencies face pressure to change. For overvalued currencies the pressure is to depreciate and for undervalued currencies to appreciate. It can get more complicated if factors such as government policies hinder normal equilibration of exchange rates, often an issue in trade disputes.

Many products

How about comparing purchasing power when countries sell more than one product? To do this, economists usually measure the real exchange rate in terms of a broad basket of goods. Because the price of such a basket normally takes the form of an index number—such as the consumer price index, which includes both goods and services—the RER is also typically expressed as an index that can be benchmarked to any chosen time period. Going back to the dollar-euro example, if the RER index is 1.2, average consumer prices in Europe are 20 percent higher than in the United States, relative to the chosen benchmark. Indices don't measure absolute prices (such as the price of the Big Mac), but changes in overall prices relative to a base year. (If, say, the index is 100 in the year 2000 and 120 in 2017, average prices are 20 percent higher in 2017 than in 2000.)

RER indices between two countries can be important. The massive US trade deficit with China has become a political and economic issue, and whether its roots are in a fundamentally misaligned exchange rate is a point of contention.

But, for the most part, economists and policymakers are more interested in the real effective exchange rate (REER) when measuring a currency's overall alignment. The REER is an average of the bilateral RERs between the country and each of its trading partners, weighted by the respective trade shares

of each partner. Because it is an average, a country's REER may be in "equilibrium" (display no overall misalignment) when its currency is overvalued relative to that of one or more trading partners so long as it is undervalued relative to others.

To establish when a currency is misvalued and, if so, by how much, a rough assessment can be obtained by the REER series over time. As with the absolute and relative RERs, there should be no changes if the currencies are in equilibrium. But because consumption patterns can change faster than the market baskets statisticians construct—as can trade policies and tariffs and transportation costs—deviations in REERs don't necessarily indicate fundamental misalignment.

One complication is that REERs' fluctuations have intensified, even though transportation costs and tariffs have declined sharply over the past century as a proportion of the final price of goods, and national consumption baskets have grown more uniform. That is, variations in tariffs and transportation costs don't shift goods prices as much as in the past, yet REERs have been moving about by quite a bit over the past three or four decades. Indeed, between the late 19th century and the 1929 financial crash, when changes in transportation costs and tariffs were comparatively large, REER fluctuations were within a 30 percent band among advanced economies (once price spikes from war-related disturbances are excluded). In contrast, in the 1980s, the United States experienced swings as wide as 80 percent, and some advanced economies also experienced variations in their REERs above 30 percent over the past two decades. Some emerging market and developing economies have experienced even larger depreciations, especially during the financial crises in the 1990s and 2000s.

WHAT IS THE REAL EXCHANGE RATE?

The real exchange rate (RER) between two currencies is the nominal exchange rate (e) multiplied by the ratio of prices between the two countries, P/P*. The RER therefore is eP*/P. Consider the case of Germany relative to the United States. Those variables can be defined so that a rise in the RER denotes appreciation (as the IMF typically does) or depreciation (as many economics textbooks do). It is just a matter of convention. Let's define the RER so that a rise denotes appreciation of Germany's real exchange rate. In this case, e is the dollar-euro exchange rate, P the average price of goods in Germany, and P* the average price of goods in the United States.

In the Big Mac example, we have a price (averaged across McDonald's restaurants) in Germany of about €4.50 and an average price in the United States of about $5.30 (both as of July 2017). For the Big Mac in Germany, take a dollar-euro exchange rate of 1.18. The RER is then 1.18 x 4.5/5.3, which equals 1. So, at the current dollar-euro exchange rate, the euro appears neither undervalued nor overvalued relative to the dollar.

Now consider the RER between China and the United States. One US dollar buys ¥6.8, so the dollar-yuan exchange rate is 1/6.8, or 0.147. With an average Big Mac price in China of about ¥20, the cost in US dollars of the burger in China (that is, e x P) is e x p = 20 x 0.147 = 2.94. Since the price of the Big Mac is $5.30, the RER of the yuan to the US dollar is 2.94/5.3 = 0.55. This is less than 1, which indicates undervaluation of the yuan. The RER is short of 1 by 45 cents, which means that, by this metric, the yuan is 45 percent undervalued relative to the dollar.

Other things at work

But not all large REER fluctuations are indications of misalignment. Some are remarkably smooth, suggesting that factors besides transportation costs, tastes, and tariffs play a key role in influencing the REER of a currency that is not misaligned.

Technology changes that cause productivity increases in goods commonly traded between countries, called tradables, are thought to be one of those factors. Because productivity increases lead to lower production costs, the REERs would rise to maintain equilibrium. But not all goods in a given market basket are tradables and subject to international competition. Nontradables, such as houses and many personal services, face minimal international price competition. While prices of tradables should tend to equalize across countries in the absence of trade barriers or currency controls, prices of nontradables can differ widely. Economic theory suggests, and data support, that much of the REER variation across countries is accounted for by fluctuations in nontradables prices.

Persistent changes in terms of trade (such as oil producers usually experience) and differences in fiscal policies, tariffs, and even financial development can also help explain why REERs can differ across countries. The IMF and other analysts take such real exchange rate fundamentals into account in estimating the "equilibrium" REER, around which the actual REER should hover if there is no misalignment.

Estimating equilibrium RERs can be difficult because prices are somewhat sticky in the short run, and the nominal exchange rate is not (in countries whose exchange rates are market determined). So REERs typically display considerable short-term volatility in response to news and noisy trading, and it's not surprising that many market participants and policymakers get things wrong—sometimes very wrong. That can lead to massive realignments with devastating consequences. A widely touted reason for the enhanced volatility of exchange rates is much greater liquidity and lower transaction costs in foreign exchange markets since the mid-1980s compared with earlier periods. Because the exchange rate measures the relative price between two currencies but is also an asset price—a foreign exchange rate can be held as a store of value and a vehicle for speculation—swings in financial market sentiment may affect its value. This makes it even harder to use RER computations such as illustrated above—based on the relative prices of two goods or baskets of goods—to gauge misvaluation. Financial market considerations and portfolio decisions by investors based on other considerations can make a difference, so it is necessary to assess the rationale and sustainability of those decisions when assessing misvaluation.

Even though they are imperfect, large variations in REERs have signaled large exchange rate overvaluations that have helped predict many financial crises and that explain many trade imbalances between countries. This is why the IMF and others should closely monitor bilateral real exchange rate and multilateral real effective exchange rate indicators. FD

LUIS A. V. CATÃO is a senior economist in the IMF's Research Department.