



Economic Letter

A Real Appreciation for Recent Exchange-Rate Movements

by Kuhu Parasrampuria and Michael Sposi

ABSTRACT: Recent movements in real exchange rates—a measure of relative prices—in the euro area and Japan are consistent with long-run adjustments toward levels predicted by economic fundamentals.

The international purchasing power of the euro area declined 16 percent and that of Japan fell 13 percent relative to the U.S. from July 2014 to last February.

Those drops signify a change in relative prices between countries, an important indicator of the attractiveness of imports and exports and also of relative standards of living. The international purchasing power of a country is measured by its real exchange rate (RER). In simplest terms, the RER is the nominal exchange rate (number of U.S. dollars needed to buy one unit of foreign currency) multiplied by the relative price level (euro-area price level/U.S. price level).¹

Evidence suggests that the recent fluctuations of the euro area and Japanese RERs are consistent with theories of the RER determination. Recent exchange rate fluctuations are a temporary part of a longer normalization and adjustment process.

One of the oldest theories of international economics is purchasing power parity (PPP). It states that if there are no costs to trading goods, then the price of goods should be the same everywhere when quoted in U.S. dollars—that is, the RER should be one. If prices are different across borders, entrepreneurial individu-

als can arbitrage these opportunities for profit, eventually pushing prices toward parity.

For example, if an American entrepreneur sees goods priced lower in Germany than at home, the entrepreneur can exchange dollars for euros, purchase the goods in Germany and profitably sell them in the U.S. Until prices equalize, such a transaction would put upward pressure on the euro-dollar nominal exchange rate (heightened demand for euros used to buy German goods), upward pressure on the German consumer price index (CPI) (greater demand for goods in Germany, increasing prices) and downward pressure on the U.S. CPI (greater supply of inexpensive goods).

Consumer prices tend to adjust slowly. This is partly because contractual agreements between workers, buyers and suppliers keep costs and prices rigid. In addition, many major central banks explicitly target a constant rate of consumer price inflation. Nominal exchange rates are much more flexible since currencies are easily traded on highly liquid foreign exchange markets.

In reality, PPP does not hold for primarily two reasons. The first is that international trade is not free. It requires resources to transport goods across borders. Moreover, tariffs and quotas are

often imposed on cross-border transactions. This makes it too costly to fully arbitrage price differences away. Second, a large component of the CPI consists of services such as dental exams and dining at restaurants, which are difficult to trade. As a result, price differences for services persist across countries.

Income-Based Price Disparities

Prices of services are systematically higher in countries with higher income per capita, as indicated in the positive slope of the services price line in Chart 1. Conversely, the prices of tradables (merchandise or goods) are not systematically related to income per capita.

Economists Bela Balassa and Paul Samuelson in their Balassa-Samuelson hypothesis rationalize these price patterns.² The hypothesis argues that higher income per capita in advanced economies reflects the fact that fundamentals such as productivity, skills and technology are greater. Higher prices of services in advanced economies follow because production costs, particularly labor, tend to be greater as workers demand higher compensation for their superior productivity. Price differences in tradables will be arbitrated away (absent the amount of trade costs), leading to small systematic differences in prices of tradable goods across countries.

Because services account for a large share of a country's CPI, the theory of PPP should be modified to account for systematic disparities of fundamentals, reflected by income by capita. However, productivity differences cannot explain all cross-country price variation. Differences in policies and trade costs contribute to variation in prices of tradables and services.

The Penn World Tables publishes a unique data set showing prices of a common basket of consumer goods and services across countries. Using this data, the RER for a country equals the dollar-price of a foreign consumption basket divided by the dollar-price of the U.S. consumption basket. The results for 121 countries relative to the U.S. are depicted in Chart 2. Exploiting the variation in fundamentals, as reflected in the income per capita, the regression line helps

explain 50 percent of the overall variation in RERs. For each country, the difference between the actual RER and the one predicted by the regression line is the "residual." This remaining variation is largely due to existing or expected policy measures, such as tariffs, taxes and monetary policy.

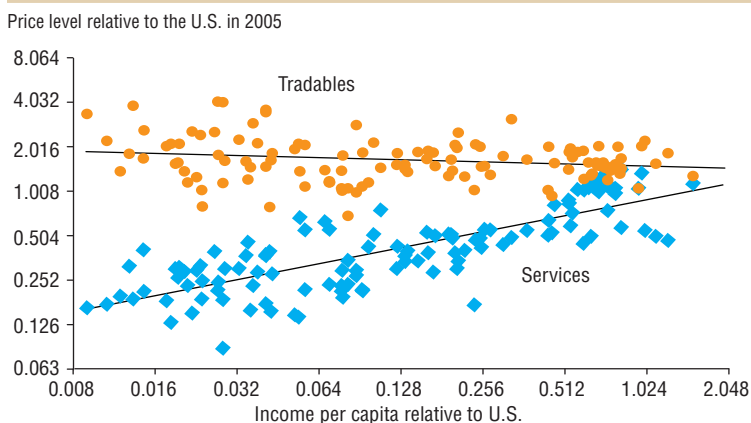
Residuals and Income Per Capita

The "residual fluctuations"—the distance a point is from the regression line—identify RER movements for which the Balassa-Samuelson hypothesis can't

account. These residuals cannot remain positive or negative forever in any given country because it would give rise to the PPP arbitrage.

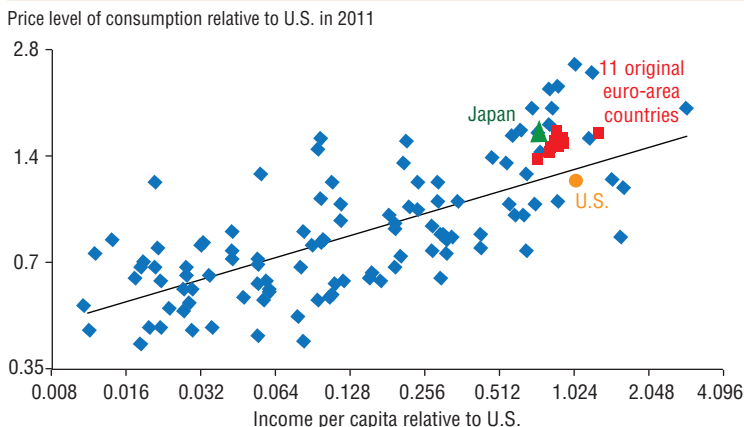
Over time, residuals should approach zero and the RER differentials not accounted for by income per capita differences will tend to disappear. Thus, according to PPP, residuals should be temporary. Since nominal exchange rates tend to be more flexible than CPI levels, most of the fluctuation in residuals is accounted for by movements in the nominal exchange rate. This is exactly

Chart 1 Prices of Services Higher in Advanced Economies



SOURCES: 2005 International Comparison Program; World Bank Development Data Group.

Chart 2 Prices of Goods Higher in Advanced Economies



SOURCE: Penn World Tables.

what the examination of recent developments in the exchange rates of the euro area and Japan suggest. The residuals were driven by economic policy changes in those countries or in others with global influence, such as the U.S.³

Changes to RERs

Many economic and political features can result in positive or negative residuals. Taxes and subsidies can change a country's price level. A large and sudden issuance of government debt by a country with an excellent credit record can attract foreign capital that must be converted to the issuer's currency. The currency demand can motivate a higher nominal exchange rate and, in turn, upwardly influence the RER.

Monetary policy can play a part. Some central banks, such as the Central Bank of Argentina and the People's Bank of China, intervene in foreign exchange markets to control their currency's nominal exchange rate. Others, such as the Federal Reserve and the European Central Bank (ECB), do not explicitly target exchange rates but, instead, intervene in credit markets to manage interest rates and indirectly impact foreign exchange markets. Finally, expectations about the future path of policy and productivity help determine the RER.⁴

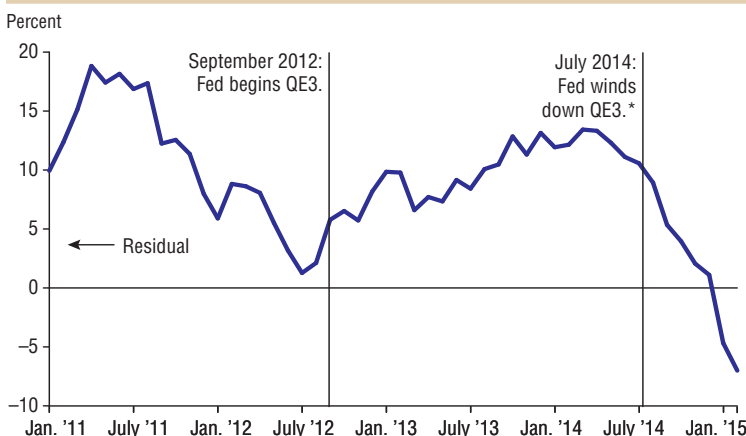
As temporary economic measures expire and uncertainty abates, economic forces should drive residuals toward zero. If a country has a positive residual, one of two things is likely—the country's nominal exchange rate will depreciate or its relative CPI will fall. For example, if the People's Bank of China were to credibly announce a fixed exchange rate forever, then RER adjustment would operate through differences in CPI inflation rates.

The Euro Area and Japan

When the euro was launched in 1999, its RER was within 2 percent of what our modified PPP theory would predict. Over the next decade, changes in economic policies and a large accumulation of sovereign debt in the euro area coincided with a rise in the RER beyond the growth rate in its relative income per capita (*Chart 3*).

During the European sovereign debt crisis in 2011, it became clear that debt

Chart 3 Devaluation Turns Euro-Area Real Exchange Rate Negative



*Fed also discusses timing of raising interest rates. European Central Bank announces discussion of a quantitative easing (QE) program.

SOURCES: Database of Global Economic Indicators; Haver Analytics; authors' calculations.

loads in the euro-area periphery (Greece, Italy, Spain and Portugal) were becoming unsustainable—the euro area's RER had a positive residual of 14.8 percent. Periphery countries, challenged to repay their debt, borrowed from the ECB and the International Monetary Fund.

But the credit came with the expectation that austerity measures would be installed to limit future borrowing and encourage saving. The current account balance—the difference between what a country saves and what it invests—rose to \$29.9 billion in February 2015 from a \$2.8 billion *deficit* in January 2011. The current account increase was accompanied by a net outflow of capital—the outside investment of accumulated savings. As a result, the euro was pressured lower and CPI inflation declined relative to the U.S.

The euro-area residual fell below 3 percent in 2012, a pattern interrupted by loosened monetary policy in other major economies, most notably the Fed's largest round of quantitative easing in September 2012. The central bank injected a large amount of dollars into the U.S. economy when it purchased Treasury and mortgage debt. Interest rates were pressured lower.

Other major central banks similarly expanded their balance sheets, including the Bank of Japan and Bank of England. The ECB did not make any such adjust-

ments. Due in part to the differing monetary policies and resulting interest rates, capital flowed from the U.S. in search of higher yield, putting upward pressure on the euro-area RER.

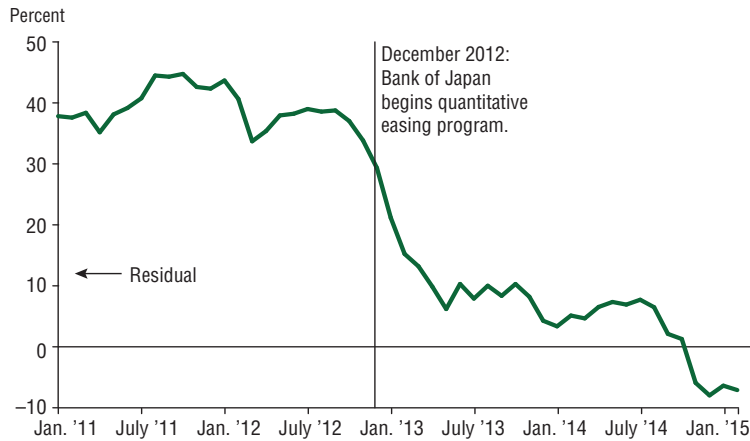
The euro-area RER declined again in July 2014 when the Federal Reserve was close to ending its quantitative easing program. Expectations of the Fed increasing short-term rates attracted capital back to the U.S. The Bank of England had also signaled future monetary policy tightening. At the same time, the ECB was preparing its own quantitative easing, leaving it as one of the few major central banks loosening monetary policy. Capital flowed from the euro area, reigniting devaluation of the region's currency. The euro-area RER declined 16 percent from July 2014 to February, and its residual fell into negative territory.

Similarly, Japan's residual was positive at 40 percent in 2011, with subsequent events dropping it to -7 percent by last February (*Chart 4*).

Japan Prime Minister Shinzo Abe, responding to sluggish gross domestic product growth and stagnant prices, instigated the Bank of Japan's quantitative easing program in December 2012. It increased the money supply and pulled down the nominal exchange rate. Japan's residual fell steadily from January 2011 to last February, the result of a 2.8 percent decline in the CPI relative to the

Chart 4

Normalization of the Japanese Real Exchange Rate Since 2011



SOURCES: Database of Global Economic Indicators; Haver Analytics; authors' calculations.

U.S. and the yen's 30 percent nominal depreciation.

Fundamentals and Exchange Rates

Long-run RERs are guided by fundamentals. However, over the shorter term, economic policy and changes in expectations about future fundamentals and economic policy lead to real exchange rate movements that fundamentals cannot always explain.

Recent exchange rate movements in the euro area and Japan are consistent with a longer-run return toward levels consistent with each area's currency fundamentals. As a result, firms in the euro area and Japan should eventually regain

competitiveness on the international market.

Parasrampuria is a research assistant and Sposi is a research economist in the Research Department at the Federal Reserve Bank of Dallas.

Notes

¹ Equivalently, the RER is the ratio of the dollar-price of foreign goods relative to the dollar-price of the same basket of U.S. goods.

² See "The Purchasing-Power Parity Doctrine: A Reappraisal," by Bela Balassa, *Journal of Political Economy*, vol. 72, no. 6, 1964, pp. 584–596; and "Theoretical Notes on Trade Problems," by Paul A. Samuelson, *Review of Economics and Statistics*, vol. 46, no. 2, 1964, pp. 145–154.

³ Since the trend line is fitted using ordinary least squares, the interpretation depends on the assumption that the policies implemented by central banks were uncorrelated with income per capita.

⁴ See "Exchange Rates and Fundamentals," by Charles Engel and Kenneth D. West, *Journal of Political Economy*, vol. 113, no. 3, 2005, pp. 485–517; and "Expectations and Exchange Rate Policy," by Michael B. Devereux and Charles Engel, NBER Working Paper no. 12213, May 2006.

DALLAS FED



Economic Letter

is published by the Federal Reserve Bank of Dallas. The views expressed are those of the authors and should not be attributed to the Federal Reserve Bank of Dallas or the Federal Reserve System.

Articles may be reprinted on the condition that the source is credited and a copy is provided to the Research Department of the Federal Reserve Bank of Dallas.

Economic Letter is available on the Dallas Fed website, www.dallasfed.org.

Mine Yücel, *Senior Vice President and Director of Research*

Carlos E.J.M. Zarazaga, *Executive Editor*

Michael Weiss, *Editor*

Kathy Thacker, *Associate Editor*

Dianne Tunnell, *Associate Editor*

Ellah Piña, *Graphic Designer*

Federal Reserve Bank of Dallas
2200 N. Pearl St., Dallas, TX 75201