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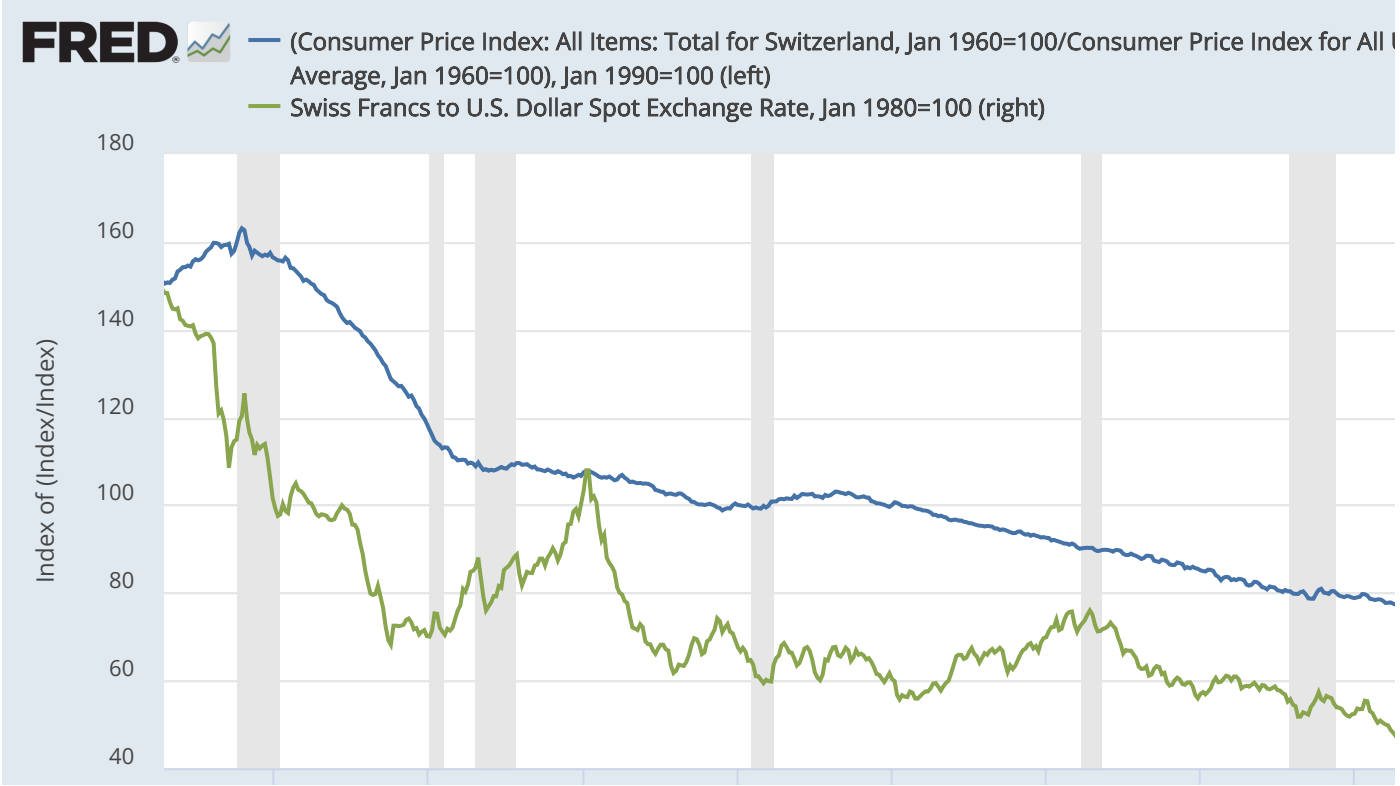
Does purchasing power parity (PPP) hold in the long run?

A look at the franc/dollar exchange rate on the Swiss national holiday

Posted on August 1, 2022

Part of the “My favorite FRED graph” guest post series.



"Under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate." —Dornbusch and Krugman (1976)

Most models in international macroeconomics assume purchasing power parity (PPP) holds in the long run. But what is PPP and what is the long run?

A good starting point is the **law of one price** (LOP), which states that the same good in different competitive markets must sell for the same price, when transportation costs and barriers between those markets are not important. Intuitively, LOP holds because, if prices were lower in country A and higher in country B, people would simply buy the lower-priced good in country A and sell it in country B at a higher price.

Purchasing power parity (PPP) is the application of LOP across countries for all goods and services—or for representative groups ("baskets") of goods and services such as those used to compute the consumer price index. If *absolute* PPP holds, a typical basket of goods in country A has exactly the same price as it does in country B, when prices are expressed in a common currency.

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Consider the case of Switzerland and the United States:

If *P(CH)* is the level of average prices in Switzerland, *P(US)* is the level of average prices in the U.S., and *E* is the Swiss franc/U.S. dollar exchange rate (number of francs per U.S. dollar), then absolute PPP holds if $P(CH) = E \cdot P(US)$.

PPP thus implies that the exchange rate is determined by the ratio of average prices.

If LOP holds for all goods and services, PPP will also hold. But there are good reasons why LOP *doesn't* hold for all goods and services. Certain services (think of haircuts or restaurant meals) cannot be traded across countries. Certain goods are costly to transport (think cement). And certain goods have tariffs. For instance, meat is much more expensive in Switzerland than in Italy, France, or Germany, but a person can't legally import large quantities of meat into Switzerland without paying large import duties.

Moving from the law of one price to purchasing power party is also complicated by the fact that people in different countries consume different goods. This is partly due to local tastes (more wine in Italy and more beer in Germany), but also income levels (in poorer countries, the typical household allocates a larger share of their expenditures to food). *Absolute* PPP doesn't hold, as shown by the fact that PPP exchange rates normally deviate from nominal exchange rates.

A less-rigorous version of PPP is *relative* PPP, which states that the percentage change in the exchange rate is equal to the difference in the percentage changes in average prices—that is, the inflation rate. (Formally: $(E_t\text{-}E_{t\text{-}1})/E_{t\text{-}1} = \pi(CH)_t\text{-}\pi(USA)_t$, where $\pi(x)_t$ is the inflation rate in country x at time t.)

Relative PPP doesn't hold at any one moment in time because the exchange rate is much more volatile than the average price level. However, standard economic models assume it holds in the long run—that is, when prices have had the time to adjust. There seems to be a consensus in the literature that in the "long-run PPP may hold in the sense that there is significant mean reversion of the real exchange rate, although there may be factors impinging on the equilibrium real exchange rate through time" (Taylor and Taylor, 2004).

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The FRED graph above looks at the case of Switzerland versus the United States. The blue line plots the ratio between Swiss and U.S. prices (the ratio is rescaled so that it takes value 100 in 1990). The negative slope shows that Swiss inflation has been substantially lower than U.S. inflation. The ratio between Swiss and U.S. prices has decreased by about 73%. The green line plots the behavior of the exchange rate between the Swiss franc and the U.S. dollar rescaled to take value 100 in 1980. It shows that over 1970-2021 the Swiss franc appreciated by about 75%, which matches the behavior of relative prices. Over this 50-year period, PPP between U.S. and Switzerland seems to hold.

How this graph was created: Search FRED for and select “Switzerland CPI.” From the “Edit Graph” panel, use the “Add Line” tab to search for and select “CPI USA.” Apply formula *a/b* and at the bottom choose the “Index” as the unit, applying 100 for 1990-01-01. Use the “Add Line” tab to search for “Switzerland USA exchange rate” and apply 100 for 1980-01-01.

Suggested by Ugo Panizza.