

## Special Feature B

# The Role Of Exchange Rates In International Price Adjustment

by Charles Engel<sup>1</sup>

## Introduction

There has been a great deal of attention recently focused on exchange rates and their role in determining competitiveness. For example, in September 2010, Guido Mantega, the Brazilian finance minister, commented that “we are in the middle of a currency war”, referring to the depreciation of the major currencies against those of Brazil and other emerging markets. In April 2014, Raghuram Rajan, then Governor of the Reserve Bank of India, complained about the “initiation of unconventional policy as well as an exit whose pace is driven solely by conditions in the source country,” specifically aiming his remarks at monetary policy in the US and other industrial countries that “hold interest rates near zero for long, as well as balance sheet policies such as quantitative easing or exchange intervention, that involve altering central bank balance sheets in order to affect certain market prices”.<sup>2</sup> More recently, in February 2017, US President Donald Trump called China “the grand champions at manipulation of currency”.

In all of these instances, the policymakers believe that a change in the exchange rate—specifically, the nominal exchange rate—influences their respective country’s competitiveness. By “nominal” exchange rate, I am referring to the price of one currency in units of another country’s currency, such as the US dollar price of Chinese renminbi. Curiously, while many policymakers place primary responsibility on the nominal exchange rate for determination of international

price competitiveness, many academic studies assign no role at all to the nominal exchange rate. That is, in the academic studies, relative international prices are determined independently of the determination of nominal exchange rates.

I believe that this disconnect between the beliefs of policymakers and the approach taken by many academic studies represents a failure by both parties. In short, the policymakers and politicians give insufficient attention to the price mechanism—the role that firms play in setting the prices of goods and services, and the role of supply and demand in determining prices. In contrast, the academic studies put too much faith in the price system, and fail to take into account the factors that lead to sluggish adjustment of prices and wages.

I will argue here that nominal exchange rates do play a role in determining international prices and international competitiveness. The academic literature that recognises the importance of price and wage stickiness allows us to understand the part that nominal exchange rates play in determining international relative prices. On the other hand, it is important to emphasise that there is also a role for price adjustments, so that competitiveness is by no means determined only by the currency price.

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<sup>2</sup> See Rajan (2014).

## Real And Nominal Exchange Rates

One important measure of international relative prices is the real exchange rate. The real exchange rate compares consumer price level movements in one country relative to another. For example, Chart 1 plots the monthly real exchange rate for the UK relative to the US (as an index, with the value in January 2000 set to 100). An increase in this real exchange rate means that consumer prices have risen in the UK relative to the US. It is important to recognise that, to compare prices internationally, they must be expressed in the same currency. The real exchange rate in this graph is constructed by first taking the price of the UK consumption basket in pound sterling, then multiplying this by the nominal exchange rate of US dollar per UK pound sterling, to get UK consumer prices in US dollar terms. This is then divided by the US consumer price level to arrive at the relative consumer prices. A key step in arriving at the real exchange rate calculation is the conversion of UK prices into US dollar terms using the nominal exchange rate.

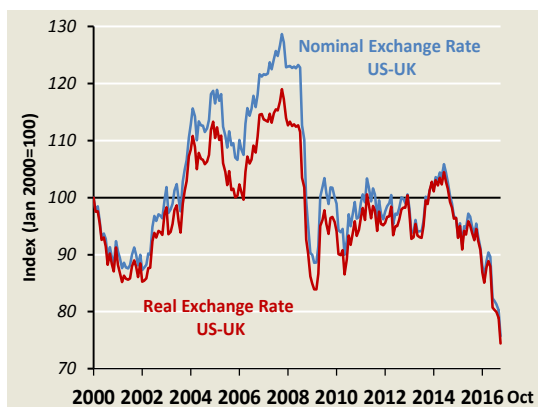
The same chart also plots the nominal US dollar per pound sterling exchange rate. It is striking that the real and the nominal exchange rates track each other very closely. Large movements in the real exchange rate over the space of a couple of years are associated with large movements in nominal exchange rates. Mathematically, this must follow simply because US inflation rates (in dollars) and UK inflation rates (in pound sterling) have been

quite similar since 2000. If the nominal price movements are nearly identical, the real exchange rate and nominal exchange rate will fluctuate in tandem. Chart 2 shows the real and nominal exchange rate for Singapore. Again, there is fairly tight co-movement between the real and nominal exchange rates.

One possible interpretation of these graphs is that they reflect some nominal price stickiness in consumer goods prices. That is, nominal exchange rates react swiftly and sometimes with large movements to economic events such as changes in monetary policy, or financial stress, but goods prices adjust only slowly.

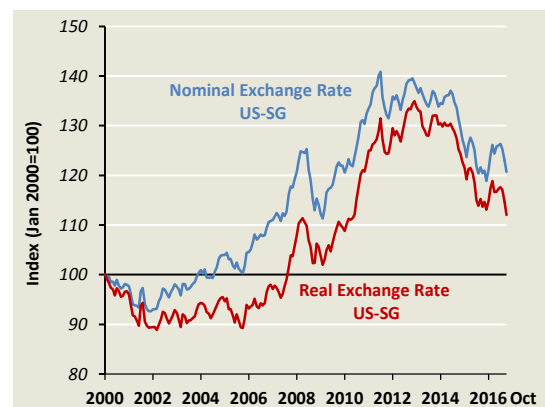
Many academic studies, however, do not allow a role for price stickiness. They would attribute all real exchange rate movements to real price changes that are only coincidentally correlated with nominal exchange rate changes. A leading theory divides consumer products into those that can be traded internationally (goods) and those that typically are not traded (generally, services such as housing and other personal services). This approach assumes that prices of traded goods are approximately equalised internationally, so one country's consumer price level rises relative to another's only because the relative prices of its non-traded services rise.

**Chart 1**  
Exchange Rates for US–UK



Source: Bloomberg, Eurostat and Federal Reserve Bank of St. Louis FRED Database

**Chart 2**  
Exchange Rates for US–Singapore



Source: Federal Reserve Bank of St. Louis FRED Database and IMF

Here is an example. Suppose that in the UK, prices of non-traded services (denominated in pound sterling) rise at an annual rate of 4%, and traded goods prices have no inflation. Assume each has a weight of one-half in the overall consumer price level, so the consumer price inflation in the UK is 2%. Now, assume in the US, the configuration is the opposite. Traded goods prices in the US rise by 4% per year in dollar terms, but prices of non-traded services have no inflation. If, again, each has a weight of one-half in the overall consumer price basket, the US inflation is also 2%. But if traded goods prices are equalised across countries, the US dollar price of pound sterling must increase by 4% (in order to equate the 4% dollar inflation in the US for traded goods to the 0% inflation of traded goods in the UK). In this example, the inflation rates in each country, expressed in their own currencies, are 2%. The relative price of UK consumer goods to US consumer goods rises by 4%. Mathematically, that is seen as a 4% increase in the nominal exchange rate. But underneath the surface, dramatic differences are occurring in these economies—services prices in the UK are rising relative to traded goods prices by 4%, while in the US services prices are falling relative to traded goods prices by 4%. Far from there being price stickiness, there are large relative price swings happening within these economies, so that the price of non-traded services in the UK relative to the US rises by 8%.

While this example is representative of many academic models, is it realistic? There are at least two reasons to think it is not. First, if this were the mechanism at work—large relative price swings within countries—and there were no nominal price stickiness, we should see the same sort of forces at work whether the country has a fixed nominal exchange rate or a floating nominal exchange rate. It is the relative price swings that matter, not the nominal exchange rate adjustment. Mussa's (1986) classic empirical study belies this claim. He documented extensively that real exchange rate movements are much less volatile when the nominal exchange rate is fixed. Indeed, consider Chart 3, which plots the real exchange rates for France relative to Germany. These countries have a nominal exchange rate that is fixed and equal to one, because they use the same currency. This real exchange rate shows considerably less volatility

than the US–UK real exchange rate. This is evidence that the volatility of the nominal exchange rate does indeed matter for the volatility of the real exchange rate.

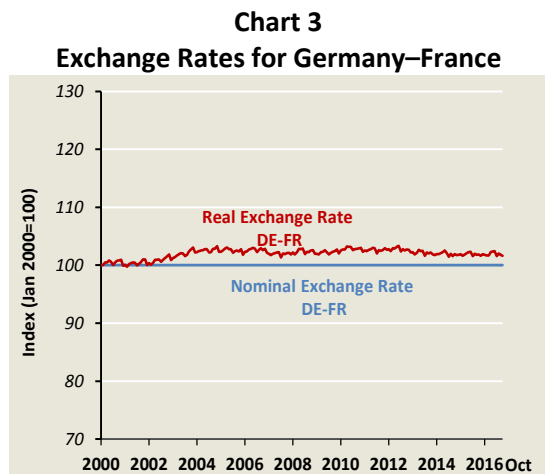
The second piece of evidence comes from Engel (1999). In that paper, I extensively examined the behaviour of the relative prices of non-traded to traded consumer prices within countries. I found that those relative price movements were always quite small, at least when we look at low-inflation, high-income countries. Instead, it appears that, contrary to the theory above, consumer prices of traded goods are not equalised across countries. Even as nominal exchange rates swing wildly, there is relatively little movement in consumer prices of tradable goods, when those are expressed in the consumers' currencies. We often see, for example, annual changes in the dollar per pound sterling exchange rate in the range of 15–20% or more, but inflation rates of traded goods are very similar across the two countries. It seems clear that nominal prices of consumer goods do not respond to the same forces that drive nominal exchange rates, so that the “pass-through” of nominal exchange rates to consumer prices is quite small.

Why do consumer prices adjust sluggishly? A rough summary of the empirical evidence points to two factors. First, it is somewhat costly for firms to change prices constantly. Firms need to assess the demand for their product, and the cost of producing the product, before setting a price. Market conditions change all the time, even within a day, but it is too costly for firms to reset prices constantly. They only occasionally recalculate the optimal price and change the price they charge to consumers.

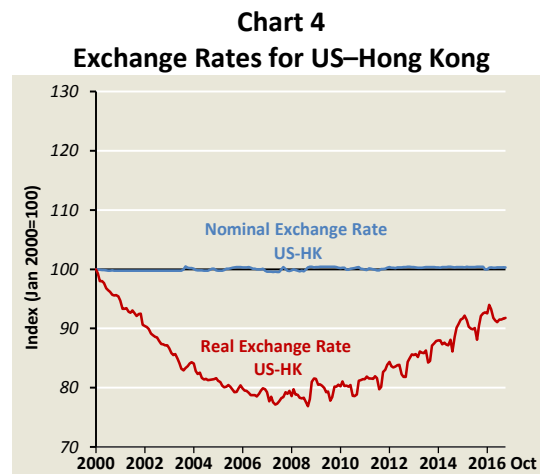
The second consideration is that there is a “coordination failure” among firms. For example, all producers of a particular product—say, knit cotton shirts—might recognise that a price increase would be optimal, perhaps because their costs have risen. Each firm, however, is reluctant to be the first to raise its price. By doing so, it will lose market share, at least temporarily, to the firms that change prices later. And, the firm could also lose customer loyalty if it is seen to be the first to pass along cost increases to its customers.

It is worth noting that even though consumer prices adjust sluggishly, they do change over time. A picture-perfect example comes from the plot of the nominal and real exchange rates for the US–Hong Kong case. The Hong Kong dollar is rigidly pegged to the US dollar, as we see in Chart 4. But there have been large, albeit gradual, swings in the

real exchange rate. These occur only because inflation rates have been different in the US and Hong Kong. Compared to the US–UK case, the real exchange rates move much more gradually, which reflects the slower adjustment of nominal prices compared to nominal exchange rates.



Source: Eurostat



Source: Federal Reserve Bank of St. Louis FRED Database and Hong Kong Census and Statistics Department

## Digging Deeper

The analysis above suggests that, in fact, competitiveness is not much affected by exchange rate changes. As the exchange rate changes, firms do not adjust the price that they charge consumers in the short run, so consumer demand is not directly affected by exchange rate changes. We need to dig down beneath the level of the consumer to see what might be going on.

The consumer does not directly import goods from the foreign producer. These goods are brought to the market by an importer or distributor. Alternatively, a local manufacturer might import an intermediate good that goes into the production of the final consumer good. In practice, the price that the distributor or manufacturer pays for the import may well be influenced by the exchange rate. We will consider how competition is affected in the UK by exchange rate changes in four cases.

### Imports Priced In Exporter's Currency

Suppose the UK retailer imports from France, and the French export is priced in euros. A decrease in the pound sterling price of euros will lead to an immediate drop in the importer's costs. But evidence shows that little of this decline in cost is passed on to the consumer. What, then, are the effects of the exchange rate change?

It may be that the importer simply enjoys a larger profit margin. The importer recognises that exchange rates fluctuate over time. Sometimes the euro will be cheap, and profit margins swell; sometimes the euro is expensive, and profit margins decrease. The importer might also try to mitigate this effect by hedging currency risk through financial markets.

The importer might source from several countries, and the drop in the price of the euro may induce it to switch business away from other countries and towards the French firm. The distributor might actually source this good partly from domestic producers, and so it may switch demand away from domestic firms towards the French competitor. This is not easy to do in the short run, as importers often have long-standing relationships with suppliers. But over time, if the currency remains inexpensive, the importer could adjust more towards the French firm.

Or, prices could adjust! The importer could eventually find that if its profit margins stay large, it makes sense to lower prices charged to consumers. The importer could gain market share at the expense of firms that source from other countries or source locally. Or, the exporter, recognising that its product is cheap in the UK, may raise the export price (in euros). Indeed, this might be tempting for the exporter to do, since it has been receiving fewer pound sterling for each euro it charges its customer.

This last point is important. At first, the exchange rate change can affect competitiveness. A cheap euro makes the imported good more competitive in the UK market, and an expensive euro could lead to a lower market share for that product. But that outcome is not set in stone. Both the distributor and the exporter can change prices—the distributor can change the pound sterling price that it charges consumers, and the exporter can change the euro price that it charges the distributor or importer. International competitiveness is not determined by exchange rates alone, but also by the price-setting behaviour of firms.

### **Imports Priced In Importer's Currency**

Here, the UK firm may buy its goods from a French exporter, but the French exporter prices in pound sterling. There is no need for the UK firm to react to an increase in the pound sterling price of euros—the exchange rate change does not affect the price it pays for the import.

In the short run, the French exporter benefits by receiving more euros for each item that it sells.

That is, if the price is fixed in pound sterling, but the pound sterling price of euros falls, the exporter reaps more euros on each sale.

Again, over time, this may lead to some adjustments. The exporter may find room to lower the pound sterling price that it charges to the importer, and the importer may in turn pass some of that price decrease along to the consumer.

Note that whether the price was set in euros, as in the first case, or in pound sterling, as in this example, the French exporter enjoys an immediate benefit from the decline in the pound price of euros.

### **Imports Priced In A Third Currency**

Gopinath (2015) shows that a large fraction of world trade is priced in US dollars, even if the US is neither the exporter nor the importer. The effects of exchange rate changes are very similar to the first two cases examined above. But now, the relevant exchange rate for the importer is the price of its currency in terms of US dollars, and likewise the exporter is influenced by its US dollar exchange rate.

### **Import Prices Are Not Sticky**

Commodities are sold on world markets, and their prices adjust instantaneously to market conditions. In this case, there is no significance to the currency that the commodity is priced in. While it is sometimes said that because oil is priced in US dollars, the market for oil is heavily influenced by US dollar exchange rates, this is misleading. Any trader with a calculator can quickly translate the US dollar price of oil into any other currency. Since the price of oil moves as quickly as exchange rates do, the US dollar exchange rate plays no special *direct* role in determining the supply and demand for oil.

## Other Considerations

Our analysis so far has assumed that the imported good is either an intermediate input, or a final consumer good, which has a price that is sticky in the consumers' currency. However, a very large part of international trade is in goods that are either final investment goods, or intermediate goods that go into the production of final investment goods. There is much less evidence of final goods price stickiness for investment goods. The pass-through of exchange rates to final prices, even in the short run, is much higher than zero. The exchange rate can have an immediate effect on the demand for the imported good, if the import is priced in foreign currency.

As Amity *et al.* (2014) document, large exporting firms also tend to be firms that import a lot of intermediate goods. The effect of an exchange rate change on those firms may be counterintuitive. In some cases, firms that are large exporters actually have import costs that exceed their export revenues. That is because these firms also have a large domestic market, and the imported inputs are intermediate goods not only in the exports of the firm, but also in the final product sold

domestically. If all goods are priced in the producer's currency, an increase in the price of foreign currency could hurt these firms. While their revenue from exports rises (because they earn more domestic currency for each unit sold abroad), that could be more than offset by the increase in their import bill.

Finally, it is important to recognise that another potential margin of adjustment for firms is in domestic costs—specifically labour costs. Suppose that the renminbi appreciated relative to the US dollar, meaning that the US dollar price of renminbi rises. That might tend to harm Chinese exporters. If their prices were set in renminbi, they would see a decline in the demand for their goods, as the US dollar price rises. In the more likely case that the price is set in US dollars, the Chinese firm is squeezed by lower renminbi earnings for each product sold. But if this effect is widespread among Chinese exporters, there may be a general tendency for wages to fall in China. The Chinese firms would have more cushion to lower their US dollar prices because their costs decline.

## Conclusion

The really striking thing about the relative price movements that are induced by swings in the exchange rate are their size. Nominal exchange rates move, sometimes, violently like other asset prices. Nominal exchange rates react to actual monetary policy changes, and anticipation of future monetary policy changes. They react to financial market uncertainty and political uncertainty. Because of nominal price stickiness, these extreme movements in nominal exchange rates are reflected, at least temporarily, in international relative prices.

While there is a long tradition that has argued that freely floating exchange rates improve the efficiency of markets, the evidence seems to point the other direction. That is, these large movements in exchange rates lead to relative price changes that are not indicative of underlying changes in

costs or demand. It may be optimal for monetary policy to aim to control large swings in the exchange rate in order to mitigate these distortions, as I have argued formally in Engel (2011).

What does price adjustment look like when there are no fluctuations in nominal exchange rates? Recent work that I have co-authored (Berka *et al.*, 2017) finds that real exchange rates within the Eurozone—the set of countries that share the euro—adjust much like traditional theories tell us they should. The relative price levels are influenced by sectoral productivity levels, and by movements in unit labour cost. Interestingly, these fundamental factors that influence costs have not been found to play a major role in the determination of real exchange rates among high-income, low-inflation countries with floating

nominal exchange rates. While perhaps the real exchange rates in the Eurozone adapt more slowly than is ideal, because adjustment relies entirely on differences in inflation, the real exchange rates are free from the sharp bounces that occur in floating rate countries with volatile nominal exchange rates.

We might conclude that, first, nominal exchange rates do influence relative international prices in the short run. The channels of influence depend on the currency of export pricing, and on how importing firms adapt to the exchange rate movements. Sharp swings in nominal exchange rates may induce temporary changes in

competitiveness that are not justified by underlying demand or cost shocks. An ideal exchange rate policy that smooths the adjustment of nominal exchange rates, but moves them in a direction such that international prices reflect underlying costs, might lead to more efficient outcomes than a purely *laissez-faire* free market for foreign exchange. But exchange rates are also subject to manipulation by policymakers, so that the implementation of the policy—the extent to which policymakers act to mitigate the effects of sluggish price adjustment when targeting nominal exchange rates—determines whether exchange-rate policies improve the efficiency of international price-setting.

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