Nominal and Real Exchange Rate Volatility

J.L.S. Abbey

(Executive Director)

Centre for Policy Analysis

Accra

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Friedman's Conjecture

Instability of exchange rates is a symptom of instability in the underlying economic structure. A flexible exchange rate need not be an unstable exchange rate. Exchange rate regimes differ in the mechanisms through which any underlying volatility is channeled. For example, 'money supply' or 'liquidity' shocks affect the nominal exchange rate when rates float but the money supply when rates are fixed. Underlying systemic volatility cannot be reduced by the regime only channeled to one locus or another. The economy can be thought of as a balloon; squeezing the volatility from one part merely transfers the volatility elsewhere.

This persuasive argument led many to be surprised by the magnitude of the increase in exchange rate volatility following the breakup of Bretton Woods in 1973. Indeed, much of the most influential work in international finance in the 1970s and 1980s was geared towards rationalizing the apparently high level of floating exchange rate volatility. Dornbusch (1976) is the classic example.

But the widespread optimism about the potential of monetary models, especially the sticky-price monetary models, to explain how flexible exchange rates function has proved unwarranted. And yet, the main cornerstones of monetary and exchange rate models were relatively non-controversial:

- long-run PPP (or some variant of it); and
- a presumption of a strong long-run correlation between money growth and inflation.

The most basic monetary models generally incorporate variables such as money supply, output and interest rates to explain exchange rate movements. And despite longer data sets on modern floating rates, and the application of more sophisticated econometric techniques, researchers have continued to find it very frustrating to demonstrate any systematic relationship between

exchange rates and macroeconomic fundamentals, at least for the cross rates between the US dollar, the Dutch Mark (euro) and the Japanese yen.

Flood and Rose (1999) – "Understanding Exchange Rate Volatility Without the Contrivance of Macroeconomics", *Economic Journal* (November) pp. 660-672 – emphasizes that the volatility of the exchange rate far exceeds the volatility of any standard measure of macroeconomic fundamentals. Even allowing for overshooting, which in principle can magnify the impact of macroeconomic variables on the exchange rate, the dominant conclusion is that short-term exchange rate volatility cannot possibly be attributed to macroeconomic factors.

It is worth noting in this regard, that the view that monetary shocks must be neutral in the long-run has been challenged. For example, Obstfeld and Rogoff have shown that in an especially intertemporal sticky-price model, temporary monetary shocks typically result in current account imbalances. Because of the resulting re-distribution of world wealth, money shocks have real effects that far outlast any price rigidities. Moreover, this effect may be quite significant empirically.

In the context of the industrial countries, money demand has been extremely unstable over the last two decades of the twentieth century, deregulation and innovation have been pervasive throughout the OECD, making the connection between any measure of money and prices a tenuous one. Moreover, inflation rates – across the US, Germany and Japan – have all converged towards zero, which makes it even more difficult to detect the effects of monetary policy differences on exchange rates.

Again, no major central bank today sets the money supply exogenously. They typically use short-term interest rates to minimize a loss function depending on output and inflation. Money supply is endogenous not the price (interest rates) as in Fund programmes.

Then also, the law of one price, from which PPP is derived often, seems to hold in the breech. While shocks to PPP tend to dampen out over the long run, the rate of convergence appears rather slow. Since one normally thinks that the real effects of monetary shocks should be largely dissipated after one, or two years, the observed periods of convergence after shocks appear inordinately long!

Admittedly, if the main sources of exchange rate disturbances are real – for example, productivity shocks, it will not be at all difficult to rationalize slow convergence to PPP. But then it would be hard to explain the very short-term volatility of exchange rates, which is usually presumed to be dominated by monetary and financial market shocks.

It has been suggested that a most plausible resolution of the PPP puzzle is the existence of large frictions in goods markets, due to transport costs, information costs, and threatened or actual tariffs. There may therefore be a sizable buffer within which exchange rates can move without producing an immediate response in most goods prices. Thus convergence to PPP may appear to be very slow, when in fact it may be reasonably fast outside the non-convergence band.

Monetary models seem not to have power in empirically explaining cross rates between the dollar, Dutch Mark (euro), and yen. However, they have proven extremely useful in explaining exchange rates across countries with significant current and/or potential future inflation differentials. In the Dornbusch 'over shooting' model a sustained unanticipated monetary tightening would be expected to lead to an appreciation of the real exchange rate and a rise in the real interest rates. This result is a central prediction of the model, which has been borne out repeatedly in several countries including Ghana. It has been particularly evident in countries that have moved from high inflation to low inflation environments via exchange rate pegs and other commitment devices. Moreover, monetary models have proven valuable in understanding the effects of major shifts in macroeconomic policy not only on the exchange rate, but on other variables such as employment and the current account.

The empirical evidence then is that, contrary to the Friedman conjecture, floating exchange rates are volatile. To a first approximation, countries with fixed exchange rates have less volatile exchange rates than floating countries while macro economies are equally volatile. Neither the exchange rate nor the exchange rate regime seems to reflect observable economic shocks. The exceptions are high inflation countries. Otherwise, by choosing the exchange rate regime, policy has an important effect on exchange rate volatility, but not on the volatility of traditional macroeconomic fundamentals.

Musa – "Nominal Exchange Rate Regimes and the Behavior of the Real Exchange Rate, *Carnegie-Rochester Series on Public Policy*, pp. 117-213 – established convincingly that nominal and real exchange rate variability changes systematically with the exchange rate regime. He showed that the variance of the real exchange rate is in order of magnitude greater in the floating period after the Bretton Woods period than it was during the Bretton Woods regime of pegged rates.

Musa's 'first important regularity' states: "*The short-term variability of real exchange rates is substantially larger when the nominal exchange rate between the countries is floating rather fixed*".

Edward Chancellor in his history of financial speculation *Devil Take the Hindmost*, explains why the conventional wisdom is so wrong about the

impact of more information on the stability of markets. It has long been held that the more information investors had, the more stable this would make markets. Thus, assuming that markets are inherently efficient, they would become even more so when supplied with better information. They might even become rather dull, like a reliable motor car. In fact, there is little historical evidence to suggest that improvements in communications create docile financial markets or better-informed investment behavior. If anything the opposite appears to be the case.

Historically, the wider availability of financial information and improvements in communications has tended to attract compulsive new players to the speculative game. Most of them do not know what they are buying or selling, they are just trading symbols. When for political, economic and social reasons the markets in currency become unstable or weak what might have been a brutal but limited market adjustment downward could be transformed into something much more painful and exaggerated. Instability is also much more quickly transmitted between markets, and from bad markets to good markets.

The essence of Flood and Rose (1999) is that macroeconomics appears to be irrelevant in explaining high and medium frequency exchange rate dynamics for low inflation countries. It is conjectured that researchers working in the early 1970s "surely supposed that since the monetary approach to the balance of payments (MABP) had succeeded in the pre-1974 industrial-country data set, its fraternal twin the monetary approach to the exchange rate (MAE) would perform well during the floating. But as Rogoff (1999) – "Monetary Models of dollar/yen/euro Nominal Exchange Rates: Dead or Undead", *Economic Journal* – points out the MAE has come to be viewed, in the dollar/yen/euro context, "*as one of the more dismal failures in modern economics*".

Nonetheless, MAE performs fairly well when inflation is high; PPP also works much better over decades than over quarters. MAE also works better at low frequencies. But for industrial countries pairs at business cycle frequencies, MAE is a major disappointment.

Instead of searching for a Holy Grail of macroeconomic differences, Flood and Rose (1999) suggests that a more promising direction is to model market structure as changing with the exchange rate regime. It hypothesizes that:

> *The policy switch between fixed and floating exchange rates entails an essential shift in market structure across regimes. In other words the structure of the foreign exchange market depends on the exchange rate regime. The parameters in structural asset market equations, the shocks to these equations, and perhaps even the very identity of foreign*

exchange market participants seem to be regime dependent.

As explained in the analysis cited above from Edward Chancellor's *Devil Take the Hindmost*, the presence of large numbers of speculators in flexible markets undermines the assumption that asset markets are efficient – that all available information is discounted into the price. Thus although it is widely accepted that randomness of price movements is neither a necessary nor sufficient condition for market efficiency, randomness of asset prices, such as the exchange rate, is nonetheless often taken to be an indication of market efficiency.

What then explains the observed volatility of the real exchange rate – asymmetrical adjustment speeds in goods and asset markets? The hypothesis, first attributed to Dornbusch, is that prices of commodities are sticky in comparison to the relative prices of currencies and so a nominal shock, by imparting volatility into the nominal exchange rate, imparts a similar degree of volatility into the real exchange rate. Here, volatility in the nominal exchange rate drives volatility in the real exchange rate:

- Volatility is generated by real shocks, such as productivity (supply changes) and preference shocks (for example, TOT changes). So for example, a productivity shock can change the nominal exchange rate, which, for an unchanged internal relative price ratio, also changes the real exchange rate. Volatility in the real exchange rate drives volatility in the nominal rate;
- Regime volatility. In particular, it is not just that real and nominal exchange rates exhibit similar volatility under floating rates, it is also that real and nominal rates are more volatile in the recent floating regime than in the Bretton Woods regime, despite there being no notable change in the volatility of the underlying fundamentals (Flood and Rose, November 1999).

These alternatives concern volatility at long and short horizons. For very short-run frequencies – daily or intra-day – it is generally accepted that exchange rate behavior is driven by market microstructure considerations rather than traditional economic fundamentals.