

Appendix 2

Exchange Rate Misalignment: What the Models Tell Us and Methodological Considerations

Often one sees references suggesting that an exchange rate is in disequilibrium or misaligned and not at the rate “it should be” or not at a rate based on market fundamentals. For example, financial institutions publish estimates of “fair value,” implying the probable direction a currency will move in the near term, as part of their client services or for their own foreign exchange trading purposes. As will be shown, these estimates often vary considerably. In extreme cases, some exchange rate models generate estimates that a currency is undervalued while others conclude that the currency is either fairly valued or even overvalued – all using the same data at the same point in time.

A Multi-Faceted Issue Where Much Can Go Wrong

Many approaches have been developed to estimate “proper” or “equilibrium” exchange rate values based on different views about how economies and financial markets work. Conclusions are then drawn as to whether a currency is misaligned based on the deviation of the actual observed exchange rate from the predicted proper exchange rate. Although it is broadly understood that no single model accurately explains exchange rate movements, estimated models still produce useful information.

For example, simplified models do not adequately describe all the millions of daily events in a modern economy relevant to determining an equilibrium exchange rate. This is especially true of economies that are fully integrated into the international economic and financial system. It is also highly unlikely that existing empirical techniques are able to fully capture all the relevant structural changes that occur within and among economies that influence exchange rates.

Though there is no “fail safe” method of estimating the proper value of an economy’s exchange rate or the extent of its misalignment, it is possible to calculate useful indicators and approximations. However, here too there are problems. One major problem is that most exchange rate models are “trade based” with the results keyed to finding the exchange rate that balances cross-border trade of goods and services. But exchange rates are prices that are determined in trading in large financial markets. Trade flows are dwarfed by financial market transactions – global trade in goods and services for all of 2005 was \$12 trillion while more than \$15 trillion in transactions flow through foreign exchange markets in a single week. Persistent trade balances can, over time, shift the ownership of financial instruments and thus exert a long-term influence on financial markets. At the same time foreign demand for a country’s assets can change the savings-investment balance and thus current account balances. Models that fail to account for the underlying dynamics of financial markets, driven by portfolio and investment management factors, are subject to sizable error as they treat either minimally or not at all some of the most important determinants driving exchange rates.

Adding to the confusion is the practice of using multiple definitions of exchange rates. For example, some models focus on the nominal bilateral exchange rate between currencies (e.g., the rate one U.S. dollar is exchanged for one Japanese yen). Other models use an index of the value of a currency in terms of many exchange rates with weights based on the value of a country's global trading pattern (i.e., trade-weighted exchange rates) but not on the country's global financial flows. Additionally, some models express currency values in "real terms" to take account of changes in relative domestic prices and thus capture the global purchasing power of a currency. Those accounting for changes in relative goods prices are known as real effective exchange rates (REERs) and are the exchange rates most commonly associated with trade based models.

Lastly, there is the practical consideration of the ability of each country to choose its own exchange rate regime. Each of the 184 members of the International Monetary Fund has an exchange rate regime that falls within one of eight different categories. Roughly half (79 countries) have adopted either floating or managed floating exchange rates (they account for 64 percent of global output). The remaining countries have adopted either conventional or crawling pegs, or currency boards or have no separate currency. The process of adjustment to equilibrium differs sharply depending on the choice of exchange rate regime.

What do the Models Say?

Rendering a view on misalignment depends first on establishing some notion about the definition and conditions constituting the equilibrium value of the exchange rate. Not all models are the same in this respect, and many approaches are in use.

The oldest, and perhaps best known, is that of "purchasing power parity". The Big Mac index published by *The Economist* magazine employs a narrow, but interesting, version of this approach, focusing on the price of one good and bilateral exchange rates. Models typically focus, however, on the REER because the real rate is often regarded as a measure of international competitiveness. Some analysts simply compare the current value of a REER with its historical values. Others incorporate a "macroeconomic" approach that takes into account saving-investment positions and sustainable current account balances. Still others focus on fundamental characteristics of an economy, such as changes in productivity of traded and nontraded goods sectors and relative openness. Many models concentrate on finding an exchange rate that will yield external and internal balance in the medium term, with inadequate consideration given to the possibility that this balance may not be consistent with efficient economic performance or with equilibrium in financial markets.

The many estimates available indicate that different approaches can produce widely different results. One financial institution develops several measures of misalignment of emerging market currencies, using different equilibrium concepts. A Treasury staff

study¹ notes that the estimates for the real effective value of the Venezuelan bolivar in September 2005 varied from an undervaluation of 18 percent to an overvaluation of 87 percent. Estimates of undervaluation of the Mexican peso ranged from seven to 40 percent. A cross-section of estimates by different financial institutions produced results on the Argentine peso ranging from a 15.5 percent overvaluation to an 18 percent undervaluation and on the South Korean won ranging from an eight percent overvaluation to a 24 percent undervaluation.

The models also tell us that they are extremely sensitive to the selection of the deflator used to generate a real value index. For example, drawing on IMF data the U.S. dollar in 2004 was found to be either 17 percent below its 1980-99 real effective average, just below, or just above depending on the deflator used. The Canadian dollar was found to be above its average when deflated by unit labor costs but below its average when deflated by consumer prices. The exact opposite results were found for the Japanese yen; above when deflated by consumer prices but below when deflated by unit labor costs.

Evaluating Misalignment

Still, model-based assessments are typically grounded in empirical estimation and can be useful tools provided they are interpreted with a full understanding of the properties and sensitivities that underlie their computations. With full recognition that financial market flows are rarely, if ever adequately incorporated into the models, and that the models must be selective in the variables they choose to use, what is the best manner to proceed? One approach might be as follows:

- Focus only on serious misalignments. Use of small deviations run too great a risk of “false positives” as was shown above when different price deflators were used.
- Focus on real effective, not bilateral exchange rates. Only real effective exchange rates capture the multilateral, multicurrency world that exists in reality. They are typically the only rates consistent with trade-based models.
- Use as many models as possible; there is no broadly accepted “right” model. If many models point in the same direction with roughly similar results, then the likelihood of obtaining an accurate judgment is much improved.
- Recognize that no model will provide a precise answer. Point estimates are often published, but it is best to know the confidence interval for the estimate. Empirical work requires working with data subject to error, and error terms and confidence intervals can be high. For instance one scholar noted his estimates needed to be given +/- 15 percent confidence interval. This imprecision casts doubt on any precise measure of misalignment, boosts the probability of finding a false positive, and encourages concentrating on substantial misalignments.

¹ Forthcoming Treasury Occasional Paper, *Equilibrium Exchange Rate Models and Misalignment*, by T. Ashby McCown, Patricia Pollard, and John Weeks.

- Focus only on ‘protracted’ misalignments where currency adjustments are not taking place. The models used to estimate equilibrium exchange rates do not typically describe formally exchange rate adjustment mechanisms. It can be necessary to repeat estimates over time to establish whether a currency that is potentially misaligned is adjusting or not. Even then there is scope for error. Structural changes occur continually in a multi-country world and so too do changes in equilibrium exchange rates.
- Even then, judgments about misalignment must be supplemented by analysis of empirical data, indicators, policies and institutional factors. Such supplemental factors might include persistent one-way intervention in exchange markets, controls on capital movements, lack of currency flexibility, and dependency on exports.
- Lastly, one should verify whether there are any market-based reasons for a currency’s misalignment. For example, a model may not account for the risk of investing in a particular currency. Higher risk weakens international demand, even if productivity is rising. Or, the deviation might reflect defective institutions that weaken the adjustment process and dampen currency demand. Similarly, high interest rate differentials, when there are little apparent offsetting currency movements, can impact capital flows.

Provided the process is well disciplined, relies on established principles, and, critically, is supplemented with additional analysis, the weaknesses of certain approaches to the assessment of misalignment can be largely overcome. Moreover, models can reasonably be expected to improve with time. Although no isolated approach will be fail safe, the existence of protracted misalignment, with little modification of the factors sustaining the misalignment, can be a significant impediment to the efficiency of international adjustment mechanisms and the smooth operation of the global economy and ought to be analyzed.