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I. Introduction

While fashions concerning appropriate exchange rate arrangements have shifted over the years, advocacy of establishing a target zone surrounding the world's three major currencies has remained a hardy perennial. Work on target zones (pioneered by McKinnon, 1997, and Williamson, 1986, and recently summarized by Clarida, 1999) has mostly emphasized the benefits of exchange rate stability for industrial countries. More recently, though, analysts have apportioned some of the blame for financial crises in emerging markets back on the shoulders of the volatile bilateral exchange rates of industrial countries (as in Goldstein, 1999, for instance). With many emerging market currencies tied to the U.S. dollar either implicitly or explicitly, movements in the exchange values of the currencies of major countries–in particular the prolonged appreciation of the U.S. dollar vis-a-vis the yen and the deutsche mark in advance of Asia's troubles–is argued to have worsened the competitive position of many emerging market economies. One solution to reducing destabilizing shocks emanating from abroad, the argument runs, would be to reduce the variability of the G-3 currencies by establishing target bands.[1] This paper examines the argument for such a target zone from an emerging market perspective but will be silent on the costs and benefits for industrial countries.

Given the reality that sterilized intervention by industrial economies tends to be ineffective and that policy makers show no appetite to return to the kinds of controls on capital that helped keep exchange rates stable over the Bretton Woods era, a commitment to damping G-3 exchange

[1] Of course, since European monetary union, the G-3 currencies cover at least thirteen countries–the United States, Japan, and the eleven nations that have adopted the euro. In what follows, we splice together the pre-single-currency data on the deutsche mark with the post-1999 data on the exchange value of the euro.

rate fluctuations requires a willingness on the part of G-3 authorities to use domestic monetary policy to that end. However, while trading patterns may become more stable in an environment of predictable G-3 exchange rates, debt-servicing costs do not owing to the greater variability of international interest rates. The welfare consequences to an emerging market economy, therefore, are ambiguous, depending on initial conditions, the specification of behavior, and the dynamic nature of the tradeoff between lower G-3 exchange rate volatility and higher G-3 interest rate variability.

In Section II, we examine the contribution of G-3 exchange rate volatility to fluctuations in the exchange rates of emerging markets. The next section discusses the policy choices open to G-3 countries should their authorities enforce a target zone. Section IV uses the example of a simple trade model to establish that, for a small open economy with outstanding debt, the welfare effect of damping variations in the exchange rate by making international interest rates more volatile is ambiguous. Evidence on the link between G-3 interest rate and exchange rate volatility and economic growth in developing countries underscores the ambiguity of this relationship.

II. Some Background on Exchange Rate Variability

The argument that excessive volatility of G-3 exchange rates imposes significant costs on emerging markets seems to rely mostly on a spending channel. A large swing in the dollar's value on the foreign exchange market in terms of the yen and the euro translates directly into changes in the competitiveness of countries that link their currencies to the dollar–either through a hard peg or a highly managed float. The evidence in Calvo and Reinhart (2000) suggests many developing countries fall into that group. They report a widespread "fear of floating," in that many emerging market currencies tend to track the dollar or the euro closely, even in cases that are officially classified as floating.

From the perspective of aggregate spending, the relevant "exchange rate" for a small open economy would be some index that averages across many bilateral real exchange rates. Consider one such index, w^i, for country i, that is the geometric mean of bilateral real exchange rates, s^{ij} (measured as foreign currency per unit of home currency):

$$w_t^i = \prod_{j=1}^{k} (s_t^{ij})^{\sigma^j}.$$

Reasonable weights, which presumably reflect bilateral or multilateral trade shares, would sum to one.[2] Because such an index is linearly homogeneous, we can write it in terms of the dollar exchange rate for country i and corresponding bilateral dollar cross rates for all the other currencies. That is, if s^{i1} and $\acute{o}^1$ are the foreign exchange value of the dollar in terms of units of the currency of country i and the trade share with the United States, respectively, we can write:

$$w_t^i = s_t^{i1} \prod_{j=2}^{k} \left\{ s_t^{ij} \Big/ s_t^{i1} \right\}^{\sigma^j}.$$

Thus, movements in the effective exchange rate for country i can be thought of as owing to movements in the dollar exchange rate of country i and all other relevant dollar cross exchange rates.

For the purpose at hand, we can take the log difference in this relationship and treat it as a regression equation to estimate the relative contribution of variability in the G-3 cross rates to the

[2] See, for instance, *International Financial Statistics,* where the International Monetary Fund calculates real effective exchange rate indexes using multilateral trade weights.

overall variability in emerging market exchange rates. For about sixty developing economies over three periods (from 1978 to 1983, 1984 to 1992, and 1993 to 2000), we regressed the monthly log change of the IMF real effective exchange rate index against the log changes in the real deutschemark/dollar and yen/dollar exchange rates (deflated using consumer price indexes), as in the regression:

$$\Delta w_t^i = a_1 + a_2 \Delta (DM/\$)_t + a_3 \Delta (Yen/\$)_t .$$

The R^2 of those regressions directly measure the systematic element of the effect of G-3 exchange rate volatility on emerging-market currencies.

Across the three periods, the countries split into two unequal groups, roughly along the two axes of Figure 1. Those countries where G-3 bilateral exchange rates are not important in explaining the variability of the real effective exchange rate (measured by a low R^2 along the vertical axis) are also those in which the overall variability of their exchange rate (measured by the variance of the monthly change in the real effective exchange rate along the horizontal axis) tends to be high. Conversely, as the advocates of target bands stress, countries with smoother exchange rates find that more of the residual variance of those exchange rates result from changes in G-3 exchange rates. Also note, as is reported using a different methodology in Calvo and Reinhart (2000), that the distribution of the number of countries between the two groups has not changed materially over the two recent periods, except for a handful of outliers, despite the fact that countries have increasingly identified themselves as floaters.

III. Exchange Rate Arrangements Among the G-3 Countries

In principle, G-3 exchange rates could be induced to stay within a target bands through some combination of three tools. First, national authorities could rely on sterilized intervention to

enforce some corridor on bilateral exchange rates. However, except to the extent that such intervention tends to signal future changes in domestic monetary policy, researchers have found little empirical support that sterilized intervention in industrial countries is effective.[3] Second, national authorities could impose some form of exchange or capital control, presumably in the form of a transactions tax or framed as prudential reserve requirements. Opponents of such efforts generally argue that capital controls generate financial innovation that undercuts them over time, implying that the controls either become increasingly complicated or irrelevant. Third, monetary policy makers in the major countries could alter domestic market conditions to keep the foreign exchange value of their currencies in a desired range. This could take the form of allowing intervention in the currency market to affect domestic reserves–that is, not sterilizing intervention–or more directly keying the domestic policy rate to the exchange value of the currency (as discussed in McKinnon, 1997, and Williamson, 1986).

Given the lack of evidence finding any independent effect of sterilized intervention (over and beyond what subsequently happens to domestic monetary policy) and the consensus supporting the free mobility of capital internationally, it would seem that the only instrument available to enforce a target zone would be domestic monetary policy of the G-3 central banks. But this implies some tradeoff, in that G-3 domestic short-term interest rates would have to become more variable to make G-3 exchange rates smoother.

IV. The Consequences for Emerging Market Economies

To understand the trade-off between G-3 interest-rate and exchange-rate volatility from an emerging markets perspective, it is important to remember that most developing countries are net

[3] The signaling channel is addressed by Kaminsky and Lewis (1996); Dominguez and Frankel (1993) examine whether there are any portfolio effects of sterilized intervention.

debtors to the industrial world and typically that debt is short-term and denominated in one of the G-3 currencies. As a result, the welfare consequences for an emerging-market economy of G-3 target zones depends on exactly those zones are enforced and the particulars of the small country's mix of output, trading partners, and debt structure.

This can be seen in a basic single-period, two-good model of trade for a small open economy, as in Figure 2. This figure is drawn for a country taking as given the relative price of the two traded goods that receives an endowment in terms of good A, which is the same good in which its external debt is denominated and pegs its currency to that of country A.[4] Volatility of the relative price of the traded goods–which might stem solely from nominal changes in exchange rates between the industrial countries if the small country fixes its exchange rate or prices to the industrial country market–pivot the budget line and thus alter the desired consumption combination in the small country. Suppose, for instance, that the currency of country A depreciates relative to that of country B, rotating the budget line from EF to GF. All else equal, welfare would decline, representing a cost associated with developments on the foreign exchange market for this small country.

Target zones for the large countries, if effective, would be able to prevent the budget line from rotating. However, this reduced major-country exchange rate volatility will only be accomplished if the major central banks change short-term interest rates in response to incipient changes in cross rates. For most emerging-market economies, which are debtors, such coordination of G-3 monetary policy could deliver more stable terms of trade at the expense of a

[4] Behind the scenes of this model in the larger industrial world, it is simplest to think of two large countries, A and B, specialized in the production of their namesake good. The net effect of our assumption about the small economy's endowment and debt structure is that the intercept of the budget line depends on the interest rate in country A.

more variable interest service. In this particular case, the central bank of country A would presumably have to raise its domestic short-term interest rate in defense of the currency. So, while the slope of the budget line would be unchanged, its location would shift in, as labeled HI. Regardless of whether the effects of the initial shock were felt through the exchange rate of the interest rate, welfare in this small country would decline. Whether they decline more or less if the large countries allow the cross exchange rate or their interest rates to adjust will depend on many factors.[5]

It may well be the case that the change in G-3 interest rates might understate the shift in the budget line if capital flows are procyclical, in which case a change in the industrial country interest rate would change the developing country's interest-rate risk premium in the same direction, implying a larger net movement in overall borrowing costs. Moreover, one could posit nonlinearities in the response if large increases in borrowing costs--by inducing balance-sheet strains and credit rationing--have more substantial effects on income prospects than do similar size reductions in borrowing costs.

Some sense of the stakes for emerging-market economies can be gotten from Table 1. We calculated simple annual averages of the absolute value of the monthly changes in the logarithms of the deutsche mark/dollar and yen/dollar exchange rates from 1974 to 1999 and the percentage point change in the U.S Treasury bill rate (on the rationale that most developing country borrowing is denominated in U.S. dollars). We then divided the sample into four cells corresponding to the combinations possible when those two volatility measures were above or below their respective median values.

Section A of the table reports the average annual growth rates of real GDP in developing

[5] Reinhart and Reinhart (2001) examine some of these issues in a small simulation model.

countries. As is evident from the first column, economic growth in developing countries tends to be faster against a backdrop of more stable U.S. short-term interest rates. Moreover, over the past twenty years it would have been a bad bet for developing countries to trade times when G-3 foreign exchange rates were volatile but U.S. interest rates stable (the lower left cell) for times when G-3 foreign exchange rates were stable but U.S. interest rates were volatile (the upper right cell). The 1-1/4 percentage point difference in real GDP growth between the two cells does suggest some caution in assuming that emerging-market economies necessarily benefit from reduced exchange rate variability of the G-3 currencies.[6]

The lower two panels address the possibility of nonlinearities in the responses of developing countries by using an indicator approach. In panel B, data on the number of currency crises in developing countries by year are sorted according to G-3 exchange rate and interest rate volatility (with the crisis indicator defined according to the methodology in Frankel and Rose, 1996, as recently updated and extended to a larger country set by Reinhart, 2000).[7] Panel C reports similar calculations using the number of banking crises from the same source. As can be seen in the first column of both panels, years in which interest-rate volatility in the United States was below its median over the past twenty years were associated with relatively fewer crises in developing countries. But it is also the case that low G-3 exchange rate volatility (the two top rows) was also associated with fewer crises. Thus, while low volatilities in financial asset prices appear conducive to avoiding crisis in developing countries, the net benefit of trading between G-3 exchange rate and interest-rate volatility would seem to be ambiguous.

V. References

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[6] Reinhart and Reinhart (2001) address this in a fuller multivariate context.

[7] The results are similar using the methodology of Kaminsky and Reinhart (1999).

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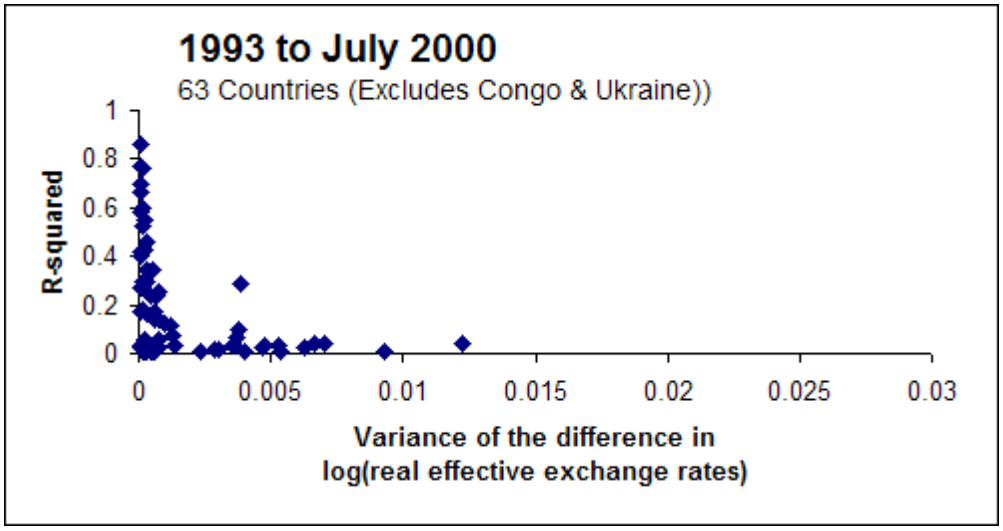
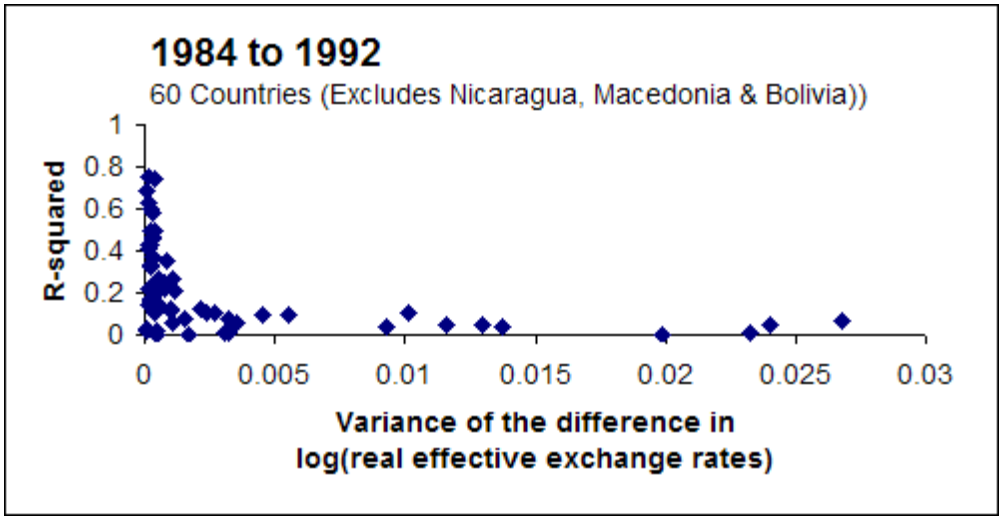
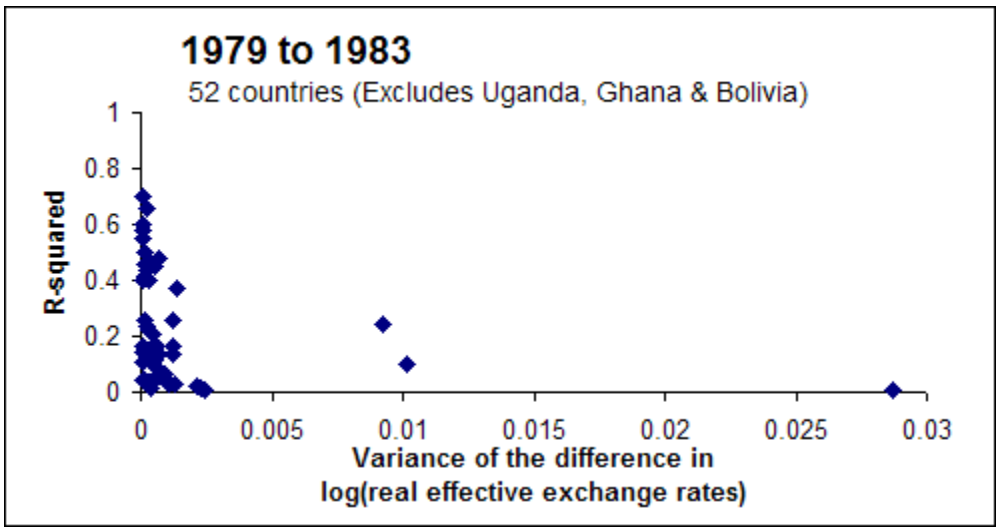
Figure 1


1993 to July 2000
63 Countries (Excludes Congo & Ukraine))
R-squared
1
0.8
0.6
0.4
0.2
0
0
0.005
0.01
0.015
0.02
0.025
0.03
Variance of the difference in
log(real effective exchange rates)


1984 to 1992
60 Countries (Excludes Nicaragua, Macedonia & Bolivia))
R-squared
1
0.8
0.6
0.4
0.2
0
0
0.005
0.01
0.015
0.02
0.025
0.03
Variance of the difference in
log(real effective exchange rates)


1979 to 1983
52 countries (Excludes Uganda, Ghana & Bolivia)
R-squared
1
0.8
0.6
0.4
0.2
0
0
0.005
0.01
0.015
0.02
0.025
0.03
Variance of the difference in
log(real effective exchange rates)

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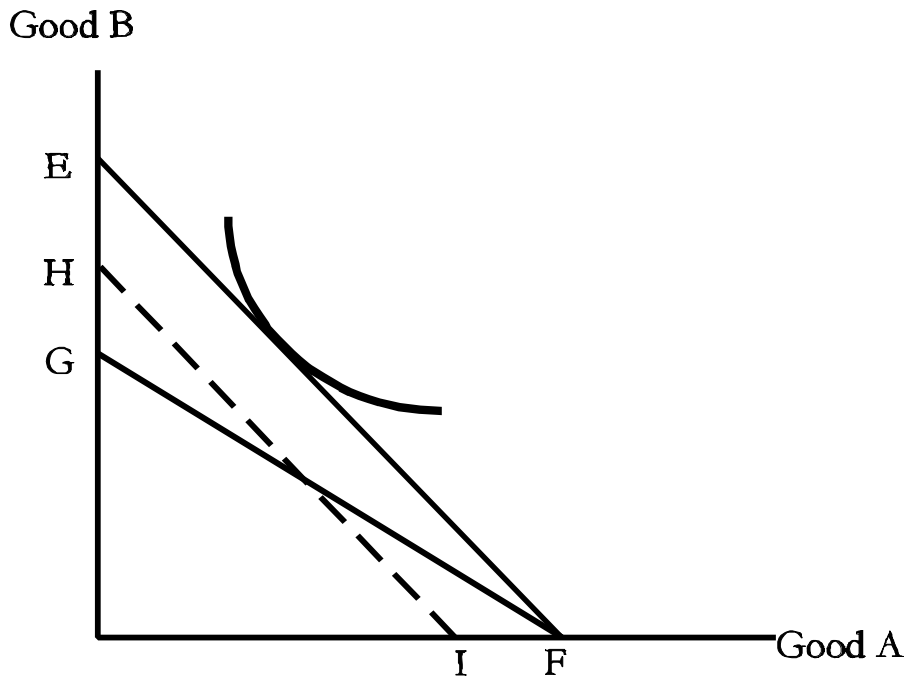

Figure 2: Welfare in a Small Open Economy

Table 1: **Economic Outcomes in Developing Countries and G-3 Exchange Rate and Interest Rate Volatility, 1980 to 1999**

A. Real GDP Growth (percent, annual rate)

U.S. interest rate / ***G-3 exchange rates***	Low volatility	High volatility
Low volatility	5.14	4.32
High volatility	5.46	4.52

B. Incidence of currency crisis (using the definition of Frankel and Rose, 1996, percent of 55 total events)

U.S. interest rate / ***G-3 exchange rates***	Low volatility	High volatility
Low volatility	12.7	27.3
High volatility	30.9	29.1

C. Incidence of banking crisis (using the definition of Frankel and Rose, 1996, percent of 66 total events)

U.S. interest rate / ***G-3 exchange rates***	Low volatility	High volatility
Low volatility	16.7	28.8
High volatility	28.8	26.7

Source: Real GDP, IMF *World Economic Outlook* (2000); incidence of currency and banking crises, Reinhart (2000). The sample is divided based on the medians of the annual averages of the monthly absolute change in the logarithms of the yen/dollar and deutsche-mark/dollar exchange rates and in the percentage point change in the nominal U.S. three-month Treasury bill rate.