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Global Interest Rate Linkages

Long-term interest rates in Germany, Japan, and the U.S. rose more or less in tandem in the early part of this year. The 10-year government bond rate in Germany rose from an average of 7.3 percent in December to an average of 8.6 percent in April; the comparable interest rate in Japan rose from 5.8 percent to 7.3 percent during the same period; and in the United States, the rise was from 7.8 percent to 8.8 percent. During most of this period the dollar appreciated against the yen and depreciated against the DM.

These trends have created concern about the apparent sensitivity of U.S. interest rates to events affecting interest rates abroad. To the extent that such sensitivity exists, many observers argue that the effectiveness of monetary policy in controlling domestic interest rates and inflation may be affected. This *Letter* discusses the mechanisms through which foreign "shocks" may affect interest rates in the United States, and attempts to interpret recent events within this analytical framework.

Exchange rates and interest rates

Financial capital has become highly mobile across international borders. Consequently, a change in the level of interest rates in one country can cause cross-border movements of funds which affect exchange rates and the level of interest rates in other countries. The way in which exchange rates and interest rates change, however, depends on the factors that caused interest rates abroad to change in the first place.

These factors can be categorized as either "nominal" or "real," corresponding to the two determinants of the level of long-term interest rates: respectively, the expected rate of inflation and the "real" interest rate, which is determined by the real supply of and demand for credit. Accordingly, the effects of developments in one country on exchange rates and other countries' domestic interest rates depend on whether interest rate rises abroad are due to "nominal shocks," such as changes in inflationary expectations, or to "real shocks," such as changes in saving or investment behavior.

To understand the recent trends in U.S. and foreign interest rates and changes in the value of the dollar, then, it is useful to consider separately the effects of the two kinds of shocks to foreign interest rates: first, an increase in foreign inflation expectations, and second, an increase in the (actual or anticipated) real demand for capital abroad. In this analysis, Germany and the U.S. represent the foreign and domestic countries, respectively, although the results are generally applicable to all other countries as well.

This analysis focuses on the near-term effects of the shock on the relative *demands* for different assets, and assumes that the *supplies* of domestic and foreign assets are given. It rules out consideration of changes in money supplies associated with possible monetary policy responses. In addition, financial capital is assumed to be perfectly mobile between countries. This rules out any barriers to asset flows, such as capital controls or taxes.

Increase in foreign inflation

A permanent rise in expected German inflation is an example of a pure "nominal" shock; it has no effect on the world equilibrium real rate of return. A rise in German inflation expectations initially will reduce the anticipated real return to holding German assets *from the point of view of German investors*. Assuming that changes in German inflation have at most a negligible effect on U.S. inflation (because German goods represent only a small share of the basket of goods consumed by U.S. residents), returns on U.S. assets will not be affected, and the decline in real German asset returns will induce a shift in

demand away from German assets towards those denominated in dollars, which offer a relatively higher real return.

This shift in asset demand will cause the German nominal interest rate to rise until the anticipated real return on German assets is restored back to the world equilibrium real rate. (As long as the change in foreign inflation expectations leaves the equilibrium world real interest rate unchanged, U.S. as well as foreign equilibrium *real* interest rates will be unchanged.) Moreover, because U.S. inflation expectations are assumed not to be affected by the rise in German inflation expectations, U.S. nominal interest rates will remain constant. Instead, the increase in the demand for dollar-denominated assets will cause the current value of the Deutsche mark (DM) to depreciate against the dollar.

In response to a permanent increase in expected German inflation, the DM will be expected to depreciate in the future at the same rate as German inflation. Accordingly, in equilibrium, the expected rate of nominal depreciation of the DM will exactly offset the rise in the nominal spread between German and U.S. interest rates, leaving the real interest rate spread at its initial level (zero, assuming that capital is perfectly mobile internationally and that U.S. and German assets are perfect substitutes).

The result that U.S. nominal interest rates remain unaffected by a change in German expected inflation is independent of the degree of asset substitutability between German and U.S. assets. If U.S. and foreign assets are less than perfect substitutes, U.S. residents will demand a premium to hold more German assets in their portfolios. This premium will raise the effective nominal return for investing in German assets (that is, the nominal yield abroad plus the expected depreciation of the DM) relative to U.S. nominal interest rates. But there is no reason for the size of the premium to change with a change in inflation expectations. Thus, U.S. rates should be unaffected by a change in German inflation expectations even if German and U.S. assets are imperfect substitutes.

In sum, flexible exchange rates generally insulate the nominal interest return on U.S. assets from a foreign nominal shock. In this case, foreign nominal interest rates and the exchange rate bear the entire burden of the adjustment.

Increase in foreign demand

Consider next an increase in (actual or expected) real investment demand in Germany. Such a shift in demand raises the demand for capital in Germany, and causes German real interest rates to rise relative to U.S. real rates. Moreover, because this shift in real investment demand tends to raise the demand for German goods by more than that for U.S. goods, the DM will be expected to appreciate against the dollar in real terms (assuming the shift in investment demand is expected to be permanent).

From the point of view of U.S. investors, then, the effective real dollar return to investing in German assets (that is, the higher German yield plus the expected appreciation of the DM) initially will rise above the real return available on dollar-denominated assets. Consequently, investors will shift their demand away from U.S. assets, and U.S. real and nominal yields will rise.

Assuming that the shift in foreign demand is permanent, but no further shifts occur, in the long run, German and U.S. real interest rates will be equalized (as long as capital is perfectly mobile, and U.S. and German assets are perfect substitutes, so that there is no risk premium). In this new equilibrium, both the world real interest rate and the real exchange value of the DM will be permanently higher.

The magnitudes of the changes in the levels of the real interest rate and the real exchange rate will depend in part on the sensitivities of U.S. aggregate demand to changes in these variables. For example, if U.S. demand is very sensitive to the interest rate, but not very sensitive to the exchange rate, small changes in the interest rate and large changes in the exchange rate will be necessary to restore equilibrium. Consequently, an increase in German investment demand would lead to a relatively small rise in the equilibrium real interest rate and a relatively large rise in the equilibrium real value of the DM against the dollar.

Assuming the money supply in each country remains constant, the rise in real (and nominal) interest rates associated with the increase in

German investment demand raises the opportunity cost of holding money and reduces money demand. As residents in each country attempt to reduce their money holdings by spending these balances on goods, national price levels will rise unless the monetary authorities respond by decreasing the money supply.

In sum, then, a floating exchange rate does not insulate either the U.S. price level or U.S. real and nominal interest rates from a real shock emanating abroad.

Interpreting recent events

Many observers argue that differences in inflation rates across countries have been the dominant force influencing the spreads between U.S. and foreign interest rates in recent years. In this environment, changes in the value of the dollar to a large extent have insulated U.S. interest rates from developments abroad. When U.S. inflation was rising relative to inflation abroad from 1985 through 1987, the dollar was weak and the U.S.-foreign yield spread widened to reflect the expected depreciation of the dollar. In 1988 when inflation rates abroad began to converge with that in the U.S., U.S.-foreign yield spreads narrowed, and the dollar strengthened.

Currently, most economists are forecasting higher inflation in Japan because of its booming economy and in West Germany because of the anticipated financial strain of rebuilding East Germany. To the extent investors believe that the rate of inflation will be higher in Japan and Germany than in the U.S., the dollar should be stronger against both the yen and DM.

However, recent developments do not accord perfectly with this pattern, implying that inflation fears may not be the whole story. First, although the dollar has been rising against the yen, it has been falling against the DM. Second, despite these changes in the value of the dollar, U.S. interest rates apparently have not been insulated from the rise in foreign interest rates; instead, U.S. rates have risen more or less simultaneously with those abroad.

These observations suggest that recent financial market developments may be due in part to real forces. Anticipated efforts by West Germany to improve the infrastructure and productive facilities of East Germany, and possibly other countries in Eastern Europe, can be expected to increase the real demand for credit, real interest rates, and the level of the DM in the future. And although little actual investment has taken place as yet, the *expectation* of higher German investment demand in the future could be influencing current real rates and exchange rates. Thus, the anticipated greater competition for funds could explain why U.S. interest rates have risen recently together with foreign interest rates. It also could explain why the dollar has depreciated against the DM, but not against the yen.

One should not put too much weight on this explanation, however, since other, independent factors also may have been at work. For example, it is possible that U.S. inflation expectations rose independently in the first part of the year. This may explain why U.S. nominal interest rates rose simultaneously with foreign rates. The concern about Japan's political future as a result of the January elections and the Tokyo stock market adjustment may have contributed to the weakness of the yen.

Important distinction

In any case, this analysis suggests that it is important to distinguish between nominal and real shocks when interpreting developments in international markets. The response of U.S. interest rates to foreign shocks depends critically on whether the shock is nominal or real in nature. Changes in the value of the dollar generally will insulate U.S. nominal interest rates from foreign nominal shocks, such as an increase in foreign inflation expectations. However, the dollar will not insulate U.S. rates from a foreign real shock, such as an exogenous increase in real capital demand abroad (as long as international capital is sufficiently mobile). In this case, any real demand shift abroad will affect the world equilibrium real interest rate. U.S. nominal interest rates will be affected accordingly.

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