Interest Rate Divergences among the Major Industrial Nations

The international integration of financial markets has increased dramatically during the last decade. Government-imposed barriers to international capital flows were gradually relaxed throughout the 1970s and by now have been substantially eliminated in the major industrial countries. More recently, the development and growth of currency and interest rate swaps, options, and other new financial instruments have further stimulated international financial integration by giving investors and borrowers a wider range of choices than that traditionally available from purely domestic channels. Distinctions between domestic and foreign financial markets are fading rapidly as major corporations can gain access to New York, London, and other international financial centers nearly as readily as their home markets.

It is widely presumed that financial integration reduces interest rate divergences among similar credit instruments and increases the degree to which yields in different markets move together over time. Historical experience with integration of domestic financial markets would seem to support this presumption. For example, the development of national money and capital markets in the United States during the latter part of the 19th century reduced regional disparities among interest rates and made the rates increasingly responsive to national, as opposed to purely local, conditions. This experience suggests that growing international financial integration should reduce interest differentials across countries and possibly limit the autonomy of national monetary authorities in controlling domestic financial yields. The actual record of the last two decades, however, raises doubts about these propositions. In particular, international interest divergences during much of the 1980s have been as great or greater than those observed during most of the 1960s and 1970s.

This article examines interest rate divergences among the United States and other major industrial countries from the 1960s through the present. As the next section shows, interest rate disparities among nations can arise from differences in currency denomination and national jurisdiction as well as from factors that cause yields to diverge domestically Expected exchange rate changes and their associated risks, together with institutional barriers to financial flows across national borders, are potentially important sources of international interest disparities. The analysis also shows that increased financial integration unambiguously reduces one source of international interest rate divergences, that arising from institutional barriers. Whether integration actually leads to interest rate convergence, however, depends critically on the nature of other economic changes occurring at the same time and their effect upon currency expectations and risks.

These points are underscored by our empirical analysis of interest divergences. Neither nominal nor real interest rates have shown any systematic tendency toward convergence during the past 25 years. However, the factors underlying interest rate disparities apparently have changed significantly. Currency expectations and associated risks are now the primary sources of divergence, while the importance of overt barriers to capital mobility has declined markedly. These changes can be attributed to the historical association of increased financial integration with the shift from fixed to flexible exchange rates that has resulted in increased volatility in currency values.

Causes of interest divergences

In general, disparities among yields on alternative assets reflect differences in their underlying characteristics. Within a given nation, liquidity, credit risk, tax treatment, and other related attributes determine the relative yields on various instruments. Differences in these characteristics also contribute to interest variations across countries—indeed, the international diversity in these attributes is often greater than the diversity within any single nation. In a world composed of many countries, however, interest rates may also diverge because of currency distinctions and jurisdictional differences, the latter reflected largely in capital controls and other institutional barriers to financial flows across borders.

The existence of different national currencies is a fundamental source of international interest rate divergences. To compare yields on assets denominated in different currencies, an investor requires an estimate of their exchange rate at maturity. For example, the *dollar* return on an instrument denominated in German marks (DM) depends upon how much the DM is expected to appreciate (or depreciate) over the holding period. This means that yield differentials among assets denominated in different currencies implicitly reflect market forecasts of future exchange rate changes. In addition, investing in one currency as against another involves potential risks because exchange rates cannot be predicted exactly. This currency risk, resulting from uncertainty about future exchange rates, is also a potential source of interest divergences across countries.[1]

International interest divergences also reflect nationality distinctions arising from a variety of government policies and institutional imperfections that effectively impede financial flows across national jurisdictions. Until fairly recently, most industrial countries explicitly restricted or otherwise regulated international capital flows; these restrictions have been substantially removed in the United States, Canada, Japan, the United Kingdom, and Germany, but remain important in many other nations.[2] Interest divergences based on nationality can also arise from differences in tax systems or other policies not explicitly aimed at capital flows, as well as from private market imperfections such as incomplete information or monopolistic restrictions on market access and pricing

The effects of these various factors on interest divergences across countries can be summarized in the following identity:

$$(i)\quad i - i^* = \%s + DOM + CRISK + BAR,$$

where i and i^* are, respectively, the interest rates on U.S. assets and foreign-currency-denominated assets of a given maturity while %s is the expected (annualized) rate of dollar depreciation to maturity. The remaining terms represent the effects of "domestic" distinctions among the assets (DOM), currency risk factors (CRISK), and official and private barriers to capital flows (BAR).[3]

The difference in asset returns expressed in a common currency, that is, adjusted for expected exchange rate changes, is a reflection of these last three elements:[4]

$$(ii)\quad i - i^* - \%s = DOM + CRISK + BAR.$$

Furthermore, an investor can in some cases avoid the risk associated with uncertainty about future exchange rates by "hedging" (selling) the proceeds of a foreign currency investment in the appropriate forward market. The return differential on this hedged (or "covered") basis is simply the interest differential ($i - i^*$) less the forward premium on the dollar (fp), defined as the annualized difference between its forward and spot values.

$$(iii)\quad i - i^* - fp = DOM + BAR$$

The covered return differential is not (directly) affected by currency distinctions since it is adjusted for both the expected level and uncertainty of future exchange rates.[5] Thus, for assets that are comparable in terms of their domestic characteristics (DOM = 0), the covered differential is essentially a reflection of barriers to capital flows (BAR).

[1]Currency risk thus arises from the variances of the perceived distribution of exchange rates rather than their means From a market perspective this risk reflects the potential loss to an investor in a currency from an unanticipated change in that currency's value

[2]Deregulation of capital flows generally has proceeded furthest in shorter-term markets See M A Akhtar and Kenneth Weiller, "Developments in International Capital Mobility A Perspective on the Underlying Forces and the Empirical Literature," Federal Reserve Bank of New York, Research Paper no 8711, in *International Integration of Financial Markets and U S Monetary Policy*, December 1987 Note that even the prospect of the imposition of capital controls can affect interest rates Risks arising from the possible inability to repatriate funds are generally referred to as "sovereign" and "political" risks

[3]The substitutability of different countries' assets is essentially a function of the importance of the factors summarized by BAR and CRISK In reality, the factors underlying these terms are often closely related, even if distinct in theory

[4]The common currency differential as we have defined it is also known as the "uncovered" differential, denoting that the relative return is not hedged in the forward market

[5]However, currency distinctions may be implicit in the covered differential when, for example, official regulations treat foreign currency investments differently from investments in domestic currencies (the effect would be captured in BAR) Generally, formal forward markets exist only for certain short-term assets, although recently developed currency swap facilities provide comparable arrangements for some longer-term assets

It is also useful to express the yield differential in terms of the traditional expected inflation (%p) and real interest (r) components of nominal interest rates:

$$\text{(iv)}\quad i - i^* = (\%p - \%p^*) + (r - r^*).$$

Nominal interest divergences among countries also can be expressed as the sum of differences in expected inflation rates and in their real interest rates (where the real interest rate measures an asset's return in goods rather than money). Furthermore, the real interest differential is itself partly a reflection of expectations about the future *real* exchange rate (x), defined as the nominal rate deflated by the ratio of home to foreign prices (p and p*).

$$x \equiv s - (p/p^*).$$

The real exchange rate effectively measures the value of a country's goods in terms of its foreign counterparts.[6] Using the last two expressions, we can write the real interest differential in terms analogous to relation (i) for the nominal difference,

$$\text{(v)}\quad r - r^* = \%x + \text{CRISK} + \text{BAR} + \text{DOM}.$$

To summarize, observed nominal interest divergences across countries can be accounted for by four sets of factors: expected changes in nominal exchange rates (which in turn reflect differences in anticipated inflation and expected changes in real exchange rates); currency risk; the effects of barriers to capital mobility; and domestic characteristics summarized in DOM. These factors are the proximate determinants of international interest differentials and will provide a useful framework for our later analysis of the actual behavior of interest rate divergences among the United States and other countries.

Fundamental determinants

These proximate sources are not, however, the most basic causes of international interest divergences, but rather the reflection of more fundamental exogenous economic conditions. In thinking about these fundamental causes, we can make a distinction between factors directly affecting particular financial markets and those determining the transmission of their effects among countries.

In principle, virtually any disturbance that affects one country's financial markets more than another's may lead to international interest rate differentials. Of particular importance historically have been divergent national inflation rates, which normally have been associated with disparate monetary policies. A country that has a higher inflation rate than abroad must generally maintain nominal interest rates above those of its trading partners in order to compensate for the decline in the value of its currency that typically results from the inflation.[7] Divergences in real as well as nominal interest rates have also resulted from shorter-term fluctuations in monetary policy that affect domestic liquidity, from disparities in fiscal policies, and even from commodity supply shocks such as the oil price increases of the 1970s.[8]

All of these conditions can create pressures for interest rates to diverge across countries. Nonetheless, the extent to which such divergences actually occur, as well as the way in which they are reflected in currency expectations and other proximate components, depends upon the nature and strength of the transmission of such disturbances from one country to another. Particularly critical to this transmission mechanism are the mobility of capital and the exchange rate regime.

In its broadest sense, capital mobility refers to the degree to which international financial flows tend to respond to changes in asset yields.[9] Key aspects of international capital mobility are the extent and severity of explicit official and private barriers to capital flows and the degree to which assets that are similar (DOM = 0) but issued in different countries or currencies are viewed as close substitutes by investors. Generally, the greater the mobility of capital, the larger the combined effect of a change in a country's interest rates on foreign interest rates and exchange rates. An increase

[6]The real exchange rate is essentially an extension of the "terms of trade" to include nontraded goods as well. Changes in the nominal exchange rate can be expressed as the sum of the change in the corresponding real exchange rate plus the inflation differential. The traditional theory known as "purchasing power parity" essentially asserts that real exchange rates are constant in the long run.

[7]To the extent that a rise in the inflation rate simply leads to a compensating increase in domestic interest rates and depreciation in the nominal exchange rate (leaving the real exchange rate unaltered), it need not lead to any further divergence in real interest rates or yields expressed in a common currency. Typically, however, inflation has indirect effects on real interest and exchange rates and may affect the BAR and CRISK components as well.

[8]For example, the mid-1970s oil price rise led to the following consequences in most importing countries: an acceleration of inflation, sharp increases in nominal and real interest rates, and a subsequent downturn in real economic activity. Because the magnitude and timing of these effects varied greatly across countries, depending on their reliance on oil imports and other factors, international interest divergences increased markedly during this episode.

[9]This is the traditional broad definition of capital mobility. Under a narrower definition, capital mobility refers only to the severity of explicit barriers and other market imperfections that impede international financial flows. Thus currency risk is a determinant of the degree of capital mobility under the broad definition but not necessarily under the narrower one.

in capital mobility can be thought of as a reduction in the average size and variability of the BAR and CRISK terms defined earlier. It follows that a given disturbance is apt to produce smaller divergences in asset yields expressed in a common currency when capital mobility is high than when it is low

Equally important to the international transmission of interest rate changes, however, is the flexibility of exchange rates Unlike a fixed rate regime where exchange rates (at least in principle) are not free to vary, a floating rate system allows changes in interest rates to affect present and future currency values. Consequently, for a given amount of capital mobility, a change in one country's interest rates will have more impact on actual and expected exchange rates (and possibly CRISK), and less on foreign interest rates, when exchange rates are flexible than when they are fixed. In this sense, the current flexible exchange rate regimes may allow greater scope for international interest rate divergences

Implications of reduced barriers to capital mobility

International financial integration has risen considerably over the last two decades, in large part because of a dramatic reduction in overt barriers to capital flows among the major industrial nations. The discussion in the preceding section shows that this development, of itself, should reduce international interest rate divergences, whether expressed in national currencies, a common currency, or in real terms. Historically, however, changes in international financial integration have not occurred in isolation but have been accompanied by other complex economic changes, some with potential effects on interest rate determination. For this reason, the implications of increased financial integration are apt to be less clear-cut in an international context than within a single nation.

In a national market, the use of a single currency precludes variations in nominal exchange rates as well as any persistent disparities in inflation rates across regions. The domestic sources of interest divergences are therefore significantly fewer than the international sources; consequently, there is a fairly strong presumption that increased financial mobility and integration will lead to closer alignment of interest rates across markets.

In an international economy comprising many nations and currencies, however, whether increased capital mobility leads to convergence of interest rates depends upon the nature of the changes in exchange rate behavior and government policies that are occurring at the same time During the postwar era, increased financial integration has been accompanied by a transition from fixed to highly variable exchange rates and, as documented in the next section, greater disparities in national inflation rates. In effect, as the importance of factors reflected in BAR has declined, the potential importance of currency expectations and risk factors may well have increased. Accordingly, interest rates have been subject to conflicting pressures: easing of restrictions on capital flows has tended to push the rates toward convergence, while greater exchange rate volatility and inflation disparities have increased pressures for the rates to diverge. As we show in the empirical analysis that follows, this configuration of economic changes over the last three decades has led to a fairly complex and variable pattern of interest rate divergences among the major industrial nations.

Evidence on interest rate divergences

We now examine the historical pattern of interest rate divergences and their proximate determinants for five major industrial countries—the United States, Germany, Japan, the United Kingdom, and Canada. Divergences among both short-term money market rates and longer-term government bond yields are considered [10] We first show that these nations' nominal interest rates exhibit no consistent trend toward convergence over the last two decades, although the impact of barriers to capital mobility (BAR) has declined markedly. This implies that currency factors are now the main source of observed international interest rate divergences. We then go on to consider the extent to which expected exchange rate changes can account for interest differentials across countries, asking whether asset yields expressed in a common currency have converged over time. Finally, we examine the nature of the currency expectations themselves, in particular the degree to which they appear to be a reflection of anticipated inflation differentials or of fluctuations in real exchange rates.

Nominal interest rate divergence

Interest rate dispersion can, in principle, be measured in several ways. In most of the analysis below, we focus on an indicator of the aggregate level of interest rate divergence for the group as a whole—the average absolute deviation of individual rates from the group mean. This indicator measures the collective impact of the proximate sources of interest differentials identified earlier. expected exchange rate changes, currency risk,

[10]The short-term rates used in this study are three-month certificate of deposit (CD) rate for the United States, three-month interbank rate for Germany, two- to three-month interbank (call) rate for Japan, the one-month financial paper rate for Canada, and the three-month interbank loan rate for the United Kingdom The long term rates are government bond yields of greater than five-year maturities These are generally the most comparable rates available for the entire period

and barriers to capital mobility, as well as any domestic comparability distinctions among assets For assets that are reasonably comparable, this measure indicates the degree to which international interest rates diverge in a given period and their tendency towards convergence over time.

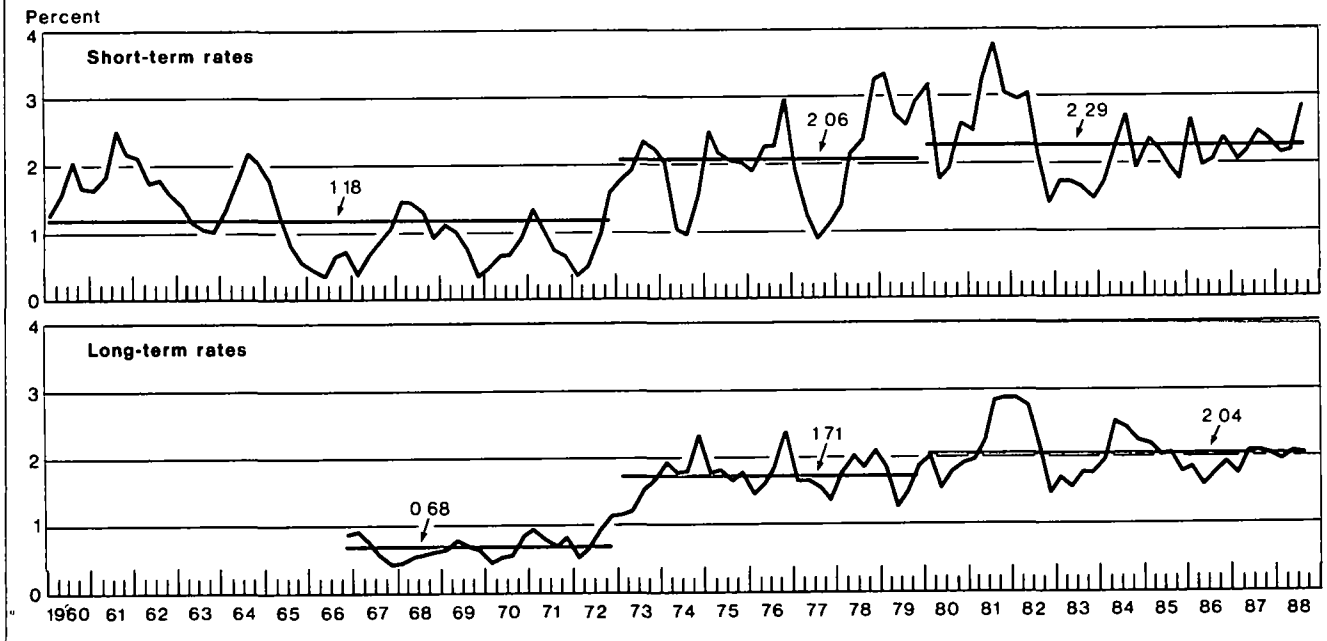
Of course, the assets considered here are not perfectly comparable, and thus interest rate divergences need not disappear across countries even as currency and jurisdictional differences subside Our analysis will suggest that domestic comparability distinctions are generally insignificant among short-term instruments. More important differences in average maturity and other characteristics are, however, reflected in long-term rates Nonetheless, these distinctions have remained relatively stable and hence are unlikely to have had a substantial impact on changes in the pattern of interest rate dispersion over time For this reason, a comparison of average levels of interest rate divergence across relevant periods should provide a reasonable indication of trends in their proximate determinants

Further insight into the nature of international interest rate divergences is provided by examining bilateral interest rate relations. We present evidence concerning one important component of our aggregate dispersion measure, U S -foreign bilateral interest rate differentials In addition, the tendency for U.S and foreign interest rates to move together is analyzed in the accompanying Box While not directly measuring the size of divergences, this analysis provides some indication of the strength of linkages between domestic and foreign asset markets during different historical periods.

Chart 1 presents our measure of the degree of dispersion of nominal interest rates from the 1960s onward The chart shows clearly that nominal interest rates often have diverged widely. The average absolute deviation of short-term interest rates from the group mean has frequently exceeded 200 basis points and has only rarely fallen below 150 basis points during this decade Long-term rates, although typically less widely dispersed than the short rates, have generally diverged by more than 150 basis points

Chart 1

Nominal Interest Rate Dispersion*



Sources Interest rates are taken from the countries' central bank publications

Note Figures with arrows indicate period averages for 1961-72, 1973-79, and 1980-88 III

*The mean absolute deviation of quarterly average interest rates from the simple average of the group The group includes the United States, Canada, the United Kingdom, Germany, and Japan Short-term interest rates are three-month money market rates Long-term interest rates are yields on government bonds with maturities of five years or more

It is also apparent that the degree of nominal interest rate divergence has tended to increase over time Interest rates were most closely aligned during the years 1966-71: both short- and long-term rates generally fell within 100 basis points of the group mean during this period. Since 1973, however, divergences among the rates have become increasingly pronounced. Average rate deviations over 1973-79 exceeded 200 basis points on short-term and 170 basis points on long-term rates, roughly double the levels of the 1960s and early 1970s The dispersion of nominal interest rates reached its peak in 1981. Nonetheless, for the 1980s as a whole, interest rate divergence has exceeded that of the two preceding decades.

This trend towards greater nominal interest rate dispersion among industrial countries can also be observed in U.S.-foreign bilateral interest rate relations The average absolute interest differential between U.S. rates and those abroad has risen steadily during the past two decades, increasing roughly by 100 basis points for both short- and long-term rates (Table 1). Underlying this trend have been particularly sharp increases in the size of U.S. interest differentials with Germany and Japan. U.S. rates, uniformly the lowest among industrial nations during the 1960s, began to rise relative to those in Germany and Japan during the 1970s; by the 1980s both short- and long-term U.S. interest rates had increased on average to more than 300 basis points above their German and Japanese counterparts. In contrast, the gap between U.S interest rates and their typically higher Canadian and U.K. counterparts exhibits no systematic tendency to increase over time. In nearly all cases, however, the volatility of the U.S.-foreign interest differentials has been substantially higher since 1973 than earlier.

The impression that interest rates have not converged is further supported by evidence on the correlation of U.S and foreign yields (see the accompanying Box). Specifically, the response of foreign interest rates to a given change in U.S. rates was generally *smaller* during the 1980s than the average response over the 1970s and 1960s.

These results are particularly striking in view of the clear evidence that the component of interest divergences attributable to explicit barriers to international capital flows (BAR) has declined markedly over time. These barriers were fairly stringent in Japan and Europe for much of the postwar period and effectively helped insulate domestic interest rates from changes in financial conditions abroad.[11] Beginning in the mid-1970s these impediments were largely removed in the major industrial countries as part of a larger move toward financial deregulation

An indication of the effect of these changes can be seen from the fall in the dispersion of *covered* short-term interest rates shown in Chart 2.[12] The identity (iii) discussed in the previous section shows that, for com-

[11]The United States also imposed barriers to capital flows during parts of the 1960s and 1970s, although they were usually less restrictive than those imposed by other major industrial countries An example is the interest equalization tax of the late 1960s

[12]Because of limitations on forward rates and other required data, our analysis is largely confined to short-term interest rates over the 1970s and 1980s To reduce comparability differences, we have used the Japanese Gensaki (bond repurchase) rate for this section and the appendix rather than the two- to three-month call rate referred to elsewhere in the article (and in all other charts and tables) The Gensaki rate is most comparable to the short rates for the other countries but was only available on a regular basis from the early 1970s on

Table 1

U.S.-Foreign Bilateral Nominal Interest Differentials

(Period Average of Quarterly Observations in Percentage Points)

	Average Absolute Deviation†		Germany		Japan‡		Canada		United Kingdom‖	
Period	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
1960-72	1 78	1 19	0 60	−1 82	−2 86	−0 85	−0 66	−0 72	−1 95	−1 88
			(1 54)	(0 82)	(2 53)	(0 75)	(0 75)	(0 37)	(1 18)	(0 52)
1973-79	2 57	2 16	1 32	−0 01	0 31	−0 04	−1 15	−0 62	−3 31	−4 93
			(2 81)	(2 01)	(3 38)	(1 51)	(1 53)	(0 44)	(2 26)	(1 49)
1980-88§	2 81	2 17	3 23	3 03	3 68	3 77	−1 49	−0 71	−1 76	−0 72
			(1 25)	(1 02)	(2 64)	(1 34)	(1 09)	(0 71)	(2 56)	(1 33)

Note Figures in parentheses are standard deviations
†Simple average of the four absolute bilateral interest differentials
‡Japan's long-term interest rates begin in 1967
‖United Kingdom's long-term interest rates begin in 1961
§1988 data through third quarter

Box: Foreign Responses to U.S. Interest Rate Changes

The analysis of interest rate dispersion presented in the text focuses on cumulative levels of interest rate divergence across countries Our aggregate indicator—the average absolute deviation of rates from the group mean—provides a good summary measure of the overall size of interest rate divergences that arise from currency and jurisdictional differences It is also useful, however, to examine whether the tendency for national interest rate movements to be associated with each other has been affected by financial integration. Accordingly, in this section we present evidence concerning the average response of foreign interest rates to movements in U S and German rates

The correlation and average response measures in Table A identify the strength and magnitude of interest rate linkages between national asset markets, thus providing some indication of the nature of the transmission of disturbances from one country to another† No clear relationship exists, however, between these measures of responsiveness and the degree of interest rate dispersion An increase in the response of foreign to U S interest rate changes, for example, does not necessarily imply a narrowing of interest differentials or consequently our measure of rate divergence The extent to which rates will diverge also depends upon the size of the original disturbance and its persistence over time

An examination of Table A suggests that only Canadian interest rates respond in a consistent and strong manner to movements in U S rates Responses of other foreign

†Like the dispersion indicator, these measures provide a purely statistical indication of the degree of association—in this case between changes in U S and foreign rates They provide no direct measure of causal relations or the strength of interest rate transmission in any fundamental sense

Table A
Transmission of Interest Rate Movements†

	Nominal						Real		
	Short-Term			Long-Term			Short-Term		
1960s	ρ	B_1	B_2	ρ	B_1	B_2	ρ	B_1	B_2
United States	—	—	0 10	—	—	0 27	—	—	0 00
Germany	0 25	0 64	—	0 35	0 45	—	0 20	0 01	—
Japan‡	0.01	0 02	0 08	NA	NA	NA	−0 07	−0.25	−0 06
Canada	0 60	0 88	0 13	0.63	0 91	0 26	0 15	0 17	0 11
United Kingdom§	0 25	0.47	0 86	−0.02	0 57	0 16	0 34	0 83	−0 26
1970s									
United States	—	—	0.45	—	—	0 34	—	—	0 31
Germany	0 50	0 56	—	0 41	0 52	—	0 34	0 38	—
Japan	0 28	0.21	0 16	0 15	0 16	0 47	−0 22	−0 26	−0 16
Canada	0 78	0 69	0 34	0 72	1 10	0 42	0 43	0 37	−0 11
United Kingdom	0 28	0 38	0 29	0 22	0 58	0 82	0 41	0 98	1 06
1980 to 1988-II									
United States	—	—	0 66	—	—	1 05	—	—	0 45
Germany	0 33	0 17	—	0 61	0 36	—	0 29	0 19	—
Japan	−0 36	−0 20	−0 10	0 42	0 21	0 40	−0 18	−0 13	−0 22
Canada	0 77	0 80	1 31	0 89	1 05	1 21	0 69	0 81	0 86
United Kingdom	0 14	0 12	0 01	0 47	0 41	0 65	0 13	0 17	0 09

†The column headings ρ = correlation of U S with foreign interest rate
B_1, B_2 = average response, in percentage points, of foreign interest rates associated with a one percent change in U S (B_1) and German (B_2) rates
‡Japan's long-term interest rates begin in 1967
§United Kingdom's long-term interest rates begin in 1961

Box: Foreign Responses to U.S. Interest Rate Changes *(continued)*

rates to U S yields have been much more variable and generally very modest In addition, movements in German interest rates seem to elicit only a weak response from all countries

Overall, these response measures support the conclusions in the text that financial integration has not been associated with a closer alignment of interest rates across countries At the least, there appears to be no systematic tendency for foreign rates to become more responsive to U S. yields over time, this result also applies generally to the responses of foreign rates to German yields Indeed, a one percent change in U S nominal interest rates was generally associated with a smaller response in corresponding European and Japanese rates during the 1980s than during the 1970s or 1960s ‡ Similarly, associations among short-term real interest rates were generally weaker for the 1980s as a whole than for the prior decade Thus, statistical linkages among national interest rates do not seem to have become stronger over time—a pattern clearly consistent with the evidence cited earlier

‡Correlations among long-term interest rates were somewhat greater during the 1980s than the 1970s This finding is largely a reflection of the higher variability of interest rates in the latter period Correlations, however, do not directly measure the quantitative change in one interest rate associated with a change in another

parable assets (DOM = 0), the level of the covered U S -foreign yield differential—with asset proceeds hedged in the forward markets to compensate for expected exchange rate changes and currency risk factors—provides a direct measure of the contribution of nationality distinctions (BAR)

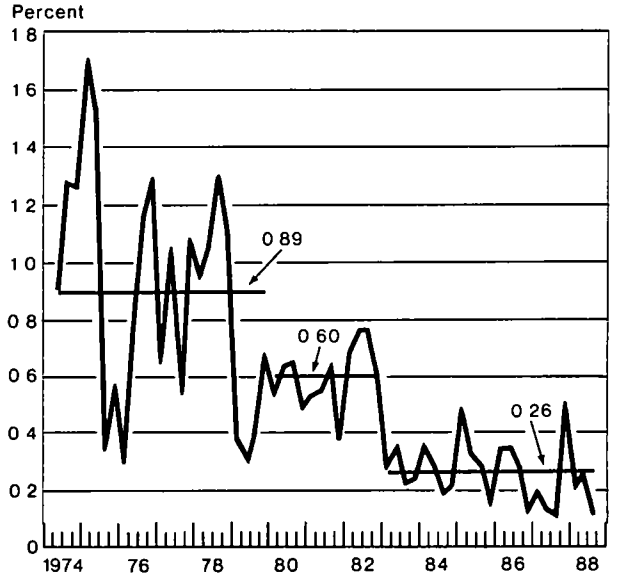
Divergences in covered yields clearly have become both substantially smaller and less variable over the past decade Most notably, since 1982 the average (absolute) deviation of short-term covered interest rates from the group mean has fallen to roughly 25 basis points, a level representing only about 10 percent of the dispersion of short-term nominal interest rates This reflects a sharp decline when compared to the 90 basis point dispersion in covered yields over the 1974-79 period, which represents more than 40 percent of the total dispersion of unadjusted rates during this period

Further insight into this apparent decline in barriers to capital mobility is presented in the Appendix, where we consider the determinants of U S.-foreign bilateral covered interest differentials The analysis suggests that the closer alignment of covered yields during the 1980s is the result of a general dismantling of official barriers to capital flows—both abroad and in the United States—as well as other developments promoting the integration of short-term financial markets across industrial nations [13]

[13]The extent of integration among longer-term markets (or its change over time) is much more difficult to gauge, in part because forward or other explicit mechanisms for hedging longer-maturity investments have not been available until the last several years A recent analysis by Helen Popper ("Long-Term Covered Interest Parity Two Tests Using Currency Swaps," unpublished paper, Department of Economics, University of California at Berkeley, August 1987) does suggest fairly close alignment of covered yields as calculated from

Chart 2

Covered Interest Rate Dispersion*



Sources Interest rates are taken from the countries' central bank publications

Note Figures with arrows indicate period averages for 1974-79, 1980-82, and 1983-88 III

* The mean absolute deviation of quarterly average short-term asset yields (converted to dollar terms by the forward exchange rate premia) from the simple average of the five countries Short-term interest rates are three-month money market rates

Differentials expressed in common currency

The fact that interest rates have not converged even as barriers to capital mobility have fallen has one reasonably unambiguous implication: currency-related factors, as reflected in forward exchange premia, are now the primary source of international yield divergences What then is the nature of these currency factors and, more specifically, how do we assess the relative importance of exchange rate expectations and currency risk?

One common view is that eliminating barriers to financial flows across countries necessarily means the near equalization of asset yields expressed in a common currency, that is, adjusted for expected exchange rate changes. This would imply that anticipated exchange rate movements are now the primary source of observed interest differentials across countries on comparable assets and that currency risks have a fairly limited role, at least at the margin. This view is implicit in several recent analyses that link the rise in U.S. interest rates above those abroad over 1981-85 to the concurrent "overvaluation" of the dollar relative to its (presumed) long-run equilibrium. Given the high and increasing exchange rate volatility over the last 15 years, however, it is far from obvious that currency risk factors are so unimportant. Indeed, it is at least conceivable that currency risk premia have increased enough to offset the tendency toward convergence in interest rate levels arising from the reductions in barriers to capital flows.

The main problem in resolving these questions is that neither exchange rate expectations nor currency risk premia are directly observable. Indeed, exchange rate expectations have been notoriously difficult to measure because of the high volatility of currency values. Any concrete analysis must be based upon proxies (preferably several) for expectations. One possibility is to use actual exchange rate changes over a given period as an approximation of the anticipated change during the same period in order to gauge the common currency yield differential. Conceptually, this indicator, which can be thought of as the ex post yield differential, is equal to the actual ex ante differential (reflecting currency risk as well as any remaining DOM and BAR) plus the market's forecast error in predicting the future exchange rate. *If* market forecasts are not systematically biased and forecast errors are roughly comparable among periods, this proxy will indicate the broad trends in actual common currency interest differentials.

Chart 3 shows the dispersion of the short-term interest rates expressed in dollars using the ex post measure Divergences in ex post dollar yields have risen dramatically over time. The average divergence has exceeded 1000 basis points over the last decade, more than twice that recorded before 1973. Furthermore, the divergences have been somewhat greater during the 1980s than over 1973-79.

It is doubtful that these trends reflect increasing currency risk premia alone. In particular, the magnitude of the dispersion of ex post differentials seems implausibly large to represent risk premia. (Note that typical gaps between yields on very high risk junk bonds and AAA rated bonds are smaller than the differentials shown in Chart 3.) The fact that the dispersion of the ex post yields is nearly five times that of the unadjusted interest rates also suggests that forecast errors are largely responsible for the observed pattern in ex post yield dispersion. Thus, the increasing divergences shown in the chart are most likely the reflection of increasing currency volatility and unpredictability; they provide no conclusive evidence whether ex ante common currency interest differentials have converged.

Possibly more informative are various surveys of the exchange rate expectations of market observers and participants that have only become available during the 1980s.[14] Estimates of dollar depreciation based on a survey reported in the *Economist Financial Review* are presented in Table 2 along with the corresponding forward discount on the dollar quoted at the time of the survey. Recall that the forward discount on the dollar is equal conceptually to its expected depreciation plus the currency risk premium (CRISK). Thus the difference between the forward discount and the market survey expectations figure can be taken as a proxy for the currency risk.

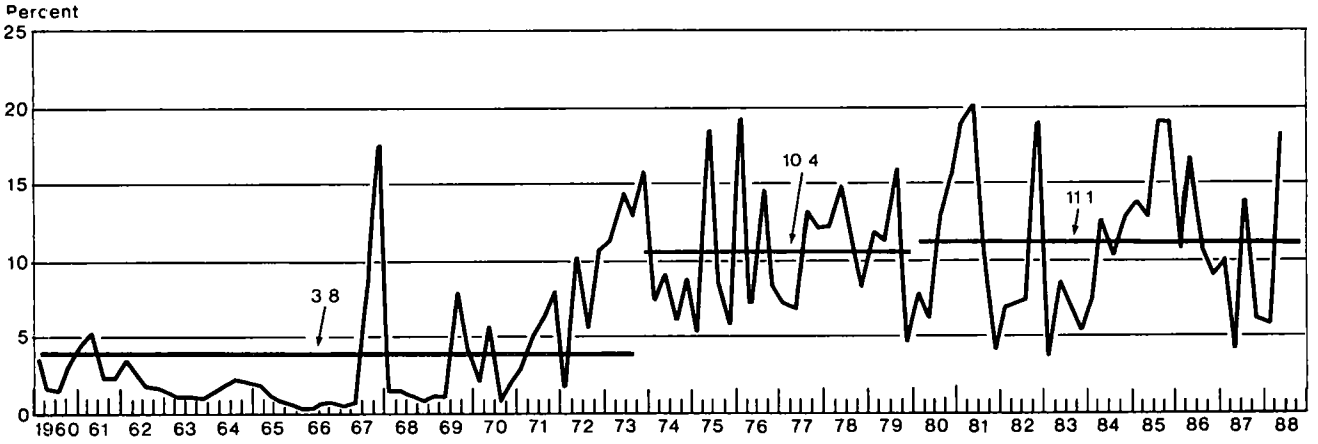
As the table shows, survey estimates of dollar depreciation typically exceeded the forward discount for most of the 1980s, suggesting that investors viewed dollar assets as generally less risky than similar assets denominated in foreign currencies The average size of these risk premia proxies is quite large, exceeding 500 basis points in many cases. Nonetheless, the survey measures and forward exchange premia do tend to vary together. As the table shows, both 3-month and 12-month forward discounts on the dollar are largest for those currencies against which the dollar is expected to depreciate most. Moreover, the expected depreciation and forward discount rates show a positive and statis-

Footnote 13 continued
currency swap quotes (essentially futures prices) for high-quality bonds issued in the Euromarkets

[14]See the work of Jeffrey Frankel and Kenneth Froot "Using Survey Data to Test Standard Propositions Regarding Exchange Rate Expectations," *American Economic Review*, vol 77, no 1, pp 133-53, and "Interpreting Tests of Forward Discount Unbiasedness Using Survey Data on Exchange Rate Expectations," NBER Working Paper no 1963, July 1986 See also Kathyrn Dominiquez, "Are Foreign Exchange Forecasts Rational? New Evidence from Survey Data," Board of Governors of the Federal Reserve System, International Finance Discussion Papers, no 241, May 1986 Here we use the *Economist Financial Review* survey data provided by Ken Froot

Chart 3

Ex Post Dollar Asset Yield Dispersion*



Sources Interest rates are taken from the countries' central bank publications Exchange rates are taken from International Financial Markets

Note Figures with arrows indicate period averages for 1960 I-1973 III, 1973 IV-1979 IV, and 1980 I-1988 II

* The mean absolute deviation of ex post dollar asset yields from the simple average of the five countries Asset yields are adjusted by actual exchange rate movements to determine ex post dollar returns Asset yields are three-month money market rates

Table 2

Survey Data and Foreign Exchange Rate Premia: June 1981-May 1987

(Period Average in Percent)

	German Mark		Japanese Yen		British Pound	
	3-Month Horizon	12-Month Horizon	3-Month Horizon	12-Month Horizon	3-Month Horizon	12-Month Horizon
Forward exchange premia on the dollar (+ = discount)	3 86	3 78	3 95	3 97	−0 94	−0 47
Survey-based estimates of dollar depreciation†	11 47	9 00	11 70	9 14	2 88	2 38
Estimated currency risk premia (+ = discount)	−7 61	−5 22	−7 75	−5 17	−3 82	−2 86
Memo correlation of survey-based estimates of dollar depreciation and forward exchange premia	0 50	0 72	0 53	0 53	0 41	0 63

Source Data provided by Ken Froot from data base used in Frankel and Froot, "Using Survey Data to Test Standard Propositions Regarding Exchange Rate Expectations," *American Economic Review*, March 1987

†Survey-based data are from the *Economist Financial Report*

tically significant association over time.[15]

As a whole, the survey evidence suggests that both expected exchange rate changes and currency risk premia are important components of forward premia and interest differentials across countries This conclusion is consistent with the findings of most other recent studies of these questions.[16] But the data are too limited to draw more specific conclusions concerning the relative importance of currency expectations and risk premia or to assess the extent to which ex ante common currency yield differentials have changed over time.

Nature of expectations

Finally, to clarify the nature and importance of the exchange rate expectations, we ask whether they reflect differences in anticipated inflation rates, expected changes in real exchange rates, or both Our earlier conceptual analysis implies that this question essentially concerns the behavior of real interest rates and their relation to the corresponding nominal rates. In particular, a comparison of relations (i) and (v) shows that real interest differentials reflect expectations of real exchange rate changes (as well as DOM, CRISK, and BAR) and, unlike their nominal counterparts, are not directly affected by anticipated currency movements arising from inflation differentials. Thus, comparing the dispersions of real and nominal interest rates should help to clarify the relative importance of expectations about inflation and about real exchange rate movements. Admittedly, real interest rates and the expected inflation rates underlying them are not directly observable; they can, however, be approximated using past inflation as a proxy for anticipated future rates.[17]

Chart 4 presents the dispersion of short-term and long-term real interest rates calculated in this manner. As a comparison of Charts 1 and 4 reveals, the dispersion of real interest rates remained relatively close to that of nominal yields during the 1960s and early 1970s and rose above that of nominal rates by well over 100 basis points during 1973-75.[18] After 1975, however, the dispersion in real rates declined, dropping to roughly its pre-1973 average. In contrast, the dispersion of nominal yields continued to increase and during the 1980s has averaged nearly twice its pre-1973 level.

The clear implication that can be drawn from this evidence is that expectations concerning inflation (that is, differences in the rate anticipated for various countries) have been a significant source of interest differentials across countries during the era of floating exchange rates and indeed were the primary cause of the increased divergence in nominal rates observed after 1975 Consequently, it appears that currency expectations arising from inflation differences have been a significant contributor to international interest divergences, at least over the past 10 to 15 years. This result is not, of course, entirely surprising in view of the substantial increase in the variability and disparity of national inflation rates that occurred during the 1970s.

More striking, however, is that the average dispersion of real interest rates has been both substantial (generally above 100 basis points) and roughly constant over time. This relative stability in the average level of real interest rate dispersion is remarkable in light of the clear evidence that financial integration has virtually eliminated one of its most significant sources. The earlier analysis strongly suggests that barriers to capital mobility probably were the main contributor to real (as well as nominal) interest dispersion prior to 1973 and an important contributor during the latter 1970s. The role of capital controls, however, became minor during the 1980s. Thus, currency factors—currency risk premia and expectations about *real* exchange rates—have increased in size and now appear to be the main source of real interest divergences among the countries.

Furthermore, there is reason to believe that expectations about real exchange rate movements have been a significant contributor to real interest rate divergences, particularly in recent years. The evidence for this conclusion stems from the conceptual nature of real exchange rates and their actual behavior in the 1970s and 1980s. This same evidence also suggests, although only tentatively, that interest rate divergences adjusted for expected movements in real exchange rates were in fact smaller on average during the 1980s than in the

[15]In "Using Survey Data to Test Standard Propositions," Frankel and Froot also compare the forecast errors (prediction less actual change) implied by the survey data and corresponding forward premia These errors are closely related, suggesting that expectations, at least as measured by the surveys, are an important element of the forward premia and corresponding interest differentials The errors are also large, both absolutely and relative to the risk premia implied by the survey data This result is consistent with our contention that forecast errors are largely responsible for the pattern of ex post nominal interest divergences

[16]Most evidence suggests that currency risk premia exist, but considerable controversy remains over their empirical importance The strongest evidence that currency risk premia play a major role in interest differentials across countries has been provided by Eugene Fama, "Forward and Spot Exchange Rates," *Journal of Monetary Economics*, November 1984, pp 319-38, his results suggest that currency risk premia are more variable than exchange rate expectations and show a strong negative correlation with them

[17]Here we use the past year's inflation (in the GNP deflator) to measure short-term real interest rates and the past two years' inflation for the long-term yields

[18]In Japan and the United Kingdom during the mid-1970s, government controls sharply restricted the flexibility of nominal interest rates in adjusting to the severe fluctuations in inflation occurring at the time This led to dramatic swings in real interest rates and largely explains the exceptionally large dispersion in these rates among the countries in the mid-1970s

1970s

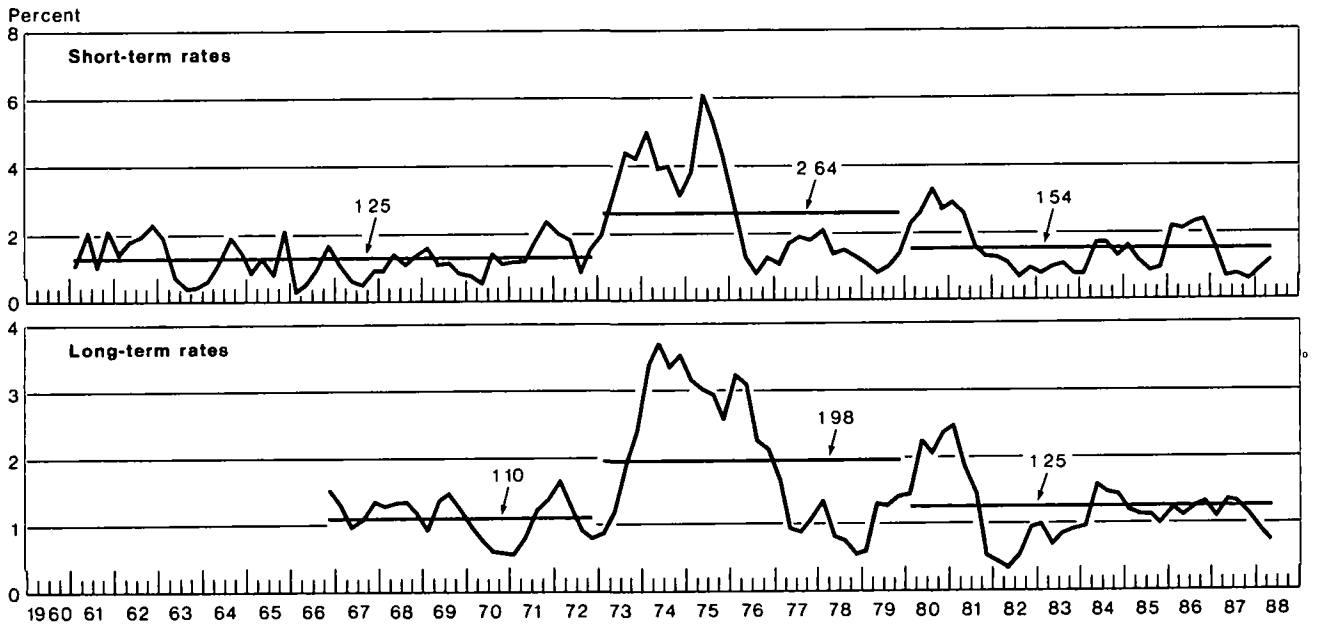
As indicated earlier, the real exchange rate for a given country measures the average level of its product prices relative to those of its trading partners, hence real exchange rates are a key determinant of the nation's international competitiveness It is therefore reasonable to suppose that at any time there is a long-run equilibrium real exchange rate level (consistent with a sustainable external payments position) toward which the actual exchange rate tends to move over time This notion is the basis for the traditional and widely accepted notion of "purchasing power parity" (PPP), which in its strictest form implies that the equilibrium real exchange rate is constant in the long run More realistic interpretations of PPP allow for some evolution in the long-run equilibrium arising from differences in productivity, demand, and other relevant trends across countries Either interpretation implies, however, that short-term variations in real exchange rates represent, at least in part, departures from long-run values that tend to be reversed over time [19]

Before the 1971 Smithsonian agreement to devalue the dollar, real exchange rates of the dollar and other major currencies were fairly stable, at least relative to their long-term trends Fluctuations in the real value of the dollar became more considerable during the 1970s and, as Chart 5 reveals, became highly pronounced in the 1980s The chart also shows that deviations of the real dollar from its past trend and period average, which can be viewed as very rough proxies for the long-run equilibrium, have also been quite large during the present decade, both in absolute terms and relative to

[19]Several recent studies of exchange rate behavior during the 1970s and 1980s imply that the long-run equilibrium real exchange rate changes fairly continuously Some in fact suggest that actual real exchange rate changes largely reflect fluctuations in their long-run equilibrium and that there is virtually no tendency for current real exchange rate movements to be reversed in the future See, for example, John Campbell and Richard Clarida, "The Dollar and Real Interest Rates," paper presented at the 1986 Carnegie-Rochester Conference on Public Policy, November 21-22, 1986

Chart 4

Real Interest Rate Dispersion*



Sources Interest rates are taken from the countries' central bank publications

Note Figures with arrows indicate period averages for 1961-72, 1973-79, and 1980-88 II

* The mean absolute deviation of quarterly average real interest rates from the simple average of the group The group includes the United States, Canada, the United Kingdom, Germany, and Japan Real short-term interest rates are three-month money market rates, less the inflation in the GNP/GDP deflator over the past year Real long-term rates are yields on government bonds with maturities of five years or more, less the inflation in the GNP/GDP deflator over the past two years

the 1970s

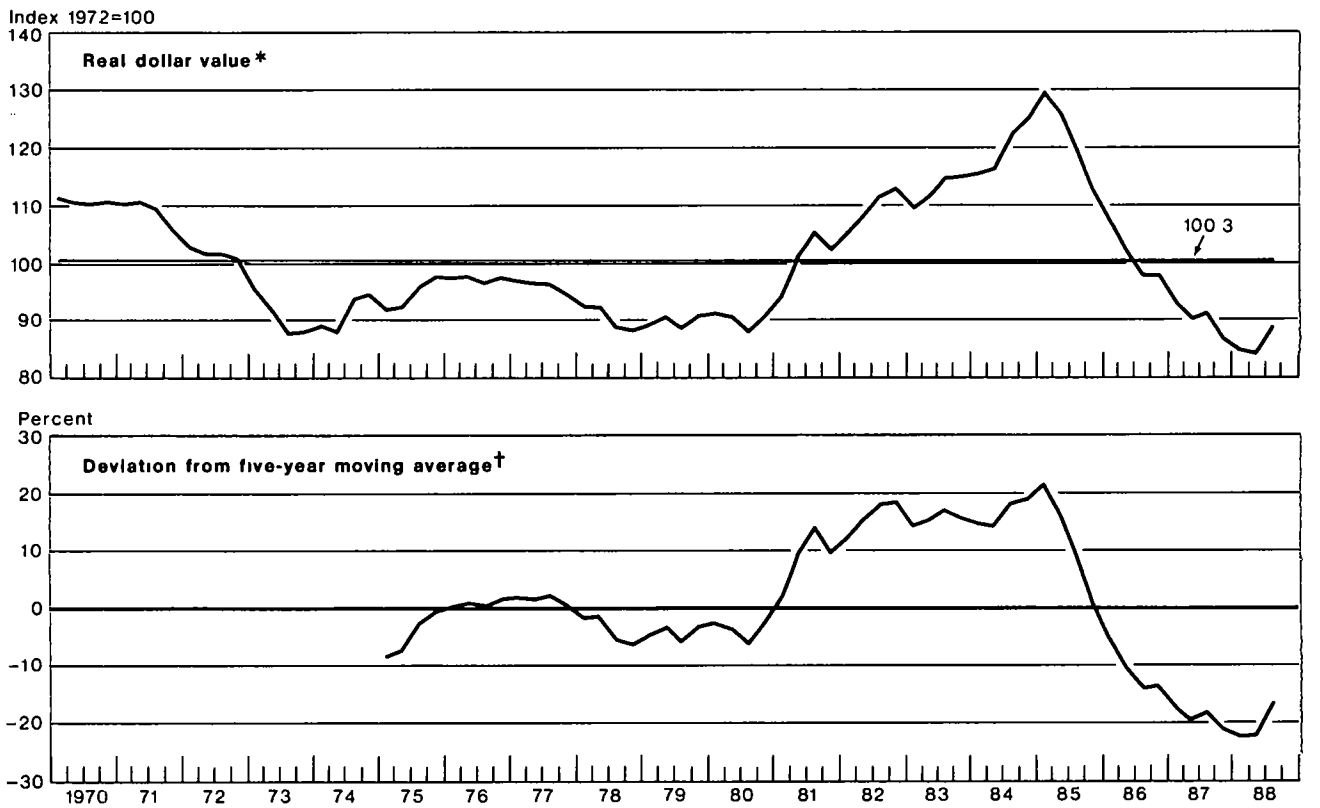
PPP theory strongly suggests that this behavior indicates a substantial "overvaluation" of the dollar relative to its long-term equilibrium during the first half of the 1980s Similarly, the theory would attribute the sharp decline in the dollar after 1985 to a "correction" of this overvaluation. From this interpretation of the dollar's movements—which is supported by the unprecedented rise in the U S trade deficit after 1982—we can infer that anticipated changes in the real value of the dollar (at least over the medium term) have been sizeable and have contributed significantly to the divergences in real interest rates observed during the decade The evidence from Chart 6 provides some support for this supposition the real long-term interest differential between the United States and the four major foreign countries rose with the appreciating real dollar over most of 1980-84; the real interest differential and the dollar also fell together after 1985 [20]

On balance these arguments suggest that expected movements in real exchange rates have been a significant source of real interest divergences during the

[20]There is, of course, no rigid linkage between real interest rates and exchange rates, either in theory or practice As Chart 6 also shows, the dollar continued to rise over 1984-85 even when U S real interest rates fell relative to abroad Nonetheless, the pattern evident before and after that period does support the hypothesis that expectations about future dollar movements were an important proximate source of real interest differentials observed at the time

Chart 5

Real Value of the Dollar



Source Morgan Guaranty Trust Company, World Financial Markets

Note Figure with arrow indicates period average

*Real trade-weighted value of the dollar against 15 industrial countries computed using dollar exchange rates deflated by the ratio of foreign to U S manufacturing wholesale prices

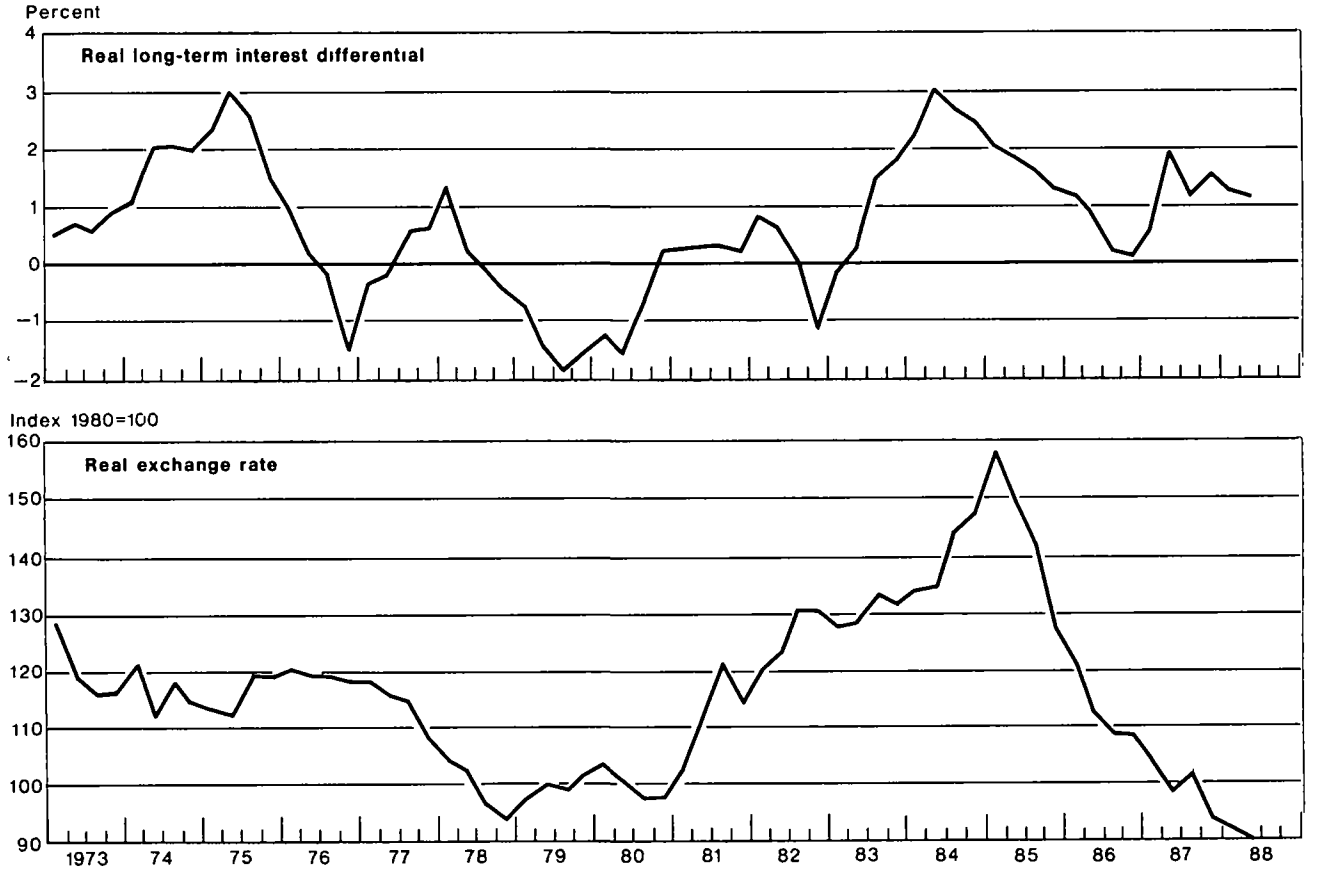
†Deviation of the real trade-weighted exchange rate from its five-year moving average

1980s, the role of real exchange rate expectations during the 1970s is less clear, but very likely less important than after 1980 More generally, this behavior provides further evidence of the major role that currency expectations, apparently reflecting perceptions about both the real and inflation components of exchange rates, have played in interest differentials across countries in recent years

More speculatively, the apparent increase in importance of real exchange rate expectations may also mean that interest rates expressed, ex ante, in a common currency were more closely aligned in the 1980s, when international financial integration was greater than earlier By definition, the real interest differential is equal to the expected change in the real exchange rate plus the common currency differential (see relations ii and v) Hence, the fact that the dispersion in real interest rates did not rise in the 1980s over the latter 1970s, while the magnitude of expected real exchange rate changes apparently did, suggests a possible decline in the dispersion of common currency differentials Of course, the very rough and preliminary nature of our analysis makes

Chart 6

U.S.-Foreign Real Interest Differential and Real Exchange Rate*



Sources Interest rates are taken from the countries' central bank publications The GNP/GDP deflators are taken from publications of the countries' central statistics offices Exchange rates are taken from International Financial Statistics

*Weighted average of bilateral U S.-foreign real long-term interest differentials and of real dollar exchange rates against Canada, the United Kingdom, Germany, and Japan Real long-term interest rates are yields on government bonds with maturities of five years or more, less the inflation in the GNP/GDP deflator over the past two years Real exchange rates are calculated using nominal dollar exchange rates deflated by the ratio of foreign to U S GNP/GDP deflators Weights are calculated using OECD estimates of GNP adjusted for purchasing power parity

this conclusion especially tentative

Conclusion

It seems reasonably clear that international financial integration has increased considerably over the last decade However, the effect of integration on the relationship of interest rates across countries has been somewhat different from that suggested by prior experience with the integration of domestic financial markets Interest rates in the major U S , European, and Japanese money markets now move very closely with their counterparts in the corresponding "offshore" Eurocurrency markets Yet divergences among national interest rates, even for instruments with very similar characteristics, have often been very large in recent years

As our analysis has shown, these patterns are not paradoxical, cross-country interest rate disparities are the natural consequences of differing currencies and jurisdictions that, while irrelevant or negligible within a single country, are potentially very important in an international context In particular, in an environment of flexible exchange rates and divergent national economic conditions, interest differentials across countries can be expected to arise even when capital mobility and financial integration are "perfect" Of themselves, reductions in barriers to financial flows may be expected to reduce international interest rate divergences, but not if accompanied by increased exchange rate fluctuations and greater disparities in national economic policies

These observations are reasonably consistent with the evidence cited in this article There appears to be no systematic tendency for interest differentials to abate across countries over time, indeed nominal interest divergences during the 1980s have been greater on average than those observed during the previous two decades Nonetheless, this analysis provides clear evidence that the sources of international interest differentials have changed During the 1960s, interest rate divergences were sustainable under a fixed exchange rate regime in large part because of fairly stringent limitations on financial flows across national jurisdictions. With the substantial reduction in such barriers over the last 15 years, interest differentials across countries have become primarily associated with expected exchange rate changes—apparently reflecting both increased divergences in national inflation rates and greater real exchange rate fluctuations—and currency risk premia

More fundamentally, this analysis has implications for the conduct of monetary policy in a financially integrated world economy Our results suggest that the ability of monetary authorities to influence domestic interest rates independently of rates abroad has not declined significantly over time In this narrow sense, the independence of national monetary policies may not have been appreciably reduced by international financial integration Nonetheless, the reduction in barriers to international capital flows has strengthened the overall linkages among domestic interest rates, exchange rates, and foreign interest rates As a result, domestic monetary policy actions influence and are influenced by foreign economic conditions more now than in the past In a broader sense, therefore, increased international financial integration has led to greater *interdependence* among national monetary policies

Bruce Kasman
Charles Pigott

Appendix: The Determinants of U.S.-Foreign Covered Interest Differentials

The closer alignment of covered interest rates across countries that has been documented in the text may reflect changes in several factors related to national jurisdiction In addition to explicit restrictions on capital flows, perceived differences in U S and foreign assets arising from domestic tax systems, default risk, transaction costs, or political and sovereign risk are embedded in covered interest differentials In this section we attempt to identify more clearly the role that factors specific to U S and foreign markets have played in the decline of covered interest differentials To this end, we decompose each U S - foreign covered interest differential into the sum of the onshore-offshore differential for each country's assets and the offshore differential on U S and foreign assets †

Covered differential = USDE + FORDE + USFORE

The first term, USDE, measures the interest differential between comparable dollar assets in domestic markets and Euromarkets Since the United States has had vir-

†In more precise terms, any covered differential $[(1+i) - (1+i^*)f]$ can be seen to equal $(i - iE) + (iE^* - i^*)f + [(1+iE) - (1+iE^*f)]$, where i, i^*, iE and iE^* are U S onshore, foreign onshore, U S Euromarket, and foreign Euromarket rates, respectively, and f is the forward exchange rate premium

Appendix: The Determinants of U.S.-Foreign Covered Interest Differentials *(continued)*

tually no capital controls from the early 1970s onward (with the exception of several months in 1980), this term captures the role of domestic U S regulations in generating covered interest differentials The second term, FORDE, is a similar measure for foreign assets and again reflects the importance of foreign regulations, including the influence of any foreign capital controls

The third term in this decomposition, USFORE, captures the covered differential in Euromarkets between dollar assets and assets denominated in foreign currencies Since controls in these markets are insignificant and identical across the assets compared, this differential provides a measure of the impact of political risk considerations Most studies have found these differentials to be rather small—indeed not significantly different from zero on average ‡

‡For a recent examination of covered interest differentials in Euromarkets, see Vincent Reinhart and Kenneth Weiller, "What Does Covered Interest Parity Reveal about Capital Mobility?" Federal Reserve Bank of New York, Research Paper no 8713, in *International Integration of Financial Markets and U S Monetary Policy*, December 1987

In the table, this decomposition of U S -foreign covered interest differentials is presented for a number of periods during the past 15 years Focusing first on our bilateral covered differentials with Japan and the United Kingdom, we see that capital controls, reflected in the large size and variability of FORDE, were a major determinant of interest rate variations before 1980. After 1979, however, sharp declines emerge in the size and variability of the FORDE component for Japan and the United Kingdom, a finding consistent with other evidence indicating that these countries dismantled their controls at roughly that time For Germany and Canada, two countries that loosened capital controls earlier, this component of the covered differential has been relatively small throughout our sample §

The small size (generally below 20 basis points) and variability of these differentials for all the foreign countries since 1982 support the conclusion that foreign barriers

§There is substantial evidence, however, that at least until the mid-1970s capital controls in Germany were a significant component of covered interest differentials

Decomposition of U.S.-Foreign Covered Interest Differentials
(In Percentage Points)

	Total Covered Differential†	USDE	FORDE	USFORE
Germany				
Jan 74 - Aug 77	−0 78 (0 50)	−0 61 (0 40)	−0 35 (0.30)	0.19 (0.20)
Sep 77 - Nov 79	−1 06 (0 43)	−0 60 (0 25)	−0 40 (0 27)	−0.06 (0 19)
Dec. 79 - Dec. 82	−1 65 (0 40)	−0 89 (0.29)	−0 48 (0 30)	−0 29 (0.20)
Jan. 83 - Sep 88	−0 43 (0 40)	−0 25 (0 22)	−0.20 (0 17)	−0.01 (0 16)
Japan				
Jan. 74 - Aug. 77	−0.30 (5 17)	−0 61 (0 40)	NA NA	NA NA
Sep 77 - Nov 79	−2 20 (1 72)	−0.60 (0 25)	−1 83 (1 76)	0.22 (0.92)
Dec. 79 - Dec 82	−0 82 (1.67)	−0 89 (0 29)	0 32 (0 72)	−0 26 (1 57)
Jan 83 - Sep 88	−0 50 (1 15)	−0 25 (0 22)	0 13 (0 25)	−0 41 (1 16)
Canada				
Jan. 74 - Aug 77	−0 32 (0 72)	−0 61 (0.40)	NA NA	NA NA
Sep 77 - Nov 79	−0 69 (0 74)	−0 60 (0 25)	−0 09 (0 16)	0 00 (0 68)
Dec. 79 - Dec 82	−0.87 (0 92)	−0 89 (0.29)	−0.18 (0.35)	0 19 (0.89)
Jan. 83 - Sep 88	−0.15 (0 68)	−0 25 (0 22)	−0 13 (0.13)	0.20 (0 64)
United Kingdom				
Jan 74 - Aug 77	1.92 (1 77)	−0 61 (0 40)	1.62 (1 25)	0 92 (0 83)
Sep 77 - Nov. 79	0.15 (0 92)	−0 60 (0 25)	0 56 (0 78)	0 19 (0.28)
Dec 79 - Dec. 82	−1 05 (0 62)	−0 89 (0 29)	−0 08 (0 43)	−0.08 (0.53)
Jan 83 - Sep 88	−0 27 (0 33)	−0 25 (0 22)	−0.07 (0 11)	0.08 (0.23)

Note Figures in parentheses are standard deviations
†The total covered differential equals the sum of the other three differentials Period averages may not sum exactly due to rounding errors

Appendix: The Determinants of U.S.-Foreign Covered Interest Differentials *(continued)*

to capital mobility, while quite important in the past, have not been a significant proximate factor determining interest rate differentials during the 1980s

A similar claim can be made regarding the importance of U S controls and political risk, factors embodied in the other components of the covered interest differentials, following 1982 Examining the interest differential between domestic U S and Eurodollar assets suggests that actions taken in U S markets might account, in part, for the large and volatile (uncovered) real interest differentials observed during 1980-82 Changes in Federal Reserve operating procedures in October 1979, combined with numerous reserve requirement shifts and the imposition of "voluntary" credit controls in 1980, led to increased interest rate divergence between these assets Interest differentials on dollar assets here and in Euromarkets rose above 100 basis points during almost all of 1980, reaching a level that was double their average for the 1974-79 period ‖ At the same time, Euromarket covered differentials between dollar assets and assets denominated in foreign currencies became more volatile during 1980-82, reflecting increased political uncertainty in the wake of the second oil price shock and the LDC debt crisis However, with the possible exception of dollar-yen rates, Euromarket covered differentials have been insignificant since 1982 Interest differentials between domestic U S and Eurodollar assets have also fallen considerably since 1982, reflecting both the removal of controls (November 1980) and the closer integration of domestic and Eurodollar markets in recent years

‖For a detailed discussion of the links between Eurodollar and U S domestic money markets during this period, see Lawrence L Kreicher, "Eurodollar Arbitrage," this *Quarterly Review*, Summer 1982