# International Interest Rate Convergence: A Survey of the Issues and Evidence

### *by Charles Pigott*

The international integration of financial markets has increased dramatically over the last two decades. Technological advances and the progressive elimination of official barriers to capital flows have spurred an enormous increase in cross-border financial transactions and activities and rapid growth in the Eurocurrency and other international financial markets. As a result, linkages among national financial markets have been greatly strengthened, and financial conditions in individual countries have become increasingly sensitive to developments in the markets of their partners.

It was widely expected that international financial integration would also lead to convergence of interest rates across countries, or at least to greater synchronization of interest rate movements than in the past. In fact, however, considerable international interest divergences have persisted across a broad spectrum of assets, even very recently. Over the last two years, for example, domestic short-term rates in the United States have fallen sharply while those in Germany and other continental European countries have remained at considerably higher levels.

This article examines why interest rates have apparently failed to converge internationally. We first consider in conceptual terms what financial integration means for interest rate relations in an international context. We then examine the evidence on interest rate convergence and the circumstances under which it has or has not occurred.

As we will see, the key feature distinguishing the international economy from a single country is the presence of multiple currencies whose exchange rates are subject to change. Interest rate convergence has several meanings in this context. Where currency distinctions are absent, integration generally has led to interest rate convergence. But where assets differ in their currency denomination, as they typically do in comparisons of national interest rates, financial integration does not imply convergence unless the economic conditions determining the rates become more closely aligned and exchange rates are fixed, or nearly so. In fact, the evidence strongly suggests that for countries with flexible exchange rates, national interest rates have varied nearly as freely with financial integration as earlier, although with much greater repercussions on exchange rates. There appears to be no systematic tendency for cross-country disparities among either nominal or real interest rates to decline, much less disappear — despite a dramatic reduction in barriers to international capital flows.

The article examines one further concept of interest rate convergence particularly relevant to international investors. This is the extent to which national interest rate differentials tend to be systematically offset by currency movements, so that returns expressed in a common currency are equalized on average. This seemingly simple and intuitive presumption has raised a number of somewhat complex, and to this point largely unsettled, issues. Currency risks arising from uncertainty about future exchange rates as well as systematic errors made by investors in predicting currency movements can, and probably have, prevented full convergence in this sense. However, the evidence suggests that these considerations, at least as they are presently understood, do not seem to provide an adequate explanation for the large systematic return differentials among currencies that are observed in practice. These findings raise questions very similar to those long encountered in analyses of the behavior of stock and bond returns within a single country.

## The meaning of international financial integration

Complete integration of an economy's financial markets basically means that all participants have equal access to all markets. Equal access implies that interest rate and other terms faced by participants depend only on objective indicators of creditworthiness such as financial position and credit history—not on residence or nationality. Integration allows portfolio diversification across markets and instruments; thus the tendency of investors to hold assets issued in their own locale when markets are isolated is likely to be substantially reduced, if not altogether eliminated, when markets become integrated.

Financial integration within a single country, where all assets are denominated in the same currency, affects the behavior of interest rates in several important ways. First, because integration allows arbitrage across markets, returns on instruments with identical characteristics are equalized regardless of where they are issued or traded. For example, within the United States, regional interest differentials among comparable assets are quite small or negligible in most cases. Second, and more generally, integration is likely to lead to much greater synchronization of interest rate movements across markets and to lower interest differentials among similar (though not necessarily identical) assets. The basic reason is that with integration, local differences in credit conditions tend to be largely eliminated by flows of funds among markets. Thus, regional fluctuations in real income, saving, or other determinants of credit demands and supplies do not themselves lead to significant interest rate divergences, as they would if markets were isolated. Instead, interest rates tend to vary with national credit conditions as determined by real growth, inflation, government fiscal positions, and other domestic macroeconomic conditions. Reinforcing this tendency is the fact that a single-currency economy sharply limits the degree to which certain key interest rate determinants, notably inflation, can differ among regions.

It follows that interest differentials within a single country largely reflect differences in instrument characteristics such as maturity, liquidity, and risks that are valued, or priced, in the common national market. For example, interest rates on ten-year corporate and U.S. government bonds move together quite closely over time, but the corporate rate is typically greater by an amount that largely reflects market perceptions about the risks of business defaults.

## Integration in the international economy

While the implications of financial integration for the international economy are broadly similar to its implications for a single country, the specific consequences for interest rates are much less straightforward, for three reasons. First, impediments to financial flows among nations arising from overt restrictions on capital flows and from differing tax laws, regulatory policies, and other institutional arrangements typically far exceed the barriers that exist among states, provinces, or regions of a single country. Second (and substantially as a result of the first), key instrument characteristics such as available maturities, minimum denominations, and liquidity generally vary much more across countries than within any single country.

Third, and most fundamentally, the international economy is distinguished by the existence of multiple currencies whose values are subject to change. Interest rate convergence in such an environment has two quite distinct, if closely related, meanings. The first, the convergence of national interest rates (as they are normally expressed), involves a comparison of returns denominated in different national monies: the quoted yields on U.S. and German government bonds, for example, refer to their yields in terms of dollars and German marks, respectively. Likewise, comparisons of real interest rates across countries usually involve returns expressed in terms of national commodity bundles whose composition typically varies across countries.[1] For investors deciding how to allocate funds among assets, however, it is the degree to which their prospective relative returns expressed in a common currency converge that matters. These relative returns are determined not only by the national interest rates themselves but also by the change in the relevant exchange rates over the investment horizon: the dollar return on, say, a three-month German mark-denominated asset depends upon the rate at which marks can be exchanged for dollars at maturity.

Even with multiple currencies, linkages among markets in a financially integrated international economy are no less strong than within a single country. The connections are more indirect, however, because the national markets are linked through the markets for foreign exchange. This fact would be of little practical consequence if exchange rates were completely and irrevocably fixed. In that case, integration would have virtually the same effects internationally as within a single economy: national interest rates would largely converge and their movements would be closely synchronized; remaining interest differentials would be determined by disparities in market and (noncurrency) instrument characteristics rather than by macroeconomic disparities among the countries.

In the actual world economy, however, exchange rates are very seldom completely fixed. The fact that national markets are linked through foreign exchange markets then has two important practical consequences. First, disparities in underlying determinants of national interest rates can be, and generally are, much greater than within a single country. In particular, inflation rates can diverge indefi-

[1] The U.S. real interest rate, typically defined as the nominal interest rate less some measure of anticipated domestic inflation, is effectively a return in terms of U.S products, while German real interest rates measure returns in German goods.

nitely provided that exchange rates can change to offset the differences.

Second, divergences in macroeconomic forces typically will lead to cross-country differences in national interest rates when exchange rates are free to vary. In the world economy, as in a single economy, a tightening of credit that pushes up interest rates in one country's markets tends to attract funds from abroad. This inflow, however, first places upward pressure on the home currency, raising its current value above the level expected to prevail in the future (and thus increasing the amount by which the currency is expected to fall subsequently). If the home government allows its exchange rate to float freely, this process will continue until the currency's prospective future decline is sufficient to eliminate the incentive for funds to flow in — leaving national interest rates both at home and abroad largely unaffected.

In a variable exchange rate environment, therefore, differentials among national interest rates stem not only from differences in their characteristics or imperfect integration of the markets, but also from divergences in macroeconomic and other determinants and their interactions with exchange rates. Disparities in economic conditions lead to national interest rate differentials, which in turn reflect perceptions about the magnitude of, and (as we will see shortly) the risk associated with, future currency movements.[2] Financial integration, even if complete, need not lead to interest rate convergence nor indeed to any increased synchronization of national rate movements across countries; interest differentials are likely to vary in magnitude as their underlying determinants become more or less aligned across countries. The main, and critically important, effect of financial integration in this context is to greatly increase the sensitivity of exchange rates to national interest rate fluctuations: as explained earlier, integration has meant that changes in a nation's interest rates relative to rates abroad lead to offsetting currency movements. The result is that financial developments in one country tend to affect conditions in others through their impact on foreign exchange markets.

**Convergence in a common currency?**

Although financial integration need not lead to equalization of national interest rates, it might seem that it should result in the convergence of returns expressed in a common currency. This is true in a narrow sense: yields on otherwise identical instruments whose returns are guaranteed by hedging ("covering") in forward foreign exchange markets must be equalized with complete integration. In the Eurocurrency markets, for example (where the instruments are identical except for their currency), the dollar return on a three-month German mark deposit whose proceeds at maturity are covered through forward market sale (for dollars) is the same as that on a three-month dollar deposit. Note, however, that hedging the mark asset amounts to its redenomination in dollars (since the hedged instrument is a fixed claim to future dollars); currency distinctions among assets are effectively abolished in comparisons of their covered returns. The sources of covered interest differentials therefore are the same as those present within a single nation — barriers to financial flows across markets and differences in instrument characteristics.[3]

The broader and much more controversial question is whether returns that are not hedged (in other words, that are "uncovered" in the sense that they depend upon actual exchange rate movements that cannot be fully predicted) converge when expressed in a common currency. In practical terms, this question amounts to asking whether exchange rate movements tend on average to offset differences in national interest rates on otherwise similar assets. If so, investing in one currency as against another will produce no systematic difference in realized returns, and national interest rate differentials (apart from differences in asset characteristics) will simply reflect market expectations about future exchange rate movements. This principle is commonly referred to as "uncovered interest parity."

As explained further below, the degree to which uncovered interest parity holds in a practical sense depends primarily upon the importance of two factors. The first and, until recently, the predominant focus of debates in this area is the importance of the "currency risks" associated with investing in one currency as opposed to another. Currency risk in this context refers to the differential riskiness among assets that arises from their denomination. To understand what currency risk means, consider a U.S. investor who holds two government bonds, one denominated in dollars and the other in German marks. Both bonds are risky in that their prices, in dollars and German marks, respectively, are to some degree unpredictable; in addition, the return in dollars of the German mark bond depends upon future exchange rate changes — which are also unpredictable. The risks of the two bonds therefore are likely to differ,

[2] In effect, therefore, national interest differentials (aside from characteristic differences and imperfect financial integration) can be viewed as the proximate reflection of expected future exchange rate changes and currency risks that, at least in principle, are ultimately determined by divergences in countries' fundamental interest rate determinants.

[3] Complete hedging is generally available only to fairly large market participants and for fairly widely used or traded instruments. Moreover, there are well-known factors other than unanticipated exchange rate movements that may impair the liquidity or solvency of an instrument and that tend to be currency-associated, including the possible default of a government or government-guaranteed borrower on its external foreign currency obligations ("sovereign" risk) and the potential inability of private domestic entities to obtain foreign exchange to meet their external obligations because of actual or prospective capital controls ("transfer" and "political" risks). These risks are currency-associated mainly because national authorities can regulate or otherwise impede the convertibility of their national money. In this discussion, however, these factors are treated as barriers to capital mobility or as sources of differences in asset (noncurrency) characteristics.

most obviously (although, as we will see later, not entirely) because of the uncertainty about exchange rates.

Currency risks are reflected (as "currency risk premia") in the uncovered returns that investors anticipate receiving in a common currency; the corresponding national interest differentials also incorporate these risks in addition to expectations about future currency changes. As with any other type of risk, the importance of currency risk depends not upon the volatility of any particular currency when viewed in isolation, but rather upon the extent to which holding an asset denominated in one money as against another contributes to the overall risk a typical investor faces; thus, uncovered interest parity is likely to hold exactly only if currency risks can be completely diversified, that is, offset by other sources of risk. From this perspective, the key question is not whether currency risk premia exist at all (the considerable volatility of exchange rates makes it very likely that they do) but how important they are in practice. If representative investors view these risks as comparatively large, there are likely to be significant average differences in dollar returns from investing in one currency relative to another.

Even if currency risks were quite small, however, common currency returns could still differ considerably and systematically for a second reason, namely biases in market forecasts. Suppose, for example, that investors consistently underpredicted increases in the value of the German mark versus the dollar during some period: mark-denominated instruments would tend to outperform their dollar-denominated counterparts even though the ex ante returns anticipated by investors would be the same. Economists have normally assumed that such biases are very small or sporadic but, as we will see later, growing evidence suggests that they may be sizable and pervasive.

### Evidence on the convergence of national interest rates

There can be little doubt that the major financial markets of the industrial countries have become much more closely integrated over the last two decades. Official barriers to capital flows have largely been eliminated by the industrial countries and substantially reduced by many developing nations. Larger financial institutions and nonfinancial corporations now have access to an array of international financial markets with relatively low transactions costs, as well as to major domestic markets of the larger countries; portfolio diversification, particularly by banks and, in some countries, by institutional investors, has increased markedly since the late 1970s.[4] International financial integration is certainly not complete (indeed barely begun for markets catering to smaller businesses and individuals), nor is it as great as that found within the United States or most other countries, but it is still considerable in economic terms.

Nonetheless, despite the obvious interdependence among financial markets resulting from integration, national interest rates, whether nominal or real, do not seem to have converged in any very meaningful sense. Indeed, the recent record is quite consistent with the conclusion of an earlier study by Kasman and Pigott (1987) that the dispersion in national interest rates fluctuates considerably over time but without any systematic tendency to decline. At present, U.S. short-term interest rates are fairly close to those of Japan but substantially below those in Germany, the United Kingdom, and Canada; substantial gaps among the countries' long-term interest rates also remain. As Chart 1 shows, divergences among short-term interest rates are now actually somewhat above their average of the last twenty years, and while the dispersion in longer term rates has declined over the last decade, it is still noticeably higher than in the early 1970s.[5]

Although financial integration has led to no discernible convergence of national interest rates, its effects are dramatically manifest in covered interest differentials. As explained earlier, these differentials largely reflect barriers to capital flows and instrument characteristics rather than currency distinctions and so provide a direct indicator of the progress of integration. By this standard, the major short-term industrial country financial markets have become very highly integrated: as Chart 2 indicates, covered interest rate differentials among national money markets, which were at times quite large during the 1970s, have largely disappeared, as have gaps between the domestic money markets and the corresponding Eurocurrency markets.[6] Analogous evidence suggests that integration has also increased in the markets for longer term instruments, although the

[4] See Benzie (1992) for a detailed description and analysis of the remarkable development of the international bond market during the 1980s For an excellent analysis of the international diversification by pension funds and insurance companies, see E P Davis (1988, 1991)

[5] Despite this evidence, some observers have argued that integration has at least increased the synchronization of interest rate movements over the last decade Several studies, in fact, have reported that by some measures, correlations between U.S and foreign interest rates were somewhat greater during the 1980s as a whole than in the 1970s, see, for example, Frankel (1989) and the introduction to Bank for International Settlements (1989) But other, equally plausible measures do not show any consistent increase in this tendency (for example, see Kasman and Pigott 1988), and in many cases national interest rates appear to have been less synchronized during the latter 1980s than during much of the 1970s, when markets were presumably less integrated than now Variations in these correlations are more likely a reflection of changing alignments among national economic conditions than a product of financial integration.

[6] Numerous studies have documented the decline in short-term interest differentials resulting from the lowering of official capital controls, beginning with the major industrial nations in the 1970s and early 1980s and spreading to virtually all the industrial countries in the latter half of the decade Among the more extensive studies are Caramazza et al. (1986) and Frankel (1988) In addition, Akhtar and Weiller (1987) and Frankel (1990) provide excellent discussions of conceptual issues concerning the definition and measurement of international capital mobility.

change has been more recent and less complete In particular, as shown in Table 1, hedged (dollar) returns on government bonds are also now fairly closely aligned for at least the major currencies [7]

Financial integration thus has significantly altered the relative importance of the factors underlying national interest rate differentials mentioned earlier Institutional barriers along with noncurrency instrument characteristics are now a relatively minor source of the divergences, national interest differentials reflect, nearly entirely, disparities in the macroeconomic determinants of interest rates and the corresponding exchange rate movements they induce.[8]

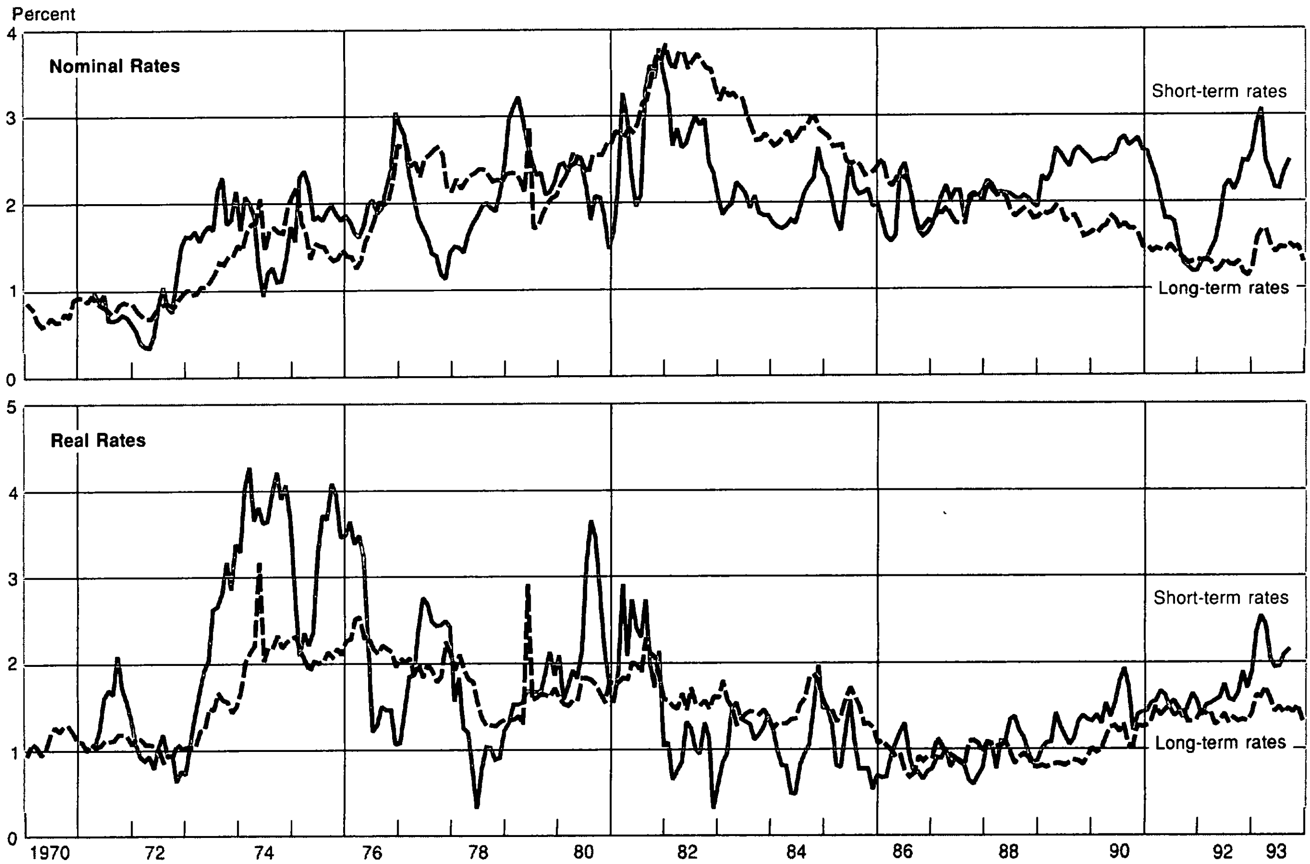
Indeed, at least the broad movements in national rate differentials in recent years can be fairly plausibly explained by fluctuations in real income, inflation, monetary and fiscal policies, and the changing alignment of these conditions across countries For example, the largest divergences in nominal interest rates, particularly longer term rates, have tended to occur during periods of rising and relatively high inflation such as the mid- and late 1970s and the early

[7] Long-term instruments can be hedged through currency and interest rate swaps The development of these facilities beginning in the mid-1980s is itself a strong indication of the growing integration of major bond markets Popper (1990) was the first to use this data to demonstrate the near-parity of hedged returns for such instruments

[8] Admittedly, heterogeneity of instrument characteristics is more important for mortgages and other assets that are less standardized than typical money market securities or government bonds

Chart 1

**Cross-Country Dispersion of National Interest Rates**




Notes Dispersion is calculated as the average absolute deviation from the country mean of each month Short-term rates are the call money rate for Japan and three-month money market rates for the United States, Canada, Germany, France, and the United Kingdom Long-term rates are long-term government bond yields for the above six countries plus Italy, Belgium, and Switzerland The real short-term rate is the nominal rate less the inflation rate over the last year, the real long-term rate is the nominal rate less the inflation rate over the last three years

1980s, largely because cross-country disparities in inflation, the stance of monetary policy, and business cycle positions have generally been greatest in these periods Likewise, the decline in long-term interest rate divergences over much of the last decade can be attributed in large part to the general fall (and convergence) of national inflation rates during the same period [9]

Furthermore, major shifts in the alignment of interest rates across countries have usually been associated with substantial movements in exchange rates A dramatic illustration is the prolonged appreciation of the dollar accompanying the rise in U S interest rates relative to rates abroad during the first half of the 1980s

The persistence of *real* interest rate differentials, while more surprising to many observers, is also understandable in these terms As normally measured, the real interest rate on a given country's asset is effectively its return in terms of some aggregate of commodities produced or consumed in that country The composition of these commodity aggregates typically varies across countries because of the inclusion of nontraded goods and services and differences in production and consumption patterns The belief that real interest rates should converge internationally is based on the presumption that returns to capital will ultimately be equalized and that purchasing power parity determines nominal exchange rates — conditions that are likely to hold, if at all, only in the very long run Over the medium term,

[9] These conclusions are also broadly consistent with more direct evidence about the forces shaping domestic interest rates This evidence suggests on the whole that while the influence of international factors has risen in some cases, traditional domestic macroeconomic factors remain the most important determinants For example, although international factors may now have some modest influence, short-term interest rates still appear to be largely determined by variations in the domestic supply and demand for liquidity See, for example, Radecki and Reinhart (1988) There are reasons to believe that international factors may have somewhat greater influence on long-term interest rates, but the evidence is limited

Table 1

**Covered Interest Differentials for Government Bonds**

(Foreign minus U S Yield to Maturity)

| | Average | Standard Deviation |
|---|---|---|
| Germany | -70 | 15 |
| Japan | -46 | 42 |
| Switzerland | 18 | 19 |

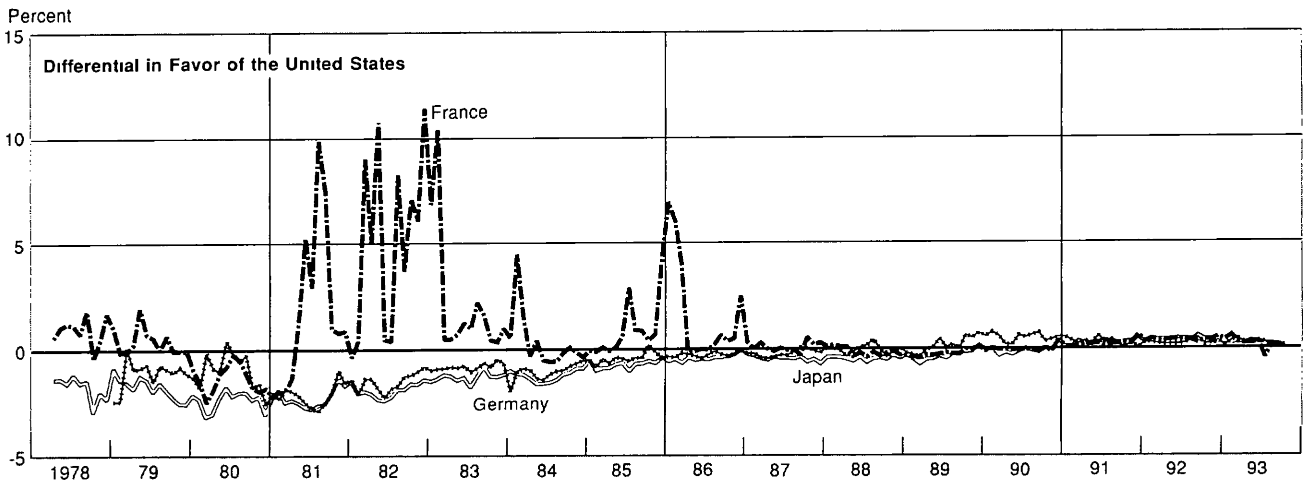
Notes Table reports the difference between the domestic (ten-year) yield to maturity on the foreign bond and the yield in the same currency of a "swapped" U S ten-year Treasury bond The differential combines the applicable interest rate swap rate for ten-year Treasuries (that is, from ten-year fixed payments into floating rate LIBOR payments in dollars) and the currency swap rate (from floating LIBOR payments in dollars into ten-year fixed payments in the relevant foreign currency)

All figures refer to averages for the period 1987–90

Chart 2

**Covered Interest Differentials**

Domestic Three-Month Rates




Notes Data are end-of-month The three-month commercial paper rate is used for the United States The foreign rates are three-month interbank rates whose dollar returns are covered in the three-month forward exchange rate real exchange rates have varied nearly as much as nominal exchange rates. Long, variable, and persistent fluctuations in real interest rates are quite consistent with this pattern, as is the corresponding tendency for domestic real interest rates to be the primary source of nominal interest rate movements over similar intervals.[10]

Overall, therefore, actual experience is quite consistent with the conceptual arguments presented earlier in this article. Integration has had clear and dramatic effects, most noticeably on covered interest rate differentials. Integration has not, however, led to any appreciable convergence of national interest rates, because of the combination of variable exchange rates and continued large disparities among nations' macroeconomic conditions that has characterized the world economy for over twenty years. Indeed, the experience of the European Monetary System, which is summarized in the box, strongly suggests that only when exchange rates are very nearly fixed and national macroeconomic policies are largely harmonized is integration likely to lead to any genuine convergence of national interest rates.

**Uncovered interest parity?**

While most investors and analysts have become quite accustomed to large and persistent divergences among national interest rates, there remains a very widespread belief that these differences tend to be offset by currency movements. Investing in one currency rather than another may yield higher or lower returns at certain times, but, according to this view, the returns should be equal on average over longer periods. Some tendency toward this "uncovered" interest parity is evident even when markets are isolated: countries with high inflation rates tend to have relatively high interest rates but also depreciating currencies. Moreover, as noted in the first section, currency-associated risks are likely to prevent uncovered returns from being fully equalized even with complete integration.

Nonetheless, it seems plausible to assume that uncovered returns would be more closely aligned now that markets are substantially more integrated and investors more diversified internationally than they were in the 1960s or 1970s. As we will see shortly, however, it is far from clear that this presumption is valid. Indeed, we will see that the issues raised by empirical analyses in this area have proved to be (at least by comparison with those encountered in the last section) often complex and perplexing — as well as substantially unresolved.

**Historical evidence on uncovered interest parity**

The historical record of return differences across currencies provides one very rough indication of the degree to which uncovered yields have converged under financial integration. Table 2 lists average ex post differential returns, expressed in dollars, of foreign relative to U.S. assets over five-year intervals for three types of instruments, namely short-term (three-month) money market securities, longer term government bonds, and stocks.[11] In principle, these differentials reflect the returns anticipated (ex ante) by investors as well as any errors made in forecasting future exchange rates and the assets' prices. The differentials are often remarkably large. Indeed in certain periods they appear (even for short-term assets) to be of greater magnitude than the national interest rates themselves. The return disparities are also highly variable: in some periods, foreign assets strongly outperform their U.S. counterparts, while in other periods, they underperform them. (Partly as a consequence, average divergences over decade intervals, as well as the entire period, are generally smaller in magnitude than the five-year average.) And, of most relevance here, the differentials seem to show no tendency to decline over time.[12]

While unexpected changes in currency and asset prices are undoubtedly responsible for some portion of the recorded divergences, a large and growing body of evidence strongly suggests that they cannot be the only explanation. If return differentials on comparable instruments result simply from random and unbiased forecast errors, they ought to vary randomly and average out to zero. Most evidence, though, indicates that the divergences are larger than is explainable by pure chance (that is, they are statistically significant). Moreover, variations in return differentials appear to be systematic in the sense that they are at least partially predictable. Several studies have found, for example, that trading rules specifying when to invest or withdraw from one currency or another tend to yield significantly greater returns

[10] In most empirical models of the U.S. and other economies, fluctuations in real income, inflation, and other macroeconomic determinants of credit market demands and supplies produce substantial variations in real interest rates. The corresponding international macroeconomic models — of the type first introduced by Dornbusch (1976) — view variations in real interest differentials across countries as a major, if not dominant, source of real exchange rate fluctuations. In an empirical analysis of several large industrial countries, Howe and Pigott (1992) develop evidence suggesting that long-term real interest rates vary substantially and are influenced both by persistent factors, such as aggregate debt and returns to physical capital, and, in the medium-term, by changes in macroeconomic policies. There is some evidence (see Mishkin 1984) of long-run real interest rate convergence, however.

[11] All data are computed from monthly holding period returns. The bond return estimates are taken directly from Ibbotson and Siegal (1991) and are based on long-term interest rate figures from the International Monetary Fund's International Financial Statistics. Note that the corresponding instruments are almost certainly not as comparable as those used for the data in Chart 1 and Table 1 (which generally are available only for a much shorter period). The stock returns are derived from aggregate stock price indexes and dividend-price ratios for the major exchanges in each country.

[12] Return differentials during the 1980s as a whole are smaller than during the 1970s in slightly more than half the cases. More often than not, however, the divergences in the three-month instruments and the bonds recorded in the first half of the 1980s are greater than during either half of the preceding decade.

## Box: When exchange rate flexibility is limited

Because interest rates do diverge considerably when currencies are relatively free to vary, a natural question is, what happens when exchange rate flexibility is substantially limited? Some light is shed on this question by the experience of the members of the Exchange Rate Mechanism (ERM) of the European Monetary System (EMS)

Until last fall, about half of the members (Germany, France, Belgium, Denmark, Ireland, and the Netherlands) limited their exchange rate movements to a band of 2 25 percent around the central parity, the remainder (Italy, Spain, Portugal, Greece, and for most of its period of participation, the United Kingdom) adhered to 6 percent bands † The central parities have been changed several times since the system's inception in the late 1970s, although with somewhat decreasing frequency up to the fall of 1992 Moreover, capital controls among the members have been removed gradually over a number of years—as early as the mid-1970s in Germany and the United Kingdom but not until the latter 1980s in several other countries.

As Chart 3 shows, interest rates among the ERM countries have moved considerably closer, but only fairly recently Except for the Netherlands, short-term interest rates did not achieve near-parity with Germany until about 1990 Most effective barriers to financial flows among these markets were removed some years earlier, as indicated by the fact that gaps between domestic money and Eurocurrency rates were largely closed by 1986 for France, and well before that for Belgium and the Netherlands Moreover, it was not until 1991, at the earliest, that any genuine alignment of longer term rates occurred (again except for the Netherlands, whose long rates have followed those of Germany for much of the 1980s).

This sequence of developments suggests that it was not financial integration alone but rather the interaction of integration, the exchange rate regime, and the evolution of macroeconomic conditions that produced the gradual convergence of ERM interest rates Given the margin for exchange rate fluctuations within the system, substantial divergences in shorter term interest rates are consistent even with complete integration For example, under the narrower bands, three-month interest rates can differ by as much as 9 percentage points ‡ Even the larger divergences among European rates in the mid-1980s were well within such limits The marked narrowing of the differentials in recent years is substantially the result of changes in monetary policy operating procedures: monetary authorities in France and several other countries have chosen to keep their official rates closely in line with those of Germany. This shift has been prompted by the planned European Monetary Union, but it is also reflective of the considerable convergence in macroeconomic conditions, particularly inflation, that has occurred §

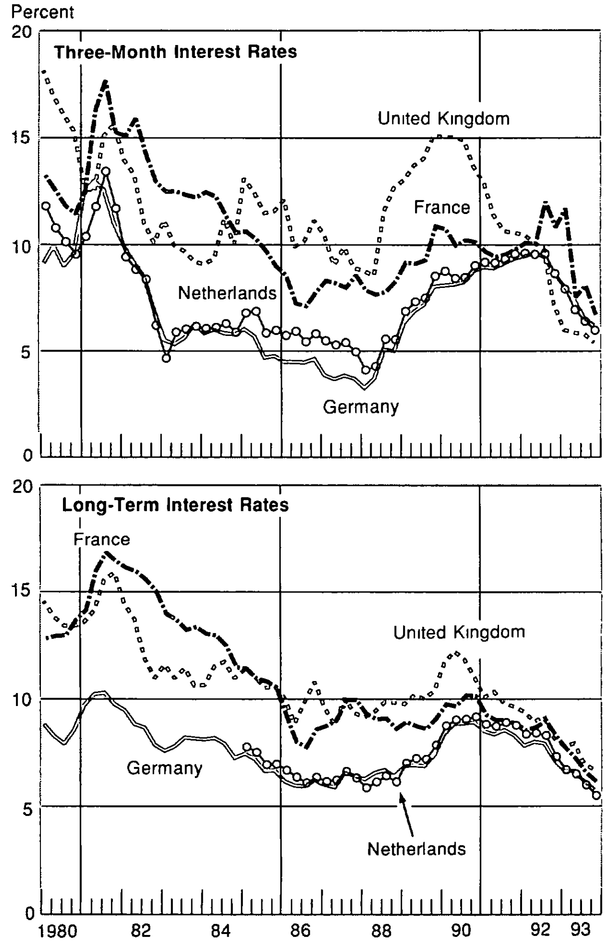
† In addition, Austria, and more recently Sweden and Norway, have sought to closely tie their currencies to the German mark even though they are not formal members of the ERM

‡ This figure corresponds to the annualized movement of a currency across the full "width" of the permissible band In practice, the maximum possible interest differentials depend upon a currency's position within the band

§ For a useful recent analysis of interest rates in the ERM, see Mizrach (1993)

Chart 3

**Evolution of European Interest Rates**




Notes The short-term rate is the three-month interbank rate, the long-term rate is the government bond rate

**Box: When exchange rate flexibility is limited** *(Continued)*

Such macroeconomic harmonization has contributed even more to the convergence of longer term rates. In the ERM, gaps among long-term rates primarily reflect prospects that the central parities will be maintained over the longer term, a virtually impossible feat unless inflation rates remain equalized. Thus the near-equality of Dutch and German long-term rates for most of the 1980s essentially stemmed from the very close alignment of their inflation performances and policies Also understandable in these terms is the relatively late convergence of French with German long-term interest rates: not until the end of the 1980s had France's underlying inflation rate clearly fallen into line with that of Germany

The record of the ERM thus indicates that under financial integration, national interest rates probably would have converged had a completely fixed exchange rate system, *including* the harmonization of policies required to sustain it, been maintained That same record also shows, however, that even modest departures from completely fixed rates can lead to very substantial interest rate divergences of a magnitude and variability barely distinguishable from those observed under floating exchange rates The reason is that interest rates, particularly longer term rates, are very sensitive to prospective disparities in economic conditions and policies. Thus an option to depart from completely fixed rates, however improbable or distant its exercise, may sustain considerable interest rate divergence

than simply holding a diversified portfolio of assets [13]

Particularly remarkable in this respect is an apparent tendency, first pointed out by Fama but since supported by other studies, for returns on shorter term assets to rise when the corresponding national interest rate differential increases [14] Thus, for example, when German national interest rates rise relative to U S. rates, realized dollar returns on mark-denominated assets typically increase also This pattern is clearly inconsistent with uncovered interest parity, which implies that an increased German-U S interest rate gap should be fully offset (again on average) by greater mark depreciation (or less appreciation)

Overall, the evidence indicates that financial integration has not led to convergence of asset returns expressed in a common currency Indeed it is even unclear whether integration has produced any closer alignment of uncovered returns Instead we find apparently sizable systematic uncovered differentials whose magnitude and sign appear to vary over time To most observers, the most plausible explanation of these patterns is currency risk We will see, however, that this explanation seems to be incomplete in important respects

### A matter of risk?

We noted earlier that otherwise identical assets denominated in different currencies are inevitably subject to different risks unless their exchange rates are completely fixed. Typically when any asset has an uncertain return, its interest rate must incorporate a risk premium as compensation From this perspective, systematic uncovered return divergences are the natural result of risk factors specifically associated with currency denomination

Currency risk is often viewed as simply reflective of uncertainty about future exchange rates and in this respect quite distinct from risks more normally encountered in domestic markets This view is misleading for at least two reasons First, as we have seen, when exchange rates are variable, the determinants of interest rates, and hence domestic asset prices, are likely to be only imperfectly correlated across currencies As our earlier example of the U S and German bonds indicated, instruments denominated in different currencies thus are subject to differing risks from fluctuations in their domestic price (price risk) in addition to the risks arising directly from unexpected exchange rate movements

Second, the factors underlying the risks associated with foreign currency assets are not fundamentally different from those determining risks on domestic instruments. Any investor holding U S bonds or Japanese bonds, for example, has to consider the outlook for inflation, real growth, and other factors in those countries that contribute to fluctuations in the bond's domestic currency price. Moreover, exchange rate movements, at least in principle, are determined by differences across countries in very much the same set of underlying conditions From this perspective, the overall size of currency risk premia largely reflects the extent to which the importance of these standard determinants differs among currencies — whether, for example, uncertainties about U S inflation are more or less important to investors than uncertainties about inflation in other countries Likewise, the risk premia are likely to change over time if and when the determinants change. Thus, assessing relative currency risks involves considerations fairly similar to those that have traditionally guided assess-

[13] Prominent examples are Dooley and Shafer (1983), Sweeney (1986), and Levich and Thomas (1993) In general, the profits found under these rules easily exceed the transactions costs incurred (by a large investor) in their implementation

[14] See Fama (1985) Even more remarkable, the results suggest that a rise in national interest rates in favor of a country is associated with an appreciation of its currency (or a diminished rate of depreciation) More generally, Fama's findings and related results imply that variations in national interest rates predominantly reflect changing risk premia

ments of domestic instruments.

Risk premia generally should decline with international financial integration because integration allows much greater risk diversification than is normally available from holding domestic assets only. The scope for such diversification is greatest when exchange rates vary simply to offset differences in national inflation rates. In that case the relative risks of assets denominated in different currencies would be the same for all investors regardless of their nationality (that is, whether returns are calculated in terms of U.S. or foreign consumption goods), and their portfolios would be very similar in composition. In reality, purchasing power parity does not hold, except perhaps in the very long run, and the variability of real exchange rates does reduce the possibilities for worthwhile diversification by giving domestic investors an effective habitat preference for assets denominated in their own currency. That is, to a German investor (one who assesses returns in terms of German goods), dollar instruments appear to be substantially more risky than a German mark asset, while the opposite is the case for a U.S. investor. Nonetheless, even though real exchange rates have often been quite volatile, much evidence suggests that investors can significantly improve their tradeoff between risk and return by devoting a significant portion of their holdings to foreign assets.[15]

Most standard frameworks for assessing risk also suggest that currency-associated risk premia are likely to be fairly modest. In the most widely used approach, the risk premium of any asset is proportional to its contribution to the fluctuations in the value of the market portfolio as a whole.[16] From this perspective, currency fluctuations account for only a small fraction of the total risk facing a typical investor; unforeseen fluctuations in domestic asset prices, for example, generally are a much more important

[15] Recent studies include Levich and Thomas (1993) and Tesar and Warner (1992). Real exchange rate variability is probably one important reason why the portfolios of even the most internationalized financial institutions are far from fully diversified.

[16] The framework is known as the "capital asset pricing model," first developed by Sharpe (1964) and Lintner (1965). An individual asset's risk premium in this framework is proximately determined not only by the asset's own return volatility but also by its correlation with fluctuations in the other asset prices. Both are determined by the fundamental economic conditions prevailing during a given period and are subject to change over time. Many extensions of this approach have been developed, the most common of which bases asset risk premia on their contribution to the variability of consumption rather than the market portfolio's value.

Table 2

**Foreign–U.S. Return Differentials in Dollars**

(Annual Average Percentage Rates)

| | 71–75 | 76–80 | 81–85 | 86–90 | 70–80 | 81–90 |
|---|---|---|---|---|---|---|
| **Short rates** | | | | | | |
| Canada | 0.4 | -2.4 | -2.4 | 7.2 | -1.0 | 2.4 |
| Germany | 7.2 | 0.2 | -7.0 | 6.9 | 3.6 | -0.2 |
| France | 5.4 | -0.1 | -9.6 | 8.7 | 2.5 | -0.7 |
| United Kingdom | -1.6 | 5.8 | -11.7 | 10.3 | 2.1 | -1.1 |
| Italy | — | 11.3 | 17.8 | -5.0 | — | 5.7 |
| Japan | 4.4 | 6.2 | -4.9 | 4.6 | -0.2 | -0.2 |
| **Equity**† | | | | | | |
| Canada | 0.5 | 6.0 | -8.1 | -5.0 | 3.2 | -6.6 |
| Germany | — | — | 6.6 | 1.9 | -6.6 | 4.2 |
| France | 4.6 | 0 | -1.5 | 9.0 | 2.8 | 3.6 |
| United Kingdom | -1.2 | 9.8 | -1.2 | 5.8 | 3.8 | 2.2 |
| Italy | -11.8 | -7.3 | -1.1 | -1.2 | -10.9 | -1.2 |
| Japan | 12.6 | 5.4 | 4.6 | 6.7 | 10.5 | 5.7 |
| **Bonds**‡ | | | | | | |
| Canada | -1.8 | 1.0 | -3.7 | 1.2 | -0.4 | -1.0 |
| Germany | 10.1 | 11.0 | -9.7 | 3.2 | 10.6 | -3.3 |
| France | 5.7 | 2.3 | -10.0 | 7.9 | 4.0 | -1.1 |
| United Kingdom | -6.2 | 17.4 | -10.3 | 4.6 | 5.6 | -2.9 |
| Italy | -3.4 | -0.8 | -6.8 | 12.6 | -2.1 | 2.9 |
| Japan | 3.3 | 14.9 | -4.8 | 0.6 | 9.1 | -2.1 |

Note: Reported values represent the difference between foreign and U.S. average monthly returns, including reinvested earnings, expressed at an annual rate.

† The 1970s periods are 1970–75, 1976–80, and 1970–80.

‡ Figures are taken from Ibbotson and Siegal (1990).

source This point is illustrated in Table 3, which lists estimates of the average (ex ante) differential between foreign currency and U S. dollar-denominated bonds predicted for the period 1978-91 on this basis.[17] The differential returns seem relatively modest in magnitude — between 1/4 and slightly more than 1/2 of 1 percentage point [18]

### Limitations of the risk explanation

These estimates suggest that currency-associated risk premia based on economic fundamentals provide a plausible explanation of why systematic return differentials exist and why they might vary over time At the same time, however, empirical analyses based on risk considerations have not accounted satisfactorily for key aspects of observed return differentials. The main problem is that even after the influence of random forecast errors is taken into account, observed ex post return differentials (such as those shown in Table 1) seem to be too large as well as too variable to be explainable simply in terms of risk factors — at least as they are understood by standard risk assessment frameworks of the type used for the figures in Table 3 [19] Furthermore, empirical studies generally have had little success in explaining observed uncovered return differences in terms of the fundamental economic factors thought to determine asset risks [20]

The shortcomings of such approaches have led a number of analysts to consider an alternative possibility, mentioned earlier ex post return differentials among currencies may reflect systematic errors in market forecasts of exchange rates and domestic asset prices, and not simply (or even primarily) risk Such errors could lead to systematic divergences in ex post returns even if the ex ante returns expected by investors were equalized (that is, risk premia were negligible) Although usually ruled out in formal economic analyses, which typically assume that expectations are rational and therefore unbiased, the view that expectations are biased is not implausible. Studies of survey data on the forecasts of market participants and analysts indicate that forecasts are generally biased, often substantially so [21]

Market survey data do not, however, support the notion that expectations biases are the main reason for the large systematic return differentials observed across countries. If such biases were the reason, we would expect that anticipated (ex ante) returns on comparable assets calculated using survey data as a measure of expected exchange rate changes would be fairly small In fact, as illustrated in Chart 3, this does not seem to be the case The chart shows the expected return differential, expressed in dollars, between U S. and foreign three-month Eurocurrency deposits. The differentials are calculated by subtracting the expected change in the relevant exchange rate, taken from a prominent survey of market forecasts, from the U.S -foreign

Table 3

**Hypothetical Differential Currency Risk Premia for Bonds**

(Ex ante Return Differential for Foreign Relative to U S Government Bonds)

| | Basis Points |
|---|---|
| Canada | -24 |
| Germany | -60 |
| France | -24 |
| United Kingdom | -24 |
| Japan | 24 |

Notes Figures refer to the annualized differential ex ante yield of a representative foreign government bond over a U S counterpart The estimates are averages for 1986–91 calculated from monthly realized returns on a portfolio of bonds from seven industrial countries (the above plus Belgium) The estimates are calibrated so that the ex ante return on the aggregate (world) bond portfolio corresponding to these figures is about 150 points above the U S Treasury bill yield For details of the model used for these calculations, see Lewis (1988)

[17] The model for these estimates extends the standard capital asset pricing model to an international context and allows for the effects of real exchange rate variability and differing investor consumption preferences, see Lewis (1988) The estimates are derived from the variances and correlations of (real) bond returns and exchange rates for the period Figures for different intervals will generally differ from those in the table because of the differences in the distribution of the asset returns The framework used here is essentially the same as that used in Hung, Pigott, and Rodrigues (1989) to estimate the potential effects of the accumulation of U S debt to foreign countries

[18] By comparison, since the 1920s, the annual returns on U S common stocks have exceeded the yield on U S Treasury bills by an average of 6 percentage points, while government bond yields have averaged about 1 percentage point over the bill return (see Ibbotson 1992) Nevertheless, differential returns are highly variable, even across decades The return differentials for short-term assets implied by this analysis are even smaller than those shown in Table 3 since short-term assets are largely free of price risk

[19] Indeed, the Fama evidence cited earlier implies that risk premia, if viewed as the sole source of observed uncovered return differentials, are the dominant contributor to fluctuations in national short-term interest rates This implication is both remarkable and implausible, it is hard to see why the normal determinants of domestic interest rates should be so strongly associated with risk

[20] Generally, empirical applications of capital asset pricing models (including consumption-based versions) have not been able to explain observed return differentials either domestically or internationally, and their underlying assumptions are quite often statistically rejected See, for example, Engle and Rodrigues (1989) and Lewis (1990) Moreover, research to identify the underlying economic determinants of asset price volatility, asset risks, and risk premia has barely begun

[21] Frankel and Froot (1989, 1990) and numerous subsequent papers have demonstrated considerable biases in market forecasts of exchange rates as measured by surveys Forecasts over near-term horizons tend to draw heavily on recent experience Earlier studies have shown a similar pattern in surveys of expected inflation

interest rate differential[22] The return differences, which can be viewed as the risk premium between the dollar and foreign currency assets that market investors expect to receive, appear to be quite substantial, indeed comparable in magnitude and variability to the historical return differentials shown in Table 1. In short, the survey data (assuming they reasonably represent expectations) seem to confirm the impression from the ex post return data that investors believe that substantial currency-associated risk premia exist. But the question raised earlier remains: Why are these apparent risk premia so large compared with those predicted by standard theoretical frameworks?[23]

Overall, therefore, uncertainties remain about differences in uncovered returns among assets denominated in alternative currencies as well as the effects that financial integration has had on these differences. Significant and variable common-currency return divergences apparently have persisted, but we cannot say to what degree currency risk factors or market expectations are responsible, individually or collectively, much less what the basic economic determinants of the divergences are

Before closing, however, we note that these uncertainties are not peculiar to international comparisons or foreign exchange markets. Systematic divergences among returns on bonds, stocks, and indeed a wide range of assets have long been observed in domestic markets in the United States as well as abroad.[24] Attempts to attribute these divergences to risk or other factors have likewise met with only limited success. As here, these divergences have suggested to many analysts that the determination of asset risks and expectations may be much more complex, and financial markets much less "efficient," than was previously thought

[22] The premia shown are calculated as the difference between the three-month U S and foreign interest rates for the date of the survey, less the (consensus) expected dollar depreciation over the next three months The survey data are from Consensus Forecasts, various issues

[23] An alternative possibility is that deviations from uncovered interest parity reflect market expectations about discrete events, such as major policy shifts, that occur only infrequently but have large impacts on asset prices if they materialize (See, for example, Evans and Lewis 1992 ) The situation of the Mexican peso during the 1980s is often cited as an example Mexican rates were substantially above those for some time in large part because of market perceptions that a devaluation was inevitable Thus, for a substantial interval before the actual devaluation, dollar returns on peso-denominated instruments were consistently higher than the returns on comparable U S alternatives Deviations from uncovered interest parity seem so pervasive, however, that such factors could only be responsible in fairly isolated instances

[24] A provocative analysis by Cutler, Poterba, and Summers (1990) reveals several stylized facts common to a wide range of asset markets, including those for foreign exchange and those for art and other collectibles These facts are 1) systematic persistence of excess returns over the near term, 2) some tendency for those returns to be reversed ("mean reversion") over longer periods, and 3) a tendency for actual asset prices and returns to converge over the long run with the values predicted by economic fundamentals (according to some model) The latter two tendencies, however, appear to be considerably weaker than the first

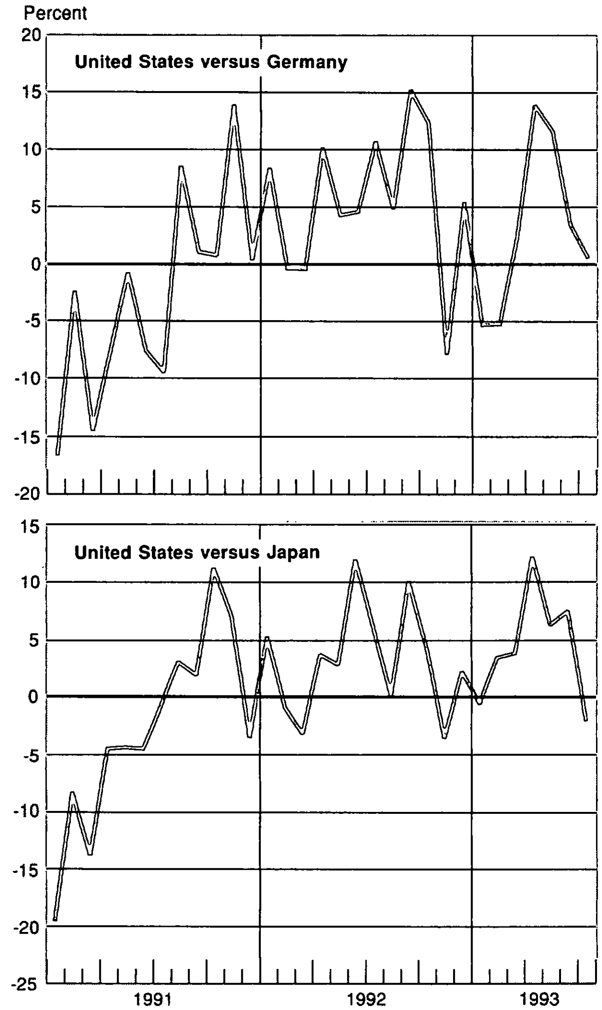
Quite possibly, complexities of this sort may be more important in international financial markets, given their shorter history and more limited experience relative to domestic financial markets, but they probably are not unique

## Conclusions

There can be little doubt that financial markets across the

Chart 4

**Ex Ante Return Differentials in Dollars Implied by Surveys of Market Expectations**




Notes The ex ante dollar return difference is the U S -foreign interest differential less the survey's consensus forecast of the rate of dollar depreciation over the three months to maturity, expressed at an annual rate Interest rates are returns on three-month Eurocurrency deposits Market forecasts of currency movements are from *Consensus Forecasts* world have become highly interdependent. News about conditions in one country's markets typically has repercussions in foreign exchange markets and nearly as often in the domestic money, bond, and equity markets of the country's partners. So rapidly do these reactions among markets occur that an observer of their daily movements might easily conclude that domestic and foreign interest rates are directly and very closely linked

We have seen that financial integration has indeed had important and tangible effects on international interest rate relations Most obviously, integration has nearly eliminated covered interest differentials among the major markets of the industrial countries

But we have also seen that, largely because of the existence of multiple currencies with changeable relative values, the effects of integration on the international economy are much less straightforward than they are within any single country In the international environment, there are several distinct relations among interest rates that are jointly determined by the currency regime, market perceptions about currency fluctuations, and countries' macroeconomic conditions. Localized fluctuations in credit demands or supplies that would be transmitted directly across markets within a single country are, in the international economy, more often than not substantially absorbed in foreign exchange markets. Thus in principle—and as the evidence reviewed here strongly suggests, in practice—financial integration need have little if any impact on divergences among national interest rates, except where exchange rates are fixed or very nearly so

Financial integration has also led to considerable international diversification of financial holdings. It thus seems plausible to expect that national interest rate differentials would tend to be offset by exchange rate changes, so that average returns on comparable assets would be substantially if not completely equalized when expressed in a common currency In fact, however, return differentials recorded over the last two decades appear to have been sizable and systematic. Little is yet known about the exact nature of these differentials or how they are determined in particular, they seem to be too large and variable to be explainable purely in terms of risk considerations — at least as they are presently understood. These findings raise questions about the formation of investors' expectations and the assessment of risk quite similar to those encountered in analyses of the term structure of interest rates or the pricing of equities. Thus the issues posed by the international integration of financial markets, while new in certain respects, are in others quite familiar

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