International credit market connections

Some test cases show how credit markets couple and decouple constantly, creating a complex web of international financial relationships

Steven Strongin

International credit markets create a sense of mystery that few economic institutions can match. As the old joke goes, "Only two economists understand international finance—and they disagree." Today that sense of mystery has become more frustrating. International events now generate immediate and obvious consequences in U.S. markets on a daily basis. Early morning business broadcasts report overnight events in foreign markets in detail and with an urgency that a decade ago would have been reserved for wars or diplomatic crises.

While it is easy to see that events move around the globe through the international markets as one market closes and the next one opens, it seems to work differently every time. One time, Japanese rates go up and U.S. rates go up in lockstep and the analysts discuss how world credit markets have become "a single market, each market tightly coupled with its international counterparts." The next day, Japanese rates go up while U.S. rates fall and the analysts talk about shifts in investor preferences and political uncertainties and theorize why the markets have become "decoupled."

The importance of the links between the international credit markets are self-evident in today's highly integrated financial world. Every two weeks on the CHIPS wire, the financial link between London and New York, there are enough credit flows between the two countries to purchase the combined GNPs of both countries. However, these links are slippery, appearing to defy normal notions of logic and consistency. It sometimes seems as if the international markets have a will of their own. Indeed, analysts often talk of the market doing such and such as though it were a sentient being instead of an organized exchange where investors buy and sell.

In truth, there is very little mystery and the mechanisms that control the linkages between markets are actually quite simple. Supply and demand work much the same way in international credit markets as they do in any other market. The impression that the markets are mysterious is an illusion created by the large number of things going on at any one time. Press explanations of international credit markets, perhaps due to some misguided notion of simplicity, often leave out key details and baffle the observer. Much like the magician, the pundit, by keeping part of the action obscured, leaves the audience open-mouthed with disbelief at the conclusion.

This article explores the relationship of highly integrated credit markets to provide a better understanding of exactly what is going on in international credit markets. It does so by examining four cases that are constructed with only one factor changing. It then shows that by mixing the four types of events analyzed it is possible to understand more fully how international markets' linkages operate and why those linkages often produce seemingly inconsistent outcomes across time. The

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cases are similar to current events, but are simplified to make the analysis clearer.

Some readers may find that the hypothetical cases presented both oversimplify the present structure of international markets and overstate the degree of integration that actually exists. This is done on purpose. The point is that even in such a hypothetical world, where markets are completely integrated and efficient, international markets will still not march in lockstep and that important information is lost by reducing our world view to "one world market." However, after the four cases are presented, it is argued that almost any real-world international credit shock can be viewed as a combination of the four presented.

In each case the question asked is, how are U.S. markets affected by foreign events? In each case a specific country is treated as the rest of the world. In the first case, for example, Japan is so designated. This in no way affects the analysis. It does, however, simplify the exposition.

A short note on jargon

Writing on international markets is filled with terms that seem to shift meanings with the seasons. In this article, jargon is kept to a minimum, but some of the most overused terms are kept in order to provide the reader with some notion of how these terms may or may not apply to actual events. The definitions of the slipperiest terms follow.

Coupled markets are markets which move together in lockstep; for example, if Japanese rates go up by 2 percentage points, then U.S. rates will go up by 2 percentage points. *Weakly coupled markets* are those that always move in the same direction, both up or both down, but not necessarily in the same increments. *Decoupled markets* are markets that someone once claimed were coupled, but move in opposite directions in response to some specific event or over some period of time.

The *market* refers to the short-term debt market of the given country. Thus, the U.S. *market* would be the market for short-term debt denominated in dollars and sold in the U.S. The German *market* would be the market for short-term debt denominated in marks and sold in Germany. The special requirements for comparing markets denominated in different currencies is discussed in an accompanying box.

Case 1: Japan tightens credit

Assume an action by the Bank of Japan that restricts credit in Japanese markets. The result: World interest rates rise, in response to a reduction in world credit supplies. This key outcome can be seen in Figure 1.

The economics of this are simple supply and demand. The world supply of credit is simply the sum of the credit supplied by each country at a given rate of return. In this case,

$$\text{Supply}_{\text{World}} = \text{Supply}_{\text{US}} + \text{Supply}_{\text{Japan}}.$$

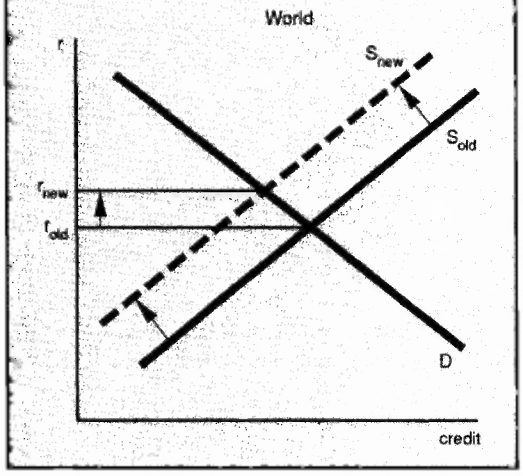
World demand is the sum of the demand within each country:

$$\text{Demand}_{\text{World}} = \text{Demand}_{\text{US}} + \text{Demand}_{\text{Japan}}.$$

Viewed as a single world market, a reduction in Japan's supply of credit directly reduces the world supply of credit. It should be noted at this point that the r in Figure 1 and all subsequent figures is the risk-adjusted (including exchange-rate risk) real return on capital. It must, thus, be equal or nearly equal across nations. At various points, it will be important to draw a distinction between this rate and the observed nominal rate which is affected by country-specific risks and inflation expectations. The use of r in this form is really an assumption that international markets are well-integrated and efficient. For the countries in question, this is probably a reasonable assumption (see accompanying box for a more in-depth analysis of this issue).

FIGURE 1

When Japan tightens credit, world rates rise



Adding up quantities of credit across nations

There are a number of ways of thinking about international markets that look very different formally, but are actually the same once you brave the mathematics. In the accompanying analysis substantial use is made of supply and demand analysis. Supply and demand has a long and venerable tradition in economics, but in the international case it glosses over two fairly important issues. First, how do you add quantities of credit that are valued in both yen and dollars, sometimes hedged, sometimes not? Second, how do you compare interest rates across countries when the debt instruments are valued in different currencies and subject to different risks and taxes? The full answer to these questions is clearly beyond the scope of this article, but the problems, at least for the cases discussed in this article, are not that difficult.

International finance typically concerns itself with questions about the efficiency of international credit markets, where very exact and precise treatment of inflation and tax differentials are necessary, and measurement of risk is the keystone of the analysis. In this article, we are trying to understand how events in one country's credit market can affect the credit market in another, and how changes in relative risk affect international markets. Thus, we can deal with these very difficult issues of international finance by assuming that international markets are efficient and by reducing the problem to the essentials of changes in the cost of capital and real flows of capital. Nevertheless, some explanation of how this is done is appropriate.

Central to understanding how we can add yen markets and dollar markets together without getting deeply mired in issues of currency valuation is the observation that credit markets are actually goods markets seen though the veil of money. Credit relates directly to the goods that are purchased. You supply credit if you consume less than you make. You demand credit if you consume more than you make. Anything more complicated cancels out when the accountants finish counting.

Thus, from an international perspective a country that produces more than it consumes is a net exporter of goods as well as credit and a country that produces less than it consumes will be both a net importer of goods and capital. The supply of credit can be thought of as the excess supply of goods and the demand for credit as the excess demand for goods. So when we add up the credit demands in two countries we are adding up the excess demand for goods and the excess supply of goods. It doesn't really matter if a ton of steel is valued in yen or in dollars, it is still a ton of steel.

Clearly, countries produce and demand different goods. Some goods are only internal to the country, such as land, and some goods are difficult to move from one country to another, such as legal services. Nevertheless, from the standpoint of international trade the adding up is valid. It is, after all, only the unconsumed traded goods that move between countries and match to the international credit flows. These other technical issues simply demonstrate why currency valuation is so complicated, since it is in the process of currency valuation that all technical issues are balanced out with movements in the international goods markets. They also show why simple notions of purchasing power parity seldom work.

In the end, international credit flows match international goods flows. Nobody borrows money just to hold it. If the foreign credit is used to buy imported goods, this is obvious. If the foreign credit is used to buy securities (Japanese purchases of U.S. Treasury bills for example) or domestic goods, then they are supplying cash or credit to someone who will buy other goods. If the country as a whole is consuming more than it makes, eventually those borrowed funds will be used to buy foreign goods. ("Goods" here is used in a general sense of all goods and services, as well as sales of assets.) In other words, you make what you can. You trade for what you cannot make. And only then do you borrow. And then it can only be to buy something that someone else makes.

In the official trade accounts, there is a difference between the current account in goods and services and the capital account. This number is labeled statistical discrepancy and represents the limitations of the trade statistics, not any real economic phenomenon.

Comparing interest rates across nations

To examine comparable interest rates, you have to reduce the price of credit to the opportunity cost of capital in international markets. In terms of real performance, the important question is the cost of investing in new capital. So the r in a supply and demand context is the cost of buying credit in order to finance capital acquisitions in a given market. What is the relationship between the domestic nominal rates we observe in the market and the opportunity cost of capital? The answer is complicated, but not hopelessly obscure.

Risk factors, taxes, and inflation all play a role in comparing debt instruments across countries. Inflation and taxes are conceptually the simplest problems to address. Rates should be compared on an after-tax basis. After all, the real cost of capital

is what is costs after the government has taken its share of the profits.

Unfortunately, it is rarely possible to calculate an after-tax return because the tax codes are sufficiently complicated that the after-tax rates differ from individual to individual, let alone country to country. Luckily, for most purposes we can ignore the tax effects, because there are no differences between funds raised domestically and those raised in foreign markets. Interest costs may be deducted from income regardless of the source of funds. So as long as the tax codes are not changing, the tax effects act as a constant or nearly constant distortion between observed U.S. rates and foreign rates, a kind of slow-moving fudge factor. Taxes can be extremely important over the long haul, but are rarely important over the short spans of time in which credit markets typically operate. Large changes in tax laws are an exception, but they luckily do not happen often and usually cause only a short-term breakdown in the relationships discussed in this article while the markets adjust.

Inflation needs to be dealt with more directly. Investors care about real returns, not nominal ones. Since the actual return on investment is the return after taxes and inflation, investors are interested in the expected return net of inflation and taxes. Thus, in a very simple world of constant marginal taxes and constant inflation, a country's real rate of interest must be adjusted for its rate of taxation and inflation by the following formula:

$$r = (1-t)(i-\pi)$$

where r is the real after-tax rate of interest; i is the observed nominal rate of interest; π is the rate of inflation; and t is the tax rate. In the real world, taxation is much more complicated although it can usually be ignored for our purposes. Expected inflation is much more volatile and unfortunately not directly observable. Nevertheless, there is a broad notion in the equation that, as long as nominal rates increase to fully reflect expected inflation, there is no effect on real rates. This is a good starting place for analysis. Put simply, if the inflation in one country goes up and nominal rates also go up by the same amount, the actual cost of capital is unaffected and there are no real economic effects. Mathematically, if i and π go up the same amount, r is unaffected. Depending on tax issues and other factors this may not always be strictly true, but, given the general level of precision in these models, it is a good working assumption and for most of the observed inflation rates in major industrialized countries fairly accurate.

Risk is a more subtle problem. Taxes, currency valuations, and inflation do not stay the same. As a result, investors require compensation for the risk they assume in a given debt instrument. International rates can only be compared when the differences in relative risk have been taken into account. A country where risks are greater will have to pay more for international funds. Risk can take many forms: worries about central bank behavior, taxes, or simple liquidity worries.

The key thing to understand about these potential problems is their effects on credit flows. Anticipated inflation, for example, will raise nominal rates and leave real rates unchanged producing no effect whatsoever on the graphs in the article. The risk of a sudden increase in inflation, on the other hand, will raise real rates and scare away credit, since the suppliers of credit will demand compensation for the potential of inflation.

If there is a chance that there will be a sudden increase in the price level due, for example, to a currency conversion as is occuring in Germany in 1990, nominal rates will rise to reflect the expectation of higher inflation. If the inflation does not occur, lenders will profit and borrowers lose. If the inflation does occur the opposite takes place—borrowers gain and lenders lose. The uncertainty about inflation makes debt contracts in that particular currency more risky. As a result, investors will prefer other currencies at the margin, regardless of which side of the contract they intend to be on. Moreover, since lenders tend to be more mobile in terms of switching from market to market, this will cause rates to rise in the riskier market. From the standpoint of the borrower, one way to think of this is that in order to achieve the same level of risk, it would be necessary to pay both for the expected inflation and for a currency hedge where the cost of the currency hedge is directly related to the amount of uncertainty.

In general, the way to separate events that affect international credit markets from those that do not is to examine the risk faced by international investors in a debt contract denominated in one currency relative to another. If the event raises the relative risk, then real effects on international credit flows are likely to follow.

Risk-induced changes cause investors to favor one country over another and create real changes in the relative cost of capital. In the pure inflation case, investors simply require an adjustment in the interest rate to compensate for inflation. This is exactly offset by the borrowers' ability to pay back their debts with cheaper inflated currencies. Inflation only causes a change in the units of measure but risk of inflation changes the actual costs. This is made more explicit in Cases 3 and 4.

The analysis of each country's individual market is somewhat more complicated. For example, the supply within each country's market is not what that country supplies, but the world supply minus the credit demanded by all other countries.

$$\text{Supply}_{US} = \text{Supply}_{World} - \text{Demand}_{Japan}.$$

The reason is that, within a country, capital is supplied both to foreign borrowers and domestic borrowers. Available to domestic borrowers is the domestic credit that remains in the U.S. plus what is left over from foreign markets. Each country can only borrow what other countries do not.

Thus, in Figure 2, the reduction in Japan's supply of credit enters the U.S. market as a reduction in U.S. supply. The inclusion of the rest of world demand assures us that after the fact r will remain the same across nations. Before examining some of the further implications of a Japanese tightening it will be useful to introduce the second case to provide a basis for comparison.

Case 2: Germany needs more capital

Case 2 follows the recent pattern of events in Eastern Europe. Assume Germany faces a substantial increase in its opportunities for profitable investment and thus increases its demand for credit. In terms of world supply and demand, this is a simple increase in demand and raises world interest rates. But, analyzing the effects in each market individually shows a different picture.

In Figure 3, the German panel shows the demand shift in German markets. This is identical to what the world market supply and demand diagram would look like. However, in the U.S. panel the shift is in the supply curve. This follows from the country-specific supply equation described in Case 1 adapted here for the German case.

$$\text{Supply}_{US} = \text{Supply}_{World} - \text{Demand}_{Germany}.$$

From the U.S. standpoint, there has been no demand shift; there has been a reduction in the available world supply of credit. Intuitively, the U.S. experiences this reduction, not because the world supply of credit is less, but because less of the world supply is available after Germany finishes its borrowing. Thus, the credit market consequences in the U.S. are the same as in the Japanese case in which the actual supply of credit was reduced. For the U.S. credit markets, it does not matter whether there has been a reduction in world supply of credit or an increase in world demand for credit. In both cases, rates rise to equalize the return to capital across countries.

These two cases are not completely identical, but from the standpoint of the U.S. credit markets their outcomes are the same.

Secondary outcomes: Cases 1 & 2

In both cases, U.S. growth will be lower because of higher credit costs. However, in the German case there will be increased export demand, which will offset part or all of the effect from higher interest rates. In the Japa-

FIGURE 2

When Japan's credit tightens, U.S. credit supply drops

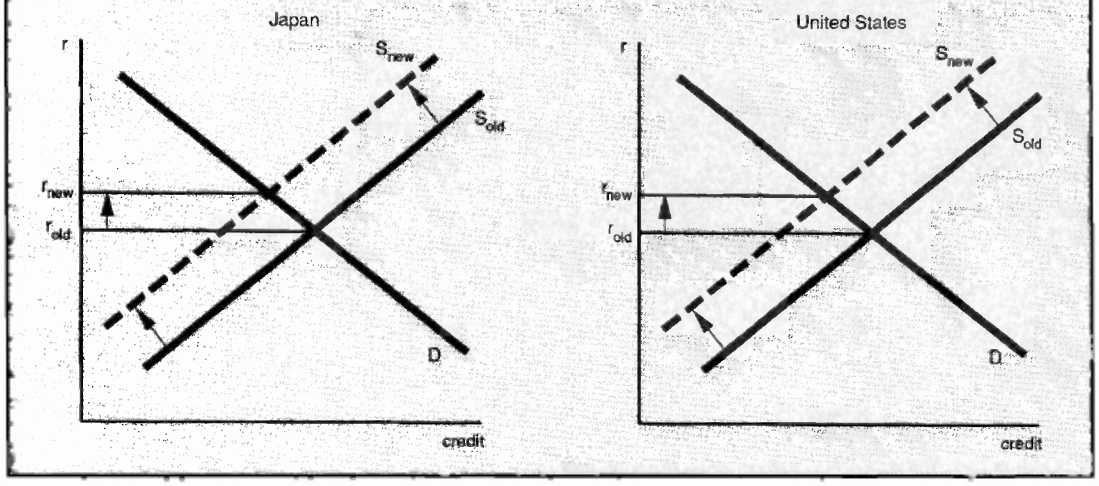
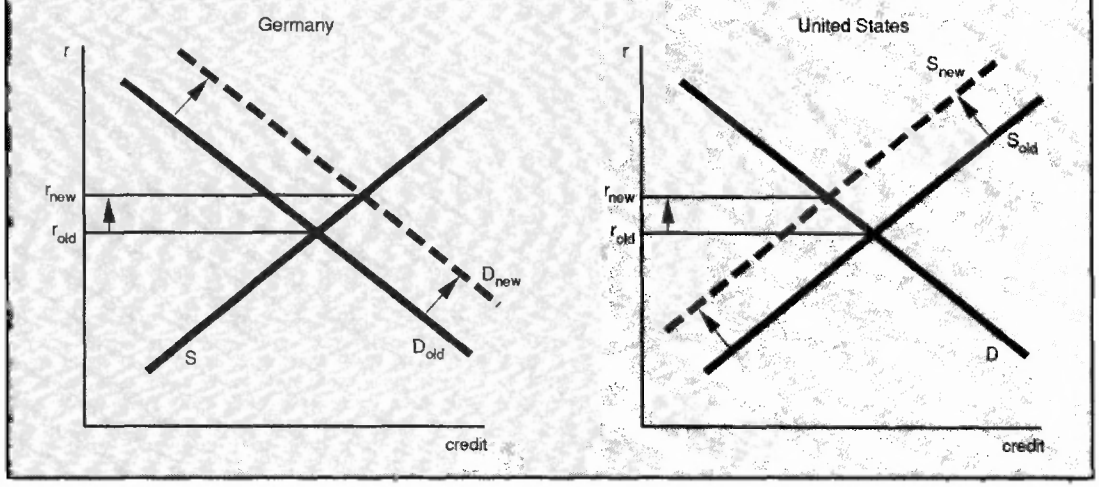


FIGURE 3

When Germany demands more credit, U.S. credit supply drops



nese case export demand will fall, which will reinforce the higher interest-rate effects.

The differences in the two cases arise from the fact that world supply and demand for goods and services are different in each case. In the German case world demand for goods is higher, while in the Japanese case world demand for goods is lower. As a result, world and country-specific inflation pressures will be higher in the German case, while in the Japanese case inflation pressures will be lower.

But, in terms of nominal interest rates, the German case will cause a somewhat greater rise in U.S. interest rates. This occurs because inflation, due to increased world demand for goods, and the real cost of capital are moving in the same direction. In the Japanese case, the reduced inflationary pressures will slightly offset the real interest-rate increases.

The effects on profits and the stock market are also different. In both cases higher rates cause future profits to be discounted more heavily, but in the German case this is offset (perhaps more than offset) by higher expected profits. In the Japanese case expected declines in profits cause an even deeper decline in stock values.

Exchange-rate effects are the same in Cases 1 and 2, but the mechanisms are quite different. If exchange rates are viewed as the relative price of two currencies, then in the German case the mark rises because there is greater demand for marks, due to higher real growth and the subsequent increase in demand for transactions deposits in Germany. In the Japanese case, the yen rises because its supply has been reduced. So, despite the fact that the channel is quite different in each case, a rise in rates causes the foreign currency to appreciate. (It should be noted that in both cases U.S. interest rates rise and the dollar falls. The positive interest-rate-to-currency effects are limited to the originating country. They are exactly opposite for the receiving country—the U.S.)

This interest-rate-to-exchange-rate relationship, which could be called the "normal" relationship, is reversed in Case 3.

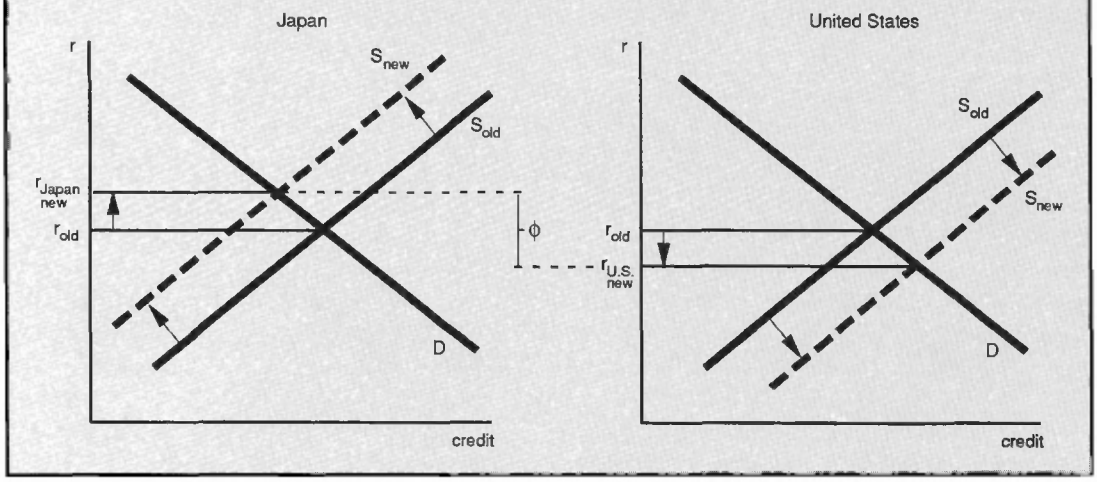
Case 3: Investors lose faith in Japan

Assume that international investors lose faith in the ability of Japan to maintain the steady growth and generally orderly markets it is famous for. Such a loss would in turn cause investors to demand higher risk premiums for investing in Japan. In terms of the previous diagrams, the original equilibrium in both countries is the same, but now the supply of credit in Japan falls while the supply of credit in the U.S. increases, as in Figure 4.

As a result, r is no longer the same in both countries, but is lower in the U.S. than in Japan. The reason for this has to do with the way r is constructed. In the previous cases, r was adjusted for all risk factors so that returns were equalized across nations. In this case, the adjustments are made for conditions prior to the shock, but afterwards an additional

FIGURE 4

Loss of confidence in Japan produces credit rate differential



premium is necessary to adjust for the now higher risk in Japan. Quantitatively, the new risk in Japan makes investors want a higher return for bearing that risk. The exact premium is the difference between the new U.S. rate and the new Japanese rate, ϕ percentage points in Figure 4.

Operationally, investors' willingness to lend to Japan is reduced by ϕ relative to their new willingness to lend to the U.S., that is, previously they would lend to Japan if r was higher in Japan and to the U.S. if r was higher in the U.S. Now they will lend to Japan only if r in Japan is at least ϕ percentage points higher than in the U.S.

In order to examine later events, both the Japanese supply and demand curves would both need to be shifted straight up by ϕ to match the U.S. curves in terms of r. This upward shift will then re-equalize the risk factors and incorporate the market's current assessment of the relative risks of Japanese versus U.S. securities. This is, in essence, exactly how the risk-adjusted curves are derived in the first place.

As a result of the shift in relative real rates, a number of consequences occur which are quite different qualitatively from the previous cases of increases in foreign rates. Lower U.S. rates cause U.S. growth to increase. Higher Japanese rates make Japanese growth fall. The increased growth in the U.S. causes an increase in the demand for money in the U.S., while reduced Japanese growth lowers the Japanese demand for yen. Thus, while Japanese interest rates rise and U.S. interest rates fall, the dollar appreciates. This is exactly contrary to the previous two cases, but makes perfect sense. If Japan is seen as riskier, it both devalues the yen and raises Japanese interest rates.

Thus, it begins to be clear how the linkages between markets can create very different results at different times. Events such as those in the first two cases, when the supply and demand for credit within one country change, cause rates to move together world-wide and the currency of the country whose rates went up first to appreciate. In this third case where investor preferences between countries change, the exact opposite happens. Rates move in opposite directions and the currency of the country whose rates increase actually depreciates, contrary to the normal notion of higher rates meaning higher values for currency. An interesting irony is that so-called domestic events such as those in Cases 1 and 2 produce what appears to be tightly coupled world capital markets, while truly international events such as those in the third case produce the appearance of decoupling.

Just within the context of these three very simple cases it is clear that strong international linkages are consistent with almost any pattern of interest rate and currency movements depending on what type of events precipitate the changes. It isn't that the rules change, it's that different types of events lead to different outcomes. Hardly a surprising result.

Case 4: Country-specific inflation

The cases until now have covered basic ways in which changes in one country or investors' views of that country can have effects on other countries. The last case spends a little time on a change that does not have important international implications but that is often thought to be very important.

Assume that, due to reunification, Germany will have an increase in its price level of 10 percent over 5 years. Obviously there will be some risk associated with this that will cause effects similar to those analyzed in Case 3. Beyond the risk effect, however, there is very little effect in terms of international capital flows.

In the supply and demand diagrams used in this article, r is adjusted for known differences in inflation and expected changes in exchange rates. In the case of a perfectly anticipated increase in inflation as assumed in the present case, all that happens is that nominal rates in Germany rise by an average of 2 percentage points a year for 5 years to cover the additional inflation (Forward exchange rates will incorporate an additional average 2 percent a year depreciation to adjust future exchange rates to the greater inflation as well.) Nothing else changes. Therefore, the diagrams do not change.

The reason for this is that investors care about the purchasing power of their investments, not about the number of pieces of paper they have at the end of the day. As a result, as long as nominal rates rise enough to cover inflation, nobody cares. Investors are compensated by the higher rates, borrowers are willing to pay the new higher rates because they will pay off their loan with cheaper currency. It all cancels out. Nominal rates in Germany change and the mark depreciates in the future when the inflation actually occurs, but that's all that happens as long as German rates adjust to compensate fully for inflation.

To the extent that German monetary authorities do not fully adjust short-term rates to accommodate the increase in inflation there will be some additional consequences. This is exactly the mirror image of Case 1 where Japan tightens credit. The failure to let rates fully reflect the rise in inflation is the equivalent to lowering rates by easing the supply of credit and real rates fall. Thus, the value of the mark would fall and world real rates would decline. This is a simple illustration of the fact that constant short-term rates do not always mean constant policy.

Putting it all together

The four cases examined were each designed to highlight specific aspects of the transmission of credit market shocks through international markets. The real world is, of course, far more complicated. However, by taking the examples described above and applying them to a real-world case, it should become clear why the descriptions of international market behavior in the business press can often be seriously misleading and seemingly inconsistent.

Take the case of the release of new CPI numbers in the U.S. Suppose those numbers come in below expectations and this is taken as a sign that inflationary pressures are less than had previously been assumed. The analysis in Case 4 would suggest that this would cause U.S. nominal rates to fall by precisely the reduction in inflationary expectations. Real rates would remain the same both in the U.S. and in foreign markets as well. The dollar would remain steady as neither the supply nor demand for money in the U.S. or anywhere else would have changed. (There could even potentially be a small rise in the dollar because inflation acts as a small tax on non-interest bearing types of money and the reduction in inflation would generate a small increase in the demand for U.S. currency.) With U.S. interest rates falling, foreign rates steady, and the dollar steady or rising, the markets would be said to be decoupled.

In reality, the response would be more complicated. The reduction in inflationary expectations would have an impact on expected monetary policy. Depending on current policy, it would either reduce the pressure to tighten or generate some expectation of lower rates. In either case it would create the expectation of a larger-than-expected supply of credit in U.S. markets. This would generate effects that mirror those in Case 1. World rates would fall as easier U.S. monetary policy would increase the world supply of credit. Thus, rates would fall everywhere, although nominal rates would fall more in the U.S. than in foreign markets due to the lower inflation. In addition, the dollar would fall due to an expected increase in the supply of dollars

relative to foreign currencies. Thus, if the Case 1 effects dominate, the markets would be said to be weakly coupled.

If, for political reasons, the lower inflation made it likely that many of the world's central banks would engage in a coordinated easing, then both foreign and domestic rates would fall together and the markets would be said to be tightly coupled. The dollar would rise rather than fall because other central banks would also be increasing the supply of their currencies, but only the U.S. would have lower inflation expectations to offset this effect.

Further complicating this situation, if the coordinated actions were viewed as inappropriate by the markets because of the substantial inflationary pressures that might, for example, occur in Germany, German rates could actually rise due to the increased risk in holding German securities, as described in Case 3. In such a case, Germany would be said to have become decoupled from the rest of the international market.

Yet, in all of these possibilities international markets have been treated throughout as one integrated market. The problem with all this talk of coupling and decoupling is that it misses the richness of the dynamics of the international credit markets. The four simple cases presented in this article are capable of displaying an enormous range of outcomes depending on how they are mixed. It is not that what is going on in international credit markets is so complicated; it is that so many different things can happen at the same time that disentangling the effects of a specific event is nearly impossible.

Conclusion

While it is not possible fully to discern what effects international events will have on U.S. markets, the surface randomness of market responses should not be all that disturbing. It is important not only to keep track of what the markets are doing, but why they are doing it.

Almost any specific international financial market shift in exchange rates or interest rates can be explained by more than one combination of the cases described above, which cover changes in both the supply and demand for credit as well as changes in relative preferences of investors between countries and the effects of inflation. However, the real economic consequences differ significantly depending on sources of the international disturbances. Thus, while international markets have become increasingly important for our economy and for the process of policy formation, the lack of a clear simple relationship between events in foreign markets and our own economy means that foreign developments have to be analyzed in terms of their likely sources and consequences and do not, in themselves, tell us very much.

Unfortunately for proponents of international coordination of monetary policy, this means that international market movements do not map smoothly into policy actions. Seemingly equivalent market movements can have radically different implications for individual economies and thus require substantially different policy actions. It is only by examining the sources of international developments and projecting their effect on the various affected economies that policy implications can be determined.

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