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Recent U.S. current account deficits represent a net inflow of foreign saving to help finance our government budget deficits. Budget deficits have raised domestic real interest rates and the real value of the dollar, causing the deterioration in our current account balance. Eventually our real interest rates should fall back toward world levels as foreign saving inflows increase. But, contrary to conventional wisdom, large U.S. current account deficits will probably remain as long as our budget deficits persist.

Over the last several years, the United States economy has seen record highs in federal budget deficits, real interest rates, the dollar and trade deficits. Last year, the federal budget deficit climbed to $195 billion, more than 5 percent of GNP—the highest rate of the postwar era. The federal deficit this year is expected to be about $170 billion. U.S. real interest rates remain far above past historical averages, while the dollar recently reached a ten-year high against the German mark and British pound. Our current account deficit, measuring the difference between our imports and exports of goods and services, will probably reach $90 billion for 1984—an all-time record. And to finance this deficit, our nation will have to borrow an unprecedented amount from abroad.

Many solutions have been proposed to deal with individual problems arising from these conditions. Growing fears that trade deficits, and the associated loss of jobs and markets for U.S. export industries, are “de-industrializing” America have added considerably to protectionist pressures. Improving our trade deficit was also an objective of the recent U.S.-Japanese agreement to reduce Japan’s barriers to international capital flows.

Increasingly, though, deficits, high interest rates, and the dollar are being viewed not as isolated problems to be dealt with separately, but as closely related consequences of a common cause—government fiscal policy. Many analysts believe that federal budget deficits, by pushing up domestic interest rates, are ultimately responsible for the strong dollar, itself the major cause of the nation’s declining international competitiveness and rising trade deficit. This view suggests that only by balancing the budget can the other problems be fundamentally and permanently resolved.

Still, there remains considerable controversy over whether the budget deficits’ impacts are really this pervasive, and over what continued deficits may mean for the future. Some analysts believe that increased business investment yields resulting from recent tax cuts, rather than budget deficits themselves, are mainly responsible for our high real interest rates. Others argue that the high dollar is more a reflection of foreigners’ flight from political and economic problems in their countries than of
the attractiveness of high U.S. interest rates. There is also a very widespread view that our current account deficits cannot be sustained much longer, leading to predictions that the dollar must soon fall substantially to bring our international trade back to balance. Yet others argue that our external deficits, far from being an economic problem, have actually been beneficial by allowing domestic investment to remain strong despite the increasingly enormous credit demands from the government.

These controversies raise the fundamental question that is the focus of this paper—what are the impacts, short-term and long-term, of budget deficits in an open economy, one with trade and financial ties to abroad? In attempting to answer this question, our analysis begins with the observation that the current account deficit is not only the difference between our exports and imports, it is also the channel through which foreign saving is brought into our economy to help meet the credit demands of both the government and the private sector. In this way, a rise in the budget deficit may easily (but not inevitably) lead to a current account deficit, depending on the extent to which the government's credit demands are met, directly or indirectly, from foreign as well as domestic sources.¹

In Section I, we develop a conceptual framework relating budget deficits, interest rates, exchange rates, and the current account for an open economy under flexible exchange rates. This framework suggests that budget deficits are likely initially to raise domestic real interest rates which, in turn, push up the real exchange rate. As time passes, this increase in the real exchange rate leads to a current account deficit, allowing foreign saving to supplement domestic saving in financing the budget deficit. In applying this framework to the U.S. (Section II), we argue that this sequence fits our experience of the last several years fairly well, suggesting that budget policy is indeed mainly responsible for our current account deficits.

Since ongoing budget deficits imply an ongoing government need for private saving, our framework implies that, in principle, they can lead to ongoing current account deficits as well. For the U.S., this suggests that our current account deficits may indeed be sustained as long as our budget deficits remain. Furthermore, these external deficits may help reduce, although certainly not eliminate, the economic costs typically viewed as the consequence of budget deficits. In particular, the inflow of foreign saving into our economy should allow our interest rates, and the real value of the dollar, to decline somewhat, and domestic investment to escape substantially, if not completely, being "crowded out" by the government's credit demands.

I. Conceptual Framework

In this section, we develop a conceptual framework to describe how budget deficits may influence the current account and the channels through which this influence is transmitted under a floating exchange rate regime. Our theory applies the modern asset market approach to exchange rate determination (for example, Dornbusch, 1976, Isard, 1980) to the static short-term fiscal analysis of Mundell (1962) and Flemming (1962). Our framework integrates and extends recent work on short-term dynamic adjustment of the open economy to fiscal deficits (for example, Blanchard and Dornbusch, 1984, Hodrick 1980, Sachs and Wyplosz 1984) with an analysis of the deficits' long-term impacts. The next section then applies this framework to recent U.S. history. Our analysis is deliberately heuristic and fairly non-technical. More formal and technical analysis is relegated to footnotes and cited references.

A. The Accounting Relation

The basic reason that budget and current account deficits are related is because budget deficits represent a use of saving and current account deficits a source of saving. This may be seen from the national saving identity:²

\[(G - T) = (S - I) + (M + R - X) + (Budget Deficit) + (Private Domestic Saving Surplus) + (Current Account Deficit)\]

The government budget deficit (expenditures less taxes, \(G - T\)) must equal, or be financed by, the excess of private domestic saving (\(S\)) over private
investment \( I \) plus the current account deficit. The current account deficit is the difference between a nation’s expenditures on foreign goods and services (imports, \( M \)) and net transfers (\( R \)) and foreign expenditures on our products (exports, \( X \)). This difference must be financed by borrowing an equal amount of funds from abroad, and in this sense a current account deficit represents a net flow of foreign funds (foreign saving) to our economy.

In flow of funds terminology, the budget deficit and private investment constitute competing "uses" of savings. The "sources" of this saving are private domestic saving \( S \) and the funds from the foreign sector represented by the current account deficit.

It is not only true that a current account deficit requires a net inflow of foreign funds to finance it; a nation can sustain a net financial inflow from abroad only by incurring an equal current account deficit. Net borrowing from abroad effectively amounts to selling foreigners more "IOUs" than we purchase from them. Overall, a nation’s accounts with abroad—trade and financial—must balance. A country cannot be a net borrower of foreign funds (net "exporter" of IOUs) without being a net importer of commodities and services. Thus, a nation can draw on foreign savings for its domestic needs only by incurring a current account deficit.

Taken by itself, an increase in government credit needs might be met partly by borrowing from abroad. This would seem to suggest that budget deficits would inevitably lead to current account deficits. However, the policies or other factors leading to a budget deficit will often affect domestic savings and investment as well. During a recession, for example, although the budget deficit tends to rise, the private domestic saving surplus typically increases even more (because of depressed investment demand). As a result, the budget and current account deficits generally move in opposite directions over the business cycle. Furthermore, government policies underlying a fiscal deficit could have an independent impact on private saving and investment that would make it unnecessary to borrow from abroad. Thus, while there is an important relation between budget and external accounts, there is no rigid mechanical linkage between the two. This means that a budget deficit’s impact on domestic saving and investment demand must be assessed before its implications for the current account can be determined.

**B. Short-run linkages**

The purpose of this section is to trace out the likely short-term effects of a rise in the government budget deficit on interest rates, exchange rates, the domestic saving surplus and the current account. To this end, we begin by sketching a simple outline of the dynamic process. We fill in the details and modify the story in the following section.

Consider the case where the government adopts policies that raise the budget deficit but do not *directly* affect private sector saving, investment or the current account. Initially, a rise in the budget deficit is likely to have expansionary effects on domestic output and employment. An expanding economy, in turn, generates an increased private domestic savings surplus which, to a large extent, may absorb the additional government demand for credit without putting significant upward pressure on real interest rates. As the standard textbook analysis suggests, interest rate pressures are more likely to be averted the larger the degree of unemployed resources in the economy and the stronger the stimulative impact the budget deficits have on output.

Once the economy approaches full employment and the initial output effects of a rise in the government budget deficit subsides, the remaining deficit must be financed from a combination of a rise in the private domestic saving surplus relative to GNP and from an inflow of foreign saving. Further increases in the private domestic saving surplus are unlikely to be forthcoming, however, without a rise in real interest rates. In this instance, credit market pressures arising from the tender of government securities exert downward pressure on bond prices, and real interest rates rise as a consequence. Higher real interest rates, in turn, tend to stimulate private savings (lower interest-sensitive consumption expenditures) and slow investment outlays. Through this adjustment process, budget deficits may at first be financed largely from domestic sources.

This is illustrated in Figure 1, which shows the sources and uses of loanable funds in the domestic economy. The uses of funds represent government and private domestic demands for credit. The sources
of funds (S) represent domestic private saving plus foreign saving flowing into the economy for a given current account deficit. That is, S represents a short-run sources-of-funds schedule. The economy is initially at equilibrium point a, with short-term real interest rate $r^*$ and the uses and sources of funds equal at $F^i$. The increase in the budget deficit shifts out $U^o$ to $U^i$ as the government's demand for funds rises. At unchanged short-term real interest rates, the total demand for funds, represented by point $a'$, exceeds the available supply. Excess demand for funds under normal conditions will increase the real interest rate from $r_1$ to $r_2$, moving the economy upward along $S^o$ as private savings increase, and away from point $a'$ to point $b$ as private credit demands are scaled back.

In an open economy, however, increased foreign savings are also likely to partly finance increased domestic budget deficits. Higher domestic real interest rates, ceteris paribus, will cause investors to attempt to shift out of foreign assets and into domestic assets in order to take advantage of higher domestic real yields. The rise in demand for domestic assets, in turn, will put upward pressure on the domestic currency in the foreign exchange market.

As investors move to sell foreign currency for domestic currency and use the receipts to purchase higher yielding domestic bonds, they bid up the exchange rate.

Real domestic currency appreciation associated with higher real interest rates also represents a rise in the price of domestically produced goods relative to those produced abroad. This weakens export demand and spurs imports, causing the current account balance to deteriorate gradually. Current account deterioration, in turn, is the mechanism that allows foreign savings to begin to supplement domestic savings in financing domestic government budget deficits and private domestic investment. In our diagram, this shifts the short-run sources of funds schedule from $S^o$ to $S^1$ and further to $S^2$. The inflow of foreign savings, which gradually develops as the current account declines, represents an increase in the net supply of domestic assets held by foreign investors.

Thus, although increased foreign demand for domestic assets may at first result primarily in price effects (exchange rate appreciation), the supply (net stock) of domestic securities available to foreigners will also begin to increase as domestic currency appreciation in real terms causes the current account to decline and foreign capital to flow into the domestic economy. However, as the sources of funds schedule shifts outward following the inflow of foreign savings, domestic credit market pressures should ease, allowing real interest rates to fall back toward the world level. This is shown in the diagram as the movement from $r_1$ to $r_2$, and the economy moves through a succession of new short-term asset market equilibrium positions represented by points b, c and d. This suggests that the inflow of foreign savings will play an increasingly important role in financing domestic budget deficits in an open economy.

The preceding describes the general pattern of initial adjustment in an open economy following a rise in the government budget deficit. However, the same pattern would also result from a business tax reduction or other policy that increases the after-tax return on domestic investment but does not necessarily increase the budget deficit. In those cases, private domestic investment demand would rise, leading to real interest and real exchange rate increases similar to those just described. Moreover,
when a policy increases both the after-tax return on domestic investment and the budget deficit, an additional reinforcing and magnifying effect on interest rates and exchange rates would likely be introduced. We now consider in more detail two features of this process: the different roles played by long-term and short-term interest rates and the role played by lags in the adjustment of the current account.

Exchange Rates and Interest Rates. The extent to which the real exchange rate initially appreciates will depend upon market expectations of the duration of government budget deficits and how they influence short-term and long-term real interest rates. The relationship between the real exchange rate and real interest rates may be seen explicitly by considering the equilibrium condition for international trade in assets:

\[ r^* = r - (q - q^e) \] (1)

where

\[ r, r^* = \log \text{of one plus the domestic and foreign real interest rates (yield to maturity), respectively.}\]

\[ q, q^e = \log \text{of the spot and expected future real exchange rate, respectively.} \]

The left-hand side of Equation (1) represents the expected real return (risk adjusted) available to foreign investors for holding a foreign bond, \( r^* \). The return available to foreign investors for holding domestic bonds has two components: the yield on the domestic bond, \( r \) (denominated in domestic currency), less the expected future depreciation of the domestic exchange rate. The expected percentage real depreciation of the currency, in turn, equals the difference between the currently observed real spot exchange rate (in log form) and the spot rate expected to prevail at the point the domestic bond matures and the foreign investor converts the proceeds from domestic to foreign currency.

Equalized expected real returns for similar bonds across countries is the condition for international capital market equilibrium. When Equation (1) holds, this condition is met. The expected real return available on foreign bonds will then equal the expected real return on domestic bonds, adjusted for the expected change in the purchasing power of the currency. Investor arbitrage in international capital markets will cause this equilibrium condition to hold almost continuously.

This equilibrium condition should hold for the full term structure of real interest rates. For example, in equilibrium, a 10 percent rate of return on a one-year foreign security and a 12 percent rate of return on a one-year domestic security indicates that a 2 percent depreciation of the domestic currency is expected by investors over the course of the year. On the other hand, 10 percent and 12 percent annualized real yields on five-year foreign and domestic securities, respectively, suggest that an average 2 percent rate of currency depreciation per year is expected by investors over a five-year period, indicating a total expected depreciation to maturity of approximately 10 percent.

That is important because it suggests that budget deficit policies that lead to an increase in long-term interest rates are likely to have significantly larger impacts on real exchange rates than a policy giving an equal rise in short-term interest rates. For example, consider a one percentage point rise in the domestic 5-year real interest rate, with no change in the foreign real interest rate and no change in the real exchange rate expected to prevail five years in the future (\( q^e \)). This would cause investors to bid up the real value of the domestic currency (\( q \)) by 5 percentage points. The real value of the spot exchange rate in this case rises to that point above the expected future value of the exchange rate where the expected depreciation of the domestic currency (five percent over a five-year period) just offsets the additional return on the domestic security. In comparison, one percentage point rise in the domestic one-year real interest rate (with no change in other expected future short-term interest rates) would lead to a one percent appreciation of the domestic exchange rate, ceterius paribus, thereby setting up an expected depreciation of one percent over the year and restoring net yields on foreign and domestic securities to equality.7

Budget deficit policies that are not expected to be
reversed in the foreseeable future and that lead to significant increases in long-term real rates of interest would, therefore, probably result in a much greater appreciation of the domestic currency than deficits that are expected to be temporary and influence mainly short-term rates. Hence, market expectations of the duration of budget deficit policies in the economy and their influence on the term structure of interest rates will play a major role in determining the extent to which the domestic currency appreciates. 8

Current Account Adjustment Lags. The path of the economy we have sketched is crucially dependent upon sluggish current account adjustment. In particular, lags in the adjustment of the current account to a rise in the budget deficit are primarily responsible for the rise, or “overshooting”, of domestic real interest rates and the real exchange rate above their long-term values. That is, given sufficient time, budget deficits may raise the current account deficit, either directly (as fiscal policies directly alter export supplies and import demands), or indirectly through their impact on real interest rates and the real exchange rate. Typically, though, these adjustments in exports and imports occur only after a considerable lag. In the interim, budget deficits must be financed primarily from private domestic surplus saving; domestic real interest rates then must rise to generate this surplus, driving the real exchange rate above its long-term value.

This process is usually rather lengthy. For example, exports and imports generally take two or more years to respond fully to changes in real exchange rates. 9 However, as the current account gradually adjusts and foreign savings do begin to supplement domestic sources in financing the budget deficit, pressures on domestic real interest rates are apt to ease. Real interest rates and the real exchange rate are then likely to begin falling back toward their long-term values, a process only completed when the current account has fully adjusted. (See Box 1.) Conversely, “overshooting” of interest rates and the exchange rate would not occur if the current account were to adjust immediately. Such immediate adjustment implies that foreign savings could be instantaneously drawn upon to finance the rise in the budget deficit.

C. Long-Term Consequences

Our analysis suggests that increasing inflows of foreign funds through the current account will ultimately ease pressures on domestic real interest rates and the real exchange rate. Where will this process end? And what are the long-term economic consequences of ongoing budget deficits? These questions raise several issues: the sustainability of current account deficits, the long-term consequences of ongoing budget deficits for domestic investment, future output and the economic well-being of the nation’s residents, as well as the ultimate level of domestic real interest rates and the real exchange rate.

In considering these issues, we assume that the government has instituted policies that lead to a permanent budget deficit fixed at some constant fraction of GNP. We also presume that domestic private saving does not rise enough to finance the deficit fully (so there is, at least potentially, a permanent need for foreign saving inflows). Full employment is also assumed since we are considering long-term consequences.

Sustainable? There is a widespread conviction that a nation’s current account cannot sustain a deficit on an ongoing basis, and ultimately must come back into balance. This view implies that an ongoing budget deficit would eventually have to be financed entirely from the surplus saving (S-I) of the domestic private sector; domestic investment (or consumption) ultimately would have to fall to finance the budget deficit.

This presumption would certainly be valid in a world in which there was no saving or growth. Foreign wealth would then be constant, yet each year foreigners would have to allocate an additional portion of that wealth to finance another nation’s current account deficit. Since foreigners would eventually run out of funds to lend, an on-going current account deficit—indeed, an on-going budget deficit—would be impossible in a static world economy.

In a growing world economy, however, foreign saving (which represents the increase in foreign wealth) could finance a nation’s current account deficit indefinitely (provided it did not exceed foreign saving). In this way, foreigners could lend to a
Box 1
Adjustment Following A Rise in the Government Budget Deficit: An Illustration

The theory outlined in the text suggests that a rise in government budget deficits over an extended period is likely to be associated with a rise in domestic real interest rates and with domestic exchange rate appreciation. It is argued that a rise in domestic savings and a fall in investment would allow the deficit to be financed initially from domestic sources, but, over time, foreign savings inflows would finance a significant portion—the speed of adjustment being dependent upon the elasticity of imports and exports to real exchange rate movements. As foreign savings supplement domestic savings to an increasing degree, however, it is argued that domestic real interest rates are likely to decline gradually toward world levels and that the real value of the domestic currency would depreciate.

Several additional assumptions allow us to provide a more specific illustration of the path the economy would likely follow given a rise in the government budget deficit. In particular, we assume that:

1. The current account adjusts more sluggishly to real exchange rate shifts than does net private savings to real interest rate movements.
2. Investors and other market participants are forward-looking in forming their expectations and anticipate perfectly the path of real short-term interest rates dictated by domestic credit market conditions (given the announcement of present and future budget deficits and knowledge of the differential adjustment speed between the current account and net private saving).
3. Monetary policy is unchanged and prices and output in the economy are not influenced by the rise in the government deficit. We also assume that foreign interest rates and prices over the transition period remain unchanged.
4. Foreign investors are willing to invest a significant portion of their savings in the domestic economy at the prevailing world rate of interest for an indefinite period.

Under these conditions, suppose the government announces a previously unexpected fiscal policy, either expenditure increase or tax reduction, that will gradually increase the size of the budget deficit (as a percent of GDP) until it reaches a maximum point at which it is expected to continue indefinitely. This could follow the path illustrated in the top panel (panel a) in Figure 2. This increased deficit must be financed and, given our assumption that the current account adjusts only gradually, net private savings will increase to meet the government’s rise in credit demands. To effect the rise in net private savings, short-term real interest rates would increase through the sale of government bonds in credit markets and thereby dampen domestic interest-sensitive consumption and investment expenditure. As explained in the text, however, the rise in real short-term interest rates will cause the exchange rate to appreciate and the current account to gradually deteriorate, allowing an inflow of foreign savings which supplements net domestic savings in financing the budget deficit. Under our assumptions, the foreign sector will finance a growing portion of the budget deficit and at some point could begin to reduce the need for the expansion of net domestic savings; real short-term interest rates may edge downward as a consequence. An illustration of this pattern for net private savings, the current account deficit and short-term real interest rates is given in panels (b), (c) and (d) in Figure 2.

“Overshooting” of the net private saving balance and real short-term interest rates suggests that real long-term interest rates and the real exchange rate will also overshoot their long-run equilibrium values during the transition period, but will do so by an initial discrete jump followed by a gradual decline, rather than a "hump" pattern. This is because we have assumed that investors anticipate perfectly the path of real short-term interest rates and that they would therefore not attach any "liquidity premium" or risk factor to long-term interest rates relative to short rates. With no uncertainty, arbitragers would
buy/sell long-term bonds until the real long-term rate of return just equals the present discounted value of the stream of real returns associated with holding a succession of short-term bonds in the future. This guarantees that no additional real return may be obtained from holding a succession of short-term bonds over one long-term bond. Thus, long-term real rates would, in equilibrium and with no uncertainty, equal a geometrically weighted average of present and future real short-term rates of interest. 22

Under these circumstances, long-term real interest rates would rise immediately at the announcement of a new budget policy because the expected weighted average of present and future short-term rates is suddenly revised upward at that point. Long-term rates (of a constant maturity) would then gradually fall over time as the weighted average of future short-rates from that point on would decline. Intuitively, this results because, as the long-term rate moves through the transition period of temporarily high (above their long-run equilibrium level) short-term interest rates, a series of high short-rates at the beginning of the period is replaced by a series of expected future “low” short-rates at the end of the spectrum, which in turn gradually bring down the short-rate weighted average and, thereby, the long-term interest rate of a constant maturity.

The real exchange rate will also “overshoot” its long-run equilibrium value under our assumptions, and will follow a pattern mirroring that of long-term real interest rates. This result is consistent with both the term structure of real long- and short-term rates and with the international asset market condition given as equation 1 in the text. Because we have assumed that foreign real interest rates remain unchanged, a rise in domestic real interest rates of any given maturity would be associated with an expected depreciation of the real exchange rate during the holding period of the bond. This equilibrium condition keeps the net return of the domestic bond equal to that available on the foreign bond. Hence, a rise in the domestic long-term real interest rate is associated with long-term depreciation of the exchange rate. This is shown in panels (e) and (f) of Figure 2.

The real exchange path shown in panel (f) is also consistent with the real short-term path in panel (d) because the t₀-t₃ period domestic short rates are all assumed to be above foreign short rates (even during the t₁-t₂ period when domestic short rates decline) and are therefore associated with a succession of short intervals where exchange rate depreciation is expected.

This discussion suggests the open economy’s adjustment to a rise in budget deficits is likely to be
complicated, and that exchange rates and the current account will play important roles. With our forward-looking expectations structure, "overshooting" of real long-term interest rates and real exchange rates is an important aspect of the adjustment process. This reflects short-term real interest rate developments, as discussed above, but more fundamentally results from differential adjustment speeds between the current account and net private savings. For example, if the current account were able to adjust immediately to the increase in domestic government credit demands, present and future interest rates—and, hence, the value of the dollar—would not likely increase substantially, if at all. In this instance, foreign capital inflows would be available immediately to fill in the domestic savings shortfall as it arose and to avert pressure on domestic financial markets.

The transition process described here thus depends crucially on our assumption that the external sector (current account) adjusts more slowly to the fiscal shock than the domestic private sector, that is, the economy is assumed to resemble that of a closed economy in the short-term but to approach that of a completely open economy in the long-term. Also central are our assumptions about the possible long-run equilibrium (steady-state) positions the economy may eventually reach.

nation year-after-year while maintaining constant the share of their wealth devoted to that purpose (this share would, of course, be greater the larger the current account deficit in relation to foreign savings).\textsuperscript{10} Thus, current account deficits are not intrinsically unsustainable in a growing world economy.\textsuperscript{11}

Willing? The real limit to the sustainability of a current account deficit is likely to be the willingness of foreigners to lend their savings to the nation incurring it. Lending to another nation (its government or its citizens) often involves certain risks—known as "country risks"—that may limit the size of the current account. Foreigners are willing to finance on an ongoing basis.

These country risks are of three basic types. The first, known as "sovereign risk", reflects the possibility that the government of the borrower will default, that is, repudiate its own and/or its citizens' foreign debts. The second, "transfer risk", refers to the possibility that the borrower will be unable to obtain the foreign exchange needed to repay a foreign debt (when the loan is extended in foreign currency). This is most likely to occur when a nation uses exchange controls to maintain an overvalued exchange rate. Transfer risk has proven to be the major country risk incurred in lending to developing nations. Finally, foreign (as well as domestic) lenders may also face possible losses from certain macroeconomic policies of the borrower's government. The most serious of these risks is from policies that lead to unanticipated inflation and currency depreciation and thereby reduce the real value of the funds lent.\textsuperscript{12}

The degree of country risk critically affects the interest rate a nation must pay to borrow from abroad, as well as the amount of funds it can obtain. Where this risk is present, a country must compensate foreign lenders by paying them a real interest rate (adjusted for expected exchange depreciation—see Equation 2) above that prevailing abroad. This difference, the "country risk premium", is analogous to the yield premium paid by Baa over Triple-A domestic bonds.

Furthermore, the amount of funds a nation can borrow from abroad on an ongoing basis (the sustainable current account deficit) to help finance a given budget deficit will be smaller the greater is the country risk and associated risk premium. Indeed, if
the risk were great enough, a nation could find itself unable to sustain any current account deficit. An ongoing budget deficit would then raise domestic real interest rates permanently above world levels, to a level that reduced private investment relative to private saving enough to finance the deficit entirely from domestic sources. Thus, the higher the country risk, the more closely a budget’s long-term impacts on interest rates and investment will resemble those for a closed economy, and the more domestic investment is ultimately constrained by the available domestic savings (less the budget deficit).

Where there is no country risk, a budget deficit’s long-term impacts on domestic interest rates and investment are likely to be very different. In that case, foreigners would be willing to lend to the nation on the same terms as they receive at home. The resulting situation is analogous to that facing individual regions of the U.S. economy. Within the U.S., the residence of a borrower does not by itself usually affect the terms of a loan, nor does it generally affect the willingness of a lender to extend credit. Hence, an Alaskan firm can borrow on the same terms as a similar Illinois firm, and neither Alaskan nor Illinois savers generally have any ‘‘habitat’’ preference for investments in their own states’ firms. In effect, all borrowers in a given type of activity regardless of their location face a single national interest rate. In an international context, the absence of country risk thus means that a nation with an ongoing budget deficit will see its domestic real interest rates ultimately fall back to world levels.13

Furthermore, absence of country risk also implies that the level of domestic investment will be determined by its profitability relative to investments abroad, not by the level of private domestic saving less the budget deficit—as is true for a closed economy. The on-going current account deficit thus equals the difference between the profitable level of domestic investment and domestic saving less the budget deficit, and will be financed by foreigners at world real interest rates. Again, the level of saving of Alaskan residents was not a serious constraint on investment in its oil fields; the oil fields were developed primarily with funds from non-residents.

In sum, where country risk is small, a budget deficit’s long-term impact on domestic investment will depend mainly upon how the policies generating the deficit affect the profitability of domestic investment. The more these policies enhance the profits from that investment, the higher the level of investment in the nation, and the larger its national output and current account deficits in the long-term. On this basis, deficits resulting from business tax cuts could raise a nation’s share of world investment. Deficits that raise the demand for products the nation has a comparative advantage producing may also tend to encourage domestic investment by raising the prices of those products and hence the profits available to those producing them. Clearly though, budget deficits may also be generated by policies that reduce the yield to domestic investment and lead to a fall in its level relative to that abroad. When country risk is absent, therefore, the ‘‘content’’ rather than the size of the budget deficit determines its long-term impact on investment (and national output) and hence plays a critical role in determining the size of the ongoing current account deficit.

A similar observation applies to the long-term impact of budget deficits on the real exchange rate. The real exchange rate is simply the nominal rate “deflated” by the ratio of the domestic to the foreign price level. As such, it effectively measures the value of the nation’s products in terms of those produced abroad (that is, the relative price of a “basket” of home-produced goods in terms of a “basket” of foreign products). Ultimately, this value will be determined by commodity demand and supply for these products. Accordingly, the deficit’s long-term impact on the real exchange rate depends on how the measures underlying it affect the demand and supply for home versus foreign products. A deficit generated by measures that shift demand toward domestic products (for example by increasing expenditures on domestically-produced defense goods) will tend to raise their relative price in terms of foreign products. But a deficit may also lead to a long-term real depreciation if it shifts demand away from home goods, or increases their supply more than the demand for them. Again, the policies making up the deficits, rather than the deficits’ size, are the determining factors.14
II. Applications to the Recent U.S. Experience

The theory outlined in the previous section leads to specific predictions about the way budget deficits are likely to affect the current account, investment and saving, and about the exchange rate and interest rate linkages through which this process occurs. How well does the United States experience, particularly recently, fit the theory? And which assumptions underlying the longer run predictions of the theory seem to best fit the U.S. and its relationship with the rest of the world?

A. The Recent U.S. Experience

The recent upward climb in the federal budget deficit is in fact associated with a substantial deterioration in the current account of the balance of payments. The federal budget deficit climbed from $57.9 billion in 1981 to $110.6 billion in 1982, and further to $195.4 billion in 1983. Following a similar trend, the current account deteriorated over this period from a $4.5 billion surplus in 1981, to an $11.2 billion deficit in 1982 and a $40.8 billion deficit in 1983. In addition, while budget deficits are expected to level off in 1984 and 1985 (the Council of Economic Advisors forecasts $183 billion and $180 billion deficits in 1984 and 1985, respectively); current account deficits are expected to grow to new records—forecasts range from $80–$120 billion in both years. Budget deficits and current account deficits of this magnitude are unprecedented.

During the post-1973 floating exchange rate period, there has been a close correlation between the current account and federal budget balances. Chart 1 shows the tight link between the cyclically adjusted federal budget deficit and the current account balance of the following year (to allow for sluggish current account adjustment) in the 1973–83 period.

These developments are consistent with the pattern predicted by theory. In addition, the sharp deterioration in the current account is most probably related to the extraordinarily high value of the dollar in recent years. This inverse correlation is shown in Chart 2. Numerous formal empirical analyses also suggest that the more than 40 percent appreciation of the average value of the dollar since 1980 is responsible for the greater part of the U.S. current account deterioration. The high level of real long-term interest rates (inflation-adjusted) prevailing in the U.S. since 1980, in turn, may be largely responsible for the dollar's dramatic appreciation. This is illustrated in Chart 3, and is the conclusion reached by a number of formal empirical studies.

Moreover, part of the recent pattern of U.S. interest rates is also consistent with the dynamic process predicted by theory. In particular, the very high

![Chart 1](image1)

**Chart 1**
Federal Budget Balance and the U.S. Current Account

![Chart 2](image2)

**Chart 2**
The Real Dollar Exchange Rate and the U.S. Current Account

Source: Fieleke (1984), Chart 2, p. 7. Budget data are from Survey of Current Business and from Commerce Department staff; current account data are from Economic Report of the President, 1984, p. 250 (net foreign investment) and Commerce Department staff, except for 1984, which is a forecast.

Sources: Current account data—see notes to Chart 1; real dollar exchange rate data are from Morgan Guaranty Trust Company, World Financial Markets.
levels of short-term and long-term interest rates since 1981 may be attributable mainly to large and increasing federal government budget deficits (see Chart 4). The rapid runup in long-term rates, in particular, is consistent with market expectations of a long series of large future budget deficits, and associated high future short-term interest rates. Formal statistical evidence on the budget deficit/real interest rate link is inconclusive, however, due perhaps to the fact that past large budget deficits have generally (aside from war periods) occurred during recessions when private credit demand was weak. In contrast to our present situation, past deficits typically have disappeared once the economy reached full-employment. Nevertheless, based on the lack of a strong simple statistical correlation during the greater part of the post-war period, several prominent observers have contended that present budget deficits are not primarily responsible for our high real interest rates, and therefore deny their consequences for the dollar and the current account.

In contrast to what theory suggests, there is as yet no indication that credit market conditions in the U.S. have eased with the large inflow of foreign capital. Both real interest rates and the real value of the dollar continue to remain at high levels. Several factors may be responsible for these developments. Perhaps most important is the great deal of uncertainty involving the future course of U.S. fiscal and monetary policies and, hence, the future course of real interest rates. In the face of significant uncertainty, and with continual revisions of expectations as new information becomes available, the exact paths of real long-term interest rates and the real exchange rate are considerably more difficult to predict than our simple theory suggests. A high dollar and high real interest rates could continue for a considerable period under these circumstances.

A second factor may be the timing of the predicted decline in real rates and the dollar. Foreign capital inflows may not yet have reached the point where they can significantly ease pressures on U.S. capital markets, particularly in light of the rapid rise in private credit demands associated with the robust U.S. economic recovery. If this is the case, interest rates and the dollar could edge downward when the recovery matures and private credit demands abate.

In any case, the budget deficit explanation is at least as consistent with the actual record as the main alternatives that have been offered. As noted earlier, some have argued that the massive net inflows of capital mainly reflect flight into the U.S. as a “safe haven” from political and economic troubles abroad rather than a response to high U.S. real interest rates. But such a flight, while it could explain the high dollar and (hence) deteriorating current account, would tend to lower, rather than raise, U.S.
real interest rates relative to those prevailing abroad. The safe haven analysis therefore cannot be the main explanation for the events we have traced.

Another potential explanation attributes the dollar’s strength, and high U.S. real interest rates (on financial assets), to the increased after-tax yield on investment in the U.S. that resulted from recent reductions in corporate taxes. As indicated earlier, such a fiscal policy would raise private investment demand and lead to essentially the same pattern of interest rate, exchange rate, and current account adjustments as a budget deficit. This explanation, however, complements rather than competes with the budget deficit explanation. Both trace high interest rates and the high dollar to fiscal policy.¹⁹

B. Long-Term Implications

Since there is some evidence that the theory of the last section does apply to the present U.S. situation, it is worthwhile to consider its implications concerning the long-term effects of our budget deficits should they persist indefinitely (as most observers believe they will without substantial policy changes). In particular, are the large current account deficits the U.S. has been running really unsustainable as many observers believe? If not, how large could they be on an ongoing basis? And will ongoing budget deficits inevitably mean high real interest rates, depressed investment and lower future output?

Large as U.S. current account deficits have been, they are still substantially less than the foreign saving available to finance them. For example, a deficit equal to 2.5 percent of GNP—slightly less than the rate projected for this year—represents about 12 percent of the saving of foreign industrial nations, net of depreciation. Foreigners certainly could finance U.S. deficits in this range, although the share of their wealth they ultimately would have to devote to claims on our country (about 12 percent) would certainly be very large by historical standards.²⁰

Moreover, any country risk associated with the U.S. is apt to be very small, indeed negligible, provided foreigners remain confident that our inflation will continue to be contained. Given this confidence, foreign willingness to lend should not be a serious constraint on the size of future U.S. current account deficits.

The risk most often associated with foreign lending—transfer risk—is apt to be negligible for the U.S. given the key international role of the dollar and the openness of our financial markets to foreign financial flows. Certainly, sovereign risk can also be neglected for the U.S. given its long history of political stability. Indeed, the U.S. and the dollar appear increasingly to be regarded as safe-havens for funds from abroad. This implies that foreigners would be willing to lend here on terms that are at least as favorable as those they would demand at home.

This scenario leaves unanticipated inflation as the major potential risk faced by foreign (and domestic) lenders to the U.S. An unforeseen and prolonged surge in U.S. inflation could seriously erode the purchasing power of funds lent (in dollars) by foreigners. If concerns were to arise that U.S. inflation might be rekindled, foreign reluctance to invest here could conceivably become a serious obstacle to the financing of our external deficits. However, another serious round of inflation is only likely to occur if there is a substantial shift in monetary policy away from its present anti-inflationary stance. In effect, then, country risk is apt to remain negligible for the U.S. as long as our government maintains the credibility of its anti-inflation commitment.²¹

How large? Assuming, then, that foreigners will finance an ongoing U.S. current account deficit, how large could it be? The answer clearly depends on the size of the ongoing public sector deficit, as well as on how private domestic saving and investment are affected (See Box 2 for further details). Current projections suggest that the combined deficit of federal, state, and local governments will average 3.0–3.5 percent of GNP in coming years under present policies.²² It is also reasonable to expect the net private saving rate to remain at its postwar average (about 7.3 percent of GNP) since past U.S. experience suggests it is both stable and not significantly affected by budget deficits.²³

Assessing our future investment rate is more difficult, since it will depend on how profit opportunities here compare with those abroad. Given that recent U.S. business tax cuts have significantly raised the after-tax return to business, the U.S. share of world investment might conservatively be projected to remain (at least) at its past average. This would
Box 2

How Large the Deficit?

If financing from abroad will not be an impediment to an ongoing U.S. current account deficit, how large will that deficit likely get? The answer clearly depends upon how large government deficits will be on an ongoing basis, as well as on how private domestic saving and investment are affected. Without pretending to give any precise answer to this question, we can nonetheless make a rough estimate of the magnitude of the ongoing current account deficits implied by current budget policies (see table below).

Most projections suggest that federal budget deficits will settle in the range of 4.5–5.0 percent of U.S. GNP in the absence of any policy changes beyond those already enacted. However, these projections also suggest that state and local governments will run a combined surplus of about 1.5 percent of GNP. This suggests an ongoing deficit of the entire government sector of 3.0–3.5 percent of GNP in the absence of further policy changes.

Furthermore, the private savings rate (as a share of GNP) has been remarkably stable historically, averaging about 7.3 percent of GNP on a net basis. More formal evidence suggests this rate has not been significantly altered by government fiscal policies in the past. (And despite some predictions that the 1980–1983 tax cuts would stimulate private savings, the private savings rate has actually remained below the historical average over the last several years.) Hence it is not unreasonable to project that private saving will continue at its historical average of about 7.3 percent of GNP in net terms.

Finally, our arguments imply that the deficit’s long-term impact on U.S. investment will depend critically on how government policies affect the profitability of that investment relative to invest-

| Estimated Ongoing Current Account Deficit (Share of GNP: "-" indicates surplus) |
|-------------------------------|-----------------|
| Projected Government Deficit  | 3.0–3.5%        |
| Federal                       | 4.5–5.0%        |
| State and Local               |                |
| Less                           |                |
| Projected "Surplus" Domestic Saving | 1.3%           |
| (Net of depreciation)         |                |
| Private Domestic Saving       | 7.3%           |
| Domestic Investment\(^1\)     | 6.0%           |
| Equals                        |                |
| Projected Current Account Deficit | 1.7–2.2%      |

Memo Item:

Current Account Deficit with Investment Rate Equal to Historical Average (6.7%)

2.4–2.9%

\(^1\)The domestic investment rate is calculated assuming a constant U.S. share of world investment and a constant foreign (public plus private) saving rate. The change in the world investment rate resulting from the U.S. budget deficit is then:

\[
 \frac{\Delta \text{ World Investment}}{\text{World GNP}} = \frac{\Delta \text{ U.S. budget deficit}}{\text{U.S. GNP}} \times \frac{\text{U.S. GNP}}{\text{World GNP}}
\]

The change in the U.S. investment rate is then:

\[
 \frac{\Delta \text{ U.S. Investment}}{\text{U.S. GNP}} = \frac{\Delta \text{ World Investment}}{\text{World GNP}} \times \frac{\text{U.S. Investment}}{\text{World Investment}} \times \frac{\text{World GNP}}{\text{World GNP}}
\]

ments abroad. If those policies have increased the yield (after-tax) to investments here compared to elsewhere, the U.S. share of world investment is apt to rise. Given that federal taxes on corporate earnings have been substantially reduced over 1980–1981, it seems likely that, overall, the policies underly­ing the deficit have raised the relative return to investing in the U.S., or at least, have not lowered it. On this basis, the U.S. share of world investment may be (very) conservatively projected to remain as high in coming years as it has been historically. If so, however, our investment as a share of our GNP will drop somewhat from its historical average because our budget deficits almost certainly will reduce the investment funds available to the world as a whole. (There is no “abroad” for the world to borrow from.)

On this basis, net private U.S. investment would average about 6.0 percent of our GNP (compared to about 6.7 percent over 1950–1979). Together with the other projections, this implies an ongoing U.S. current account deficit of 1.7–2.2 percent of GNP (this represents $55–70 billion at 1984 prices and GNP). At this rate, over half the U.S. public-sector deficit would be effectively financed with foreign funds.

Needless to say, this estimate is very rough. If the private saving rate were to rise significantly from its historic norm, the current account deficit could be substantially lower. However, if the U.S. share of world investment were to rise, the deficit could be larger than indicated above. For example, if investment as a share of our GNP were to remain at its historical average (this implies an increase in the U.S. share of world investment), the ongoing U.S. current account deficit would be 2.5–3.0 percent of GNP.

Despite these uncertainties, there can be little doubt that ongoing U.S. budget deficits of the size now projected are likely to imply unprecedentedly large and sustained U.S. current account deficits.

imply (see box) a net investment rate of approx­i­mately 6.0 percent of our GNP.

Together, these (very) rough projections imply an ongoing U.S. current account deficit of 1.7–2.2 percent of GNP, representing $55–70 billion at 1984 prices and GNP. Foreigners would then be financing over half of our public sector deficit, leaving less than half to be financed from domestic sources. Of course, if domestic saving were to rise (as supply-siders expect), the current account deficit could be significantly less. Alternatively, if the U.S. share of world investment were to rise, the deficit could be much greater. Despite these uncertainties, this exercise does indicate that the persistence of budget deficits at current rates almost certainly will lead to unprecedentedly large ongoing U.S. current account deficits. Still, as we now argue, such deficits, shocking as they may seem, are not, of themselves, necessarily harmful to our economy.

Where's the Burden? Government budget deficits are thought to impose burdens, or economic costs, on the nation incurring them. Of course, these costs must be weighed against the benefits the policies underlying the deficits may bring. In this sense, the costs of budget deficits reflect the reallocation of society's resources—from future to present expenditure and between public and private spending—rather than any misallocation of those resources, or burden to the nation as a whole (that is, present plus future generations). Nonetheless, conventional theory suggests that deficits will impose costs on certain sectors and individuals—manifest in terms of higher real interest rates, lower domestic investment, and lower private consumption for future generations.24

We have argued here that by borrowing from abroad through current account deficits, the U.S. may not ultimately suffer much increase in real interest rates and may be able to maintain its past investment levels. This does not mean that by borrowing from abroad our nation can entirely escape the budget deficit burden, however. By borrowing from abroad the deficit's costs may be reduced (compared to the cost if we could not borrow), but a significant burden is likely to remain.

As noted earlier, the deficits have temporarily raised real interest rates. Even if this increase is not permanent, housing and other interest-rate-sensitive
sectors of our economy certainly have suffered in the interim. Furthermore, the high real value of the dollar brought about by increased real interest rates has sharply reduced the demand for the output of our traded-goods sectors.

Admittedly, by borrowing from abroad over the last several years, the U.S. has probably been able to maintain real interest rates at a lower level than would otherwise have been possible in the face of the budget deficits. But this does not necessarily mean that the burden has been avoided—only that it has been shifted from interest-sensitive to tradeable goods industries. That is, in order for the U.S. to borrow from abroad (during the transition to the long-term), our exports must shrink relative to our imports, and this implies a reduction in the output of our tradeable goods industries. In effect, budget deficits do “crowd-out” certain domestic industries, even in an open economy—and tradeable goods industries may suffer as much or more than interest-sensitive sectors.

Ultimately, the burden of a budget deficit is apt to be manifest in lower (private) consumption for future generations. In a closed economy, this burden comes about as the lower investment resulting from the deficit reduces the future capital stock, and hence future output available to meet the nation’s needs.

IV. Conclusion

Over the last several years, the U.S. has experienced unprecedentedly high real interest rates, real dollar values, budget deficits and current account deficits. We have argued in this article that these conditions are closely related and largely the result of the increase in U.S. budget deficits that threaten to remain at extraordinarily high levels for many years.

Our budget deficits represent a demand for funds by the government that must be met from an excess of domestic saving over investment, or by borrowing from abroad, or both. In an open economy, an increased budget deficit may be met partially through an increase in borrowing from abroad; its counterpart is an increase in the current account deficit. In contrast to the textbook closed economy case, the channels transmitting the effects of budget deficits to the open economy include exchange rates as well as interest rates. This is particularly evident during the transition period before the current account has fully adjusted to a budget deficit. Initially, an increased budget deficit is likely to raise domestic real interest rates which, in turn, raise the real exchange rate. The higher real exchange rate then induces a current account deterioration that affects the transfer of foreign saving to help finance the budget deficit. After several years, however, when the current account has fully adjusted to the budget deficit rise, the initial pressures on interest rates are likely to subside substantially, and real interest rates and the real dollar should then fall back toward lower levels.

In a growing world economy, ongoing U.S. current account deficits can in principle be financed from foreign savings, and there is no theoretical reason and, in the absence of a shift in Federal Reserve policy toward monetizing federal deficits,
few practical reasons why the United States could not borrow from foreigners for many years to come. The U.S. current account may therefore remain in substantial deficit as long as budget deficits of the present magnitude persist.

Our analysis has direct implications for policymakers concerned about our growing trade deficits. First, attempts to eliminate our current account and trade deficits by imposing trade barriers (for example, quotas, "voluntary" export agreements, tariffs, legislation of domestic content ratios for imports, and other measures), are likely to do more harm than good to the economy. These measures will raise costs to consumers and, by encouraging an inefficient and distorted allocation of our resources, may make U.S. industry less, not more, competitive in international markets. In addition, to the extent that trade barriers are effective in reducing our current account deficits and, hence, in reducing foreign capital inflows, U.S. interest rates are likely to be higher than would otherwise be the case. This would both lower domestic private investment and raise the overall cost of our budget deficits.

Similarly, a more expansionary monetary policy designed specifically to reduce real interest rates and the value of the dollar in the foreign exchanges also would most likely prove counter-productive over the longer term. In particular, a more expansionary U.S. monetary policy probably would cause the dollar to depreciate and eventually narrow the U.S. current and trade account deficits. Not only would this policy reversal undermine our hard-won gains against inflation, it could greatly undermine foreigners' willingness to lend to the U.S., and hence reduce the extent to which we could finance our budget deficits by borrowing from them. For this reason, expansionary monetary policy could ultimately lead to higher real interest rates and lower domestic investment (greater crowding out) than we would otherwise suffer.

Thus, our analysis implies that if a reduction in our current account and trade deficits is deemed an important policy objective, the most effective and efficient measure for doing so is through a major reduction in the U.S. federal budget deficit. Only in this way will our external deficits be reduced without creating either serious distortions in our liberal trade environment or a resurgence of U.S. inflation. Conversely, in the absence of a federal deficit reduction, the benefits derived from continued foreign savings inflows—the counterpart of our large current account deficits—are likely to outweigh their costs.
1. A recent empirical study by Laney (1984) finds only in a few cases a positive (statistically significant) link in the postwar period between the external balance and the fiscal balance for the major industrial economies. The empirical investigation of the study showed a much tighter linkage for the smaller developing countries than for the industrial countries, however, presumably because of the lack of domestic capital markets and inelastic private domestic savings in developing nations.

2. In national income accounting terms, the value of national output (Y) equals the sum of private consumption (C) and investment (I), government expenditures (G), and exports (X), less the amount spent on imports (M). National income—which equals the value of national output less net transfers to abroad (R)—is divided into private consumption and savings (S), and taxes (T). Hence,

\[ C + I + G + (X-M) - R = C + S + T \]

from which the relation (1) in the text follows immediately.

3. Note again that our analysis assumes a floating exchange rate regime. The dynamic adjustment to a budget deficit under fixed exchange rates is very different from that traced in the text.

4. A large and growing literature exists on the relations between budget deficits and real interest rates and output in closed economies. Some have argued that deficits bear no relation to real interest rates in either a setting with less than full employment of resources or a full employment situation. This view is often termed the Ricardian equivalence proposition. Its central tenet is that the private sector is indifferent between tax- and deficit-finance of government expenditures, and that interest rates will not be affected by the division between the two forms of financing the government. (See J. Bisignano, 1984 for a complete discussion of this issue). The discussion in the text assumes the received macroeconomic theory holds, however, and that government budget deficits are likely to exert upward pressure on real interest rates when the economy is at full employment.

5. A "risk premium" or equilibrium real interest differential also is included in this equation. We have subsumed this premium within our "risk adjusted" real interest rate measure for simplicity of exposition. See Hutchison (1984) for a more detailed discussion of risk premium determinants and references to the literature on the subject.

6. The text relation follows directly from the parity condition for nominal interest rates,

\[ i^* = i + (s^o - s) \]

This says that the foreign nominal interest rate (i* — expressed as the percentage yield to maturity) must equal the domestic nominal interest (i— for the same maturity and expressed similarly) plus the expected appreciation (to maturity) of the nominal exchange rate (s— expressed as the logarithm of the foreign currency price of domestic currency). Defining the logarithm of the domestic and foreign price levels as p and p* respectively, while 'e' refers to expected future values,

\[ i^* - (p^*e - p^o) = [i - (p^o - p)] + [s^o - (p^*e - p^o)] - [s - (p^* - p)] \]

The left-hand expression and the first term on the right are simply the foreign and domestic real interest rates, respectively; the second bracketed terms are the logarithms of the expected future and current real exchange rate. These relations apply, in principle, to all maturities. For further discussion, see Hutchison (1984).

7. This adjustment process is termed exchange rate "overshooting". See Dornbusch (1976) for an original contribution on overshooting in a simple monetary model of exchange rate determination with sluggish price adjustment in the goods market.

Note that the proportionality described in the text between the exchange rate impact of an interest rate change and the maturity is strictly valid only for pure discount instruments. For coupon instruments, the impact is proportional to the duration rather than the nominal maturity.


9. The determinants of this lag can be fairly complex. The lag could be very long if, for example, the policies underlying the budget deficit were to raise substantially the return to domestic investment. As explained later in the text, this could lead to an increase in the domestic share of the world capital stock to bring domestic and foreign returns to capital share toward equality. Such a process is apt to take many years to be completed, however. The lag could also be very short, particularly if the policies generating the deficit directly and immediately alter export and import demands.

10. The size of a nation's external debt in relation to its GNP, and the share of foreign wealth that debt represents, can be related to the long-term current account/GNP ratio. To illustrate, suppose that the domestic and foreign economies are growing at the same rate, "g" (allowing these rates to be different does not significantly alter the conclusions). Then,

\[ D/Y = (CA/Y)/g \]

where D/Y is the long-term external debt (D) to GNP (Y) ratio and CA/Y is the long-term current account deficit (CA/GNP) ratio. This condition follows immediately from the observation that a constant D/Y over time implies that the growth of external debt equals the growth rate of GNP. Similarly, it is easy to show that:

\[ D/W^* = (CA/Y)(Y/Y^*) + (W^*/Y^*)g \]

where D/W* is the long-term external debt/foreign wealth (W*) ratio, Y/Y^* is the ratio of home to foreign income (Y), and W^*/Y^* is the foreign wealth/GNP ratio. Thus, for a given constant current account/GNP ratio, there is a constant debt/GNP and debt/foreign wealth ratio in the long-run (admittedly, this conclusion is somewhat altered if domestic and foreign growth rates differ). Conversely, the external
The risk that a government will prevent its citizens from repaying foreign debts, either by defaulting or denying them access to foreign currency, is also known as “political” risk. Risks in lending to a country arising from unexpected exchange rate changes, which we include among our macroeconomic risks, are commonly known as “exchange risks.”

12. The risk that a government will prevent its citizens from repaying foreign debts, either by defaulting or denying them access to foreign currency, is also known as “political” risk. Risks in lending to a country arising from unexpected exchange rate changes, which we include among our macroeconomic risks, are commonly known as “exchange risks.” Note also that the risks associated with lending to a given country are not always the same as those incurred by lending in its currency. Sovereign risk generally does not depend on the currency in which the loan is extended, while transfer (and exchange) risk does.

13. Applying relation (1) to “long-term” real interest rates (again expressed as percentage yield to maturity rather than on an annualized basis),

\[ r_L = r^*_L + (q - q^*_L) \]

where \( q^*_L \) is the expected “long-run” real exchange rate. Suppose that there is no long-term secular trend in domestic relative to foreign prices and hence in the real exchange rate. Then, since (by definition) the real exchange rate must ultimately come to equal its long-run value, the domestic long-term real interest rate must settle to a level equal to that of its foreign counterpart. (At this point, short- and long-term real interest rates are equalized internationally.)

More generally, the domestic real interest rate must ultimately equal the foreign real rate plus the long-term, or secular, rate of change of the real exchange rate. In either case, it is evident that the equalization of domestic and foreign real interest rates—as conventionally defined in terms of domestic and foreign price indices—is not dependent upon the speed of arbitrage in financial markets, but on the adjustment of prices in goods markets to their long-term values, a process which can take many years (see, for example, the discussion in Niehaus, 1984, Chapter 6).


15. For example, a recent study by Robert Feldman (1982) suggests that the nearly 30 percent real appreciation of the dollar over 1980–1983 reduced the U.S. trade balance by as much as $60 billion. See also Peter Hooper and Ralph Tryon (1984).

16. See, for example, a recent study by Peter Hooper (1983). See also Fielke (1984).

17. For a survey of this literature, see the recent U.S. Treasury study, The Effect of Deficits on the Prices of Financial Assets: Theory and Evidence (1984). This study concludes that there is no empirical support for a systematic real interest rate-budget deficit link for the United States. Other researchers, however, do present evidence of a systematic linkage. (See Sinai and Rathjens, 1983 and Friedman, 1982.) In addition, Hutchison and Pyle, in an accompanying article in this Review, find support for this linkage by looking at international evidence.

18. This view has been expressed in a recent article by Arthur Laffer in the Los Angeles Times, (January 24, 1984).

19. As this argument suggests, changes in fiscal policies may have implications for interest rates, exchange rates, and the current account very similar to those discussed in this text, even if they do not lead to a budget deficit. The converse is that our real interest rates and the dollar could remain high even if our budget deficit were eliminated, provided that fiscal policy continued to encourage investment in the U.S. (For example, if the deficit were reduced by raising taxes on consumption). Note also that to the extent that investment incentives are responsible for recent developments, the “adjustment” period required to bring our interest rates back to world levels may be very long, perhaps considerably longer than if budget deficits themselves were the main cause. The reason is that changes in the after-tax yield to investment relative to abroad will ultimately have to be offset by a “redistribution” of the world capital stock toward the U.S. (To the point where the marginal revenue product of capital falls enough to offset our more favorable tax treatment). This process could take many years.

20. Our current account’s deficit’s (CA) share of foreign saving (S\*) can be written as:

\[ CA/S^* = (CA/Y)/(Y/Y^*) + (S^*/Y^*) \]

where \( Y/Y^* \) is the U.S./foreign GNP ratio, which is roughly 55 percent, while \( S^*/Y^* \) is the foreign industrial country (net) saving rate, whose average is about 11 percent. These figures were derived from the OECD National Accounts: Main Aggregates, 1953-1982. They represent averages for 1979–1981.

In the long-term “steady state”, the current account deficit will largely, if not entirely, consist of interest payments to abroad while the budget deficit consists of interest payments on the national debt. More precisely, if the long-term (U.S.) real interest and growth rates were the same, then the long-term current account deficit would exactly equal the net interest payments of the U.S. on its foreign debt, while the budget deficit equaled the interest payments on the
national debt. Thus, when the interest and growth rates are the same, net exports of goods and services (that is, the portion of the current account excluding net interest payments to abroad) must be in balance, while government expenditures net of interest payments must equal government revenues. When the interest rate exceeds the growth rate, the current account and budget deficits are ultimately less than the respective interest payments. Government revenues must then exceed non-interest expenditures and net exports of goods and services must be in surplus in the steady state. In general, then, a permanent deficit in the non-interest portion of the budget is not possible in the long-run, at least not without some financing from money creation, unless the interest rate is below the growth rate. This has been pointed out by T. Sargent and N. Wallace, “Some Unpleasant Monetarist Arithmetic,” Federal Bank of Minneapolis Quarterly Review, Fall, 1981, p. 1–17. Conversely, when the interest rate is below the growth rate, the current account deficit exceeds foreign interest payments, allowing the borrower to maintain a long-term trade deficit.

In making this argument, we are relying as much, or more, on theoretical plausibility as actual evidence. There remains considerable controversy about the degree of international capital mobility. While several studies suggest there are country/currency risk premiums in short-term interest rates for the major industrial nations (Meese and Singleton, 1980 and Hodrick and Hansen, 1980), there is very little evidence to suggest they are very large, or systematically related to a nation’s external debt (Frankel, 1982; Blanchard and Dornbusch, 1984).

Several other studies have found that current account deficits have not historically contributed much to domestic investment (Feldstein and Horoika, 1980 and Dooley and Pennati, 1984). This finding is consistent with the hypothesis that international capital mobility is very low, but this pattern can also be explained in terms of other factors. Furthermore, there is some evidence that international capital mobility has increased over the last decade; if so relations among current account deficits and investment may have changed.

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The Real Interest Rate/Budget Deficit Link: International Evidence, 1973-82

Michael M. Hutchison* and David H. Pyle**

There is a widespread belief that current and expected federal government credit demands are keeping U.S. real interest rates stubbornly high and may slow the speed and limit the duration of the economic recovery. To shed light on this debate, this study investigates the link between budget deficits and real interest rates by "pooling" annual time series data for the last decade across the seven major industrial countries. The results suggest that short-term real interest rates are systematically and positively associated with central government budget deficits across countries and across time.

There is a widespread belief that current and expected federal government credit demands are keeping U.S. interest rates stubbornly high and may slow the speed and limit the duration of the economic recovery as it matures. This conventional wisdom is generally supported by a body of macroeconomic theory that posits a strong positive causal link between government budget deficits (or outstanding government debt) and real interest rates. Nevertheless, there are theoretical challenges to this proposition, and empirical support for it is sketchy and largely based on indirect evidence derived from simulations of large scale econometric models.1 Little empirical evidence of a direct link running from budget deficits to interest rates has been found.2 In fact, the conclusion of a recent study by the U.S. Treasury (1984) was that "...high deficits have had virtually no relationship with high interest rates..." during the past two decades.3 Other recent studies of the U.S. experience (for example, Evans, 1983, Motley, 1983, and Hoelscher, 1983) also have failed to find a significant positive link between U.S. budget deficits and interest rates.

Although considerable research has investigated real interest rate behavior and the relation between real rates and budget deficits, very little of this research has focused on countries outside the U.S. Extending the analysis to other countries could be useful in several ways. For example, it could provide information about the robustness of the result found for the U.S. Also, by extending the analysis, one can conduct joint tests for several countries at once. This could result in more powerful statistical tests of the deficit-interest rate link because more data, that exhibit greater variation, can be exploited.

The latter consideration motivates the strategy of this paper. We pool annual time series data across the seven major industrial countries (the U.S., the U.K., France, Japan, Italy, Canada and Germany) to investigate whether budget deficits are significantly positively associated with real interest rates. Pooling observations increases the variability of the data, both over time and across countries, because of the diversity of experience with real interest rates and budget deficits in the seven countries of the sample.

Using our pooled data sample, we regress short-term real interest rates on budget deficits, holding constant money growth and a cyclical measure of

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economic activity. The results of our empirical work suggest that short-term real interest rates are systematically and positively associated with central government budget deficits across countries and across time. To test the robustness of our surprisingly strong result, we test for the budget deficit/real interest rate association in a variety of ways. The basic result does not appear particularly sensitive to the choice of government deficit measure or money growth proxy. However, the budget deficit/real interest rate linkage is weakened somewhat when the cyclical measure (a standardized unemployment rate) is included as an explanatory variable.

On balance, this research provides empirical support for the hypothesized positive linkage between government budget deficits and real interest rates. This evidence is consistent with the view that budget deficits lead to high real rates of interest. To the best of our knowledge, this is the first international evidence supporting the hypothesis.

The next section provides an outline of the methodology we use to analyze the data. Section II follows with a description of the data and the empirical results from estimating the basic model. Section III extends the basic model and presents estimates of various equations designed to test the robustness of the deficit-interest rate relationship found in the preceding section. The paper concludes with a brief summary and some tentative policy implications.

I. Methodology

The purpose of the research reported here is to test the hypothesis that high short-term real interest rates \( r \) are positively associated with high budget deficits \( B \), after controlling for other systematic influences on the real rate \( Z \):

\[
r = f(B, Z, \mu)
\]

The vector of other systematic variables, \( Z \), should include all variables that are correlated with short-term real interest rates. We limit \( Z \), however, to a money growth variable \( M \), a cyclical variable—the standardized unemployment rate \( U \), and country-specific dummy variables \( D \).

In searching for the relevant systematic variables to include in \( Z \), we think of real interest rates as influenced by the demand and supply of credit in the economy. As money growth represents a net addition to the supply of credit, it should be negatively associated with short-term real rates. The net cyclical private demand for credit, in contrast, will vary with the fluctuations in business activity—roughly proxied by the unemployment rate variable. The higher the level of economic activity (the lower the rate of unemployment), the greater is the private demand for credit. However, higher business activity and income are also generally associated with greater saving—increasing the net supply of credit. The net effect of the cyclical variable on the short-term real interest rate depends on which factor dominates: the increase in private credit demand or private credit supply associated with expanding economic activity.

Thus, although we do not develop a complete structural model of real interest rate determination, our formulation of Equation (1) is consistent with both the familiar IS-LM framework and a simple loanable funds flow model of the bond and money markets. This body of macroeconomic theory predicts a positive relation between budget deficits and short-term real rates and a negative relation between money growth and short-term real rates. The expected sign of unemployment is ambiguous, although most models generally predict a negative correlation with real interest rates.

The dummy variable for each country in the sample is introduced to take into account some of the institutional and structural diversity, such as tax rates, non-homogeneous inflation measures, and political instability among the industrial countries. These differences might explain persistent international discrepancies in real interest rates (beyond those associated with money growth, government budget deficits and cyclical variables). Taking note of them is important because pooling data has the major disadvantage of constraining the estimated coefficients in a model to be equal across countries. Introducing dummy variables is an attempt to capture significant structural differences among countries in the level of real interest rates. It does not capture differences in their cyclical behavior. Nevertheless, it allows us to pool the sample and to use a greater degree of diversity in real interest rates and budget deficits than would otherwise be the case.
The real interest equation that we have estimated is:

\[ r_i = b_0 + b_1 B_i + b_2 M_i 
+ b_3 U_i + \sum_{t=1}^{T} b_{3+t} D_i + \mu_i \]  

(2)

where \( r_i \) = short-term real interest rate at time \( t \) in country \( i \)

\( B_i \) = government budget deficit (percent of GNP) at time \( t \) in country \( i \)

\( M_i \) = money growth rate at time \( t \) in country \( i \)

\( U_i \) = unemployment rate at time \( t \) in country \( i \)

\( D_i \) = 1 for country \( i \) for all \( t \),

0 otherwise

\( \mu_i \) = random error term

The estimation of Equation (2) using pooled data implies that the variation over time and across countries in short-term real interest rates is not purely random but is due to structural (D), cyclical (U), and policy-determined (B and M) differences across countries. In general, estimation on a country by country basis does not provide enough variation in the budget deficits to produce powerful tests of their effect on interest rates. For example, there are only three years between 1973-82 in which U.S. budget deficits were over 2.5 percent of GNP. Pooling data over the seven countries provides numerous observations with deficits of this magnitude or greater.

To obtain the added statistical power for discerning the effects of deficits, we constrain the policy and cyclical variables to have comparable effects across countries and ask, controlling for other variables, does a higher deficit generally imply a higher real interest rate for each country? Our interpretation of OLS (Ordinary Least Squares) estimates of the coefficient \( b_1 \) in Equation (2) is that it reflects the correlation of short-term real rates with budget deficits, holding other relevant variables constant.

II. Empirical Results

Table 1

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<td>Budget Deficit</td>
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<td>-.003</td>
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<td>(-2.59)</td>
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<td>-.065</td>
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<td>-.034</td>
<td>-.057</td>
</tr>
<tr>
<td></td>
<td>(-2.48)</td>
<td>(-2.85)</td>
<td>(-4.27)</td>
</tr>
</tbody>
</table>

\( R^2 \) = .39 .51 .58
Observations = 70 70 70
Standard Error = .029 .027 .025

Notes: t-statistics in parenthesis; OLS regressions
post real interest rates were calculated from quarterly average rates (compounded annually) which, in turn, were calculated by subtracting the actual CPI inflation rate over a quarter from the nominal interest rate for that quarter. Short-term interest rates were employed in all countries to obtain a consistent and internationally comparable series of market-determined interest rates. The central government budget deficit/gross savings ratio is also employed in several regressions.

Our empirical analysis focuses on the influence of central government budget deficit on real interest rates. However, general government budget deficits (combining central and local governments) are employed in several instances to test the robustness of the empirical results to the deficit measure choice. Deficits are measured as a percent of GNP to standardize the figures for international comparison.

The results from estimating Equation (2) are presented in Table 1. This table also presents results from several formulations of the basic equation to provide some insight into the stability of the estimated coefficients generally and, in particular, the stability of the budget deficit coefficient.

Coefficient estimates in the various formulations of the model given in Columns (1)-(3) are, without exception, statistically significant with the theoretically predicted signs. The nominal money growth coefficient is not affected by the inclusion of the cyclical variable, unemployment. The budget deficit coefficient is larger, however, when unemployment is excluded from the model. The unemploy-

<table>
<thead>
<tr>
<th>Table 2</th>
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<tr>
<td><strong>Real Interest Rate Equations:</strong></td>
</tr>
<tr>
<td><strong>Real Money Growth and Cyclical Money Growth;</strong></td>
</tr>
<tr>
<td><strong>Pooled Sample: 1973-1982 Annual Observations</strong></td>
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<table>
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<td><strong>Real Money Growth</strong></td>
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<tr>
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<tr>
<td><strong>Unemployment</strong></td>
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<td>(2.72)</td>
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<tr>
<td></td>
<td>(-1.14)</td>
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<tr>
<td></td>
<td>(-4.00)</td>
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<td>Canada</td>
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<td>-.032</td>
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<td>(-2.32)</td>
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R^2: .39 .45 .42 .49
Observations: 70 70 70 70
Standard Error: .029 .028 .029 .027

Notes: t-statistics in parenthesis; OLS regressions
ment coefficient is statistically significant and positive. This suggests that a cyclical downturn (proxied by an increase in the unemployment rate and given unchanged budget deficits and money growth rates) is associated, on average, with a rise in real interest rates.

These results lend support to the commonly held view that large budget deficits (as a percent of GNP) are one factor causing high real short-term interest rates. In particular, these estimates suggest that a one-percentage point increase in the budget deficit/GNP ratio over a one-year period is associated with an average real interest rate increase of between 40-100 basis points. Rapid nominal money growth, on the other hand, is associated with lower real interest rates. A one-percentage point increase in the annual rate of narrow money growth is associated with an average real interest rate decline of approximately 30 basis points. This result parallels those found earlier by Mishkin (1984) in a study of real interest rates in the Euro-deposit market using quarterly data over the 1967-II to 1979-II period.

When combined with the trends in budget deficits and in nominal money growth, these empirical results imply that the sharp increase in short-term real interest rates in the U.S. between 1980-1982 is

Table 3
Real Interest Rate Equations
with General Government Deficits and the Central Government Deficit—
Gross Savings Ratio as Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>General Government Budget Deficits</th>
<th>Central Government Budget Deficits/Gross Savings Ratio</th>
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<tbody>
<tr>
<td>Constant</td>
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<td>.034 (3.09)</td>
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<tr>
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<td>.012 (0.95)</td>
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<td>-.021 (-1.79)</td>
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<td>.007 (1.37)</td>
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<td>.004 (1.75)</td>
<td>.009 (1.89)</td>
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<td>Nominal Money Growth</td>
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<td>-.003 (-3.95)</td>
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<td>-.003 (-4.17)</td>
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<tr>
<td>Cyclical Money Growth</td>
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<td>-.002 (-2.09)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-.001 (-1.95)</td>
</tr>
<tr>
<td>Unemployment</td>
<td>.009 (4.23)</td>
<td>.008 (3.18)</td>
</tr>
<tr>
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<td>.009 (4.07)</td>
<td>.008 (3.05)</td>
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<tr>
<td>Standard Error</td>
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<td>.027</td>
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Notes: t-statistics in parenthesis; OLS regressions
partly attributable to slower money growth (120 basis points), but that the rise in federal budget deficits over the period probably played a larger role (100-250 basis points).

Experiments using alternative explanatory variable definitions are reported in Tables 2 and 3. The focus of these experiments is to determine the sensitivity of the budget coefficient to alternative specifications. For the regressions reported in Table 2, alternative money supply definitions, real money growth (nominal money growth less actual inflation) and a measure of cyclical money growth (current money growth less the weighted average of money growth during the preceding three years) were used. In the macroeconomics literature, these money growth variables are often offered as alternatives in real interest rate equations to the nominal money growth variable. The use of either of these alternative money supply variables increases the magnitude and significance of the central government budget deficit coefficient as compared to those reported in Table 1 for nominal money growth. The real money growth coefficients are statistically insignificant and of the wrong sign, however.

Other experiments were conducted to address questions about the appropriate budget deficit measure, for example, whether it should be limited to the central government or should also include deficits due to local governments and social security funds. The first three columns of Table 3 give the results from substituting general government deficits (central government plus local governments and national social security funds) scaled by GNP for the central government deficit variable used in the previous regressions. Somewhat surprisingly, the results for general government deficits in Table 3 are similar to the results using the central government budget deficit/GNP ratio presented in Table 1 and Table 2. The coefficient for the general government deficit/GNP ratio is significant in two of the three cases, and the effect of the deficit on real interest rates is similar to that when only central government budget deficits are used. However, when both nominal money growth and unemployment are included in the estimation, the coefficient for the general government budget deficit/GNP ratio falls off in magnitude and significance.

The scaling of budget deficits by GNP rather than some other aggregate may also be questioned. Columns (4)-(6) of Table 3 report on the use of central government budget deficits scaled by gross national savings instead of GNP. This alternative deficit variable measures the degree to which savings in an economy are absorbed by central government deficits and might provide a better indicator of the pressure exerted on real interest rates. These results also generally support the earlier findings. The central government deficit/gross savings coefficient has the anticipated sign in each equation, but, again, it is not significant in the equation that includes unemployment.

In all of the experiments reported in Table 3, the magnitudes and significance levels of the money supply and unemployment variables are similar to those reported in Tables 1 and 2. On balance, the results in Table 3 suggest that there is significant positive correlation between deficits and short-term real interest rates regardless of how deficits are measured.

III. Extensions

Apart from measurement issues, the simple empirical tests we have reported may be criticized on several levels. One criticism concerns the appropriateness of pooling the data, and thereby constraining the slope coefficients of the model to be equal across the seven countries. A second criticism could question the homogeneity of the data across the period of estimation. Some economists have argued that major structural changes in the world economy have occurred since 1979, potentially changing the linkages between budget deficits and real interest rates. These potential objections to the methodology behind the estimates reported in Table 1 are discussed in turn below.

Pooling the Data

Pooling cross-section and time-series data implicitly assumes that all observations come from the same population regardless of country. As a test of the appropriateness of this assumption, we allowed the coefficients of the fully constrained model, that is, the model with a single intercept term (no country dummy variables), money growth variable and central government deficit variable, to vary across
countries. Denoting the model with no restrictions across countries (intercept terms, money growth slope coefficients and central government deficit coefficients are all allowed to vary across countries) as the “expanded model,” the relevant F-statistic measuring the significance of the reduction in squared errors between the expanded model and the fully constrained model equals 1.43. The critical level of the F-statistic at the 5-percent level of confidence for the test is 1.92. This result suggests that pooling may be appropriate, since the F-value is substantially below the value needed to reject (at the 5-percent level) the null hypothesis that all observations come from the same population. Because this test is also unnecessarily strong, since our model formulations in Table 1 also include unrestricted country-specific intercept terms, one can be even more confident of the result.

**Tests for Structural Change**

The international evidence reported here contrasts markedly with numerous domestic studies that suggest very little association between budget deficits and real interest rates. In fact, the lack of strong empirical evidence supporting almost any reasonable hypothesis attempting to explain the high levels of real interest rates since 1979 have led some economists to suggest that a major structural change (presumably unquantifiable) has occurred in the process generating real interest rates.

To shed some light on the issue, we split our sample into two periods, 1973-1979 and 1980-1982, and estimated the real interest rate equation for both subperiods. The year 1980 is chosen as the breaking point of the sample because of the rapid run-up in real interest rates that began in that year, and because it is the first year following the October 1979 policy shift by the Federal Reserve toward monetary aggregate targeting. In another structural change test, the budget deficit coefficient alone is allowed to vary between the two sub-periods, while the money growth and country intercept variables are constrained to be equal over the full 1973-82 sample. This allowed us to compare the significance of the budget deficit-real interest rate link in the two periods and, in particular, to test whether the significant positive association noted above has become stronger since 1980.

The estimated equations are reported in Table 4. The results of a Chow test suggests, with a degree of confidence of better than 90 percent (the F statistic equals 2.05), that a structural shift did occur between the two sets of parameter coefficients estimated over the 1973-1979 (Column 1) and 1980-1982 (Column 2) periods. Somewhat surprisingly, the correlation between money growth and real interest rates becomes less significant in the latter period. In contrast, the positive correlation between real interest rates and budget deficits increases substantially. In addition, the structural change test for the budget deficit coefficient alone during the latter period (Column 3 in Table 4) suggests that it has increased significantly, from .006 in 1973-1979 to .01 (.006 + .004) in 1980-1982. Hence, while the evidence suggests that significant structural changes

### Table 4


<table>
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<tr>
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<tr>
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<td>.006</td>
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<tr>
<td></td>
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<td>(-.73)</td>
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<td>(-2.52)</td>
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Notes: t-statistics in parenthesis; OLS regressions

have occurred in the world economy in recent years, it appears that the significant positive correlation between budget deficits and real interest rates remained, and may have grown stronger.10

IV. Conclusion

This paper presents some simple tests of the hypothesis that high real interest rates in recent years are significantly correlated with large central government budget deficits. We look at international data to explore this linkage. Specifically, we pool annual observations over the last decade for the seven major industrial countries and regress real interest rates on central government deficits, holding constant money growth, standardized unemployment rates and country-specific dummy variables.

The results generally support the hypothesis. We find that a statistically significant positive relation generally holds between real interest rates and deficits, irrespective of included variables, money growth measures and deficit measures. Although there are some exceptions to this conclusion, the positive deficit-real interest rate correlation is sufficiently stable in a variety of model formulations to give us confidence in the robustness of this empirical result.

The policy implications from these results should be drawn cautiously. Strictly speaking, the single equation methodology employed here does not allow us to determine the causal linkage between budget deficits and real interest rates. Nevertheless, our evidence is clearly consistent with the hypothesis that sizeable central government budget deficits in the world’s major economies may be an important factor holding up real interest rates in recent years.

The results of our empirical analysis are also consistent with the hypothesis that the recent slowdown in monetary growth may also bear part of the responsibility for current high real interest rates. In particular, the empirical results suggest that the sharp increase in U.S. real interest rates between 1980-1982 is partly attributable to slower money growth (120 basis points), but that the rise in federal budget deficits over the same period likely played a larger role (100-250 basis points). Moreover, in light of the evidence gleaned from splitting the sample into the pre- and post-1980 period, it appears likely that large central government budget deficits are playing an increasingly important role in maintaining real interest rates at their present levels.

DATA APPENDIX

Data Sources: International Monetary Fund, International Financial Statistics (IFS); Organization for Economic Cooperation and Development (OECD-1), Occasional Studies, June, 1983; Organization for Economic Cooperation and Development (OECD-2); Economic Outlook, December 1983.

1. Central and general government deficits as a percent of GDP are from OECD-1.
2. Nominal money growth rates are from IFS, line 34x.
3. CPI inflation rates are from IFS, line 64x.
4. Domestic short term interest rates data are from:
   France, call money rate, IFS line 60b
   U.S., Treasury bill rate, IFS line 60c
   Germany, call money rate, IFS line 60b
   U.K., Treasury bill rate, IFS line 60c
   Japan, call money rate, IFS line 60b
   Italy, call money rate, IFS line 60c
   Canada, Treasury bill rate, IFS line 60c
5. Unemployment rates are from OECD-2.
6. Country specific dummy variables equal 1 for named country, 0 otherwise.
1. Simulations of the familiar MIT-Penn-SSRC econometric model, for example, suggest a substantial increase in short-term interest rates given a fiscal stimulus (see Friedman, 1982). The Federal Reserve Board's multi-country (MCM) model also predicts a rise in interest rates in response to a fiscal stimulus (see Haas and Symansky 1983). Both of these models are large-scale structural models of the economy.

2. Reduced form estimates of a direct link between budget deficits and interest rates have generally been unsuccessful. Recent work has investigated various aspects of a potential reduced form linkage. Motley (1983) considers the impact of several measures of budget deficits on real interest rates and finds little correlation. Hoelscher (1983), on the other hand, investigates the impact of budget deficits during the post-war period on nominal interest rates and finds no statistically significant relationship. Evans (1983) takes a different perspective and investigates war-time experiences, again failing to find the hypothesized deficit-interest rate relation. One recent empirical study (Sinai and Rathjens, 1983) purports to have found a significant link, however, on interest rates arising from real government deficits per capita in the U.S. Feldstein and Eckstein (1970), in an earlier study, also estimated a significant effect for real per capita federal government debt on interest rates. Nevertheless, a significant body of literature has failed to find any systematic support for a strong deficit-interest rate link.


4. Hoelscher (1983) derives this model and discusses its relationship to the standard IS-LM model. This reduced form equation is consistent with various theoretical frameworks. The important point to note, however, is that this model is a flow model rather than a stock model of interest rate determination.

5. Mishkin (1984) discusses the assumptions implicit in using the ex-post real interest rate as a proxy for the expected (ex ante) real interest rate. Basically, this approach assumes that markets are efficient, that is, all transactors utilize all available information in forming their expectations about future inflation. The assumption that ex-post real interest rates are good proxies for ex-ante expected real interest rates is quite strong, perhaps unnecessarily so. For example, however one proxies inflationary expectations, the assumption that the inflationary expectations are absorbed in nominal interest rates on a one-for-one basis places an additional constraint on the estimation. This constraint can be relaxed by re-arranging equation (2) to make realized inflation the dependent variable and the nominal interest rate an additional explanatory variable. This change in the estimated equation resulted in modest increases in the magnitude and the significance of the budget deficit coefficient. Specifically, the regressions reported in columns 2 and 3 of Table 1 were re-run with realized inflation as the dependent variable and nominal interest rates as an additional explanatory variable. Except for the anticipated change in sign, the coefficients for money growth and for unemployment are virtually unchanged in either magnitude or statistical significance. Regressing realized inflation on the nominal interest rate, the central government deficit, nominal money growth, and the country dummies results in a coefficient (t-statistic) for the central government budget deficit of −0.010 (−4.28) as compared with 0.008 (4.09) in the original formulation. With unemployment included as an explanatory variable, the comparison is −0.006 (−2.10) vs. 0.004 (1.85).

6. Unemployment was included in the estimation equation to attempt to control factors associated with business cycle fluctuations. Unemployment, however, has a significant rising trend component. To address this problem, we constructed a “cyclical” unemployment variable as the deviation of current unemployment from its past weighted average (three previous years; weights equal to .5 for the first year and .3 and .2, respectively, for the second and third years) and used this constructed variable in the equation in column (3) of Table 1. The results of the regression provided strong support for the hypothetical budget deficit/real interest rate link; estimated coefficient values (t-statistics) equal 0.007 (3.12) for the central government budget deficit, −0.003 (−3.89) for nominal money growth and .004 (1.12) for the constructed cyclical unemployment variable.

7. The weights on lagged money growth are .5 for the first year, .3 for the second year and .2 for the third year.

8. Capio, et al (1983) discuss the problems involved with using deficit-savings ratios as indicators of interest pressure in both the closed and open economy context. A major criticism of deficit-savings ratios posed by the paper is that deficit-savings ratios are not exogenous indicators and are affected differently across countries given similar exogenous shocks to government deficits.

9. A third potential criticism is the question of simultaneity in the estimation of the real interest rate equations. Although we do not suggest that the observed correlation between budget deficits and real interest rates necessarily implies causation, the empirical results may be interpreted this way by some. Critics of this latter view may therefore raise the simultaneity issue. Specifically, it may be argued that an increase in real interest rates depresses economic activity which, in turn, causes government budget deficits to rise. Thus, the budget deficit/real interest rate correlation may be picking up a reverse causation running from real rates to budget deficits.

To address this issue, we estimated equation (2) in the text using several instrumental variables procedures. The instrumental variable estimates also suggest a positive budget deficit/real interest rate association, but do so less strongly than the OLS results. In particular, the budget deficit coefficient is statistically significant at the 10% level when the unemployment variable is excluded, but drops off in significance when it is included in the instrumental variable estimates. We are not satisfied with our instrumental variable results and do not report them in the text because we could not find an appropriate exogenous instrument for the budget deficit variable for each country.

In addition, it should be pointed out that a similar simultaneity argument is most commonly made to explain why budget deficits may be negatively associated with real interest rates. Namely, an exogenous fall in real income may simultaneously cause both a fall in real interest rates and an increase in government budget deficits. Proponents of this view therefore argue that "structural" budget deficits (a hypothetical estimate of the budget deficit based on a full-

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FOOTNOTES

1. The Federal Reserve Board's multi-country (MCM) model also predicts a rise in interest rates in response to a fiscal stimulus (see Friedman, 1982).

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employment output level in the economy) are positively associated with real interest rates, even though observed deficits may be negatively associated with real interest rates. This commonly held view suggests that our estimates of a positive correlation between unadjusted budget deficits and real interest rates have a negative bias (for example, should have a stronger positive correlation than is reported), rather than the positive bias discussed in this text.

10. This result is weakened, however, when the nominal money growth coefficient is allowed to vary together with the budget deficit coefficient during the latter period while the other coefficient values are constrained to be equal. Nevertheless, in this instance the evidence also suggests that the influence of budget deficits on real rates of interest has increased in recent years.

REFERENCES


Money Supply Announcements, Forward Interest Rates and Budget Deficits

John P. Judd*

The positive association between long-term interest rates and M1 "surprises" typically is ascribed to changes in inflation expectations induced by the unanticipated money supply changes. The empirical tests in this paper use a term structure framework for explaining long-term interest rates to isolate more carefully this effect. One of the surprising results is that the expectations effect does not show up in the pre-October 1979 data, the period in which it is generally assumed that the Fed's procedures for controlling money were less well designed to fight inflation. An hypothesis that the presence of large government budget deficits in the post-1979 period may account for the presence of a significant expectations effect then does not appear to be borne out by the data.

In recent years, many financial and monetary economists have offered explanations for the strong responses of interest rates and exchange rates to the Federal Reserve's weekly M1-announcements. For example, when an announced increase in M1 is larger than expected by the market (or a decrease is smaller than expected), short- and long-term interest rates generally increase on the following day, and the dollar appreciates in the foreign exchange market. The opposite movements generally are observed when M1 comes in below market expectations.

This phenomenon probably arises because the market perceives that the Fed attempts to exercise control over M1, but that it does so somewhat cautiously. That is, in the short-run, the Fed is perceived as attempting to offset some, but not all, of the deviations of M1 from target. The responses of short-term interest rates and exchange rates therefore probably reflect a policy anticipations effect: when M1 increases more than anticipated, the market expects the Fed to tighten monetary policy temporarily, which will raise real short-term interest rates and exchange rates. Responses of long-term rates have been interpreted primarily as reflecting changes in inflation expectations: the market expects the Fed to react against a money surprise, but not to react strongly enough to prevent some increase in inflation in the future. This phenomenon is called the expected inflation effect.

Given these effects, it is nevertheless puzzling that long-term bond rates have responded as sharply as they have in the past five years to money supply announcements, and that they have responded more sharply since October 1979 than before. Since the Fed changed its operating procedures in October 1979 to enhance control over M1 to attain better the objective of gradually bringing inflation down, it would make more sense if bond rates responded more sharply to M1-surprises in the earlier period than in the later one. In this paper, we attempt to solve this puzzle in two separate ways. First, instead of analyzing the behavior of long-term bond rates, as most previous studies have done, we examine short-term interest rates expected to prevail in the distant future. For the reasons discussed below, changes in long-term rates can be difficult to interpret because they reflect changes in short-term real rates as well as expected inflation. However, the expected future short-term rates examined in this study should provide "cleaner" estimates of the responses to expected inflation, and therefore may help solve the puzzle described above.

Second, we examine the possibility that the exis-

* Research Officer. David Murray and David Taylor provided research assistance.
tence of “large” expected future structural budget deficits in recent years might have affected the size of responses to money supply announcements. The argument is that when current and future federal deficits are high, positive M1-surprises may tend to intensify fears that the Fed might monetize part of the government debt associated with the deficits. Conversely, negative M1-surprises could reduce concerns about monetization. Thus, the change in fiscal policy regimes that occurred in 1981, when expected future deficits apparently became large, could have affected the responses of interest rates to M1-surprises.

The tests in this paper support the conclusion that there is both a policy anticipation effect and an inflation expectation effect operating simultaneously. Their existence confirms the idea that the market believes the Fed pursues its monetary control objectives somewhat cautiously. Moreover, the tests provide some evidence that a stronger policy anticipations effect is associated with a weaker inflation expectation effect. Finally, the results suggest that expected inflation effects are significant for only about seven years into the future, and that these effects, together with movements in current

and near-term real interest rates, account for the observed large responses of 30-year bond rates.

The major remaining puzzle is why there was not a significant expected inflation effect prior to the Fed’s anti-inflation policy that began in October 1979. As noted above, this paper examines the hypothesis that this apparent inconsistency might be related to the change in fiscal policy regimes in 1981. It is possible that greater fears of monetization in the latter period may have caused the inflation expectations effect to be larger. However, tests of this hypothesis met with only mixed success, and this puzzle will have to be solved by future research.

Section I reviews the literature on money supply announcements, and points out the apparently puzzling behavior of long-term interest rates. Section II presents empirical estimates of the responses of short-term spot rates and several forward interest rates to M1-surprises in three monetary control regimes: September 1977–October 1979, October 1979–October 1982, and October 1982–February 1984. Section III tests for effects of the change in fiscal policy regimes in mid-1981. Conclusions are presented in Section IV.

I. The Money Supply Announcement Puzzle

In recent years, economists have produced a plethora of journal articles on the responses of various financial asset prices to the Federal Reserve’s weekly announcements of M1. Interest in this subject became intense following the Federal Reserve’s change in operating procedures in October 1979. Prior to that date, the Federal Reserve had attempted to control money over periods of several quarters through very gradual changes in the Federal funds rate. Under the new procedures, which used non-borrowed reserves as the instrument of monetary control, the Fed permitted short-term interest rates to vary in the short-run more than they had previously. Greater interest rate volatility was considered necessary to achieve greater control over the monetary aggregates in the short-run. Moreover, for most of the period up to the fall of 1982, M1 was given the most weight in monetary policy decisions.

Coincident with the change in Federal Reserve operating procedures, interest rates and foreign exchange rates began to respond strongly to the Fed’s weekly announcement of the most recent weekly M1 figure. Actually, the reactions were systematic only when changes in M1 differed from the change expected by the market. Thus, changes in M1 anticipated by the market seemed to induce no systematic response in asset yields, presumably because the responses previously had been incorporated into yields.

A large number of studies have estimated the responses of yields to unanticipated changes in M1, both before and after the October 1979 change in the operating procedures of the Fed. These studies used similar econometric techniques in their tests. The explanatory variable in the regressions was the “surprise” in the change in weekly M1—that is, the change in the actual M1 announced by the Fed minus the change in expected M1. The latter variable is measured as the median value of a set of forecasts by money market economists surveyed and recorded by Money Market Services, Inc. This survey has been conducted from September 1977 to

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the present. The dependent variables in previous studies include changes in a variety of long- and short-term interest rates and exchange rates, where the change is measured from the end of the day of the M1 announcement to the following day.

Although different studies have used somewhat different sample periods, they have obtained very similar results. Prior to October 1979, the responses of short-term interest rates, long-term interest rates and dollar exchange rates were very small, and generally (though not always) statistically insignificant. For example, using data from January 1978 to October 1979, Cornell (1983) found that, in response to a 1-percent positive M1-surprise, the three-month Treasury bill rate rose by (statistically insignificant) 2 basis points, and the 30-year Treasury bond rate fell by (statistically insignificant) 0.4 basis point. A very small response also was found for the dollar price of the German mark. From October 1979-December 1981, the response became highly significant. A 1-percent positive M1-surprise was associated with a (statistically significant) 30-basis point increase in the three-month Treasury bill rate, a 15-basis-point increase in the 30-year Treasury bond rate, and an appreciation of the exchange rate.

Alternative Theoretical Explanations

A number of theories would predict responses of asset yields to M1-surprises. To understand these channels of influence, it is useful to consider the Fisher equation (1). This equation states that the nominal interest rate \( i \) of a particular holding period can be decomposed into the real interest rate \( r \) of the same holding period and the expected rate of inflation over that period \( \hat{p}^e \). Both the real and inflation components of the nominal rate depend on expectations about the future. M1 announcements can cause changes in interest rates by altering those expectations.

\[
i = r + \hat{p}^e \tag{1}
\]

A second concept that enters the discussion of M1-surprises is the expectations theory of the term structure of interest rates. This theory maintains that securities of different maturities are good substitutes, so that competition in the financial markets will equate the holding period yields of securities of different maturities. Thus, for example, the investor can expect to obtain the same yield by (1) holding a six-month Treasury bill to maturity, or (2) holding a three-month T-bill to maturity and then reinvesting the proceeds in a second three-month bill and holding it to maturity. For this reason, the yield on the six-month bill will be equal to a weighted average of the yield on the three-month bill and the expected yield on the three-month bill, three months from now. The latter yield is called a forward rate. Changes in these short-term forward rates cause changes in the same direction in long-term rates. This term structure theory provides a link between expected future short-term rates and long-term rates that plays an important part in the various explanations advanced for the effects of M1-surprises.

Expected Inflation Effect

The expected inflation theory holds that an M1-surprise is taken as new information about the current and future growth in the quantity of M1 supplied by the Federal Reserve. As such, a positive M1-surprise causes interest rates to rise because it raises inflation expectations. This theory has an unambiguous implication for long-term rates and for the exchange rate. Higher expected inflation should raise the former and depreciate the latter. The effect on exchange rates follows from the anticipated drop in the purchasing power of the dollar. The effects on short-term rates would depend on how quickly the price level can adjust to a change in money supply—that is, on how "sticky" prices are in the short-run. Presumably, if prices were sufficiently flexible, one would observe an increase in short-term rates following a positive M1-surprise.

The empirical results contradict the expected inflation hypothesis in two ways. First, the exchange rate appreciates with a positive M1-surprise rather than depreciates, as predicted by theory. Second, the positive effects of M1-surprises on long-term rates grew larger with the change in Fed operating procedures in 1979. If M1-surprises changed long-term rates by altering inflation expectations, then the implementation of a new anti-inflation policy should have reduced the estimated responses. Even if the change in procedures had no credibility, it would not have increased them; it would have left the responses unchanged.
Policy Anticipations Effect

The policy anticipations theory\(^4\) proposes that M1-surprises lead to changes in real interest rates. When the Fed attempts to control M1, a positive M1-surprise leads the market to anticipate an increase in short-term (real) interest rates as the Fed attempts to bring M1 under control. In other words, the market believes that the change in M1 was induced by a factor other than an intentional action of the Fed. Since the Fed wants to control M1, it subsequently will take actions to do so and its actions will affect real interest rates. The anticipation of these actions causes rates to change immediately.

The maturities of the rates that are affected depend on what the market perceives is the source of the M1-surprise. If pressures for the change in M1 are not expected to persist for long, then only very short-term interest rates should change. It is also possible, for example, that the market interprets a positive M1-surprise as an indication that GNP is stronger than it originally believed, and that this growth has raised the quantity of money demanded. An upward revision in estimated current GNP could lead to expectations of higher GNP for several years to come, and the market might expect the Fed to offset these pressures through gradual and fairly prolonged increases in short-term rates. As a consequence, expected forward rates would rise, and their rise would push up longer term spot interest rates. However, since the Fed cannot hold real interest rates above the equilibrium level into the very distant future, this theory would predict that little, if any, of the effect of M1-surprises on forward rates would prevail into the distant future.

Finally, the policy anticipation theory predicts that a positive M1-surprise causes the dollar to appreciate. This occurs because money surprises cause real interest rates to move, and higher real U.S. interest rates cause the demand for dollar-denominated assets to rise.

This hypothesis is consistent with the responses of short-term interest rates and exchange rates. It also is consistent with the result that both of these variables moved more after October 1979, when the Fed's monetary control efforts were more aggressive, than before that date, when the Fed tended to respond more gradually. However, the strong rise of long-term interest rates after October 1979 has been interpreted as contradicting this hypothesis. The reasoning goes that although the Fed can drive real interest rates up by reducing the money supply in the short-run, the effect on real rates should not be evident in the distant future when prices have had time to adjust. If the period of monetary restraint lasts only a short time, then only the current interest rate and forward rates covering the near future should rise; the effect on long-term interest rates should be small. If the Fed follows a tighter policy far into the future, the policy should eventually reduce inflation expectations and lower long-term interest rates.

Combined Effects

The theories discussed above are not mutually exclusive. One can reasonably combine the policy anticipations and expected inflation effects into an explanation of responses of various asset prices to M1-surprises.\(^5\) The argument is that, in the post-October 1979 period, the Fed tried to control M1 but did so somewhat cautiously. As a result, when the market observed a larger-than-expected increase in M1, it assumed that only part of it would be offset by a policy response and that part of it would permanently raise M1. Short-term rates consequently rose because the Fed was expected to tighten policy, and long-term rates rose at the same time because part of the M1 increase was expected to remain in the money stock permanently. Unfortunately, this combined theory cannot be tested with the exchange rate after October 1979 because the predictions are ambiguous, that is, the increase in real rates would cause the dollar to appreciate, while the increase in inflation expectations would cause a depreciation.

This explanation fits the post-October 1979 data quite well, with both long- and short-term interest rates rising when M1 came in over expectations. For the pre-October 1979 period, the prediction clearly would be for (at most) the observed small response of the short-term rate because the Fed reacted very gradually to the M1 numbers. However, the long-term rate should have responded positively, because the former funds rate operating procedure of the Fed implied that a larger part of an M1-surprise would be permanent. By the same token, the exchange rate should have depreciated when M1 came in over expectations. These last two predictions of the combination theory do not fit the data for the pre-October 1979 period—neither the long-term rate nor the exchange rate responded significantly in that period.
II. Forward Interest Rates

One key aspect of the puzzling reaction of financial asset prices to M1-surprises is that short- and long-term rates seem to respond in the same way. Thus, prior to October 1979, neither rate responded significantly, whereas afterward, they both responded positively. As discussed above, the two theories used to explain these responses, as well as the combination theory, do not necessarily predict that long- and short-rates will move in the same direction. The reason is that short-term rates are taken as a measure of changes in real interest rates, whereas changes in long-term rates are seen primarily to reflect changes in inflation expectations. The real and expected inflation components of nominal interest rates should respond in different ways to an M1-surprise depending upon the public’s perception of how policy is being conducted. Prior to October 1979, the Fed may have been perceived as permitting a significant part of a positive M1-surprise to remain in the money supply permanently. In reaction, there should have been only a small response by real rates (reflected in the short-term rate) and a fairly large increase in inflation expectations (reflected in the long-term rates). After October 1979, short-term rates should have responded strongly, whereas long-rates might have been expected to respond only slightly because of the Fed’s anti-inflation stance.

The assumption that the responses of short-term rates to M1-surprises reflect the real component of interest rates is strongly supported by evidence that prices adjust to changes in the money supply with a lag. Given this evidence, it is difficult to believe that today’s money “blip” causes any perceptible change in the inflation expected, say, over the next three months.

However, the assumption that movements in long-term rates primarily reflect changes in inflation expectations does not rest on such firm footing. According to the expectations theory of the term structure of interest rates, long-term spot rates are weighted averages of the current short-term spot rate and the expected short-term forward rates. Thus, it is possible that long- and short-term rates move in the same direction because long-term rates, in part, are made up of short-term rates. In other words, changes in inflation expectations may not always dominate observed changes in long-term interest rates. At times, observed changes may simply reflect movements in short-term spot rates and fairly near-term forward rates. This observation suggests that the hypotheses concerning responses to M1-surprises should be tested with short-term spot rates and short-term forward rates expected to prevail far into the future. Changes in, say, the expected one-year rate, thirty years forward should give an indication of movements in inflation expectations.

Unfortunately, it is mathematically difficult to calculate expected forward rates from the term structure when one must use bonds that are coupon instruments. Forward rates have been used in another study of M1-surprises, but the calculations were simplified by assuming, in effect, that coupon bonds were discount bonds. This method provides only very rough estimates of forward rate changes, and the result that forward rates far into the future moved in the same direction as long-term spot rates should be viewed with caution.

The study in this paper uses a method of calculating forward rates from a term structure of spot rates on coupon bonds developed by Shiller, Campbell and Schoenholtz (1983). The authors have demonstrated that their approximation of the true formula for calculating the desired forward rates yields close estimates, except in cases of extreme interest rate volatility.

Empirical Results

In this section, we analyze the impact of M1-announcements on the financial markets by regression methods similar to those that have been commonly applied in the literature described above, except that we look at the responses of short-term forward rates rather than long-term spot rates. More specifically, we use weekly M1-surprises as the variable to explain changes on the day after the M1-announcement in three financial variables—the three-month Treasury bill rate; the two-year T-bill rate, expected 5-years forward; and the ten-year T-note rate, expected 20-years forward. Changes in the three-month rate are taken to reflect changes in the real component. Changes in the two forward rates are taken as reflecting changes in expected inflation.
These (ordinary least squares) regressions were run over three sample periods, each corresponding to a different monetary policy regime. Regime I stretches from September 21, 1977 to October 3, 1979, and falls in the period when the Fed used the Federal funds rate as an operating instrument. As discussed earlier, this is a period when the Fed attempted monetary control only over periods of several quarters through gradual movements in the funds rate. In doing so, it tended to smooth short-run changes in the funds rate. Regime II covers October 6, 1979 to October 3, 1982, the period of the nonborrowed reserves operating procedure in which the Fed attempted monetary control over shorter time periods, and in doing so permitted much more short-run variation in short-term interest rates. In Regime III, which covers October 10, 1982 to February 8, 1984, nonborrowed reserves no longer were linked to M1 as they had been before. This period can be considered a kind of “half-way house” between I and II. The Fed used borrowed reserves as its operating instrument, and

Table 1
Regression Results
\[ DA_t = \alpha_0 + \alpha_1 UM_t \]

<table>
<thead>
<tr>
<th>Regime I: 9/21/77 to 10/3/79 (98 degrees of freedom)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Three-Month Treasury Bill Rate</td>
<td>0.03**</td>
<td>5.79**</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>(2.76)</td>
<td>(2.59)</td>
<td></td>
</tr>
<tr>
<td>Two-Year Treasury Rate, Five Years Forward</td>
<td>0.01</td>
<td>0.25</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.86)</td>
<td>(0.16)</td>
<td></td>
</tr>
<tr>
<td>Ten-Year Treasury Rate, Twenty Years Forward</td>
<td>0.001</td>
<td>1.34</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.50)</td>
<td></td>
</tr>
<tr>
<td>Regime II: 10/10/79 to 10/3/82 (135 degrees of freedom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-Month Treasury Bill Rate</td>
<td>0.04</td>
<td>36.45**</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>(1.18)</td>
<td>(6.38)</td>
<td></td>
</tr>
<tr>
<td>Two-Year Treasury Rate, Five Years Forward</td>
<td>0.03</td>
<td>7.48*</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(1.50)</td>
<td>(2.08)</td>
<td></td>
</tr>
<tr>
<td>Ten-Year Treasury Rate, Twenty Years Forward</td>
<td>0.02</td>
<td>2.21</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>(0.36)</td>
<td>(0.21)</td>
<td></td>
</tr>
<tr>
<td>Regime III: 10/10/82 to 2/8/84 (52 degrees of freedom)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three-Month Treasury Bill Rate</td>
<td>0.004</td>
<td>16.31**</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>(0.35)</td>
<td>(5.45)</td>
<td></td>
</tr>
<tr>
<td>Two-Year Treasury Rate, Five Years Forward</td>
<td>0.02</td>
<td>12.57*</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>(0.73)</td>
<td>(2.17)</td>
<td></td>
</tr>
<tr>
<td>Ten-Year Treasury Rate, Twenty Years Forward</td>
<td>0.01</td>
<td>7.17</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.21)</td>
<td>(0.99)</td>
<td></td>
</tr>
</tbody>
</table>

UM = weekly percentage change in M1 minus the expected weekly percentage change (latter variable defined as the median forecast of the survey of money market economists conducted by Money Market Services, Inc.).

DA = change in specified variable
where, the changes are calculated for Friday over Thursday in weeks prior to 1/30/80, and for Monday over Friday in weeks ending 1/30/80 and after. When the day of or the day following an M1 announcement fell on a holiday, data for that week were excluded from the sample.

Note: * significant at the 5-percent level
** significant at the 1-percent level
\( t \) = statistics in parentheses.
Thus, purely on the basis of considering monetary policy regimes, we would expect to find the largest increases in short-term rates in response to positive M1-surprises to occur in Regime II, the next largest in Regime III and the smallest in Regime I. The size of these hypothesized responses reflects the hypothesized market perception of the Fed’s commitment to controlling money in the short-run, that is, the greatest perceived commitment is demonstrated by the greatest willingness to permit short-term interest rates to move in response to a money “blip.” Moreover, we might expect that forward rates would respond most strongly in the funds rate Regime I, less strongly in Regime III and the least strongly in Regime II.

The empirical results are presented in Table 1. These results seem to resolve some, but not all, of the money supply announcement puzzle. The results for Regimes II and III seem to make sense in terms of the theoretical expectations discussed earlier. In the nonborrowed reserves Regime II, a one percent positive M1-surprise caused a substantial 36-basis-point increase in M1 on the following day. Moreover, this response is highly statistically significant (the t-statistic is 6.38).

This large response in the real rate contrasts with the far smaller increase in expected inflation, as measured by the 7½ basis point increase in the two-year rate, five years forward. Although this response is fairly small, it is statistically significant (the t-statistic is 2.08). Forward rates extending beyond seven years are not statistically significant, indicating that a money surprise today has no systematic effect on inflation expectations beyond seven years. The point is illustrated by the result presented in Table 1, that the 10-year rate, twenty years forward, has a coefficient of only 2 basis points with a t-statistic of only 0.21. (Other results not presented show that the three-year rate, seven years forward, also was not significantly influenced by M1-surprises).

As expected, the results for Regime III show a smaller response for the real component (as reflected in the 3-month T-bill rate) and a larger response in inflation expectations (as reflected in the forward rates).

Specifically, a one-percent positive M1-surprise causes the three-month T-bill rate to rise by 16 basis points (less than in Regime II) and the two-year rate, five years forward, to rise by 12½ percent (more than in Regime II). As with Regime II, there is no significant response of the ten-year rate, twenty years forward.

However, the real puzzle occurs in Regime I, the federal funds rate period. The apparent perception by the market that the Fed reacted cautiously to M1-surprises did not translate into changes in inflation expectations when M1 came in over or under expectations. In that period, a one-percent M1-surprise caused a small, but statistically significant, 6-basis-point increase in the Treasury bill rate, and no statistically significant change in the two forward rates reported.

### III. Large Structural Deficits and the Effects of Money Supply Announcements

The preceding analysis of the impact of M1-announcements on asset prices separated the sample period at October 1979 and October 1982 on the theory that the Federal Reserve has a significant influence on those prices. With different operating procedures, the market presumably anticipates different Fed behavior and asset prices respond differently. This is quite a reasonable presumption. However, the Fed’s change in operating procedures was not the only major policy change affecting the data in the 1980s. There also was a major change in fiscal policy, as reflected in the emergence of large sustained federal deficits. Expectations of future large structural deficits were well-formed at least as early as President Reagan’s tax cuts in July 1981.

How could the presence of large structural deficits affect the response of asset prices to money supply announcements? They could affect the response of asset prices if the public believes the Federal Reserve may monetize part of the federal debt that is generated by budget deficits. Some evidence of past monetization is in the economics literature, although it is by no means conclusive, and expectations concerning monetization are frequently voiced in the financial press. For example, Hoey and Hotchkiss (1983) report results of a sur-
vey of financial decision-makers in December 1983, which found that out of over 600 respondents, about two-thirds agreed with the following statement: "One can have no confidence in the staying power of disinflationary monetary policy as long as federal deficits remain in triple digits."

Monetization of the debt obviously would result in higher inflation rates in the long-run, and thus higher long-term interest rates. Once it becomes clear that deficits are and will remain large, bond rates should rise if the public believes the monetization hypothesis. What role do M1-announcements play? Although the public might believe the monetization hypothesis as a general principle, it presumably would be uncertain about how much of the federal debt might be monetized. Such uncertainty would be consistent with the apparently changing relationship between deficits and M1 growth in the past. Moreover, changes in the make-up of the Federal Open Market Committee, and in the general political "climate" may be expected to influence the degree of monetization.

As the weekly stock of M1 is announced, the public may refine its views about the degree of monetization, and therefore about future money growth and inflation. Thus, if M1 comes in higher (lower) than expected, the market may revise up (down) its estimate of the degree of monetization, and as a consequence, long-term rates will rise (fall). The effects on long-term rates would not be observed in a period of low budget deficits because there would not be much pressure for monetization in such a period. With respect to short-term rates, a positive M1-surprise might elicit smaller responses when deficits are large because the market expects a less aggressive offsetting action by the Fed.

As pointed out by Hardonvelis, 1982, large structural deficits may help to make more sense out of the combined inflation expectations/policy anticipation explanation of asset price movements. In the 1980-1982 period, a positive M1-surprise may have caused short-term rates to rise because of anticipations of a partially offsetting action by the Fed under the reserve control procedures. The same positive M1-surprise may have caused forward rates to rise because the public revised up its estimate of how much of the government debt would be monetized, and thus its view of inflation in the long-run. In the pre-1980 period, short rates may have responded only slightly because no immediate Fed policy reaction was anticipated, and forward rates may have responded only slightly because deficits were small and there was little pressure for monetization.

A Test of the Monetization Hypothesis

Simply stated, the monetization hypothesis is that a positive (negative) M1-surprise will elicit a smaller increase (decrease) in short-term rates and a larger increase (decrease) in forward rates when deficits are "large" than when they are small. This hypothesis can be tested using data from monetary policy Regime II. If we assume that the dividing line between "small" and "large" expected future deficits was designed by the Reagan tax cuts of July 1981, then we can test the monetization hypothesis by using data from monetary policy Regime II—October 1979 to October 1982. Specifically, we can see whether the estimated responses of spot and forward interest rate and exchange rates changed as predicted in mid-1981. To do so, we estimate the same model as in Table 1 over the period October 10, 1979 to October 3, 1982, with two additional arguments: (1) a dummy variable (D), that is zero prior to July 6, 1981 and unity thereafter; and (2) the M1-surprise variable (UM) multiplied by the same dummy variable (D). The first of these two additional arguments permits the intercept term to shift, while the second additional argument permits the estimated response of interest rates to M1-surprises to shift. The t-statistics on these coefficients will indicate whether the estimated shifts are statistically significant.

The regression results are presented in Table 2. The results for the short-term spot interest rate are consistent with the monetization hypothesis. Prior to the Reagan tax cut in mid-1981, a one-percent M1-surprise induced a 44-basis-point increase in the three-month Treasury bill rate. After the tax cut, the policy anticipations effect is estimated to be much smaller—the effect falls by 22 basis points. The same basic result is obtained for the one-year rate, one-year forward: before the tax cut the response was 32 basis points, and after the tax cut it fell by a statistically significant 22 basis points.

The results for the more distant forward rates, however, seem to be inconsistent with the monetization hypothesis. If, in the presence of large defi-
Table 2

Regression Results

\[ DA_t = \alpha_0 + \alpha_1 UM_t + \beta_0 D_t + \beta_1 D_t UM_t \]

<table>
<thead>
<tr>
<th>Sample Period: 10/10/79 to 10/3/82 (135 degrees of freedom)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Three-Month</td>
</tr>
<tr>
<td>Treasury Bill Rate</td>
</tr>
<tr>
<td>One-Year Treasury</td>
</tr>
<tr>
<td>Rate, One-Year Forward</td>
</tr>
<tr>
<td>Two-Year Treasury</td>
</tr>
<tr>
<td>Rate, Five Years Forward</td>
</tr>
<tr>
<td>Ten-Year Treasury</td>
</tr>
<tr>
<td>Rate, Twenty Years Forward</td>
</tr>
</tbody>
</table>

\( D_t = 0 \) in 10/10/79 to 6/30/81, and \( 1 \) in 7/6/81 to 10/3/82.

Note: Variables are defined in note to Table 1.

* significant at the 5-percent level (one-tailed test)
** significant at the 1-percent level (one-tailed test)

cits, the public interprets a positive M1-surprise as raising the odds that the Fed is monetizing part of the deficit, then it simultaneously should raise its expectations of future inflation. For this reason, coefficient \( \beta_1 \) in Table 2 for the two-year rate, five years forward (and possibly for the ten-year rate, twenty years forward) should be significantly positive. Instead, it is insignificantly negative—that is, there was no statistically significant shift in the responses of this variable corresponding to the tax cut in mid-1981.

On the basis of the evidence presented, it does not appear that the presence of large structural deficits resolves the inconsistencies that appear to exist in the responses of forward interest rates to M1-surprises. The main mystery that still exists is the following: if a positive M1-surprise after the Fed began exercising better long-run control over M1 in October 1979 caused an increase in inflation expectations, why did it not also do so prior to that date, when the Fed’s control procedures seemed less well designed to control inflation? The monetization hypothesis holds that some of this inconsistency could be resolved by the presence of large deficits and the fear that they might be monetized after mid-1981, and the lack of large deficits in the earlier period. However, there does not appear to have been a change in the response of inflation expectations to M1-surprises between the two periods.

### IV. Conclusion

This paper has examined the responses of interest rates to announcements of changes in M1 that are not anticipated by the market. The findings can be summarized as follows. Short-term spot rates of interest increase in response to a positive M1-surprise, and like earlier studies, we found that the responses became much larger when the Federal Reserve used a nonborrowed reserves-oriented operating procedure in October 1979 to October 1982 than in the earlier Federal funds rate regime. The Fed’s current operating procedure, which is oriented around borrowed reserves, seems to be interpreted by the market as a kind of ‘‘half-way house’’ between the previous two regimes. The responses of short-term spot rates are larger than in the funds rate regime, but smaller than in the nonborrowed re-
serves regime. These positive responses of short-term rates, together with their relative sizes in the various monetary policy regimes, strongly suggest that the responses represent a policy anticipations effect. That is, when M1 comes in over expectations, the market expects the Fed to tighten policy to some extent, depending on the policy regime.

The interpretation of the responses of long-term rates is not as straightforward. Earlier studies have found a highly significant, and surprisingly large, positive response of long-term interest rates, even out to maturities of thirty years, in response to M1 surprises in the post-October 1979 period, but little effect before. These responses sometimes have been interpreted as demonstrating changes in inflation expectations. It is difficult to imagine why a single weekly M1 figure would have a substantial impact on long-run inflation expectations. To cast more light on this issue, we examined the responses of forward rates of interest far in the future. It does appear that inflation expectations were affected by M1-surprises after October 1979, but these effects seem to extend out only about seven years, and to be of a fairly reasonable size. Thus, the responses of 30-year bonds do not suggest that expected inflation thirty years hence has changed. Instead, the responses reflect changes in real interest rates currently and in the near future, and inflation expectations out to about seven years.

This combination of responses is consistent with the view that the market believes the Fed has attempted to control M1 somewhat cautiously. A positive M1-surprise apparently causes the market to expect some tightening action by the Fed, but not enough tightening action to prevent a moderate increase in inflation. This interpretation is confirmed by the result that when the Fed switched from a nonborrowed reserves- to a borrowed reserves-oriented operating procedure, the policy anticipation effect became smaller and the inflation expectations effect larger. The market's apparent perception that there would be a less aggressive tightening of policy when M1 increased unexpectedly therefore corresponded to the anticipation that inflation would increase by more than it would have in the earlier policy regime.

The remaining puzzle about M1-announcement effects is that there appears to have been no response in inflation expectations prior to October 1979, when the Fed used a funds rate operating procedure. Since that procedure involved only a very small policy anticipations effect, one might expect a large inflation expectation effect, especially compared with the period after October 1979 when the Fed explicitly pursued an anti-inflation policy.

This paper hypothesized that the lack of a strong inflation expectation effect may be related to the change in fiscal policy regimes in mid-1981, when expected future structural budget deficits clearly became "large." It is possible that the public fears monetization of the government debt when deficits are large, and that a positive M1-surprise tends to add to this fear. Conversely, the lack of large deficits in the funds rate regime might help explain the lack of an inflation expectation effect. The results for short-term spot rates seem to confirm this hypothesis, but those for expected future interest rates do not. Further research will be required to solve the money supply announcement puzzle completely.
FOOTNOTES
1. See Cornell, 1983, for a review of this literature.
4. Cornell, 1983, discusses two other theories. The real activity hypothesis argues that the demand for money is a function of expected future income, and that an M1-surprise causes an upward revision in estimates of expected future income. As a consequence, interest rates rise when M1 rises more than expected. Cornell also discusses the risk aversion hypothesis, which argues that an unanticipated increase in M1 reveals that aggregate risk aversion has increased.
6. Ibid
7. For example, the ten-year rate, twenty-years forward is calculated as a duration weighted average of the difference between the thirty-year spot rate and the twenty-year spot rate. The linear approximation enters the formula for calculating duration. This method also is employed in Loeys, 1984, which came to the present author's attention as this paper was going to the printer.

REFERENCES