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# FRBSF WEEKLY LETTER

June 5, 1987

## Interest Rates and Exchange Rates

During the last several weeks, asset prices, seemingly driven by developments in foreign exchange markets, have fluctuated widely in U.S. financial markets. In particular, bond prices have responded strongly, and in the same direction, to fluctuations in the dollar/yen exchange rate. A puzzling aspect of these movements is the extent to which rates on bonds with maturities as long as 30 years have been affected by the dollar/yen rate.

Three alternative hypotheses have been suggested to account for these recent exchange rate and interest rate movements. The first posits an increase in the expected rate of U.S. inflation as the primary factor at work. The second views recent asset price changes as reflecting an increase in the risk premium foreign (predominantly Japanese) investors are requiring to hold U.S. dollar-denominated assets. Finally, the third view cites revisions in market participants' expectations about the longer run value of the dollar required to turn the U.S. trade balance around.

As will be shown, forward interest rates implied by the term structure of interest rates and expected future dollar depreciation as implied by forward exchange rates can be analyzed to help discriminate among these alternative explanations. Our conclusions are that the strong recent response of interest rates to exchange rates seems best explained by the probable impact recent declines in the dollar have had on expectations of future U.S. inflation, while the dollar declines themselves may be due to a downward revision in market participants' views of the longer run value of the dollar required to correct the U.S. current account deficit.

### Expected inflation

The most recent Decision Makers Poll by Drexel Burnham Lambert indicated that expectations of inflation rose approximately one-half of one percentage point between December 1986 and March 1987. This increase seems to have occurred over all time horizons covered by the

survey; the consensus inflation rate expected over the next 12 months rose from 3.5 percent in December to 4.0 percent in March, and the rate expected over the next ten years rose from 5.0 percent to 5.5 percent over the same period. These increases in expected inflation rates apparently were based on two factors. First, oil prices will no longer make a negative contribution to inflation during 1987 because they are not expected to fall significantly (they actually rose from December to March), and, second, the continued fall in the value of the dollar will add to inflation as it causes the prices of imported goods to rise.

The interest rate increases that have accompanied declines in the value of the dollar suggest that financial markets may be focusing on the inflationary implications of further declines in the dollar. Based on historical relationships between changes in the dollar and changes in U.S. inflation, exchange rate movements should have their major impact on inflation over the next two to three years.

The behavior of nominal interest rates on bonds of different terms to maturity — the term structure of interest rates — can shed light on this issue. According to the expectations theory of the term structure, interest rates on long-term bonds should be approximately equal to the average of expected future short-term rates over the life of the bond. The observed term structure can therefore be used to derive estimates of expected future short-term rates. Evidence that expected short-term rates way out on the term structure have not risen would be consistent with the hypothesis that increases in expectations of inflation over the next few years are responsible for the rise in both short-term and long-term interest rates.

Chart 1 shows the pattern of the current 1-year rate and two forward rates — the implied one-year rate expected in one year and the implied five-year rate expected in five years — since January 2, 1987 based on daily observations. (The forward rates were calculated from the term

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structure of interest rates using a duration-corrected linear approximation to estimate the implied expected future rates.)

As Chart 1 shows, since mid-March, both forward rates have risen relative to the current one-year rate. However, since the middle of April, the one-year rate expected to occur in one year has continued to rise while the other two rates have been relatively flat. This suggests markets recently have come to expect higher interest rates one year from now relative to both current rates and rates five years into the future.

Although not shown in the chart, the current five-year rate also has risen during the last two months relative to the five-year rate expected in five years, indicating a greater expected increase in market rates over the next five years than over the period five to ten years from now.

According to the Decision Makers Poll, expected inflation rose about 0.3 percentage points between January and March. This would imply that a rise in nominal interest rates of around 40 basis points would be consistent with unchanged expected after-tax real rates. The actual rise in rates from January to March was between 30 and 40 basis points, suggesting little change over this period in expected real rates. The increase in long-run rates during April, particularly the implied 1-5 year rates, is consistent with a further 0.3-0.4 percentage point rise in expected inflation concentrated within the next few years.

This evidence does seem consistent with the expected inflation story. The recent decline in the dollar should have a significant impact on actual inflation with a lag, so the rise in rates one or two years out on the term structure may reflect the impact of dollar depreciation on expected inflation. However, since a real dollar depreciation — a fall in the price of U.S. goods relative to that of foreign goods — produces a rise in the equilibrium price level, it is hard to attribute the 90 basis point rise from March 2 to April 30 in the expected twenty year rate, ten years forward, to expected inflation within the next few years. Nevertheless, such difficult-to-explain movements in long-term interest rates and forward rates are not unusual. For example, during 1980-82, long-term rates seemed to respond excessively to the weekly money supply announcements.

## Risk premium

Great concern has been expressed about the willingness of Japanese investors to continue to accumulate dollar-denominated assets. Some reports have been fearful of a coordinated move by Japanese investors to withdraw funds from the U.S. bond market, perhaps in retaliation for U.S. trade sanctions against Japan. These concerns can be thought of as producing a change in the implicit risk premium between dollar and yen assets. A risk premium change is an alternative explanation for recent exchange rate and interest rate movements.

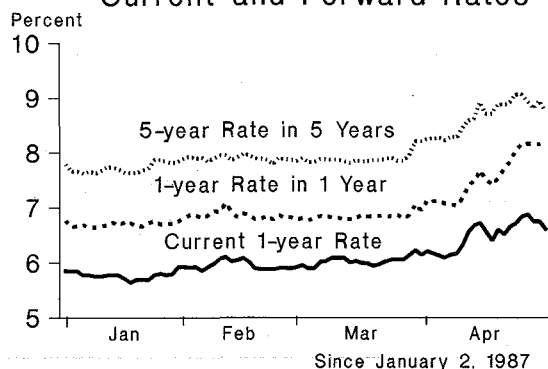
The interest parity condition linking expected real returns on dollar assets and foreign assets states that arbitrage will force risk-adjusted expected real returns on dollar and yen securities to be equal. A rise in the risk premium Japanese investors require to purchase dollar-denominated assets generates an incipient capital outflow in the U.S. Equilibrium is restored by some combination of a rise in the U.S. real interest rates and a fall in the exchange rate sufficient to generate a smaller expected future depreciation.

It seems difficult, however, to reconcile this explanation with the behavior of the term structure discussed earlier. A rise in the risk premium should have its main effect on short-term interest rates, not long-term rates. Since the U.S. economy is much larger than Japan's, the main long-run adjustment should work through a fall in Japanese interest rates, not a rise in U.S. rates. Thus, while all rates might rise, the yield curve should become flatter, or even downward sloping, as short rates rise relative to long rates. However, one-year rates expected in one to two years are the ones that have risen the most.

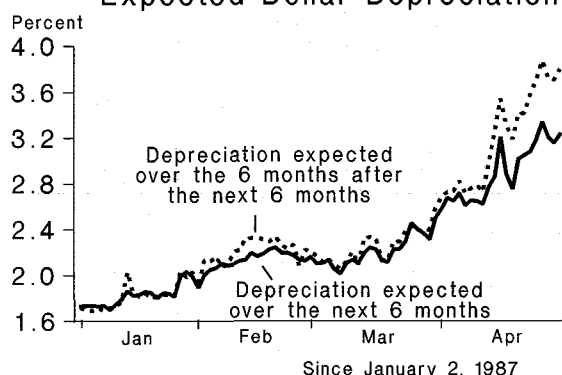
The risk premium argument implies that the dollar must fall in order to generate an increase in the expected rate of future appreciation or at least a smaller expected rate of depreciation. This means that the spot exchange rate for the dollar should decline more than the expected future value of the dollar. Forward exchange rates can be used to test this implication.

Chart 2 presents the expected rate of depreciation of the dollar versus the yen as implied by the 6-month and 12-month forward rates, i.e., the rates expected over the next 6 months and

**Chart 1**  
Current and Forward Rates



**Chart 2**  
Expected Dollar Depreciation



over the 6-month period after the next six months. Contrary to the risk premium story, forward rates have fallen more than the spot rate, producing an increase in the expected rate of depreciation beyond six months. Of particular interest is the fact that the rate of depreciation expected over the next six months has risen less than the rate expected over the period from six to twelve months ahead. This seems most consistent with an expected rise in future inflation as prices adjusted with a lag to recent dollar declines.

#### Equilibrium exchange rates

John Campbell and Richard Clarida have recently argued that exchange rate fluctuations tend to be predominantly fluctuations in the long-run equilibrium expected exchange rate. Thus, a possible explanation for the recent decline in the value of the dollar is that the decline reflects a fall in market participants' assessment of the long-run equilibrium value of

the dollar.

The recent focus on the bilateral trade deficit with Japan may have lowered the market's estimate of the value of the dollar necessary to eliminate the U.S. trade deficit. A fall in the expected equilibrium exchange rate will produce an approximately equal fall in the current exchange rate. It could also generate expectations of further depreciation and depress bond and stock prices in the U.S.

This explanation might also be consistent with the evidence from the forward exchange markets, which suggests that less depreciation was expected over the next six months than over the six months after that. This would also seem to fit with the term structure evidence since interest rates would be expected to rise to offset the expected greater depreciation. However, the explanation does not seem consistent with the observed rise in interest rates on 20-year and 30-year bonds.

#### Conclusion

An examination of the forward interest rates implied by the term structure and the expected change in the value of the dollar implied by the forward exchange market yields two findings: 1) while interest rates across the term structure have risen, the greatest increases appear to be concentrated in the one-year rates expected one and two years in the future, and 2) during March and April, the expected rate of depreciation expected over the next six months increased less than did the rate of depreciation expected over the following six months.

These forward interest rate and expected exchange rate movements seem most consistent with the hypothesis that recent dollar declines are expected to produce a rise in the rate of inflation, particularly over the next one to two years. A rise in expected inflation due to the dollar decline cannot, however, explain why the dollar has fallen. One explanation that appears consistent with the observed asset price movements attributes the fall in the value of the dollar to a fall in market participants' expectations of the long-run equilibrium value of the dollar resulting from the unexpectedly persistent U.S. current account deficit.

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# San Francisco Bank of Federal Reserve Research Department

## BANKING DATA—TWELFTH FEDERAL RESERVE DISTRICT

(Dollar amounts in millions)

Selected Assets and Liabilities Large Commercial Banks	Amount Outstanding	Change from	Change from 5/14/86	
	5/13/87	5/6/87	Dollar	Percent <sup>7</sup>
Loans, Leases and Investments <sup>1 2</sup>	204,136	- 690	258	0.1
Loans and Leases <sup>1 6</sup>	181,518	- 718	- 3,270	- 1.7
Commercial and Industrial	53,206	- 359	- 342	- 0.6
Real estate	68,053	283	1,456	2.1
Loans to Individuals	37,289	89	- 3,404	- 8.3
Leases	5,411	- 2	- 230	- 4.0
U.S. Treasury and Agency Securities <sup>2</sup>	15,318	36	4,095	36.4
Other Securities <sup>2</sup>	7,300	- 9	- 568	- 7.2
Total Deposits	204,463	- 1,696	1,243	0.6
Demand Deposits	51,905	- 1,618	1,718	3.4
Demand Deposits Adjusted <sup>3</sup>	48,109	- 1,010	1,891	4.0
Other Transaction Balances <sup>4</sup>	19,171	- 390	3,469	22.0
Total Non-Transaction Balances <sup>6</sup>	133,387	311	- 3,943	- 2.8
Money Market Deposit Accounts—Total	0	0	- 46,013	- 100.0
Time Deposits in Amounts of \$100,000 or more	31,607	213	- 5,475	- 14.7
Other Liabilities for Borrowed Money <sup>5</sup>	22,985	- 274	- 2,813	- 10.9
<b>Two Week Averages of Daily Figures</b>	Period ended 5/4/87	Period ended 4/20/87		
<b>Reserve Position, All Reporting Banks</b>				
Excess Reserves (+)/Deficiency (-)	19	89		
Borrowings	104	72		
Net free reserves (+)/Net borrowed(-)	- 84	17		

<sup>1</sup> Includes loss reserves, unearned income, excludes interbank loans

<sup>2</sup> Excludes trading account securities

<sup>3</sup> Excludes U.S. government and depository institution deposits and cash items

<sup>4</sup> ATS, NOW, Super NOW and savings accounts with telephone transfers

<sup>5</sup> Includes borrowing via FRB, TT&L notes, Fed Funds, RPs and other sources

<sup>6</sup> Includes items not shown separately

<sup>7</sup> Annualized percent change