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Revisions in the "Flash" Estimates of GNP Growth: Measurement Error or Forecast Error?

Carl E. Walsh*

This paper examines the Department of Commerce's "flash" estimate of real GNP growth. Differences between the flash and the final real GNP figures are often large, but the flash is shown to provide an unbiased forecast of the final GNP figure. Other preliminary estimates of GNP are also released by the Department of Commerce, and these are shown to provide unbiased, but inefficient, forecasts of the final real GNP growth rate.

Fifteen days before the end of each quarter, the Department of Commerce releases its "flash" estimate of that quarter's economic activity, including the real GNP growth rate.¹ Even though these flash estimates are prepared before the quarter is over, they are widely used as early indicators of the current state of the economy. The flash estimates are also used to update and revise forecasts of future real GNP growth and price inflation, although they are frequently subject to large revisions. This paper looks at whether the revisions to flash GNP growth estimates are due to forecast or measurement error, since the type of error bears directly on the usefulness of the flash for forecasting or policy analysis.²

The differences between the actual growth rate of real GNP³ and the flash estimate are plotted in the chart for the period from the first quarter of 1976 through the fourth quarter of 1983. While the average revision in the growth rate was less than 1 percentage point, in comparison with the average actual GNP growth rate of 2.9 percent over the period, the flash

differed from the final growth rate by 3 percentage points or more in five of the thirty-two quarters.

At times, the flash has even incorrectly signalled the direction of GNP growth. For example, the flash estimate of real GNP growth in the first quarter of 1978 was a negative 1.3 percent, in contrast to the final figure of a positive 3.4 percent. This represented the second largest difference between the GNP flash and the final figure during the 1976-1983 period.

There are two alternative ways to view the revisions shown in the chart. One approach is to think of the flash estimate as equal to the true, but as yet unobserved, growth rate, plus some measurement error. This measurement error could be due, for example, to the limited data available at the time the flash estimates were made. If, in a particular quarter, the measurement error were positive, then the flash figure would overstate the actual growth rate and land above the final figure. If the error were negative, the flash would be too low and fall below the final. In other words, the flash estimates would be positively correlated with the measurement error.

The second approach views the flash estimates as forecasts, as opposed to measures, of the final figures. In such a case, the errors plotted in the chart are forecasting errors, rather

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than measurement errors, with properties that distinguish them from measurement errors.

If a forecast has been based on all the relevant information available at the time it was made, any forecast errors would arise only because of unpredictable events or developments that were not incorporated into the forecast because they were, by definition, unpredictable. Forecast errors therefore should have no systematic correlation with the forecast. If they did, the forecast could have been improved by taking the correlation into account. Forecasts that are uncorrelated with their forecast errors are called rational forecasts. If the flash estimate of GNP growth is a rational forecast, then there should be no correlation between the flash and subsequent revisions.

Interpreting revisions to flash estimates as measurement errors or forecasting errors has different implications for how the flash can best be used in forecasting or policy analysis. For example, suppose the flash estimate of the current quarter's GNP growth were used to help forecast next quarter's GNP growth. The subsequent forecast error would depend, in part, on the revision to the flash. If revisions are best viewed as necessitated by measurement error,

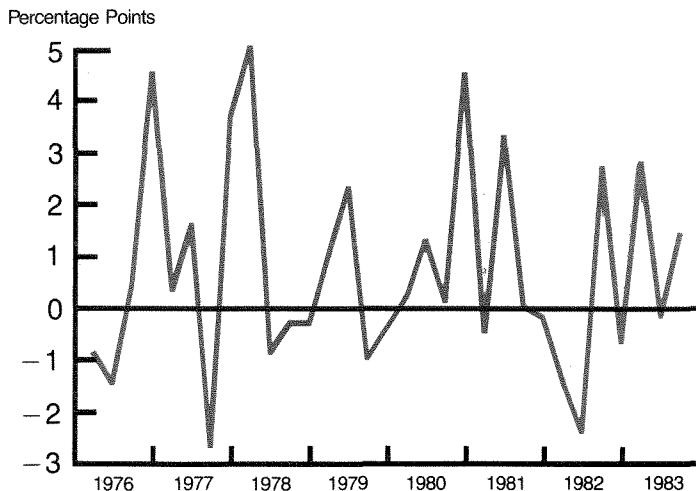
the forecast error in predicting the next quarter's GNP growth will be correlated with the current flash since the flash is correlated with the measurement error. This means that using the flash produces forecasts that are systematically in error and that do not use information efficiently; the forecasts will not be rational.

If, in contrast, the revisions to the flash estimates are themselves rational forecast errors, this problem does not arise. Errors in predicting future real growth will still be affected by revisions to the current flash, but because the revisions are not correlated with the flash, no systematic bias is introduced. Thus, if flash estimates are to be used to measure current economic activity, to forecast future prices or output, or to forecast future Federal Reserve policy actions, it is important to determine which view of the errors is most appropriate.

This paper sets forth some recently proposed tests for distinguishing between measurement error and forecast error and applies these tests to the flash estimate of real GNP growth.⁴ Subsequent estimates of GNP, such as the preliminary, first revised, and second revised figures are also released before the final figures are published, and these data also are analyzed.

Chart 1

Difference Between Flash and Final
Growth Rate of Real GNP



The test results clearly support the view that revisions to the flash, preliminary, and revised real GNP growth estimates are forecast errors and not measurement errors. They imply that using the flash, and other preliminary estimates of real GNP growth, for forecasting purposes will not lead to the biases that would occur if measurement error accounted for the revisions. However, some evidence is found that the revised real GNP growth estimates are inefficient forecasts of final GNP growth in the sense that they do not incorporate readily available information.

I. Analytical Framework

This section discusses the method that will be used to test whether the revisions between final and flash data are better characterized as measurement error in a classical errors-in-variables model (EVM) or as forecast error in a rational forecast model (RFM). The implications of using the flash data in forecasting applications are briefly considered and shown to depend on whether EVM or RFM is the true model.

To understand why it is important to distinguish between alternative interpretations of the flash estimates, consider the use of flash estimates as an input into a forecast of future real GNP growth. In general terms, suppose x_t is the true value of some random variable (i.e., the growth rate of real GNP), and let x_t^p denote a preliminary estimate of x_t . Suppose that one wishes to forecast x_{t+1} using a model, estimated from historical data, of the form

$$x_{t+1} = a + bx_t + cZ_t + \varepsilon_t \quad (1)$$

where Z_t is a vector of additional variables with coefficient vector c , and ε is a random disturbance term. For the purposes of this illustration, the variables in Z_t are assumed to be known and uncorrelated with both x^p and ε . Since x_t is not yet known, suppose x_t^p is used in its place in forecasting x_{t+1} . Letting x_{t+1}^f denote the forecast of x_{t+1} ,

$$x_{t+1}^f = a + bx_t^p + cZ_t. \quad (2)$$

The remainder of this paper provides a technical development of these points. In the first section, the test for distinguishing between the measurement error and rational forecast error views is discussed. This test was originally proposed by Mankiw, Runkle, and Shapiro who applied it to preliminary data on the money stock and found that the differences between final and preliminary money stock numbers are best viewed as due to measurement error. Test results using data on real GNP growth are presented in Section II.

From equations 1 and 2, the error in forecasting x_{t+1} can be written as

$$x_{t+1} - x_{t+1}^f = b(x_t - x_t^p) + \varepsilon_t \quad (3)$$

Equation 3 shows how the error in forecasting x_{t+1} depends on the difference between x_t and x_t^p . The properties of the errors in the forecast of x_{t+1} will thus depend crucially on the properties of $x_t - x_t^p$. As demonstrated below, the errors-in-variables model and the rational forecast model make different predictions about the potential presence of systematic bias in the forecast error $x_{t+1} - x_{t+1}^f$.

Errors in Variables Model

Cast within the classical errors-in-variables model (EVM)⁵, x^p is viewed as equal to the true value of x plus a measurement error, u , with mean zero:

$$x_t^p = x_t + u_t. \quad (4)$$

In this formulation, u and x are taken to be uncorrelated. Consequently, x^p and u will be positively correlated. Thus, in equation 3, $x_{t+1} - x_{t+1}^f = -bu_t + \varepsilon_t$ and the covariance of $(x_{t+1} - x_{t+1}^f)$ and x_t^p is $-\sigma_u^2 \neq 0$, where σ_u^2 is the variance of u . Using x^p to forecast x_{t+1} leads to forecast errors that are systematically related to x^p . This implies that x_{t+1}^f will be an inefficient, and biased, forecast of x_{t+1} .⁶ If x_t^p

is high, it will tend to be so in part because of a measurement error that is positive. Since x_t^p overestimates x_t , x_{t+1}^f will also overestimate x_{t+1} . (This assumes b is positive.) The errors in x^p produce systematic errors in forecasting x_{t+1} .

Equation 4 can be viewed as a regression equation in which the intercept term is equal to zero and the slope coefficient on x_t is equal to one. That is, we can write a more general version of equation 4 in the form

$$x_t^p = a + bx_t + u_t \quad (4a)$$

where $a = 0$ and $b = 1$ if equation 4 is the true model. Under the null hypothesis that EVM is the true model, x and u are uncorrelated. Thus, we can estimate equation 4a by OLSQ and test the restrictions $a = 0$, $b = 1$.

Rational Forecast Model

As an alternative to the errors-in-variables model, suppose x^p is a forecast of x . In the rational forecast model (RFM), the difference between x and x^p is a forecasting error that is uncorrelated with the forecast x^p . Thus, we can write

$$x_t = x_t^p + v_t \quad (5)$$

where v_t is the forecast error. Any correlation between v and x^p would imply forecast errors that are systematically related to the forecast, and one property of rational forecasts is the ab-

sence of such systematic errors. Hence, if x^p is a rational forecast, x^p and v will be uncorrelated. Equation 3 shows that using x^p to forecast x_{t+1} produces an error of $bx_{t+1} + \varepsilon_t$ that is uncorrelated with x_t^p . In this case, x_t^p is not systematically related to the error in estimating x_t . A high x_t^p is just as likely to underestimate as overestimate x_t . Consequently, no systematic error is introduced into the forecast of x_{t+1} .

Just as was done with equation 4, equation 5 can be viewed as a regression equation in which the intercept is zero and the slope coefficient is one. A more general version of equation 5 is

$$x_t = a + bx_t^p + v_t \quad (5a)$$

Under RFM, $a = 0$ and $b = 1$. Since x^p and v are uncorrelated under RFM, equation 5a can be estimated by OLSQ and the restrictions on a and b can be tested.

Mankiw, Runkle and Shapiro propose estimating both equations 4a and 5a and testing the null hypothesis that the intercept is equal to zero and the slope coefficient is equal to one in each equation. For the money stock, they find that the null hypothesis could be rejected for 5a but not for 4a. The preliminary money stock appears, therefore, to be an example of classical errors-in-variables. In the next section, we report the results of estimating 4a and 5a for real GNP growth.

II. Test Results

In this section, EVM and RFM are tested by estimating equations 4a and 5a. Recall that under the errors-in-variables model (EVM), the intercept should be zero and the slope coefficient one in a regression of a preliminary estimate on the final value. Under the rational forecast model (RFM), the intercept should be zero and the slope coefficient one in the reverse regression of the final value on each preliminary estimate.

This test can be applied to the flash estimate of real growth, and to subsequent estimates released by the Department of Commerce. In

fact, there are at least three subsequent estimates of GNP growth before the final values are established, and the tests outlined above can be applied to each.

The variables analyzed in this paper are defined in Table 1: y denotes the final real GNP growth rate, while $y(t)$ denotes an earlier estimate of y released t days after the end of the quarter. Four estimates of the annual percentage growth rates of real quarterly GNP plus the final figures are used, and the data are from 1976:Q1 to 1983:Q4.⁷ The data are given in the Appendix.

TABLE 1

Definitions	
$y_t(-15)$	= flash estimate of the percentage growth rate of real GNP from quarter $t-1$ to quarter t , expressed at an annual rate. This figure is released 15 days <i>before</i> the end of quarter t .
$y_t(15)$	= preliminary estimate, released 15 days <i>after</i> the end of quarter t .
$y_t(45)$	= first revised estimate, released 45 days after end of quarter.
$y_t(75)$	= second revised estimate, released 75 days after end of quarter.
y_t	= final value of growth rate during quarter t , taken as the value reported as of July 1985.

TABLE 2

Tests of the Two Models¹

Errors-in-Variables Model
 $y(t) = a + by$, where $t = -15, 15, 45,$ and 75
 Test: $a = 0, b = 1$

Dependent Variables	Intercept	y	F	M.S. ²
1. $y(-15)$	-0.030 (0.37) ³	0.735 (0.07)	11.00	.0003
2. $y(15)$	-0.036 (0.39)	0.815 (0.07)	4.79	.016
3. $y(45)$	-0.052 (0.33)	0.874 (0.06)	3.26	.052
4. $y(75)$	0.255 (0.32)	0.875 (0.06)	2.35	.113

Rational Forecast Model
 $y = a + by(t), t = -15, 15, 45,$ and 75
 Test: $a = 0, b = 1$

Intercept	$y(-15)$	$y(15)$	$y(45)$	$y(75)$	F	M.S.
5. 0.634 (0.43)	1.081 (0.10)				2.69	0.085
6. 0.602 (0.42)		0.990 (0.09)			1.29	0.289
7. 0.431 (0.34)			0.996 (0.07)		1.02	0.371
8. 0.095 (0.34)				1.006 (0.07)	0.082	0.921

1. Sample period is 1976:Q1-1983:Q4.
2. The Marginal Significance level is the probability of observing an F-statistic greater than or equal to the reported value.
3. Numbers in parentheses are standard errors.

Rows 1–4 in Table 2 present the results of testing the EVM for preliminary real GNP growth estimates. For the flash, $y(-15)$, and the preliminary, $y(15)$, the hypothesis that $a = 0$, $b = 1$ can be rejected at the 5 percent significance level. The hypothesis that $a = 0$, $b = 1$ for the first revision, $y(45)$, can be rejected at the 6 percent level. For the second revision, $y(75)$, however, the F value is 2.35 with a marginal significance level of 11.3 percent. Except for $y(75)$, the data clearly reject the errors-in-variables interpretation of early estimates of the growth rate of real GNP. The failure to reject EVM for $y(75)$ is perhaps explained by the fact that revisions between $y(75)$ and y are small, which suggests that the power of the test may be low.

Rows 5–8 of Table 2 present the tests of RFM. In striking contrast to the results for EVM, the hypothesis that the preliminary announcements of GNP growth are rational (unbiased) forecasts cannot be rejected at the 5 percent level of significance for any of the GNP estimates. Unlike the results for preliminary money stock numbers reported by Mankiw, Runkle and Shapiro, the preliminary real GNP numbers seem to be rational forecasts of the final rate of growth in GNP.

In addition to being viewed as an estimate of the final growth rate of real GNP, the flash is also viewed as an estimate of subsequent estimates of GNP growth. Thus, we investigated whether the flash is better represented as a rational forecast of subsequent revised estimates or as equal to future estimates plus some measurement error. The EVM regressions of $y(-15)$ on each subsequent revised estimate of y are given in the top half of Table 3. The null hypothesis under EVM can be rejected in each case. The lower half of Table 4 presents the test statistics under the RFM. At the 5 percent significance level, the hypothesis that $y(-15)$ is a rational forecast of $y(15)$ and $y(45)$ cannot be rejected. It can be rejected, however, for $y(75)$.

Efficiency of Forecasts

The bulk of the evidence from Tables 2 and 3 favors the RFM interpretation of the prelim-

inary GNP growth rate estimates. These results, however, do not shed much light on the *efficiency* of the preliminary estimates as forecasts of the final growth rate (a forecast is efficient if it correctly incorporates all relevant information). If x_t^p is an efficient estimate of x_t , then the prediction error $x_t - x_t^p$ should be uncorrelated with *any* information available at the time x_t^p is formed. In a regression of $x_t - x_t^p$ on known information, all the coefficients should be zero.

The hypothesis that preliminary announcements of real GNP growth are efficient forecasts implies, at a minimum, that the prediction error of each estimate should be uncorrelated with earlier revisions in the estimate. For example, $y - y(75)$ should be uncorrelated with $y(75) - y(45)$, $y(45) - y(15)$, and $y(15) - y(-15)$. Similarly, $y - y(45)$ should be uncorrelated with $y(45) - y(15)$ and $y(15) - y(-15)$, while $y - y(15)$ should be uncorrelated with $y(15) - y(-15)$. These hypotheses are tested in Table 4.

The hypothesis that $y - y(15)$ is uncorrelated with $y(15) - y(-15)$ clearly cannot be rejected. However, the hypotheses that $y - y(45)$ and $y - y(75)$ are uncorrelated with earlier revisions is rejected by the data. Rows 2 and 3 of Table 4 show that $y - y(45)$ and $y - y(75)$ are related to the difference between both the first revised and the preliminary estimates, $y(45) - y(15)$, and the preliminary and flash estimates, $y(15) - y(-15)$. If the first revision, $y(45)$, shows one percentage point more estimated GNP growth than did the preliminary estimate, $y(15)$, i.e., $y(45) - y(15) = 1$ in rows 2 and 3, then both the first and second revised estimates, $y(45)$ and $y(75)$, will tend to underestimate the final growth rate, y , by 1.1 percentage points. This evidence of inefficiency is consistent with the earlier results which showed both $y(45)$ and $y(75)$ to be rational forecasts of y . Table 2, for example, shows that the unconditional expectation of $y - y(t)$ is zero for $t = 45, 75$. Table 4, however, shows that the expectation of $y - y(t)$, conditional on $y(45) - y(15)$ and $y(15) - y(-15)$, is not zero. Hence, these estimates do not use all prior information as efficiently as possible.

The results reported in this paper support the view that the flash, and other early estimates of real GNP growth, are rational forecasts of actual GNP growth. Generally similar conclusions apply to estimates of the percentage change in the GNP Price Deflator.⁸ The flash

numbers provide unbiased forecasts of the final figures. Although the revisions that are subsequently made to the flash are often quite large, the problems that would occur if these revisions were due to measurement error do not apply.

TABLE 3
The Flash and Subsequent Estimates*

Errors-in-Variables Model					
$y(-15) = a + by(t), t = 15, 45, 75$					
Test: $a = 0, b = 1$					
Intercept	y(15)	y(45)	y(75)	F	M.S.
1. 0.033 (0.16)	0.889 (0.03)			6.42	.005
2. 0.003 (0.22)		0.845 (0.05)		7.99	.0023
3. -0.246 (0.25)			0.841 (0.05)	10.53	.0003

Rational Forecast Model					
$y(t) = a + by(-15), t = 15, 45, 75$					
Test: $a = 0, b = 1$					
Dependent Variable	Intercept	y(-15)	F	M.S.	
4. y(15)	0.067 (0.18)	1.076 (0.04)	2.69	.084	
5. y(45)	0.192 (0.25)	1.090 (0.06)	2.82	.075	
6. y(75)	0.535 (0.27)	1.075 (0.06)	4.98	.014	

* See notes to Table 2

TABLE 4

Tests of Efficiency*						
Test that all coefficients are zero						
Dependent Variable	Intercept	y(75)-y(45)	y(45)-y(15)	y(15)-y(-15)	F	M.S.
1. $y - y(15)$	0.646 (0.37)			-0.297 (0.40)	0.559	.461
2. $y - y(45)$	0.390 (0.27)		1.082** (0.39)	-0.601** (0.29)	4.972	.014
3. $y - y(75)$	0.098 (0.30)	-0.056 (0.48)	1.114** (0.38)	-0.622** (0.28)	3.89	.019

* See notes to Table 2.

** Significantly different from zero at the 5% level.

APPENDIX

TABLE A.1

Estimates of Percentage Change
in Real GNP (Annual Rates)*

	y(-15)	y(15)	y(45)	y(75)	y
1976:1	5.0	6.4	7.3	7.5	9.1
1976:2	3.6	5.0	4.9	5.1	2.7
1976:3	3.8	3.9	3.7	3.8	2.3
1976:4	3.2	2.9	2.3	2.5	3.7
1977:1	4.4	5.5	6.5	7.1	8.9
1977:2	6.4	6.3	6.0	6.0	6.7
1977:3	5.2	3.9	4.9	5.2	6.8
1977:4	3.5	3.9	3.6	3.5	0.8
1978:1	-0.3	0.5	0.6	1.0	3.4
1978:2	6.0	6.3	6.9	7.6	11.0
1978:3	4.2	4.3	4.3	3.5	3.3
1978:4	5.8	6.9	7.2	7.7	5.5
1979:1	1.4	0.8	0.4	0.8	1.1
1979:2	-1.9	-2.7	-1.8	-1.8	-0.9
1979:3	2.5	3.5	4.5	4.1	4.8
1979:4	1.7	1.6	2.3	2.2	0.7
1980:1	2.3	1.5	1.0	1.6	1.9
1980:2	-9.2	-9.8	-9.8	-10.3	-9.0
1980:3	-0.5	0.5	0.3	2.4	0.8
1980:4	3.7	5.0	4.0	3.8	3.8
1981:1	5.5	6.5	8.4	8.6	10.0
1981:2	0.0	-1.9	-2.4	-1.6	-0.5
1981:3	-0.5	-0.6	0.6	1.4	2.8
1981:4	-5.4	-5.2	-4.7	-4.5	-5.4
1982:1	-4.4	-3.9	-4.3	-3.7	-4.7
1982:2	0.6	1.7	1.3	2.1	-0.8
1982:3	1.5	0.8	0.0	0.7	-0.9
1982:4	-2.2	-2.5	-1.9	-1.0	0.5
1983:1	4.0	3.1	2.5	2.6	3.3
1983:2	6.6	8.7	9.2	9.7	9.4
1983:3	7.0	7.9	7.7	7.6	6.8
1983:4	4.5	4.5	4.8	5.0	5.9

*Variables are defined in Table 1 of the text. Source: Department of Commerce, Bureau of Economic Analysis.

FOOTNOTES

1. The second revised estimate of GNP growth in the previous quarter is released at the same time.
2. For a somewhat skeptical view of the usefulness of the flash, see "A Flash in the Pan," *Morgan Economic Quarterly*, September 1985.
3. "Final" or "actual," refers here to the values reported as of July 1985.
4. Similar tests were carried out for the GNP Price Deflator and the results are described in footnote 8.
5. For a general discussion of the errors-in-variables model, see E. Malinvaud, *Statistical Methods of Econometrics* (North Holland, 1970), chap. 10.
6. The unbiased forecast of x_{t+1} , conditional on x_t^p and z_t , metrics (North Holland, 1970), chap. 10.

$(\sigma_x^2 + \sigma_0^2)$ is equal to the coefficient b corrected for the ratio of the variance of x to the variance of x^p .

7. The flash estimates have been prepared by the Bureau of Economic Analysis, Department of Commerce, since the mid-1960s. Prior to 1976, the data as originally released is not consistent with the current definition of GNP because of the re-benchmarking of the National Income and Product Accounts in January 1976.
8. Results for the percentage change in the GNP Price Deflator were similar to those for real GNP growth. EVM could not be rejected at the 5% level only for the first revised estimates. However, no evidence of inefficiency was found for the inflation estimates.

TABLE A.2
Estimates of Percentage Change
in GNP Price Deflator (Annual Rate)**

	p(-15)	p(15)	p(45)	p(75)	p
1976:1	4.0	3.7	3.6	3.7	3.9
1976:2	4.4	5.0	5.4	5.5	3.8
1976:3	5.0	4.4	4.2	4.5	5.1
1976:4	6.4	6.5	6.0	6.0	6.7
1977:1	5.7	5.6	5.5	5.7	5.9
1977:2	6.5	7.1	7.5	7.6	7.1
1977:3	5.4	5.3	5.1	5.1	6.3
1977:4	6.6	6.6	6.6	6.3	6.5
1978:1	7.5	6.8	6.8	6.8	5.5
1978:2	8.4	10.7	11.5	11.8	12.0
1978:3	7.4	7.4	7.5	7.2	9.0
1978:4	8.9	8.6	8.6	8.7	9.7
1979:1	9.1	8.6	8.8	8.9	8.7
1979:2	9.8	9.1	8.6	8.7	8.4
1979:3	8.2	7.9	7.7	8.3	8.8
1979:4	8.6	8.3	8.2	7.9	7.4
1980:1	10.2	9.4	9.2	9.4	9.8
1980:2	9.7	9.3	9.5	9.5	9.9
1980:3	10.1	9.7	10.5	9.4	8.9
1980:4	12.1	11.7	11.2	11.1	11.7
1981:1	8.3	8.4	10.9	10.6	12.1
1981:2	6.2	5.9	6.5	6.3	6.5
1981:3	9.3	9.4	9.6	10.0	10.3
1981:4	8.3	7.9	8.9	9.1	7.9
1982:1	4.5	3.5	3.4	3.7	4.4
1982:2	5.0	5.4	4.9	4.7	5.5
1982:3	6.6	5.4	4.7	5.1	3.4
1982:4	4.4	4.2	3.6	3.6	3.4
1983:1	4.5	6.0	5.8	5.7	5.2
1983:2	4.3	4.8	3.8	3.6	2.9
1983:3	3.5	3.7	3.5	3.9	3.3
1983:4	4.2	4.1	4.4	4.1	4.7

**Variables are defined analogously to those in Table A.1 (i.e., p(-15) is the flash estimate of p). The percentage change in the GNP Price Deflator was obtained by subtracting the change in Constant Dollar GNP from the change in Current Dollar GNP.

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Developments in British Banking: Lessons for Regulation and Supervision

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The British banking system has experienced significant stress in the last decade or so. In this paper, the authors examine the sources of this stress and study the reaction of British banking policy to these changes. Like their American counterparts, the British are striving to maintain a stable banking environment in the face of increasing competitive pressures.

During the last two decades, the economic and technological environment in which financial institutions operate has undergone important changes. Improved communications, electronic data processing and a volatile economic environment have combined to challenge the extant structure of the financial industry and its supervision and regulation by banking authorities. In the United States, these developments have resulted in the creation of new nonbank competitors, essential elimination of deposit rate regulation, and weakened prohibitions against interstate banking activity. They have also contributed to serious strains on and loss of confidence in portions of our financial system.

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The purpose of this paper is to examine the recent changes in banking policy that have occurred in the kindred financial system of the United Kingdom. Despite many similarities, British and American banking policy differ significantly in the ways they achieve financial stability as well as in their impacts on the efficiency of their respective banking systems. In particular, British policymakers historically have relied more heavily on "self-regulation" by the banking industry, and have tolerated pricing cartels and restrictions on entry. The high levels of concentration in the British banking sector also facilitated a supervisory approach that, while more informal than that practiced in the United States, was also more intimate. Furthermore, the British approach involved banks more directly in national economic policy initiatives.

By the 1970s, British policy had stimulated the growth of nonbank competition that was undiversified and entirely unsupervised by any regulatory authority. The failure of these fringe institutions precipitated a crisis of confidence that threatened the entire British banking system.

The British experience illustrates the strength of natural competitive forces, particu-

larly in an environment where implicit central bank protection is provided asymmetrically to various financial institutions and bank restrictions on entry and portfolio composition exist. This interpretation is supported by recent changes in British banking policy that would appear to be moving Britain toward a system with relatively free entry, but also one with

more intensive supervision and examination of financial institutions.

We turn now to a brief review of the evolution of the British banking structure. This discussion is followed by an analysis of current efforts to reform banking policy. The paper concludes with a brief summary and interpretation of recent events in British banking.

I. The Structure and Evolution of the British Banking System

Examining the evolution of British banking institutions in the context of changing economic policy illustrates how regulation, market structure, and the performance of the banking system interacted in a way that resulted in considerable instability. The following discussion does not attempt to encompass the range of institutions making up the British banking system, but rather, focuses on those banking entities salient to the main issues of this paper. These entities include the "clearing banks" (roughly analogous to U.S. commercial banks), the "building societies" (resembling mutual savings banks in the U.S.), and, finally, the fringe group of bank-like financial organizations known as the "secondary banks." Together, these three groups account for over 75 percent of total deposits in the U. K., although they do face some competition from various other British banking institutions.¹

The London Clearing Banks

Before the early 1960s, clearing banks were overwhelmingly the most important providers of demand deposits in the British banking system. They continue to control about 35 percent of total U.K. deposits, and are active in both commercial and consumer lending.² The group derives its name from its exclusive ownership and control of the nation's major funds transfer and check clearing system.³ This privilege has restrained competition from other institutions for checkable deposits, or "current accounts" as they are known in the U.K.

The clearing bank industry historically has been highly concentrated. Indeed, today, only 4 major London banking groups own or effectively control almost all the clearing banks and

their subsidiaries.⁴ It was not until relatively recently that British banking policy addressed the problems stemming from this market structure.

Historically, the Bank of England only gradually assumed the supervisory and regulatory functions of a modern central bank. The concentrated nature of the clearing bank industry fostered the development of a supervisory system that was informal and therefore flexible. Moreover, within this system, the Bank of England may have benefitted from according the clearing banks a privileged competitive position in exchange for their cooperation in carrying out the Bank's monetary and other policy objectives.⁵

The concentrated character of the clearing bank industry is due to a history of legislative barriers to entry imposed to a significant degree by the Bank of England. As a result of these barriers, very few new banks formed after the mid-19th century.⁶ Instead, there was a period of extensive amalgamation of smaller banks. Protected from competition from new banks, competition between existing banks took the form of rapid branching.

Through the first half of this century, the Bank of England essentially ignored the effects of the clearing bank cartel's collusive pricing and monopoly of the clearing mechanism on the British banking industry, including the possibility that the clearing banks enjoyed supra-normal profits.⁷ The *quid pro quo* of this arrangement was that the banks would comply with the Bank of England's "requests" regarding monetary and other policy objectives without requiring explicit, formal regulation.⁸

Supervision of the clearing banks was likewise simplified due to the concentration of the

industry. No explicit legislation regarding bank supervision was perceived to be necessary given the overall stability of the industry. Instead, the Bank generally relied on "moral suasion" to influence the clearing banks, as well as the implicit threat of refusing to maintain a bank's account. Consequently, supervisory efforts consisted of relatively informal discussions with senior management about the nature and quality of its business, including its management, and an annual review of the banks' accounts.⁹

Before 1979, Britain lacked an equivalent to U.S. deposit insurance. However, clearing bank control of the nation's funds transfer and clearing mechanism, the general intimacy between the Bank of England and the clearing banks, and several historical precedents contributed to the general perception that, in the event of a major financial crisis, the Bank would step in to uphold the continued operation of the clearing banks.

Until the early 1960s, the British banking system was highly concentrated and dominated by a cartel of clearing banks enjoying oligopolistic benefits. This situation resulted in a banking industry that, for many years, was stable and easy to control from the point of view of the Bank of England.¹⁰ However, during the 1960s and 1970s, a number of interrelated factors upset the *status quo* and jeopardized the stability of the system. In the postwar era, restrictions on the clearing banks, including lending and interest rate ceilings and portfolio restrictions, in combination with rising interest rates and a higher standard of living resulted in the emergence of lucrative banking opportunities for other institutions. Consequently, despite the relatively protected status of the clearing banks, competition emerged from several quarters.

Building Societies

At present, building societies comprise important competition for the clearing banks, controlling some 33 percent of total deposit liabilities. They were formed during the industrial revolution to provide a mechanism for financing the home purchases of workers drawn

to new industrial centers. They were then, and remain today, "mutual societies" in that most of their liabilities take the form of "shares." This arrangement leaves management authority, at least in concept, in the hands of depositors.¹¹ Since their formation, they have been viewed by British policymakers as a mechanism for promoting and financing home ownership in the United Kingdom. Their assets have consisted, therefore, primarily of mortgage loans.

Competition within the building society industry has been more vigorous than that among clearing banks throughout the societies' history. A cartel was formed in the 1930s to stabilize the industry, but after some 50 years of operation, the maverick behavior of members disabled its effectiveness; the cartel was dismantled in 1984.¹² However, the number of building societies in the U.K. has fallen sharply since the turn of the century and market share has become increasingly concentrated in a few firms from a five-firm concentration ratio of 39 percent in 1930 to 55 percent in 1983. The largest society now has over 20 percent of total industry assets. However, unlike the case of the clearing banks, the building society sector did not face significant barriers to entry. Consequently, some 210 institutions exist today with extensive branch networks throughout the United Kingdom.

Overall, the building societies played a relatively minor role in the British financial industry until the 1950s and 1960s when reform of the tax treatment of owner-occupied housing increased the demand for residential mortgages. The combined effect of increased residential mortgage demand, tax advantages, and an ability to compete for deposits at competitive rates then stimulated rapid growth in building societies. Their share of total deposits relative to the clearing banks rose from less than 30 percent in 1955 to almost 90 percent in 1985.

Unlike their American analogs in the thrift industry, British building societies were not subject to Regulation Q-type deposit rate ceilings. They were thus able to pay shareholders and depositors returns consistent with those enjoyed elsewhere in the marketplace. The clear-

ing banks had tied rates of interest paid on non-checkable deposits to the Bank rate, which was frequently lower than rates paid elsewhere.

The building societies also received more favorable tax treatment than the clearing banks in that depositors received their interest on an after-tax basis. The tax on interest earnings was paid at a so-called "composite" rate by the building society, thus no further tax obligation was incurred by resident depositors. Since the composite rate, historically, has been lower than the very high marginal personal tax rates in the U.K., building societies were very attractive to retail depositors. In addition, the societies have been insulated somewhat better from interest rate and credit risk than their American counterparts because of their policy of making adjustable rate mortgage loans and government policies which provide funds for mortgage payments to the unemployed. Building societies are supervised by the "Chief Registrar of Friendly Societies."

Despite relative advantages such as the ability to pay market rates of interest and preferential tax treatment, the extent to which the building societies were able to compete with the clearing banks has been restrained. Restrictions on the composition of building society assets did not permit deposit account overdrafts—a major mechanism in the British system for making loans—and thereby precluded societies from offering "checkable" current accounts. In addition, the clearing banks' monopoly of the clearing and settlement mechanism has also impeded building societies from offering effective competition.

The Secondary Banking Sector

The fringe financial institutions in the British banking system, frequently referred to as "the secondary banks", did not become important until the post-war period when restrictions on clearing banks induced the development of other institutions to take advantage of new and unexploited banking opportunities in the then generally favorable economic climate.

During the 1950s and early 1960s, the Bank of England discouraged clearing banks from

lending to individuals or to property interests, hoping thereby to channel investment into the industrial sector. Meanwhile, post-war personal income was rising and generating more demand for consumer goods. The secondary banks emerged during this time to exploit the new lending markets. In general, they engaged in activities such as the finance of auto and household goods purchases and equipment leasing to businesses. They freely obtained deposits from the newly developing wholesale money markets. And generally higher market interest rates combined with interest ceilings on clearing bank deposit accounts induced depositors to seek higher yielding deposit alternatives from them.

By the 1960s, as lending and other restrictions continued to handicap the clearing banks, the secondary banking sector presented increasingly strong competition. However, the rapid development of this fringe banking sector, generated by restraints elsewhere in the industry, introduced elements of risk that threatened the traditional stability of the British banking system.

First, these institutions were largely undiversified, lending only to the narrow sectors to which they had access. Consequently, these banks were left with more risky activities and engaged in more speculative ventures than the clearing banks had been wont to do. Whereas the clearing banks had traditionally eschewed investment in equity shares of other companies, the new financiers participated actively in holding and dealing in shares, takeover activities and investment management.

A second element of risk stemmed from the complete lack of supervision of these institutions. Growth in this new banking sector occurred so rapidly that the supervisory scope of the Bank of England was not expanded to incorporate it. Neither were codified standards of prudential management proposed.¹³ Finally, unlike the clearing banks, there was no entity to function as a lender of last resort to the secondary banks; the money placed through the wholesale markets was (and is) entirely unsecured.

The Crisis

In 1971, the Competition and Credit Control policy was introduced that loosened many of the lending restrictions on clearing banks. This act encouraged the clearing banks to compete with other financial institutions as well as among themselves in previously restricted markets at competitive interest rates. The Bank of England had expected the number of fringe financial institutions to contract under this increased competition and thereby free more investment credit for industrial uses. Overall lending did skyrocket as a result, but the clearing banks also began to compete with the secondary banks for lucrative property development and other lending markets. By mid-1972, the clearing banks were once again restricted from lending in the property market. Their competition, however, had forced the unsupervised fringe banks to extend themselves even farther into property markets and other more speculative dealings.¹⁴

When the ensuing monetary boom began to manifest itself in rising inflation rates in 1973, the Bank of England abandoned the Competition and Credit Control policy, re-imposed interest rate ceilings, and introduced a form of noninterest-bearing reserve requirement on the clearing banks.¹⁵ The Bank also pursued a

tighter monetary policy that raised interest rates.

The resulting fear of the effects of higher interest rates on asset valuations of property companies and their creditors, as well as fear of a rent freeze and a new development tax, generated considerable uncertainty in the property market. In late 1973, a sizeable finance company collapsed and sparked a crisis in confidence in the secondary banking sector. The incident initiated a flight of funds from the unprotected fringe to what was perceived as the "safe haven" of the clearing banks.¹⁶

The Bank of England recognized the need to prevent the secondary bank crisis from affecting the banking system proper and stepped in to initiate a rescue operation named "the Lifeboat".¹⁷ The Bank backed a group of clearing banks in essentially "recycling" deposits (originally withdrawn from the secondary banks) back to illiquid fringe institutions. By 1974, the number of troubled institutions had multiplied as a result of the collapse of property values. As the security (property) behind their lending melted away, these institutions' debts mounted, often at increasing interest rates. Consequently, the overall cost of the lifeboat operation to the Bank of England and the clearers was considerable.¹⁸

II. Directions of Change in British Banking

We have discussed how a history of policy decisions contributed to the concentrated and segmented nature of the British banking industry. British policy makers, like their American counterparts, have attempted to achieve a workable balance between soundness and vigorous competition within the banking industry, assuming that vigorous competition alone would lead to socially excessive levels of risk-taking.¹⁹ The British historically have maintained this balance by restricting entry into commercial banking, permitting coordinated pricing and by tolerating the high concentration of banking activity in a relatively few institutions with which the Bank of England had a productive, albeit informal, relationship.

Events in the early 1970s, including the secondary banking crisis, revealed two basic flaws in this strategy. First, the lack of complete coverage of portfolio and entry restrictions and supervisory authority resulted in an inability to protect the clearing banks from competition from building societies and other non-bank deposit takers ("the secondary banks").²⁰ Second, as a consequence, the hoped-for protection of the banking system from the destabilizing effects of excessive risk-taking on the part of individual financial institutions was not realized. Indeed, the coexistence of an implicitly protected clearing bank sector and an unprotected secondary banking sector actually may have exaggerated the flight of deposits from the sec-

ondary banks to the clearing banks that necessitated the “lifeboat” operation in 1973. In this section, we examine the modifications in policy that have been used to redefine the balance between soundness and competition in British banking markets.

Changes in Supervisory Policy

After the initial responses to the secondary banking crisis—abandoning Competition and Credit Control policy and imposing other restrictive policies—British policymakers sought legislation to extend the supervisory authority of the Bank of England to cover the previously unregulated, secondary banking sector. They achieved the extension with the passage of the Banking Act of 1979. The Act extended the supervisory authority of the Bank of England to all deposit-taking institutions, with the exception of Building Societies, which remained under the aegis of the Registrar of Friendly Societies. All depository institutions thus were required to meet minimum managerial and financial requirements and to file periodic statements of condition with the Bank of England. This change represented a significant increase in the extent and formality of bank supervision by the Bank of England, although by American standards, supervision remains relatively mild.²¹

The Banking Act of 1979 also sought to re-emphasize the distinction between clearing banks and other banking sectors by creating a new category of institutions called “Licensed Deposit Takers.” This classification embraced most of what we have referred to above as secondary banking institutions. The rationale for re-emphasizing this distinction was that, in the public’s mind, a true “bank” had come to be regarded as an institution that enjoyed a special and protected relationship with the Bank of England. Indeed, given the historical exclusivity enjoyed by clearing banks, such perceptions were probably not unrealistic.

In reaction to the events of the 1970s, British policymakers also increased pressures to institute deposit insurance as a bulwark against runs on deposit-taking institutions. Prior to the 1970s, neither government nor the financial in-

dustry had expressed much interest in deposit insurance. They relied instead on credit controls and rate-setting cartels in the building society and banking sectors to control potentially destabilizing risk-taking.

However, as discipline in the building society cartel deteriorated, the Building Societies Association independently devised a Voluntary Depositor Protection Scheme to protect the industry from associations with individual societies weakened by excessive risk-taking. The voluntary depositor protection scheme covers 100 percent of all deposits and 90 percent of all shares in participating institutions. As of 1984, over 80 percent of all building societies were participating in the deposit insurance scheme, with the result that over 95 percent of all shares and deposits in the building society industry enjoyed protection.²²

The Banking Act had specified that banks and other licensed deposit-takers be subject to a compulsory deposit insurance plan. This plan, which took effect in 1983, has features similar to the programs administered by the Federal Deposit Insurance Corporation (FDIC) and the Federal Savings and Loan Insurance Corporation (FSLIC) in the United States.²³ It differs, however, in several important respects. First, the Compulsory Depositor Protection Scheme insures only 75 percent of a depositor’s funds up to a maximum of 10,000 pounds sterling. Thus, unlike its American counterparts, the scheme is designed to provide protection only for small depositors and, even then, to provide them with an incentive to maintain active personal surveillance of financial institutions, since less than 100 percent of their deposits will be recovered in the event of failure.

Second, the depositor protection scheme is designed to function only as a first line of defense against capricious runs initiated by unsophisticated investors. The Bank of England and the clearing banks remain *de facto*, if not *de jure*, the main sources of emergency liquidity in the British banking system. Indeed, the clearing banks opposed the creation of the Compulsory Depositor Protection Scheme precisely on the grounds that it afforded them no relief from their responsibilities but required

them nevertheless to be major contributors to the insurance fund.²⁴ In recent policy papers on the Building Society industry, it has been recommended that the Compulsory Depositor Protection Scheme currently in place be extended to the building society sector to replace its current voluntary plan.

In summary, the debut of deposit insurance and the extension of the Bank of England's supervisory authority represent a move toward less reliance on self-regulation and competitive restraint as the means of bringing stability to the U.K. banking system. Supervisory mechanisms remain *pro forma*, however, in comparison with the procedures followed in the United States. In addition, the features of the Depositor Protection Scheme (the low insured maximum and investor co-insurance) suggest that British authorities still regard industry self-regulation, investor prudence and a strong clearing bank sector as the main lines of defense against financial instability.

Addressing the Competitive Balance

The new supervisory and insurance measures signal a recognition on the part of British policymakers that the forces of competition frequently regarded as potentially destabilizing in banking markets are difficult to suppress. In some ways, the clearing banks' loss of market share to building societies and the secondary banking sector in the 1960s and 1970s and the Secondary Banking Crisis were to British policymakers what the cycles of disintermediation and growth of money market mutual funds and other "nonbanks" were to U.S. policymakers in the same time period. Both sets of events alerted policymakers to the strength of the forces of financial innovation and the weakness of extant regulatory devices. In the U.K., this change in policy perception is manifested in a number of significant changes in the competitive "playing field" of British banking.

First, the Banking Act of 1979 provides a mechanism by which a nonbanking institution may formally enter the retail banking business. The institution may become a retail bank, and use the word "bank" in its corporate title, if it

has operated successfully for a specified period of time, subject to approval by the Bank of England. (The British operations of a foreign bank automatically are eligible for retail bank status if they belong to a *bona fide* bank in their home country.) This time provision represents a relaxation of former barriers to entry into the demand deposit-taking, retail banking sector. Current statistics of the Bank of England identify 140 institutions in the retail banking sector, including in addition to former nonbanks, the clearing banks and subsidiaries of foreign banks.²⁵

A second, and perhaps more important, concession to clearing bank competitors is the granting of access to the Bankers' Clearing House to entities other than the handful of original clearing banks. A bank may gain access to the Clearing House if it can demonstrate that it handles one percent or more of total daily payment volumes (that is, checks and electronic funds activity). Access to the clearing house is particularly important for institutions wishing to compete economically with the clearing banks for demand deposit ("current account") and credit card customers. The U.K. representatives of large foreign banks have been the first to seek access to clearing facilities. Lack of such access—as well as the difficulty of establishing *de novo* a branch system to rival the extensive networks of the clearing banks—may explain the difficulty foreign banks have had in competing with clearing banks, despite their perception of the market as a profitable one and the availability of considerable resources from their overseas parents.

The third major area of reform involves the role of the building societies. Building societies have been, and are likely to remain, the main source of increased competition for clearing banks. Unlike foreign banks and secondary banks, the building societies have long-established and extensive branch networks throughout the United Kingdom. The largest building society has nearly 1,000 branches, and the roughly 200 societies in existence have roughly 7,000 branches in total throughout the U.K. This long reach provides the building societies

a geographically diversified clientele, familiarity with local credit needs and conditions, and name recognition not enjoyed by clearing banks' other potential competitors.²⁶

Public policy toward building societies is moving rapidly toward giving them the same treatment as banks. In 1983, for example, legislation was passed giving building societies greatly improved access to wholesale deposit markets. In addition, a variety of proposals made by the Chancellor of the Exchequer to the Parliament in 1984 would give building societies certain powers now only enjoyed by banks. Under the proposals, expected to become law in 1987, building societies would, for example, be able to invest up to 10 percent of their assets in commercial loans.²⁷

In addition, most of the current restrictions on the provision of money transmission services by the building societies would be removed, allowing them to offer, for example, point-of-sale electronic debit services, automated funds transfer on behalf of customers between institutions, check guarantee cards, and other services. Relieving them from these restrictions would substantially eliminate the competitive disadvantage building societies have faced by being unable to offer true demand deposit services.²⁸ In addition, it has been proposed that building societies be permitted to sell insurance products and offer real estate brokerage services in addition to their traditional product lines.

While giving societies certain bank powers, public policy also is eliminating the preferential tax treatment building societies have enjoyed. The preferential treatment of building societies

under corporate tax law, for example, in essence will have been eliminated by this year.²⁹ The asymmetric treatment of interest paid to depositors at building societies versus banks, which many argued worked to the competitive advantage of the building societies, also was phased out this year.³⁰

Building societies and banks already are responding to the existing and pending changes in their competitive environment. Building societies formally abolished their interest-rate cartel in 1984, and are now competing more vigorously among themselves and with the banking sector for deposits and mortgage assets.³¹ The building societies also have begun to explore the use of a shared automated teller machine (ATM) network that could be expanded to allow depositors to pay bills or transfer funds. Some of the clearing banks also have hastened to establish correspondent relationships with the building societies. Through "sweep"-type arrangements with clearing banks, the building societies can provide checking services to their customers.

The clearing banks, for their part, also are reacting to the actual and potential increase in competition by altering their price and service strategies. In a sharp break with tradition, few of the clearing banks are offering interest, for example, on current account deposits. Some also have extended banking hours, expanded their customers' access to credit, and taken steps to improve the efficiency of their internal operations.³² Others are experimenting with home electronic banking, point-of-sale debit systems, and expanding their ATM networks rapidly.

III. Conclusions and Implications for U.S. Banking Policy

The attitude of British policymakers toward their banking system has changed significantly since the late 1960s. Generally speaking, they have allowed and encouraged the British banking system to evolve toward one that permits greater competition albeit with a deeper overlay of government supervision, insurance and oversight. The previously informal nature of

banking regulation—facilitated by the existence of interest rate cartels, restricted entry, and fraternal relationships with the central bank—appears to have been codified and formalized, although policymakers indicate a preference to retain some elements of "self-regulation." In sum, relationships between the banking community and the British central

bank are becoming increasingly more formal as the competition for domestic markets has grown more vigorous.

Whether the new regime will increase the long-term efficiency of the British banking sector depends largely on whether the greater efficiency brought about by competition is offset by greater public expenditures on supervising and examining financial institutions. The latter is needed to maintain the stability that has characterized the British financial system throughout most of this century. All that can be said at this time is that the economic environment and the pace of financial innovation have made it impossible to ignore the role of competitive forces in the U.K.

The British banking experience may inform U.S. banking policy in a number of ways. First, the British have learned that although it is possible to affect the structure of the financial industry through credit controls, portfolio restrictions, and tax policy, competitive forces run counter to attempts to manage credit flows. For example, both rapid growth in the building society industry and the existence of the secondary banking sector are, to a considerable extent, the results of restrictions on clearing bank activity and other credit allocation policies.³³

Second, the U.K. has learned that banking activities cannot remain segmented without the appropriate economic conditions and stable regulatory policy. When British policymakers relaxed some of the controls on clearing banks in 1971, the market found it difficult to adjust. The change contributed to weakness in the secondary banking sector and eventually led to a crisis of confidence in the entire payments mechanism. It was not until nearly a decade

later that deregulation in the British financial system could safely resume.

Third, the British experience illustrates the hazards of asymmetric treatment of like institutions concerning receipt of "protection" from the central bank or benefitting from deposit insurance mechanisms. The coexistence of a "protected" clearing bank sector and an "unprotected" secondary banking sector that also accepted deposits may have exacerbated the problems experienced by the secondary banking sector in 1971-1973 as depositors sought a safe haven for their funds in the clearing banks. British policymakers reacted, probably not inappropriately, by extending supervision and depositor protection mechanisms to virtually all depository institutions. The same problem may arise in the United States given the presence of unprotected or only privately insured depository institutions in a few markets. Indeed, U.S. policymakers appear to be reacting to these cases by trying to extend insurance and supervisory coverage to those institutions as well.

Finally, American observers of the British banking system often cite its structure as an indication of how U.S. banking might appear in the absence of geographic branching restrictions and deposit rate regulation. In fact, as we have pointed out, the structure and high levels of concentration observed in the British banking industry are at least partly the result of British banking and antitrust policy. While it is true that British banking has developed without certain restrictive regulations imposed upon its American counterpart, its structure also is partly the consequence of attitudes toward managing a perceived trade-off between competition and payments system stability.

FOOTNOTES

1. These other institutions include wholesale banks such as merchant banks, foreign and consortia banks, and discount houses. In addition, the British system includes several deposit-taking institutions serving primarily small individual savers. These include the Trustee Savings Banks, the National Savings Bank, and the National Giro-bank. For a comprehensive explanation of these institutions see Cooper, *The Management and Regulation of Banks*.

2. Since a considerable portion of their deposit base is made up of liquid retail deposits, the generally conservative clearing banks have preferred to lend by overdraft, recallable at very short notice.

3. The Committee of London Clearing Bankers (CLCB) operates most of the nation's cash distribution and money transmission activities primarily through the Bankers' Clearing House or the Automated Clearing Services, both of which are owned by the London clearing banks.

4. These four major banks are: Barclays Bank, Lloyds Bank, Midland Bank and National Westminster Bank. Besides these, there are two other London clearing banks (Coutts & Co. and Williams and Glyn's Bank), three Scottish clearing banks and four Irish clearing banks. The four major London clearers own outright or have very substantial interests in nine of the other clearing banks. Two of the Irish clearing banks are independent. The Committee of London Clearing Bankers will be supplanted in the near future by an enlarged trade group to be known as the Committee of London and Scotland bankers. This new group initially will have seven members, all of whom were members of the London or Scottish Committees of clearing banks.

By way of comparison, even U.S. state-level 4-firm concentration ratios are nowhere near this high. In 1984, for example, California—which permits statewide branching and comprises a large economy itself—had over 450 banks and a 4-firm concentration ratio of less than 64 percent.

The 5-firm, 55 percent concentration ratio observed among building societies in Great Britain, however, more closely matches U.S. experience. In California, for example, there are approximately 200 savings and loan associations (and no other mortgage lenders such as mutual savings banks), and the 5-firm concentration ratio is 40 percent.

5. In the past, this cooperation has frequently taken the form of clearing bank compliance with directives by Bank of England on such issues as the volume and direction of bank lending and the composition of balance sheets.

6. The Bank Act of 1844, introduced by the Bank of England and repealed in less than 15 years, temporarily restricted entry to the British banking industry. Already-existing banks—many the forebears of the main contemporary clearing banks—were consequently sheltered from competition for a period of time. This period of relative freedom, enhanced by the advantages of acceptance into the Committee of London Clearing Bankers in 1854, allowed those banks to entrench themselves in the banking sector at the expense of any competitors. William T. McCaffrey, *English and American Banking Systems Compared*, pp. 28–29.

7. One example of such collusive pricing behavior was later to become a competitive disadvantage, as discussed

below. For many years, the cartel made the interest rate paid on noncheckable deposits two percentage points below Bank Rate, or the Bank of England's lending rate (somewhat like the Federal Reserve Bank's discount rate). Likewise, borrowers paid a set rate above Bank Rate.

8. For example, during the post-war period, on the Bank of England's recommendation, the clearing banks channeled their lending into the rebuilding of the industrial sector—a policy that was to affect the entire banking system considerably, as discussed below.

9. This process was facilitated by the social homogeneity of both clearing bankers and the Directors of the Bank of England. They belonged to the same class, attended the same schools, or met at the same clubs.

10. Cartels in the financial industry may have functioned as an alternative to regulation in that they have attempted to regulate interest rates to achieve a lower risk, lower return equilibrium in loan portfolios. (See "Building Societies: A New Framework, p. 27).

11. Building societies are analogous, in this sense, to mutual savings banks in the United States.

12. In the 1970s, in an environment of high interest rates, a few very large building societies broke away from the cartel, threatening its risk-optimizing function. Discipline continued to erode until, in 1984, the interest rate cartel officially was abandoned although the Building Societies Association continues to publish recommended deposit and mortgage rates.

13. Many of the secondary banks possessed certificates, issued by the Board of Trade, stating that they engaged in *bona fide* banking business for the narrow purpose of exempting these institutions from the Money Lenders Act of 1900. This certification created the illusion that the companies were recognized by a responsible government department.

14. M.K. Lewis and B. Chiplin, *De-Regulation and Competitive Pressures upon British Banks*.

15. In September 1973, the Bank of England imposed a ceiling of 9.5 percent per annum on interest that could be paid on bank deposits of less than £10,000. This ceiling was withdrawn in February 1975. The Supplementary Special Deposits Scheme, or the "corset", put up to 50 percent of deposit increases into noninterest bearing reserves and constituted an important tool of British monetary policy during that period.

16. See Margaret Reid, *The Secondary Banking Crisis, 1973–75*.

17. "While the U.K. clearing banks appeared secure from the domestic effects of any run, their international exposure was such that the risk to external confidence was a matter of concern for themselves as well as for the Bank." (Bank of England, "The Secondary Banking Crisis. . .")

18. The recycled deposits were "loaned" at a market rate of interest plus a premium for the perceived riskiness of the loan. The Bank of England agreed to assume responsibility for financing 10 percent of the amounts outstanding. Although no precise data are available, it has been estimated that the total financing of the Lifeboat amounted to about £3 billion. Losses from the operation could have

been as much as £50 million for the clearing banks and £100 million for the Bank of England. Reid, *op. cit.*, pp. 190–92.

19. This notion rests on the view that runs on essentially sound institutions can occur as the result of the failure of similar institutions. Risk-taking that is rational from an individual institution's point of view may impose costs in the form of increased risk of failure on other institutions.

20. Indeed, the Competition and Credit Control policy that some feel precipitated the secondary banking crisis was instituted partly to redress the diminishing dominance of the clearing banks. (See Lewis and Chiplin's account of this policy.)

21. The Bank of England, for example, does not conduct on-site or surprise examinations as do the supervisory authorities in the United States. It relies instead on a rather arms-length review of the submitted reports of condition. In recent months, these have been argued to be insufficient. (See "A Juicy Summer Scandal is Rocking the City of London," *Business Week*, August 19, 1985, page 44.)

22. The Depositor Protection Scheme employed by the building societies was enabled by permissive language in the 1962 Building Societies Act. The Scheme is run by the Building Societies Association (BSA), although participation is not reserved to BSA members or participants in the BSA cartel.

23. The Depositor Protection Scheme in Britain is funded by a fee based upon the level of short-term deposits at each institution, with stipulations for a minimum and maximum contribution. It is administered by a special commission composed of representatives from the Bank of England and affected sectors of the financial industry.

24. The clearing banks recalled the burden imposed upon them by the "lifeboat" operation begun in 1973. Their feeling was that, should a major banking panic occur, they once again would be called upon to shoulder a large portion of the burden of re-establishing stability in the banking system. The proposals for reforming the building societies are presented in a so-called "Green Paper" titled "Building Societies: A New Framework," presented to Parliament by the Chancellor of the Exchequer, July 1984.

25. No statistics are available on the size of the licensed deposit-taker institutions that have not achieved retail bank status. Conversations with experts on British Banking suggest, however, that the conversion of licensed deposit-takers to retail banks has not been rapid.

26. These factors, combined with preferential tax treatment of interest earned at building societies, caused the share of building society deposits relative to deposits at

clearing banks to rise from approximately 50 percent in 1965 to 90 percent in 1975.

27. Currently, approximately 80 percent of building society assets are in mortgage loans; the remainder is invested in liquid and other securities.

28. Some building societies employ "sweep"-type arrangements with clearing banks to provide their customers with checking-like services.

29. Building society corporations traditionally faced a 40 percent tax rate on corporate profits, whereas banks faced a 52 percent tax rate. However, banks were able to reduce their corporate tax liability through leasing activities not allowed building societies. In 1984, policymakers considerably reduced the tax advantages enjoyed by leasing operations and began a progressive reduction of the corporate tax rate to 35 percent—applied uniformly to banks and building societies. In addition, the building societies' ability to count income from the sale of certain types of securities as capital gains rather than ordinary income was eliminated in 1984.

30. Prior to 1985, building societies paid interest to investors net of a composite tax rate, which was slightly lower than the basic income tax rate. Interest payments by clearing banks, in contrast, were paid gross of tax, subjecting the taxpayer to the basic rate and, thus, a lower after-tax rate of return, *ceteris paribus*.

31. Clearing banks traditionally had not involved themselves in the residential mortgage market. As recently as 1980, their loan portfolios contained essentially no mortgage assets. Since BSA policy frequently kept mortgages issued by building societies in short supply, the absence of clearing banks from the mortgage market must not have been a matter of choice but the result of credit restrictions imposed on clearing banks by the Bank of England. Today, the clearing banks hold approximately 5 percent of their assets in the form of mortgages.

32. The Clearing House Automated Payment System (CHAPS), for example, will facilitate the interbank transfer of sterling funds.

33. In terms of deposits, building societies and clearing banks in Britain today are virtually identical in size. By comparison, savings and loan associations, an American counterpart to the building society, have deposits equal to only about one-third of the deposits of commercial banks. Thus, a much greater share of total deposits in Great Britain resides with highly undiversified, mortgage-oriented financial institutions. Some argue that this places the British financial system in greater jeopardy should some systemic problem affect the quality of mortgage loan assets.

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U.S. Budget Deficits and the Real Value of the Dollar

Michael M. Hutchison* and Adrian W. Throop**

As a direct result of U.S. fiscal expansion, the real value of the dollar has remained much stronger than can be explained solely by differentials between real interest rates in the U.S. and those abroad. Forecasts of the dollar's value based on a longer run, general equilibrium model have much smaller errors than those from a short-run, partial equilibrium model relying on interest rate differentials alone. Thus, the real value of the dollar is likely to remain high by pre-1980 standards for the foreseeable future unless and until U.S. or foreign countries change their fiscal policies.

By the summer of 1985, the real trade-weighted value of the dollar stood at nearly 35 percent above its 1980 value (see Chart 1). In September, the United States together with West Germany, Japan, the United Kingdom and France announced that they were prepared to undertake coordinated intervention in currency markets to drive the dollar down and make it better reflect fundamental economic conditions. However, there is considerable disagreement among policymakers, academics, and market participants alike over the fundamental forces causing the phenomenal strength of the dollar. Moreover, a strong argument can be made that the dollar is not fundamentally overvalued.

Among the factors most often cited for generating a strong dollar are the present stance and future outlook of U.S. budget policy. According to this view, the exchange value of the dollar has closely followed the course of U.S.

budget policy relative to budget policies abroad.

Casual evidence seems to support this linkage as Chart 2 indicates. Measured on a cyclically adjusted basis, the U.S. general government fiscal balance has fallen from a fairly large surplus position in 1980 (0.7 percent of potential GNP) to a large deficit position (1.9 percent of potential GNP) in 1985. Moreover, the generally expansionary fiscal policy in the U.S. has not been matched, and in fact has been counteracted, by restrictive fiscal policies followed by most other major nations in recent years. West Germany, for example, reversed a 2.4 percent budget deficit (cyclically adjusted) in 1980 into a 1.1 percent surplus in 1985. Similarly, Japan's large 4.0 percent deficit in 1980 was cut to 1.0 percent by 1985.

However, even among the group of economists that are convinced of strong causal links between fiscal policy and real exchange rates, there is considerable controversy. At least two views may be distinguished. One view, expressed for example by former Chairman of the Council of Economic Advisers Martin Feldstein (see Box), states that the influence of the recent U.S. fiscal stimulus on the dollar works primarily through interest rate differentials and portfolio adjustments. High and rising U.S. real interest rates associated with domestic

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U.S. Fiscal Policy and the Real Value of the Dollar: Two Views

“The sharp increase in the dollar has occurred because dollar securities and dollar bank deposits have become much more attractive in comparison to investments in other currencies. The principal reason for this increased attractiveness has been the sharp rise in the real interest rate on medium-term and long-term investments relative to the return available elsewhere. . . . The sharp rise in real interest rates since the beginning of the decade is due primarily to the dramatic increase in the level of current and future structural budget deficits. . . .

Although a sharp reduction in real interest rates and projected budget deficits would bring an immediate decline of the dollar, we can say with confidence that the dollar must eventually fall even if budget deficits are not reduced. At some point, possibly as long as several years from now, foreign investors will become reluctant to continue putting a larger and larger share of their portfolios in dollar securities because the increasing risk of an unbalanced portfolio will outweigh the yield advantage of dollar securities. When that occurs, the dollar will fall.”

Martin Feldstein (*The United States in a Global Economy*: Hearing before the Committee on Foreign Relations, United States Senate, February 28, 1985, pp. 116–118)

“The model for the real interest rate does well in explaining that a rise in U.S. interest rates should lead to an appreciation of the real exchange rate. But it fails when it predicts that the real exchange rate should also be depreciating. That has not in fact been happening, and a theory is needed that will explain why the dollar—real or nominal—is both high *and* stuck. I believe fiscal policy may provide an answer.”

“The fiscal interpretation of exchange rate movements does not suggest that U.S. fiscal expansion leads to higher U.S. real rates and lower real rates abroad. The world capital market is integrated and securities are highly substitutable. Therefore, except for transitory anticipated real exchange rate movements, the real rate of interest is internationally approximately equal. Fiscal expansion in the world, given tight money, will raise the *world* real rate of interest in response to the current and anticipated stimulus to demand. In addition the currency of the country that is relatively more expansionary will appreciate.”

Rudiger Dornbusch (*Brookings Papers on Economic Activity*, 1: 1983; p. 83; and *Foreign Exchange Value of the Dollar*, Joint Hearings Before the Subcommittee on International Trade, Investment, and Monetary Policy and the Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance, and Urban Affairs, House of Representatives, Oct 5, 25, 27 and November 1 and 2, 1984, pp. 186–9)

budget deficits, in this view, have created an interest rate differential that has attracted a foreign capital inflow. This inflow has, in turn, caused a temporary appreciation of the dollar exchange rate above its long-run equilibrium value.

The causality described represents a short run and partial equilibrium portfolio balance perspective. In that perspective, the real value of the dollar should gradually fall back to its former level, either because interest rates will eventually fall or because investors will become reluctant to invest an increasingly large share of their portfolios in dollar-denominated securities. A number of major published forecasts apparently have based their predictions of a gradually falling dollar on this type of reasoning. One problem with the simple portfolio balance view is that the dollar continued to strengthen after 1983 even though the real interest rate differential in favor of the U.S. diminished sharply, as shown in Chart 1.

An alternative view, expressed for example in the quotations from Dornbusch (see Box), does not necessarily question the short-run links between fiscal policy and exchange rates working through interest rate differentials and portfolio preferences. But, it stresses the long-run effects on goods markets and interest rates in a world of high capital mobility. This second link may be characterized as a goods market channel of transmission.

Basically, this longer run, general equilibrium view argues that the U.S. fiscal expansion has increased both the aggregate demand for goods worldwide and the relative demand for U.S. goods (because the fiscal expansion in the U.S. has led to relatively larger increases

in spending on U.S. goods). Excess demand for goods in the U.S. and abroad causes an increase in the general level of world interest rates, while the relative excess demand for U.S. goods associated with the fiscal stimulus is eliminated by a real dollar exchange rate appreciation.

This view assumes that U.S. and foreign goods are imperfect substitutes, and that their relative price (the real exchange rate) will change over time in response to shifts in fiscal policy. No expectation of a subsequent fall in the value of the dollar back to its original level is therefore required. Moreover, a high degree of substitutability between U.S. and foreign financial assets limits the extent to which U.S. real interest rates can diverge from foreign real interest rates in the long-run.

This paper develops a simple theoretical model that incorporates both the short-run, partial equilibrium portfolio balance and the longer run general equilibrium views of the way exchange rates are influenced by a fiscal stimulus. The portfolio balance view is presented in Section I, and the general equilibrium view is explained more fully in Section II. The methodology employed for empirical implementation of the completed model is presented in Section III. Empirical tests are performed in Section IV to estimate the relative importance of the various factors in influencing the trade-weighted real value of the dollar over the 1974–1985 floating rate period. The out-of-sample forecasting performance of the two models, as well as the performance of a simple random walk forecast are examined. The final section draws some conclusions for policy.

I. Interest Rate, Risk and the Exchange Rate: Portfolio Balance View

To show the linkages between the real exchange rate and real interest rate, we used an approach that is basically a simplification of Hooper and Morton's (1982) extension of the sticky-price monetary model of exchange rate determination developed by Dornbusch (1976) and Frankel (1979). The exchange rate equa-

tion in this framework may be derived initially from the uncovered interest parity condition. This is an arbitrage condition that states that the expected percentage change in the exchange rate over any period is equal to the difference between the nominal returns on securities at home and equally risky securities

abroad, with maturities for that same period:

$$\ln s - \ln s^e = n(i - i^*) \quad (1)$$

where i = U.S. interest rate on security with n years to maturity;

i^* = foreign interest rate on a similar security;

s = foreign currency price of the dollar;

s^e = foreign currency price of the dollar expected to prevail n periods in the future.

Equation 1 holds when financial capital is freely mobile across national boundaries and investors are willing to accept equivalent yields on U.S. and foreign securities regardless of the currency of denomination. In this case, any deviation from uncovered interest parity would cause investor arbitrage to bid the exchange rate back to that point where equation 1 would again hold.

Under circumstances where U.S. and foreign assets are less than perfect substitutes, however, equation 1 will not strictly hold as an equilibrium condition; and U.S. and foreign expected yields generally will differ. This case is represented by augmenting equation 1 with an expected equilibrium yield differential, or "risk premium", ϕ^e :

$$\ln s - \ln s^e = n(i - i^*) - n\phi^e \quad (2)$$

Rearranging gives:

$$\ln s = n(i - i^*) - n\phi^e + \ln s^e \quad (3)$$

Equation 2 is a condition that will hold in internationally integrated financial markets when investors behave rationally. It simply states that the market expectation of domestic currency depreciation over a given period will be equal to the difference in nominal returns between securities at home and those abroad over a similar holding period, less any expected yield differential. Portfolio balance models suggest that the expected yield differential (risk premium, ϕ^e) will depend on both investors' preferences and the relative supply of domestic and foreign securities. If investors view these securities as imperfect substitutes because of

exchange rate risk or other factors, the expected yield differential would be positively associated with the supply of domestic debt relative to debt abroad.

It is convenient to think of the current spot exchange rate as linked to the future expected exchange rate through the interest differential. Equation 3 illustrates this relationship: A given risk-adjusted interest differential (that is, including ϕ^e) is consistent with any given spot exchange rate level, and only indicates the expected change in the (log) level of the exchange rate over the maturity of the bonds in question. Once expectations about the future spot rate are identified, however, the spot rate is determined. The link between the current price of a currency and its expected future price is hence quite strong, as it is in the case of any asset price.

Equation 3 also holds in real (or price-adjusted) terms.¹ Thus,

$$\ln q = n(r - r^*) - n\phi^e + \ln q^e \quad (4)$$

where q = real value of the dollar;

q^e = real value of the dollar expected n years hence;

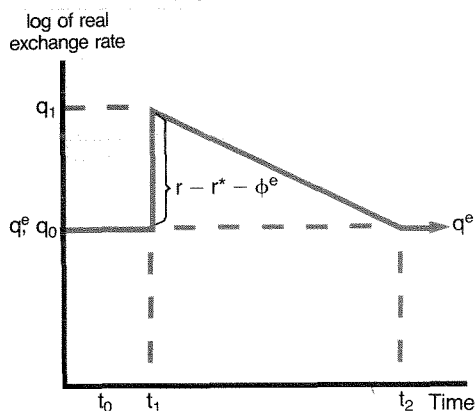
r = U.S. real interest rate;

r^* = foreign real interest rate.

The difference between the current real exchange rate and its expected future value—that is, the expected change in the real value of the currency—is thus proportional to the expected (risk-adjusted) real interest rate differential, $r - r^* - \phi^e$. For example, a one-percent rise in the U.S. one-year real (risk-adjusted) interest rate above the equivalent foreign rate would appreciate the real value of the dollar by one percent above the spot value expected one year hence. This sets up the expectation of a one-percent dollar depreciation over the course of the year, which, in turn, equalizes expected risk-adjusted yields on the underlying foreign and domestic securities. Thus, the dynamics of exchange rate changes are implicit in the relative yield differential across currencies. This process is illustrated in Diagram 1. An important point to note, however, is that the effect

Diagram 1

Real Exchange Rate Response
to Rise in the Domestic
Real Interest Rate Differential



The real exchange rate is price of the dollar in units of foreign currency (price adjusted). The risk adjusted real interest differential ($r - r^* - \phi^e$) rises at point t_1 , causing an appreciation in the dollar exchange rate from q_0 to q_1 . Over the maturity of the interest rate in question (from t_1 to t_2), the exchange rate gradually depreciates and causes a capital loss on domestic securities which exactly offsets the explicit additional interest rate return. At time t_2 the exchange rate returns to its original equilibrium value.

of interest rate variations on exchange rates is temporary. Over the maturity of the particular rate in question, the spot real exchange rate is expected to return to a fixed equilibrium value.

A central aspect of this theory is its emphasis on term structure effects. For example, if the 1-year U.S. real interest rate goes up by 1 percentage point, but future 1-year interest rates are not expected to change, then the real value of the dollar will go up only 1 percentage point. However, if the same increase in the U.S. 1-year rate is expected to last for 5 years, then the 5-year bond rate will immediately rise by 1 percentage point and the real exchange value of the dollar will rise by 5 percentage points. Thus, the long-term real interest differential controls movements in the real exchange rate.

The expected long-run real value of the exchange rate, or the relative value of a representative bundle of domestic goods in comparison to their foreign counterparts, is assumed to be

roughly constant. Budget deficits, whether of a transitory or more permanent nature, do not alter the expected long-run real value of the dollar in this framework. The assumption of a fixed long-run relative price between domestic and foreign goods provides a convenient anchor on which expectations of the future real exchange rate can be based. Furthermore, the dynamics of exchange rate adjustment to interest rate shocks can also be derived from this assumption.

The real interest rate/real exchange rate link may be thought of as a portfolio balance channel through which budget deficits influence the real exchange rate. A rise in the U.S. budget deficit, to the extent that it causes U.S. real interest rates to rise above world levels, attracts a foreign capital inflow that temporarily appreciates the real value of the dollar, q , above its expected long-run equilibrium value, q^e . The dollar appreciates to the point where an expected future depreciation is set up that (in order to maintain internationally comparable yields on dollar and foreign investments) just offsets the extra interest rate return on dollar assets compared with foreign currency denominated assets. In other words, the dollar appreciates until an offsetting expected capital loss is created. In this view, the influence of budget deficits on exchange rates through the interest rate channel is transitory.

The pattern of initial exchange rate appreciation followed by gradual depreciation will occur in this framework regardless of whether budget deficits are perceived as temporary or longer lasting. In the former case, both interest rates and the exchange rate would rise and gradually fall back to their initial levels as financial market pressures associated with transitory budget imbalances subside. In the case of longer lasting budget deficits, however, interest rates would rise and stay above their initial values for as long as private aggregate demand is "crowded out" by the fiscal stimulus. This would not preclude a subsequent gradual exchange rate depreciation—as expressed in the quotation by Feldstein—if the expected return differential (ϕ^e) gradually rises over time in response to the accumulation of government debt associated

with the longer lasting government deficit. In both cases—temporary or longer lasting budget deficits—the portfolio balance view predicts that the real exchange rate gradually depre-

ciates and returns to its original level (q^e). However, both cases exemplify a partial equilibrium model because q^e is either assumed constant or determined outside the model.

II. Goods Markets, Interest Rates and the Exchange Rate: General Equilibrium View

The longer run, general equilibrium view of the budget deficit/real exchange rate link abstracts from the dynamics of expected changes in the exchange rate. The analysis is static and longer run so that expected and actual exchange rates do not differ. It focuses on the potential for budget policy to alter the real exchange rate in the long-run, and therefore to cause shifts in the expected equilibrium real exchange rate (q^e) that enters into the shorter run portfolio balance approach.

While the portfolio balance view allows for assets denominated in different currencies to be imperfect substitutes ($\phi^e \neq 0$), it in effect assumes that domestic and foreign goods are perfect substitutes, making their expected equilibrium relative price (q^e) constant. The general equilibrium model, in contrast, allows goods produced in different countries to be imperfect substitutes and allows their equilibrium relative price to change in response to shifts in the supply and demand for domestically produced versus foreign goods. The real exchange rate in this framework is a key factor helping to maintain a balance in domestic and foreign goods markets.

For example, a domestic fiscal stimulus—effected through either an increase in expenditures or a reduction in taxes—will increase the demand for both domestic and foreign goods, but is likely to raise the demand for domestic goods more. This relative rise in domestic demand, in turn, will put upward pressure on the domestic real interest rate relative to the foreign real interest rate. But since, in a world of high capital mobility, interest rates at home and abroad can differ by only a relatively small risk premium, the resulting inflow of capital will be sufficient to raise the domestic real exchange rate enough to offset most, if not all, of the

effects of the fiscal stimulus. An appreciation of the real exchange rate accomplishes this both by lowering the private demand for domestically produced goods (exports and import-competing goods), and by raising that component of domestic demand directed towards imports.²

To put this argument in more formal terms, consider the equilibrium conditions for domestic and foreign goods markets, assuming a complete adjustment to full employment in both the U.S. and the rest of the world:

$$y = A(r) + NX(q) \quad (5)$$

$$y^* = A^*(r^*) + NX^*(q) \quad (6)$$

where y (y^*) = y_0 (y_0^*), fixed domestic (foreign) output

A (A^*) = domestic (foreign) absorption of goods and services, i.e. both home production and imports ($A = C + I + G$)

NX (NX^*) = domestic (foreign) country net exports

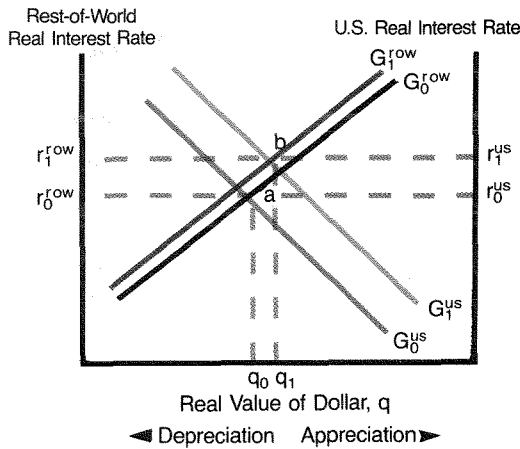
$$\text{and } \frac{\partial A}{\partial r} < 0 ; \frac{\partial A^*}{\partial r^*} < 0 ;$$

$$\frac{\partial NX}{\partial q} < 0 ; \frac{\partial NX^*}{\partial q} > 0 ;$$

We have three unknowns (r , r^* , and q) but only two equations. However, r can be solved as equal to r^* in the case where U.S. and foreign assets are perfect substitutes, or equal to $r^* + \phi$ in the risk premium case. This reduces the system to two equations and two unknowns.³

Diagram 2 provides a graphical representation of this system.⁴ The downward sloping (q , r^{us}) locus, or G_0^{us} , is the U.S. (domestic country) goods market clearing condition, that represents equation 5. It is downward sloping because, for any given level of output, a fall in

Diagram 2
Effects of U.S. Fiscal Expansion
when U.S. and Foreign Assets
are Perfect Substitutes



q (depreciation of the real value of the dollar) stimulates net exports and must be offset by lower U.S. absorption brought about by an increase in the U.S. real interest rate. G_0^{row} , the rest-of-world (foreign) goods market equilibrium locus (q, r^{row}), is upward sloping for analogous reasons. In this case, however, a fall in q represents an appreciation of the foreign currency, and hence a contraction of rest-of-world net exports to the U.S. This is offset by a fall in rest-of-world interest rates and a corresponding rise in A^{row} (rest-of-world absorption) to maintain equilibrium in the rest-of-world goods market.

In the no risk premium case, the initial steady state equilibrium is found at the intersection of the goods market equilibrium schedules for the U.S. and the rest of the world, or point a , where $r_0^{us} = r_0^{row}$. Depending on the state of domestic aggregate demand and output relative to demand and output abroad, the U.S. has either positive or negative net exports.

Consider the comparative statics of a U.S. fiscal expansion. As U.S. fiscal expansion increases the demand for U.S. goods and services, domestic absorption (A^{us}) rises correspondingly. This shifts the U.S. goods market locus upward from G_0^{us} to G_1^{us} because,

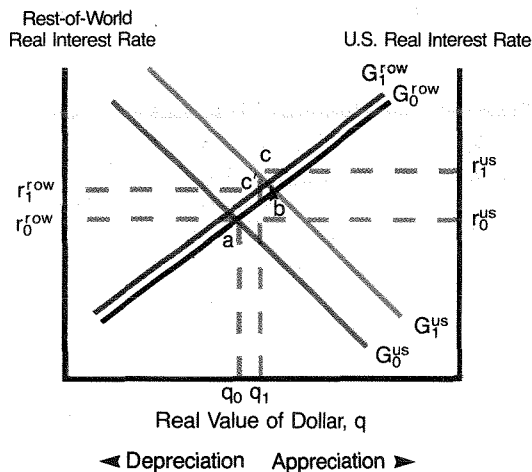
for any given real exchange rate, higher U.S. real interest rates are necessary to offset the rise in absorption and to restore equilibrium. Similarly, to the extent that the rise in U.S. government expenditures falls on foreign goods, the demand for rest-of-world net exports rises (at an unchanged real exchange rate) and G_0^{row} shifts upward to G_1^{row} . The rise in aggregate demand in both countries thus causes U.S. and rest-of-world interest rates to rise.

Most of the rise in aggregate demand falls on U.S. output, however. As long as U.S. and rest-of-world securities are perfect substitutes—which implies equal real rates of return in static equilibrium ($r_1^{us} = r_1^{row}$)—the incipient real interest differential in favor of the U.S. appreciates the dollar real exchange rate to divert private demand away from U.S.-produced goods towards foreign-produced goods. A general equilibrium is restored at point b , where the higher level of world interest rates dampens excess world aggregate demand (U.S. plus rest-of-world) pushed up by the U.S. fiscal stimulus, while dollar appreciation (from q_0 to q_1) dampens the relative excess demand for U.S.-produced goods.⁵ Unlike the short-run portfolio balance model, the dollar appreciates without *any* increase in the equilibrium real interest rate differential.

The possibility of a risk premium ($\phi \neq 0$), or real yield differential, is easily incorporated into this framework. As noted earlier, a risk premium could arise if, over time, investors become reluctant to absorb an increasingly large share of U.S. debt into their portfolios. As shown in Diagram 3, a gradual rise in the risk premium (from an assumed initial value of zero) associated with cumulative U.S. budget deficits would allow a gap in the static equilibrium real interest differential.

In the case of a U.S. debt-financed fiscal stimulus, the U.S. real interest rate would rise above the rest-of-world interest rate ($r_1^{us} > r_1^{row}$), and the difference would be reflected in the gap between the G_1^{us} and G_1^{row} loci at an equilibrium real exchange rate to the left of point b (points c, c^1 for example). The result is that both the rest-of-world interest rate (r_1^{row})

Diagram 3
Effects of U.S. Fiscal Expansion
when U.S. and Foreign Assets
are Imperfect Substitutes



and the value of the U.S. dollar (q_1) rise less than in the no risk premium case. Once again, the result differs from the portfolio balance view in that, in the goods market view, the dollar normally appreciates following a fiscal stimulus in the U.S. even though there is no change in the *risk-adjusted* differential between real interest rates.

However, in the extreme case in which the risk premium grows so large that it leaves the real exchange rate and the rest of the world's interest rate unchanged, the end result is the same as that characterized by the portfolio balance view. That is, over the longer run the U.S. interest rate would rise enough to cause a fall in domestic interest-sensitive expenditures that entirely offsets the fiscal expansion's impact. The introductory quotation by Feldstein expresses this view of how the economy adjusts to ongoing fiscal deficits.⁶

III. Estimation Methodology

In the short-run, partial equilibrium portfolio balance approach, the real value of the exchange rate is expected to return to a constant expected long-run real value. In contrast, in the general equilibrium analysis, persistent budget deficits change the long-run equilibrium value of the real exchange rate. Because exchange market participants have a time horizon of at least several years, a combination of both approaches is required for explaining the actual behavior of exchange rates.

In a static long-run equilibrium, interest rates can diverge by only the amount of the risk premium. In the short-run, larger disparities in interest rates can temporarily occur, but they are counterbalanced by expected changes in the exchange rate. A useful synthesis of the two views therefore embeds a rational expectation of longer run equilibrium into the short-run dynamics of the portfolio balance approach.

In the general equilibrium model, the real exchange rate may depart from its original value even over extended periods of time. It can be altered by changes in tastes, technology, or supplies of productive factors. It can also be affected by imbalances between private saving

and investment caused by budget deficits, or by changes in the risk premium. In our empirical estimation, we abstract from factors other than fiscal deficits that might cause changes in the equilibrium real exchange rate. Thus, the log of the real exchange rate expected in the future is assumed equal to some constant plus a function of the expected U.S. budget balance (B) and the rest of the world's budget balance (B^*):

$$\ln q^e = a_0 - a_1 B^e + a_2 B^{*e} \quad (7)$$

Substituting equation 7 into equation 4 yields the synthesis of the two views to be estimated:

$$\ln q = a_0 + n(r - r^*) - n\phi^e - a_1 B^e + a_2 B^{*e} \quad (8)$$

To empirically estimate this model, we use Morgan Guaranty's real trade-weighted value of the dollar for q . We also calculated trade-weighted measures of real interest rates and expected budget balances. Because of data limitations, variables for the rest of the world were limited to the six largest OECD countries.⁷

As pointed out earlier, the real interest differential dominating movements in the real exchange rate is the long-term one. Rather than

attempting to construct direct measures of long-term inflation expectations for each country, we used an indirect approach based upon the theory of the term structure of interest rates. Our model of the real long-term bond rate is based on the "preferred habitat" theory of the term structure of interest rates developed by Modigliani and others. This approach synthesizes the market segmentation and expectational theories of the term structure.

In this approach, the long-term interest rate is equal to the average of expected short-term rates, modified by a risk premium that reflects preferences of the two sides of the market for long versus short securities. In the original statement by Modigliani and Sutch (1966), the past history of nominal short-term rates is used to forecast expected future nominal rates. Therefore, the long-term bond rate is explained by the past history of short rates and a risk premium represented by a constant term. Analogously, in an inflationary world, one can model the real long-term bond rate as a function of the past history of real short-term rates (proxying for expected real short-term rates) plus a constant term to represent the risk premium.

For the real short-term interest rate in the U.S., we used the 6-month commercial paper rate. We forecasted inflation on the basis of past changes in M1 and past inflation.⁸ Foreign interest rates are 90-day interbank rates, or the nearest equivalent. Expected inflation abroad was measured by the rate of change in consumer prices over the previous four quarters.⁹ The empirical results are not particularly sensitive to various alternative measures of expected inflation.

In earlier work, it was found that the U.S. real bond rate can be satisfactorily explained by an 11-quarter distributed lag on the real short-term interest rate.¹⁰ Consequently, we have modeled the real long-term interest rate differential, $r - r^*$, by an 11-quarter distributed lag on the difference between the real 6-month commercial paper rate and the trade-weighted value of real short-term interest rates abroad.¹¹ The estimated coefficient on this syn-

thetic real long-term rate differential equals n , or the relevant time horizon of investors in the market, times the sum of the weights in the distributed lag on short rates. But since the latter should theoretically sum to a value close to one, the sum of these estimated coefficients should approximate n .

To measure anticipated budget surpluses or deficits (expected values of B and B^*), a moving average of the actual high employment, or structural, budget balance for one year ahead was used. Structural budget balances are preferable to actual (non-cyclically adjusted) deficits because they better capture the goods market pressures associated with fiscal policy shifts. The one-year ahead measure was found to give more satisfactory results than a moving average over longer time horizons. Budget balances more than one year ahead cannot be known with any high degree of certainty because they can always be altered by policy changes. And even though the relevant time horizon of participants in the foreign exchange market is likely longer than one year, the structural budget balance for one-year ahead appears to be as good as any other indicator of the expected value of future structural budget balances.

We tried both inflation-adjusted and unadjusted structural budget balances, measured as a percent of potential GNP, in empirical estimates of the model. The inflation-adjusted measures treat the amount of the inflationary erosion in the real value of outstanding government debt as a receipt. Their appropriateness for this analysis depends upon the behavior of the private sector. To the extent that changes in real wealth affect household consumption, the inflation-adjusted indicator may be a more accurate gauge of fiscal impact on the economy than the unadjusted one. But if the inflation premium embedded in the interest rate were treated as disposable income, the nominal component of interest rates would affect consumption and the "inflation tax" would not. The unadjusted structural budget balance would then be the more appropriate one.¹²

The final variable requiring explanation is the expected risk premium, ϕ^e . This yield differential is determined by the interaction of demand and supply for assets in both the home and foreign countries. Following the large body of literature on the topic (e.g., Dornbusch, 1980; Frankel, 1982; Hutchison, 1984), we focus on the relative supplies and demands for government debt (“outside” assets). This approach assumes that exchange risk on privately issued “inside” assets is eliminated by portfolio diversification.¹³

An increase in the supply of domestic government debt, other things equal, causes a rise in the risk premium. In contrast, a rise in the proportion of domestic financial wealth in total world wealth, assuming domestic investors prefer the home country habitat, would cause a rise in the demand for domestic government

debt and therefore lower the risk premium. The excess of domestic financial wealth over the domestic supply is represented by the cumulative domestic current account surplus. The domestic current account surplus represents the surplus of domestic national saving over private investment.

The risk premium can therefore be expressed as:

$$\phi^e = a_0 + a_1 \frac{D_s}{W_w} + a_2 \frac{\sum CA}{W_w} \quad (9)$$

$$a_0 < 0; a_1 > 0; a_2 < 0.$$

where D_s represents the supply of U.S. government debt, W_w represents the total supply of government debt (both foreign and domestic), and $\sum CA$ represents the cumulative U.S. current account surplus.¹⁴

IV. Empirical Results and Forecasts

Tables 1 and 2 present empirical estimates of three formulations of the real exchange rate model. The tables use structural budget balances adjusted for inflation and ordinary structural budget balances, respectively. As shown in Chart 2, the inflation-adjusted budget is always in larger surplus than the ordinary budget balance as long as inflation is positive because the adjustment for inflation treats the erosion in the real value of government debt as a tax. The inflation-adjustment can be relatively large—as much as 2 percent of GNP for the United States and somewhat larger for other major OECD countries. But the pattern of variation over time has been fairly similar for both budget concepts. In the United States, the largest difference between them occurs from 1978 to 1981 when inflation first rose quite sharply and then dropped even more abruptly. This caused the inflation-adjusted budget first to shift more sharply into surplus and then to fall more rapidly into deficit.

Columns 1–3 in both tables show estimates of three real exchange rate models for the 1974:Q3 through 1981:Q4 sample period, and columns 4–6 show estimates for the 1974:Q3 through 1984:Q3 full sample period. The

shorter sample period was estimated to evaluate the stability of the estimated model coefficients and to perform out-of-sample forecasts that can be compared with actual movements in the dollar exchange rate. The shorter sample ends at the time when U.S. budget deficits were beginning to rise sharply relative to GNP and foreign deficits had begun to decline. Out-of-sample forecasts of recent experience therefore provide a useful test of the importance of U.S. and foreign budget balances, relative to the importance of real interest rate differentials, in affecting the real value of the dollar.

The three real exchange equations estimated represent the model containing only real interest differentials (columns 1 and 4), the model containing both real interest differentials and U.S. and foreign budget balances (columns 2 and 5), and the full model which includes real interest differentials, budget balances and the risk premium determinants (columns 3 and 6).

In Table 1, which contains the inflation-adjusted budgets, the estimates of the coefficients on the risk premium variables are statistically insignificant. However, lack of statistically significant risk premium variables is consistent with previous research (e.g., Frankel, 1982;

TABLE 1

**Real Exchange Value of the Dollar:
Regression Estimates With Inflation-Adjusted Structural Budget Surpluses¹**

	Sample: 1974:Q3 – 1981:Q4			Sample: 1974:Q3 – 1984:Q3		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.44 (179.1)	4.59 (85.4)	4.49 (151.2)	4.82 (27.6)	4.61 (191.4)	4.47 (171.9)
$\sum_{i=0}^{11} (r_s - r_s^*)$	4.78 (4.58)	3.40 (3.70)	3.50 (7.20)	4.16 (3.42)	3.46 (4.49)	4.24 (8.91)
B ^c		-4.30 (-3.05)	-4.11 (-7.00)		-4.48 (-7.60)	-2.83 (-5.44)
B ^{*c}		2.96 (2.11)	1.94 (2.29)		3.22 (3.12)	1.00 (1.13)
D ^s /W _w			7.76 (0.55)			-2.87 (-1.02)
$\sum CA/W_w$			-8.93 (-0.82)			-0.02 (-0.01)
\bar{R}^2	.84	.88	.92	.95	.97	.98
SER	.019	.017	.013	.022	.018	.015
$\hat{\rho}$	.71 (5.44)	.59 (3.96)	-.21 (-1.19)	.98 (33.4)	.62 (5.03)	.16 (1.02)
D.W.	1.68	2.00	2.22	1.65	1.84	1.88

¹ See text for definitions of variables and data sources. All equations were estimated using ordinary least squares and the Cochrane-Orcutt procedure to adjust for first-order serial correlation. The t-ratios are in parentheses.

TABLE 2

**Real Exchange Value of the Dollar:
Regression Estimates With Ordinary Structural Budget Surpluses¹**

	Sample: 1974:Q3 – 1981:Q4			Sample: 1974:Q3 – 1984:Q3		
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.44 (179.1)	4.54 (55.9)	4.37 (91.9)	4.82 (27.6)	4.62 (94.4)	4.40 (77.6)
$\sum_{i=0}^{11} (r_s - r_s^*)$	4.78 (4.58)	3.70 (3.02)	4.07 (7.25)	4.16 (3.42)	3.22 (3.38)	4.61 (8.27)
B ^c		-4.19 (-2.19)	-4.28 (-4.49)		-5.86 (-4.82)	-3.35 (-4.42)
B ^{*c}		1.90 (0.91)	-0.22 (-0.14)		3.77 (2.49)	0.12 (0.07)
D ^s /W _w			5.25 (0.33)			-3.09 (-1.00)
$\sum CA/W_w$			-7.91 (-0.64)			-0.63 (-0.24)
\bar{R}^2	.84	.86	.90	.95	.97	.97
SER	.019	.018	.016	.022	.018	.016
$\hat{\rho}$	.70 (5.44)	.72 (5.76)	-.03 (-0.19)	.98 (33.9)	.73 (6.86)	.17 (1.13)
D.W.	1.69	2.00	2.01	1.65	1.91	1.93

¹ See Table 1 notes.

Danker, et.al., 1984; and others), indicating that risk premia on internationally traded assets are small, vary with time, and are difficult to associate systematically with structural variables.

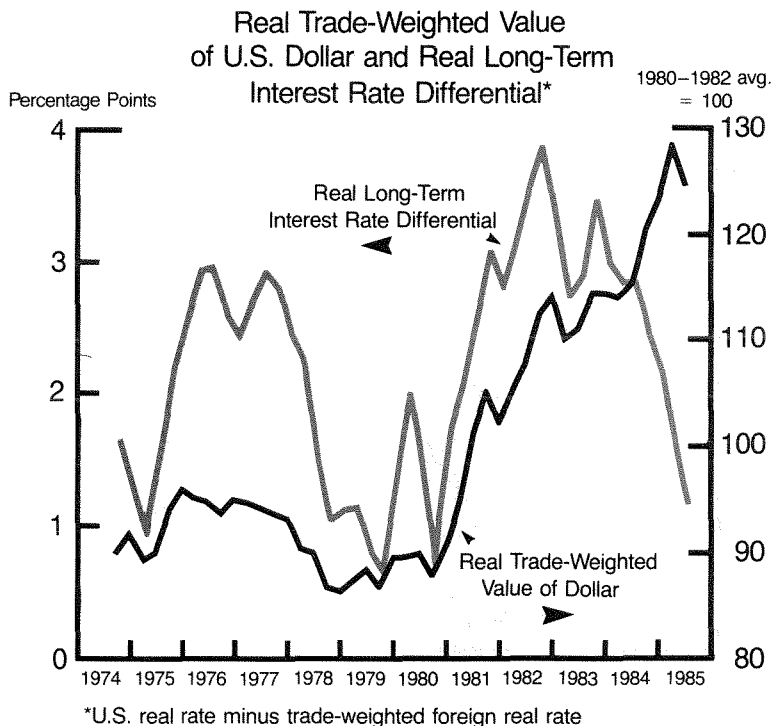
In contrast, the model estimates in Table 1 give statistically significant coefficients on the real interest differential ($r - r^*$), the expected U.S. structural budget balance (B^e), and the expected foreign structural budget balance (B^{*e}) of the theoretically predicted signs. Also, there is a high degree of stability between the estimates from the shorter and longer sample periods.

An increase of 1 percentage point in the real long-term interest rate differential in favor of the U.S. is estimated to have raised the real trade-weighted value of the U.S. dollar by 3.5 percent in the 1974:Q3—1984:Q3 sample period (column 5). This estimate is consistent with the view that investors in the market have a time horizon of roughly 3–4 years. A rise in the U.S. budget surplus by 1 percent of GNP is estimated to reduce the real trade-weighted value of the dollar by 4.5 percent. And a similar

movement in the budget balances of our major trading partners is estimated to raise the real value of the dollar by 3.2 percent.

The estimates using ordinary structural budget balances (not inflation-adjusted) shown in Table 2 provide similar but somewhat less robust results. The estimated real interest differential and budget balance coefficients are again of the predicted signs and highly significant in the full sample, whereas the risk premium variables are statistically insignificant. The goodness of fit (\bar{R}^2), standard error, and other summary statistics are also very similar. However, the coefficient on the foreign budget balance is statistically insignificant in the shorter sample. Moreover, the coefficient estimates using ordinary budget balances are less stable across the two samples. Since these results suggest that the behavior of the private sector is affected, at least to some extent, by the wealth changes included in the inflation-adjusted measure of the budget balance, further discussion of the empirical results and forecasts is limited to those using this measure.

Chart 1



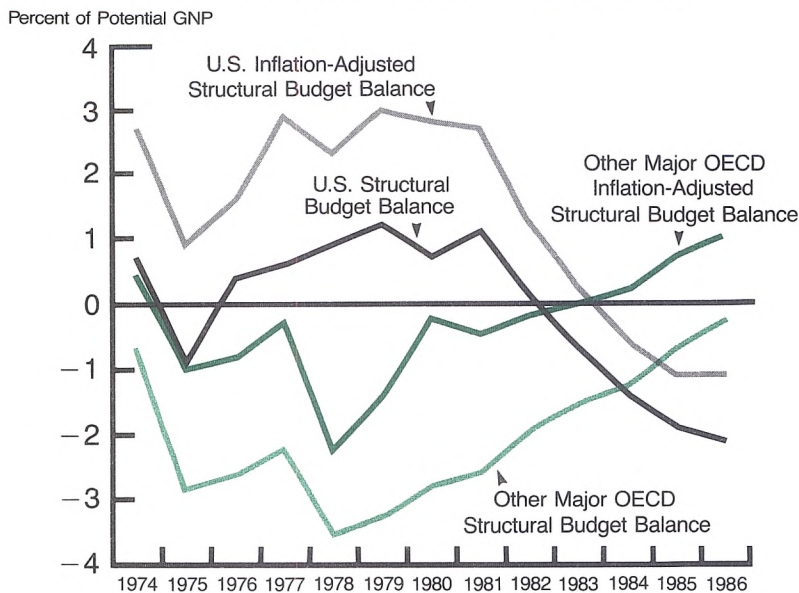
The results thus far presented provide considerable support for the general equilibrium model and suggest that the omission of expected structural budget balances from the portfolio balance model is a serious error. They also indicate that the U.S. fiscal stimulus has had significant impact on the dollar and that its influence has worked through goods market pressures and interest rate differentials, but not through a risk premium.

Chart 1 shows the movement in the real long-term interest differential between the U.S. and other major OECD countries implied by our estimated model from 1974 through the second quarter of 1985.¹⁵ The real long-term interest rate differential in favor of the U.S. peaked in 1982 at around 4 percent and has since dropped sharply to around 1 percent in the second quarter of 1985. At the same time, the real value of the dollar continued to rise until early 1985. The shift of the U.S. budget into deficit and an accompanying movement of foreign budget balances towards surplus, shown in Chart 2, helps to explain the otherwise puzzling opposite movement between the real exchange rate and the real interest rate differential.

Estimates derived from the shorter sample period (1974:Q3–1981:Q4) shed further light on this explanation of the current strength of the dollar (Table 1, columns 1 and 2) and also provide an indication of the stability of the exchange rate model. These equations were used to make out-of-sample forecasts of the real value of the dollar through the second quarter of 1985. The results are shown in Chart 3. As expected, the exchange rate model containing only the real interest rate differential forecasts a steadily declining real value for the dollar after 1982. In contrast, the exchange rate model that also includes budget balances forecasts the extraordinary strength of the dollar out-of-sample rather well. Its forecast is almost exactly on track through the end of 1984, but misses the spike in the value of the dollar early in 1985.

A recent study by Meese and Rogoff (1983) has tested the out-of-sample forecasting properties of the most widely employed empirical exchange rate models. Their conclusion was that a random walk model, which uses the current exchange rate to predict future rates, generally had smaller out-of-sample forecasting error variance than any of the structural models

Chart 2
U.S. and Foreign Structural Budget Balances



examined. Interest rate differentials are an important element in a number of the models tested by Meese and Rogoff, but none of these models contains domestic or foreign budget balances.

In the post-1981 period, the random walk model has a smaller root mean square error (equal to 14.7) in forecasting the real value of the dollar than does the model containing only the real interest differential (equal to 18.1). This result comes as no surprise since it parallels the earlier findings of Meese and Rogoff. It is noteworthy, however, that the root mean square error of the out-of-sample forecast from the exchange rate model that includes U.S. and foreign budget balances as well as the real interest differential is much smaller (at 5.39) than that for either alternative forecast.

Out-of-sample fit is an important criterion to consider when evaluating any econometric model. This seems particularly true for exchange rate models, which appear to be subject to more than the usual degree of instability. Our out-of-sample forecasts suggest that a model stressing the importance of direct fiscal effects on the real value of the dollar, and not limited to indirect effects operating through interest rate differentials or risk premium determinants alone, gets a distinctly better rating than do most other models of exchange rate determination. The direct effect of fiscal policy on the longer run equilibrium value of the dollar is a largely neglected theoretical point, but one that appears to be highly important in practice.

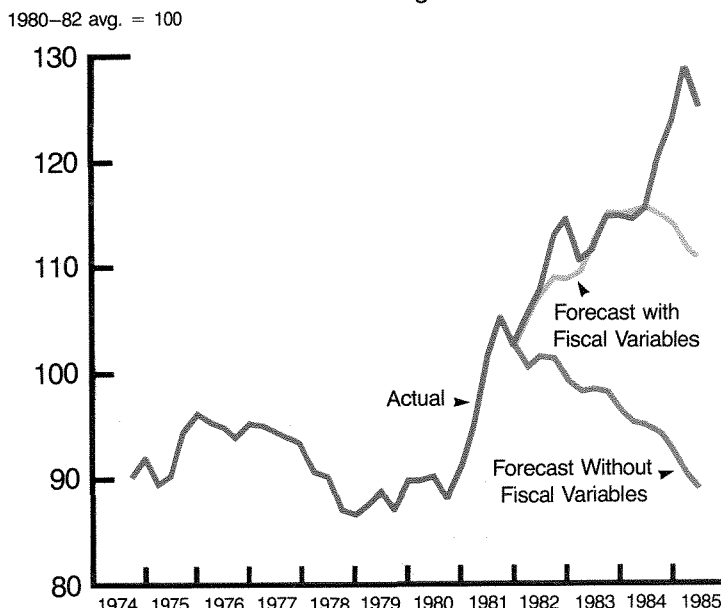
V. Conclusion

This paper has presented two alternative views on the way fiscal policy influences real exchange rates. Each leads to substantially different conclusions about the future course of the dollar in the foreign exchange market. The first view, based on a short-run, partial equilibrium portfolio balance model of exchange rate determination, predicts that the dollar will con-

tinue to depreciate either because of a declining real interest rate differential or because of investors' reluctance to continue to absorb U.S. dollar-denominated debt into their portfolios.

The second view, based on a longer run, general equilibrium model, predicts that the dollar is likely to remain strong by the standards of the late 1970s. In particular, this view suggests

Chart 3
Real Trade-Weighted Dollar



that as long as U.S. structural budget deficits remain large relative to those abroad, the real value of the dollar should remain substantially above its pre-1980 level.

Empirical estimates and out-of-sample forecasts based on the two alternative views largely support the "strong dollar" prediction of the general equilibrium model. Recent dollar declines appear mainly to be related to a narrowing real interest rate differential between the U.S. and abroad, and not to investors' reluctance to continue to absorb increasingly large amounts of U.S. debt into their portfolios. There is very little evidence that a significant exchange risk premium on dollar assets exists, or will soon develop.

In the absence of substantial further declines in U.S. real interest rates (or increases in foreign rates), our results suggest that aggregate demand pressures associated with U.S. budget deficits could well keep the dollar strong in the intermediate term. This conclusion contrasts with what appears to be the majority opinion of economists and forecasters. Although we accept the theoretical possibility of the consensus view that the dollar is likely to continue to fall in the near term, our evidence and that of other studies provides little empirical support for it.

A large number of analysts apparently hold to the opinion that the dollar must ultimately fall back to its pre-1980 level because a persistently high dollar value would continue to generate, in their view, unsustainably large U.S. current account deficits. This conclusion is based on the assumption that foreigners will not be willing to finance U.S. current account deficits at their present magnitude indefinitely. The rising stock of U.S. external debt, it is usually argued, will eventually generate large risk premia on U.S. assets. A rising risk premium, in turn, would cause U.S. interest rates to rise and the real value of the dollar to fall.

One recent projection (Krugman, 1985) indicates that if the dollar only gradually depreciated from its present high level, the U.S. foreign-debt-to-GNP ratio would continue to climb for the next 23 years, stabilizing at roughly 46 percent. If this were considered an unsustainably high ratio, then the implication is that the equilibrium value of the dollar must be considerably less than its present value.

Admittedly, our theoretical and empirical analysis does not purport to deal with a time horizon of a quarter of a century and a full long-run steady state stock equilibrium. But, as shown in Hutchison and Pigott (1985), our basic model's predictions appear to be reasonable even in the context of very long-run growth.¹⁶ Moreover, we believe that time horizons of most market participants are relatively short. Our empirical estimates suggest horizons of roughly three to four years, and an informal survey of actual participants in the foreign exchange market suggests even shorter time horizons.

Even if market expectations are formed on a time horizon as long as a steady state analysis implicitly entails, there is some question as to whether a 46 percent foreign debt-to-GNP ratio for the U.S. is implausibly large. A number of countries less politically stable than the U.S. have external debts considerably larger than half of their GNP. And, given the status of the U.S. dollar as the premier investment, reserve and international transactions currency, world demand for U.S. assets is presumably (proportionally) larger than that for most other nations.

In conclusion, our results suggest that the real value of the dollar could well remain high by pre-1980 standards for the foreseeable future. Its strength is caused by aggregate demand pressures associated with greater fiscal expansion in the U.S. than abroad, combined with the general willingness of foreign lenders to finance U.S. current account deficits. Moreover, there is little evidence to suggest that the dollar's underlying strength is a speculative bubble that could easily be punctured by further official exchange market intervention. In early 1985, the dollar was indeed stronger than could be explained by fundamental factors. But by the third quarter a subsequent depreciation had moved the dollar back into line with the value predicted by our model.¹⁷ At the present time, coordinated policies designed to reduce fiscal imbalances between the United States and abroad would likely be the most effective approach to bringing about a significant and long-lasting decline in the real exchange value of the dollar in a non-inflationary environment.

FOOTNOTES

1. To show that (3) holds in real (price-adjusted) as well as nominal terms, we define the real exchange rate (q) and the future real exchange rate (q^e) expected to prevail n periods hence as:

$$s = q \frac{P^*}{P}$$

$$s^e = \frac{q^e P^*(1 + \dot{p}^*)^n}{P(1 + \dot{p})^n}$$

where

- P = U.S. price level;
- P^* = foreign price level;
- \dot{p} = expected U.S. inflation rate (annualized);
- \dot{p}^* = expected foreign inflation rate (annualized).

Taking logarithms of these two equations and substituting into equation 3, one gets:

$$\ln q = n [(i - \dot{p}) - (i^* - \dot{p}^*)] - n\phi^e + \ln q^e$$

$$\text{or } \ln q = n (r - r^*) - n\phi^e + \ln q^e$$

where $r = i - \dot{p}$
 $r^* = i^* - \dot{p}^*$

2. This is a description of the adjustment to a fiscal stimulus in a world of flexible exchange rates and relatively unchanged price levels. The logic of the argument can be applied equally well to a world of fixed exchange rates and flexible price levels. As before, the fiscal stimulus is assumed to produce more of an increase in the demand for domestic goods than in the demand for foreign goods. In a world of fixed exchange rates, the result would be an increase in domestic prices relative to foreign prices. With a given nominal exchange rate, this relative change in prices implies an appreciation in the domestic real exchange rate.

3. This model is essentially a classical, or full employment, version of the Mundell-Fleming model of fiscal policy in a world of perfect capital mobility. See Mundell (1963) and Fleming (1962). However, the assumption about the relative impact of fiscal policy on spending in the two countries is also crucial to the outcome for the real exchange rate. If fiscal expansion increased the demand for foreign goods as much as the demand for home goods, there could be no impact on the exchange rate.

This part of the analysis is similar to the classical transfer problem. The literature on the classical transfer problem deals with the question of how a financial transfer of purchasing power between two countries—for example through gifts, reparations payments, or capital flows—effects a corresponding transfer of real resources. A question of particular importance in this literature is whether a change in the real exchange rate is required to effect the transfer. The answer turns on the income effects of the transfer on spending in the two countries. A famous early discussion of the transfer problem was between J.M. Keynes and Bertil Ohlin with regard to German reparations payments. See Ellis and Metzler (1950, pp. 161-179).

There is an important difference, however, between the effect of a fiscal expansion and the classical transfer anal-

ysis. This is that the former, the aggregate demand for goods worldwide is increased by a larger budget deficit (at the initial level of interest rates), while in the latter aggregate demand rises in the country receiving the transfer payment but falls in the paying country as the amount of the transfer payment is collected. In the classical case of no change in worldwide aggregate demand, the transfer of real resources can be carried out through a change in the trade balance without any alteration in the real exchange rate so long as the marginal propensities of the two countries to import sum to one. See Caves and Johnson (1968, pp. 115-171) and Mundell (1960). However, in the case of a fiscal expansion in only one of the countries, for there to be no change in the real exchange rate, it is necessary that fiscal expansion increase the demand for foreign goods as much as the demand for home goods.

4. This diagram comes from Dornbusch (1983) and Blanchard and Dornbusch (1984).

5. The difference between the classical transfer problem and the general equilibrium view of the effect of a budget deficit on the exchange rate can be illustrated with Diagram 2. The shift of G_0^{us} to G_1^{us} and G_0^{row} to G_1^{row} could just as well be produced by the effect on U.S. income of a transfer payment to the U.S. from the rest of the world. As the diagram is drawn, the propensity of the U.S. to spend the transfer on U.S. goods is greater than the propensity to import, so G^{us} shifts by more than G^{row} .

However, unlike the case of pure fiscal expansion in the U.S., in the classical transfer analysis the collection of the transfer abroad through taxation has income effects that reduce the demand for home goods and imports there. If the sum of the marginal propensities to import in the two countries were equal to one, the relatively large propensity of the U.S. to spend on domestic goods would be matched by an equally large propensity by the rest of the world to import. Adding the income effects for the rest of the world from the transfer to the diagram, the G_1^{us} schedule would therefore shift back exactly to G_0^{us} and, similarly, G_1^{row} would shift back to G_0^{row} . As a result, when the sum of the import propensities equals one, a pure transfer payment from the rest of the world to the U.S. would effect the required movement in real resources through a deterioration in the U.S. trade balance without any change in either the real exchange rate or the world interest rate.

6. This view has been widely expressed. Another example is Branson (1985). Moreover, in the analysis of Branson and others, the exchange rate will eventually depreciate below its initial level. This is because a zero balance current account is assumed to be a necessary equilibrium condition in the no-growth context of their models. Because the initial exchange rate appreciation causes a fall in net exports and an associated foreign capital inflow, the U.S. external debt rises. To generate a trade balance surplus that equals the net foreign debt interest payments (keeping a balanced current account), the exchange rate will fall below its initial level (see Rodriguez, 1979).

7. These are Japan, West Germany, France, the United Kingdom, Italy, and Canada.

8. The estimated equation for forecasting U.S. inflation over the maturity of the 6 month commercial paper rate is:

$$\begin{aligned} \dot{p}_{i+2} &= -.141 + .463 \sum_{i=0}^{16} M1_{-i} + .552 \sum_{i=0}^{10} \dot{p}_{-i} \\ & \quad (-.486) \quad (3.11) \quad (4.24) \\ R^2 &= .812 \quad S.E. = 1.26 \quad D.W. = 1.09 \end{aligned}$$

Equations based on monetary growth overpredict inflation in 1982 and 1983 by a substantial margin because of an unusual decline in M1 velocity. However, the demand for M1 was stable, so the decline in M1 velocity can be explained statistically by the decline in inflation and nominal interest rates that occurred in the period. If M1 growth is adjusted for this effect, it continues to predict the growth of nominal income and inflation reasonably well. Consequently, for this period, an adjusted M1 growth was used in the inflation forecasting equation instead of actual M1 growth. The adjustment factors that were used are described in Judd and McElhattan (1983). For an analysis of the effect of the decline in velocity on inflation and why it occurred, see Throop (1984a, b).

9. The source of the interest rate data is the Board of Governors' macrodata library. The data on consumer prices is from the International Monetary Fund, *International Financial Statistics*.

10. See Throop (1984,c).

11. The trade-weights used are those described in "Index of the Weighted-Average Value of the U.S. Dollar: Revision," *Federal Reserve Bulletin*. August 1978, p. 700.

12. If changes in real wealth affect consumption so that the inflation-adjusted measure of the budget balance is the correct one, then the theoretical model in Section II should be amended to include wealth as an argument in the absorption of goods and services in both countries.

Useful discussions of the concept of the inflation-adjusted budget balance include Eisner and Peiper (1984), Jump (1980), and Siegel (1979). The budgetary data used are the combined federal, state, and local balances compiled by the OECD. Trade-weights are clearly appropriate for combining the rest of the world's real interest rates. However, in the case of the structural budgets, the relative size of the country is a further consideration. The impact of a 1 percentage point change in a country's structural budget on the *bilateral* real exchange rate with the U.S. should be greater the larger is the size of that country's economy. Given the influence of relative GNP on the bilateral real rate, the impact on the real trade-weighted value of the dollar then depends upon the trade-weight of that country. Therefore, the weight for the foreign budget balances that we used is the trade-weight times the relative GNP-weight. Since GNP-weights and trade-weights are highly correlated, this weighting scheme is not, in fact, very different from pure trade weights.

Since the relative effects of B and B* on the real exchange rate depends upon the relative size of the U.S. versus the rest of the world, there is no reason in principle why the coefficients on the two budget balances should be constrained to be of equal absolute value, as is the case with U.S. and foreign interest rates.

13. This point is rigorously demonstrated in Frankel (1979).

14. D_s is calculated as U.S. federal government debt less liabilities to foreign official institutions and the Federal Re-

serve. W_w equals D_s plus central government debt net of central bank holdings in the six foreign countries. ΣCA is the value of U.S. net external assets in 1970 plus the U.S. current account surplus cumulated quarterly from 1971:Q1 on. The source of data for central government debt and the U.S. current account is the International Monetary Fund, *International Financial Statistics*. U.S. liabilities to official institutions is taken from U.S. Treasury Department, *Treasury Bulletin*. Since the supply of U.S. debt is measured net of U.S. liabilities to official institutions, the cumulative current account is also measured net of changes in these liabilities.

The domestic (D_d) and rest of world (D_d^*) demand functions for U.S. government debt may be expressed as proportions of total government bond holdings (both foreign and domestic), W and W^* , of residents in each country. (The proportions of this wealth invested in the rest of the world's government debt equal one minus the percentages invested in U.S. debt.)

$$\begin{aligned} D_d &= (b_d + b_0\phi^e)W \\ D_d^* &= (b_d^* + b_0\phi^e)W^* \end{aligned}$$

This formulation assumes that domestic and foreign demand for U.S. government bonds differ only by a constant term, which is higher in the U.S. because domestic investors prefer the home country habitat. Setting the supply of U.S. government debt, D_s , equal to the total demand, $D_d + D_d^*$, we have:

$$\begin{aligned} D_s &= (b_d + b_0\phi^e)W + (b_d^* + b_0\phi^e)W^* \\ \text{Letting } W + W^* &= W_w, \\ D_s &= b_dW + b_d^*(W_w - W) + b_0\phi^eW_w \end{aligned}$$

Then solving for ϕ^e ,

$$\phi^e = \frac{D_s}{b_0W_w} - \frac{b_d - b_d^*}{b_0} \frac{W}{W_w} - \frac{b_d^*}{b_0}$$

Thus, the risk premium is a function of the ratio of the supply of U.S. government debt, D_s , to the total supply of government debt (both foreign and domestic), W_w , and also the ratio to total U.S. holdings of government bonds (both foreign and domestic), W , to total government debt. We measure W by adding to total U.S. government debt an amount that is some fraction of the cumulative current account surplus since only a portion of net private investment abroad goes into government bonds. This gives the values of ϕ^e to be substituted into equation 8 for the real exchange rate.

$$\begin{aligned} \phi^e &= \frac{D_s}{b_0W_w} - \left(\frac{b_d - b_d^*}{b_0} \right) \left(\frac{D_s + \alpha \Sigma CA}{W_w} \right) - \frac{b_d^*}{b_0} \\ \text{or } \phi^e &= \frac{1 - b_d + b_d^*}{b_0} \frac{D_s}{W_w} - \alpha \frac{b_d - b_d^*}{b_0} \frac{\Sigma CA}{W_w} - \frac{b_d^*}{b_0} \end{aligned}$$

15. Since the estimated coefficient on each of the lagged differentials in short rates equals n times the weights in the distributed lag of an ordinary term structure relationship, and the sum of the estimated coefficients should be approximately equal to n , the original weights in the term structure can be obtained by dividing each estimated coefficient on the lagged differential in short rates by n .

synthetic real long-term interest differential is then obtained by applying these derived weights to the current and past differentials in real short-term rates.

16. Hutchison and Pigott show that a permanent real exchange rate appreciation following a fiscal stimulus is likely under a wide range of plausible conditions. These condi-

tions include a low risk premium and both modest output responses and small world interest rate increases in response to the fiscal stimulus.

17. When equation 2 in Table 1 is estimated through 1985:Q2, its predicted value for 1985:Q3 is almost exactly equal to the actual value of the real exchange rate.

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