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BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM

DIVISION OF RESEARCH AND STATISTICS

Date: March 15, 2001

To: Dave Stockton

From: Tilda Horvath, Eileen Mauskopf, and John Williams

Subject: FRB/US Estimates of R*

This memo reports preliminary estimates of the equilibrium real federal funds rate (R*) based on the FRB/US model. Strong potential growth, an exuberant stock market, and surprisingly strong private spending boosted the FRB/US-based estimate of R* to about 4 percent at the beginning of this year. But, the recent and projected declines in the equity valuations cause the FRB/US estimate of R* to fall to 3-1/2 percent by the middle of 2001, and it remains at about that level through the end of 2002.

We define the equilibrium real interest rate to be the real federal funds rate at which real GDP equals potential, once the effects of past transitory disturbances have dissipated. Only highly persistent disturbances to the economy should influence our estimate of R*.[1] We use the FRB/US model to generate a time series for estimates of R*, where each estimate is conditional on assumed values for a set of variables listed in Table 1. In computing the equilibrium real rate for period t, we hold these conditioning variables *fixed* at their period t values, computed according to the rules given in the third column of the table. In particular, we hold capital and debt (government and net foreign asset) stocks constant relative to trend nominal GDP because these variables tend to adjust very gradually over time. (For this reason, an estimate of R* consistent with full

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1. This definition is the same as in the Kalman filter-based estimates using a small macro model reported earlier by Laubach-Williams. Note that R* is defined to be consistent with GDP equaling potential, and not necessarily with constant inflation. For example, in the presence of a persistent adverse supply shock, output may need to be held below potential for some time in order to stabilize inflation.

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Table 1

Conditioning Variables for FRB/US-based Estimates of R*

Category	Variables	Rule
Fiscal policy	tax rates govt. spending	1-year average HP filter
Structural trends	GDP, labor prod.	FRB/US estimate
Foreign	trend GDP real exchange rate residual	HP filter HP filter
Nonfinancial prices	Aggregate price inflation relative prices	4-yr. ave. core PCE price inflation current level
Asset prices	equity premium bond premiums	1-year average 4-year average
Equation residuals	nonfinancial	4-year average
Stocks	physical capital government debt net foreign assets	current level (rel. to trend GDP) current level (rel. to trend GDP) current level (rel. to trend GDP)

adjustment of stocks – a multi-decade process – may provide an inaccurate measure of the R* relevant for monetary policy, an so a shorter-run concept is more appropriate for our purposes.)

The solid line in the upper panel of Chart 1 shows the FRB/US-based estimates of R*; the dashed line shows the actual real fed funds rate – measured as the nominal fed funds rate less the four-quarter percent change in the core PCE price index. The lower panel shows the difference between the actual real fed funds rate and the FRB/US estimate of R*. The FRB/US-based estimates of R* vary from a low of below one percent in 1994 to a peak of over 5 percent in the early 1970s; this range is similar to that of the Laubach-Williams Kalman filter model and earlier work by Antulio Bomfim using the FRB/US model. Chart 2 shows the contributions from several key conditioning assumptions on the historical estimates of R*.

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Table 2

Estimates of a Time-varying R*

Model	History 1999	History 2000	GB Projection 2001	GB Projection 2002
FRB/US	4.0	4.2	3.6	3.5
Laubach-Williams – raw filter (estimated. through 2002q4)	3.5	3.9	3.3	2.9
Laubach-Williams – smoothed (estimated through 2002q4)	3.2	3.1	2.9	2.9

Table 2 provides a closer look at the FRB/US estimates both for the past two years and for this year and next, treating the March Greenbook projection as data. The FRB/US-based estimate of R* in 2000q4 is 4.0 percent (not shown); this figure declines to about 3.5 percent by mid-2001 and remains at that level though the end of 2002. In 1999 and 2000, high trend GDP growth, a low equity premium, and the persistent component of spending equation residuals all boost R*, while a strong dollar and restrictive fiscal policy have the opposite effect. Going forward, the recent and projected rise in the equity premium more than explains the decline in the FRB/US estimate this year and next. For comparison, the Laubach-Williams random walk estimate of R* is 3.9 percent based on data through 2000q4 – labeled "raw filter" in Table 2 – and declines to about 3 percent by the end of 2002, based on the Greenbook projections of the output gap and real interest rates.

A number of caveats apply to the FRB/US estimates. First, these results are still preliminary; we are continuing to study and refine the methods used to estimate R*. In particular, the estimates assume that debt and capital stocks are fixed; we are now considering partial adjustment of stocks that may occur within the time frame of monetary policy. Second, the estimates are naturally sensitive to assumptions regarding the conditioning variables, especially, structural trends, asset prices, and filtered equation residuals. Finally, the confidence bands, which we have not yet formally computed, are likely to be *quite* wide.

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Chart 1

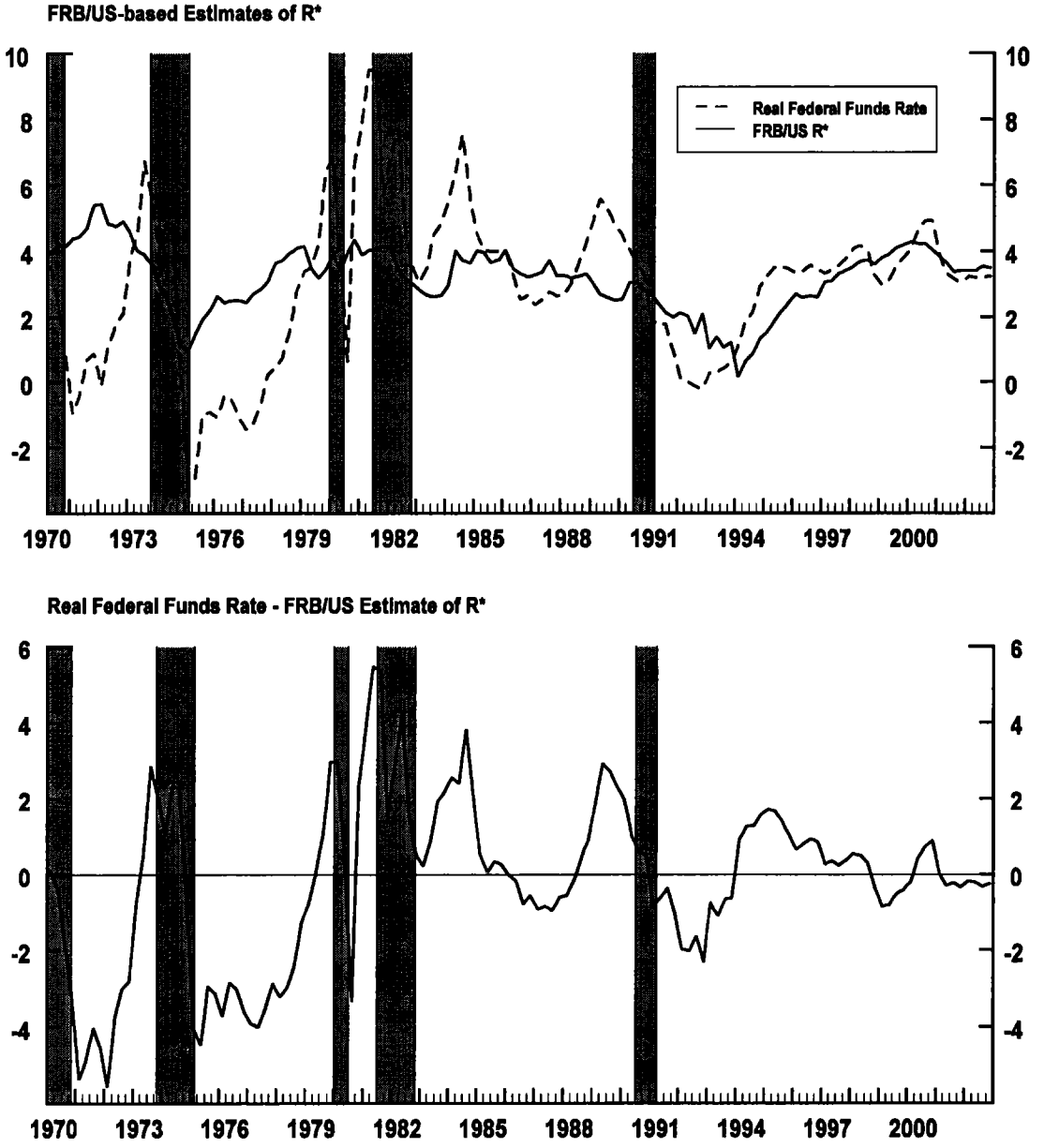

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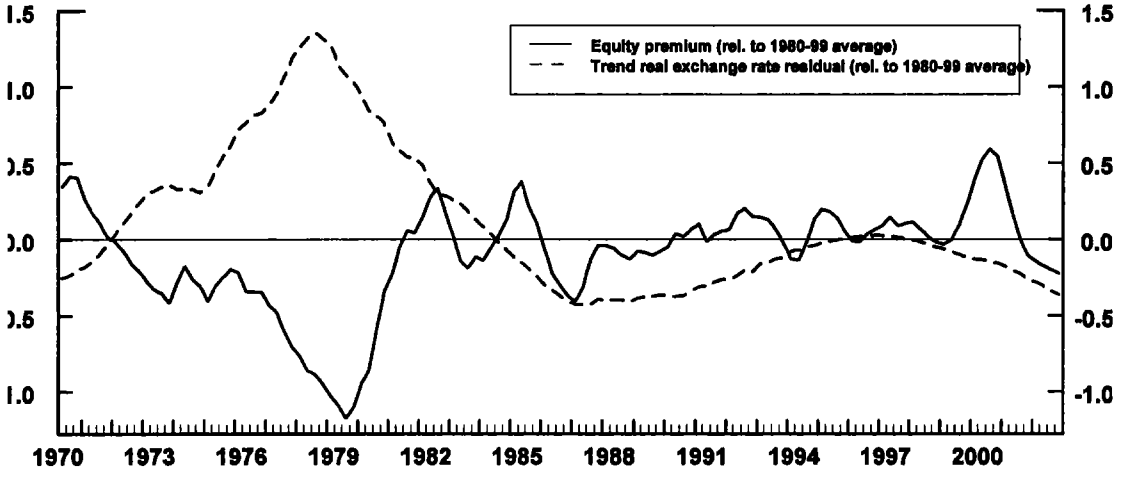
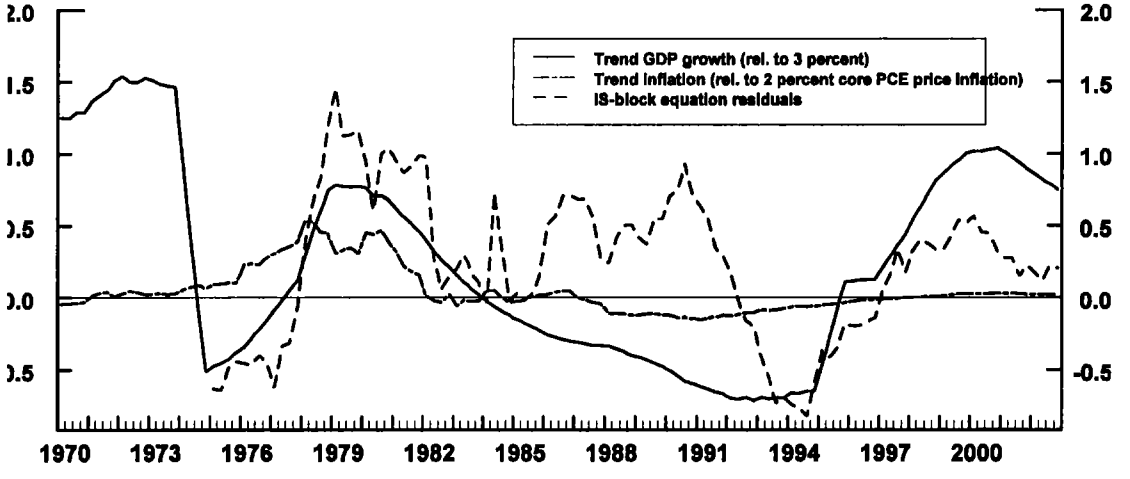
Chart 2

Estimated Contributions to R* from Financial Conditions



Estimated Contributions to R* from Real Conditions