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In This Issue . . .

A decline in the growth of U.S. productivity and international competitiveness has been caused by deficient public capital formation, according to some public policy analysts. These analysts suggest that a sharp rise in public capital formation will be necessary to restore earlier trends in productivity growth. In the first article in this *Review*, John A. Tatom examines the production function estimates that provide the underpinning for these arguments.

The author shows that simply accounting for the influence of energy price movements on productivity and for the slowing trend rate of technological change in the typical production function framework reduces recent estimates of public capital's effect on private sector output by more than half. More important, Tatom argues, such findings are examples of "spurious regression bias," where variables appear to be statistically significantly related but are not. He explains this statistical problem and shows how it applies to tests of the public capital hypothesis. When the private sector production function is appropriately estimated, Tatom explains, the public capital hypothesis is rejected; the public capital stock has no statistically significant effect on business sector output.

The author concludes that the pace of public capital formation has played no role in accounting for movements in U.S. productivity.

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Concern over the increasing number of bank failures and the resulting deposit insurance fund losses has led to numerous proposals for bank regulatory reform. One recent proposal calls for bank supervisors to undertake "prompt corrective action" to achieve stronger enforcement of bank capital requirements at undercapitalized banks, including restrictions on their asset growth, shareholder dividends and insider loans.

In the second article in this *Review*, "Supervision of Undercapitalized Banks: Is There a Case for Change?" R. Alton Gilbert examines banks whose capital ratios were below the specified minimum for periods longer than one year during 1985 to 1989 to determine whether they generally violated the constraints that would be imposed under prompt corrective action. He finds that, while most long-term undercapitalized banks did not violate these constraints, a substantial minority did so. He also finds, however, that there was no significant difference in the recovery rates between the banks that violated the "prompt corrective action" constraints and those that did not.

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In the third article in this issue, "The FOMC in 1990: Onset of Recession," James B. Bullard presents this *Review's* annual synopsis of the re-

cent actions of the Federal Open Market Committee, the prime policy-making group in the Federal Reserve System. Calendar 1990 was an interesting period from the perspective of monetary policy-watchers because the national economy slipped into recession in the latter half of the year, thus providing an opportunity to study policy-making during the onset of recession. In the context of a chronology, the author emphasizes some difficulties that the Committee experienced in attempting to implement its stated short-run policy goals. These include the problems of inaccurate short-term forecasting and the appropriate measurement of the policy stance.

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In the final article of this issue, Allan H. Meltzer, John M. Olin Professor of Political Economy and Public Policy at Carnegie Mellon University, discusses U.S. international economic policy during the Bretton Woods era. His article, which was presented in St. Louis on April 8, 1991, as the fifth annual Homer Jones Memorial Lecture, reviews the roles of the U.S. as the world's strongest economy and the dollar as its reserve currency in a system of fixed exchange rates. Key within this review is the lack of consistency between U.S. monetary policy, which ultimately (although unofficially) was responsible for maintaining the fixed rate system and domestic policy objectives that often ran counter to this goal. By noting this conflict and other tensions within the Bretton Woods arrangements, Meltzer is able to trace the steps that led to the collapse of the fixed rate regime in 1973.

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John A. Tatom

John A. Tatom is an assistant vice president at the Federal Reserve Bank of St. Louis. Kevin L. Kliesen provided research assistance.

Public Capital and Private Sector Performance

A GROWING BODY of literature now argues that the public capital stock has significant, positive effects on private sector output, productivity and capital formation.[1] Most of this literature suggests that a decline in the growth of the public capital stock since the early 1970s caused a "productivity slump" in the private sector lowering profitability and investment.[2] Unless these trends are reversed, say the studies, the nation's standard of living will be further threatened. This article explains this public capital hypothesis and evaluates the evidence supporting it.

THE PUBLIC CAPITAL HYPOTHESIS AND PRIVATE SECTOR PRODUCTIVITY

Public capital comprises federal, state and local government capital goods. It includes highways, streets and roads, mass transit and airport facilities, educational buildings, electric, gas and water supply facilities and distribution systems, wastewater treatment facilities, and administration, police, fire, justice and hospital facilities and equipment.

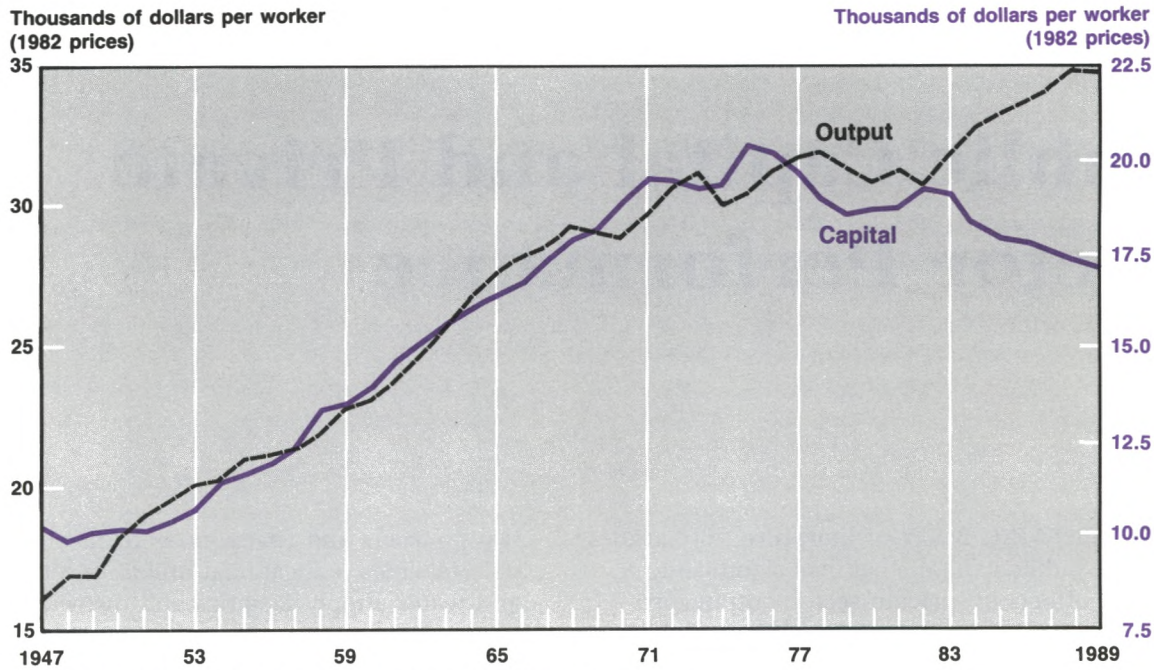
The public capital hypothesis is that the stock of public capital raises private sector output both directly and indirectly. The direct effect arises, according to the hypothesis, because public capital provides intermediate services to private sector firms, or the marginal product of public capital services in the private sector is positive. The indirect effect arises from an assumption that public and private capital are "complements" in production—that is, the partial derivative of the marginal product of private capital services with respect to the flow of public capital services is positive.[3] Thus, a rise in public capital raises the marginal productivity of private

[1]This argument will be referred to as the public capital hypothesis; it has been developed most fully by Ratner (1983), Aschauer (1989a), (1989b) and (1990) and Munnell (1990). Also see Deno (1988) and Eberts (1990). The hypothesis was suggested earlier by Schultze (1981), Arrow and Kurz (1970), Eisner (1980) and Ogura and Yohe (1977).

[2]See The National Council on Public Works Improvement (1988), Malabre (1990) and Reich (1991) for analyses that attribute such consequences to the slowdown in public capital formation. A previous article, Tatom (1991), explains how several factors account for the decline in the rate of growth of the public capital stock. These factors suggest that a *reversal* of this past decline would not be economically justifiable, even if the public capital stock has the effects emphasized by the public capital hypothesis.

[3]The notion of complementarity and substitutability used here has been called q-substitutability and q-complementarity. It refers to the effect of the quantity of one resource on the marginal product of another resource. The concept of p-substitutes or p-complements is more common; these terms refer to the effect on the demand for a resource of a rise in the price of another resource, holding other resource prices and output constant. See Sato and Koizumi (1973) for a discussion of this distinction, or its use in Tatom (1979b).

Figure 1
Business Sector Output per Worker and Public Capital Stock per Worker



Note: capital stock is measured from the end of the previous year.

capital services so that, given the rental price of such services, a larger flow of private capital services and a larger stock of private assets producing them are demanded. The rise in the marginal product of capital increases private capital formation, further raising private sector ouput.

The indirect effect of a rise in public capital on private output, however, is not necessarily positive. In fact, this effect is negative if public and private capital are substitutes. Economic theory does not dictate whether private and public capital are complements or substitutes.[4] The analysis below focuses on estimating the direct effect, the private sector's marginal product of public capital. If public capital does not enter the production function for private output, as is demonstrated below, the sign of the indirect effect must also be zero.

The Productivity Decline and Public Capital Formation: A Look at the Record

Advocates of the public capital hypothesis argue that a slowdown in public capital formation caused a "productivity slump" beginning in the early 1970s. Some perspective on this issue is provided by figure 1, which shows output per worker in the business sector and the real nonmilitary net stock of public capital (1982 prices) per business sector worker from 1947 to 1989. Public capital per worker is measured by

[4]There is, however, a growing literature that suggests that government spending is a substitute for private sector spending. Recent attention to this view owes much to its elaboration by Aschauer (1985). Other research that develops the direct substitution channel for crowding out include Kormendi (1983), Kormendi and Meguire (1986) and (1990) and Tatom (1985). Critics of the Kormendi and Meguire view include Barth, Iden and Russek (1986), Feldstein and Elmendorf (1990), and Modigliani and Sterling (1986) and (1990).

the capital stock at the end of the previous year divided by the average level of business sector employment during the year.[5]

The growth of output per worker slowed from a 2.5 percent annual rate from 1948 to 1973 to nearly zero (−0.1 percent rate) from 1973 to 1982, before rebounding to a 1.8 percent rate from 1982 to 1989. Advocates of the public capital hypothesis emphasize only the post-1973 slowing. The growth of the public capital stock per worker also slowed abruptly in the early 1970s. Public capital per worker rose at a 3 percent rate from 1948 to 1971, then showed no growth from 1971 to 1982, much like the 1973-82 slowing in productivity. Since 1982, however, the growth in the stock of public capital per worker slowed further, falling at a 1.6 percent rate. This inconsistent shift in trends after 1982 does not contradict the fact that both variables grew more slowly after the early 1970s than they did before then.

The simple correlation coefficient for the logarithms of the two measures shown in the figure is 0.95 for the period 1947 to 1989. This strong positive relationship is a classic case of a spurious time-series relationship. In fact, changes in the public capital stock per worker are not statistically significantly related to changes in business sector output per worker. The correlation coefficient for changes in the logarithm of each measure is negative and equals only −0.03 for the period 1948 to 1989. The reversal in the size, significance and sign of the correlations among levels and first-differences illustrates the importance of the issues explored below in assessing the public capital hypothesis.

THE BUSINESS SECTOR PRODUCTION FUNCTION AND PUBLIC CAPITAL FORMATION

The most direct aggregate evidence on the positive effect of public sector capital formation can be obtained from production function estimates. The aggregate production function indicates the maximum output that can be produced with labor and capital given technology and other factors influencing production. The marginal product of each resource is assumed to be positive and inversely related to the quantity of the resource (diminishing returns).

The Conventional Approach

Ratner (1983) provides the first model that explicitly adds public capital to the production function to test whether the marginal product of public capital is positive. More recent analyses by Aschauer (1989a) and Munnell (1990) use a similar approach. Ratner assumes that the business sector production function (Q) can be represented by a Cobb-Douglas function:

$$(1)\quad Q_t = Ah_t^{\alpha}k_t^{\beta}kg_t^{\delta}\, e^{(rt+\varepsilon_t)},$$

where A = a scale parameter,

h_t = business sector hours,

k_t = the flow of services from K_t, the constant-dollar net nonresidential stock of private capital at the end of the previous year,

kg_t = the flow of services from KG_t, the public capital stock at the end of the previous year,

r = a rate of disembodied technical change,

t = a time trend, and

ε_t = a normally and independently distributed random disturbance term.

The same utilization rate, c_t, is used for public capital as for private capital, so the flow of private capital services, k_t, is c_tK_t and the flow of services from government capital, kg_t, equals c_tKG_t.[6] The utilization rate is measured by the

[5]The net public and private capital stock data used in this article were provided by John Musgrave from data he prepares for the U.S. Department of Commerce, which is described in U.S. Department of Commerce (1987) and Musgrave (1988). The series are constructed by deducting depreciation from gross stock measures, which cumulate gross investment less discards (assets that are scrapped). The depreciation methods use straight-line depreciation for service lines equal to 85 percent of the U.S. Treasury Department's Bulletin F service lines. Constant cost measures (1982 prices) are used throughout this article.

[6]The questionable assumption of an identical utilization rate for public and private capital is not required, however. The derivation of equation 2 requires only that the use of public capital be proportional to that of private capital. In this case, the constant term A in equation 2 will include this factor of proportionality.

Federal Reserve Board's index of manufacturing capacity utilization.

Ratner also assumes that the production function is characterized by constant returns to scale, which means that a proportional rise in each resource raises Q by the same proportion; this assumption is expressed as $\alpha+\beta+\delta=1$. Thus, the production function can be rewritten as:

$$(2)\quad \ln(Q_t/k_t) = \ln A + \alpha\ln(h_t/k_t) + \delta\ln(KG_t/K_t) + rt + \varepsilon_t.$$

The public capital hypothesis that KG affects Q is tested by determining whether δ, the output elasticity of public capital, is positive.[7] The output elasticity is the marginal product of public capital services divided by the average product of these services (Q/kg). The coefficient α is the output elasticity of labor which, in principle, should equal the share of labor cost in total cost.

Ratner estimated equation 2 using data for 1949 to 1973. Since then, the data have been revised numerous times, including changing the base period for computing constant-dollar output and capital stock data. When this equation is estimated for the original sample period 1949-73, using the latest available data, the estimate is (t-statistics in parentheses):

$$(3)\quad \ln(Q_t/k_t) = \underset{(11.52)}{1.410} + \underset{(9.32)}{0.548}\ln(h_t/k_t) + \underset{(2.81)}{0.277}\ln(KG_t/K_t) + \underset{(6.24)}{0.0128}\,t$$

$$\bar{R}^2 = 0.93 \quad \text{S.E.} = 1.02\% \quad \text{D.W.} = 1.65.$$

The statistically significant output elasticity of public capital is estimated to be 27.7 percent. This is much larger than Ratner's earlier estimate of 5.8 percent.[8] The rise in the output elasticity of the public capital stock arises from data revisions subsequent to Ratner's study.[9]

Aschauer (1989a) and Munnell estimate similar production functions for the business sector over the period 1949-85 and the non-farm business sector over the period 1949-87, respectively.[10] They both find a positive and significant output elasticity for public capital; their estimates, however, are about 30 to 40 percent, somewhat larger than that in equation 3.[11]

Three Potential Shortcomings of Existing Estimates

Estimates like that in equation 3 are suspect for three reasons. First, they ignore the significant influence of the relative price of energy on

[7]There are two alternative transformations of the variables that could be used to derive the theoretical specification. Equation 2 arises from the substitution ($\beta = 1 - \alpha - \delta$), but α or δ could have been eliminated instead. The alternative expressions are analytically and statistically equivalent, however; in particular, the estimates are normalized on output in all three specifications.

[8]The output elasticity of a resource equals the ratio of the resource's marginal product to its average product. Ratner's original estimate implied that the ratio of the marginal product of private capital to that of public capital was 3.8 times the ratio of the public to the private capital stock. During the 1949-73 period, the latter averaged 55.4 percent, so that the private gross rate of return (rental price of capital and marginal product) was about 2.1 times the respective measure of the public sector, according to his earlier estimate. The updated estimate of the relative marginal product of private capital in equation 3 is 35 percent of the marginal product of public capital.

[9]When equation 3 is estimated with a first-order autocorrelation correction term, its coefficient is not statistically significant.

[10]Munnell (1990) uses a capital input series prepared by the U.S. Bureau of Labor Statistics (BLS) to measure the services of capital rather than the services yielded by the constant dollar net nonresidential private capital stock. The BLS series is described by Oliner (1989). This series is relatively new and is intended to measure the flow of services as measured here, but does not appear to be much different from the capital stock measure used here. The capital stock measure and its utilization rate used in this article are also used by Ratner and Aschauer. Both Munnell and Aschauer (1989a) include the capacity utilization rate in manufacturing as a separate variable to capture the influence of the business cycle on productivity. They provide no theoretical justification, nor do they indicate whether the capacity utilization rate is intended to capture any influences besides the varying use of the stock of business sector capital.

[11]Schultze (1990) has criticized such estimates for implying implausibly large estimates of the rate of return to infrastructure. Aaron (1991) also questions the magnitude of the effect, the conceptual basis for such an effect and whether the estimate is spurious. A counterpart to the relatively high rate of return, at least in equation 3, is that the output elasticity of hours is only 54.8 percent. This is well below the theoretically expected value, which equals the share of labor cost in total cost of about 66.7 percent. The output elasticity of private capital is about 17.5 percent, about half of the expected value.

productivity found in similar studies (see the shaded insert on page 10). Second, they omit a significant time trend or reductions in the trend found in other studies. Third, they contain variables that are not stationary, raising the possibility of spurious estimates.[12]

Consider the Cobb-Douglas production function including the flow of energy, E_t:

$$(4)\quad Q_t = Ah_t^{\alpha}k_t^{\beta}kg_t^{\delta}E_t^{\gamma}e^{(rt+\varepsilon_t)},$$

where γ is the output elasticity of energy. The quantity of energy is assumed to satisfy the first-order condition for its employment, $E_t = \gamma Q_t/p_t^e$, where p^e is the price of energy measured relative to the price of business sector output.[13] In addition, the production function is assumed to be characterized by constant returns to scale, $(\alpha+\beta+\gamma+\delta=1)$.[14] Substituting these two assumptions into equation 4 and taking logarithms of both sides yields:

$$(5)\quad \ln(Q_t/k_t) = \ln A^* + \alpha^*\ln(h_t/k_t) + \delta^*\ln(KG_t/K_t) + \gamma^*\ln p_t^e + r^*t + \varepsilon_t^*,$$

where $\alpha^* = \alpha/(1-\gamma)$
$\delta^* = \delta/(1-\gamma)$,
$\gamma^* = -\gamma/(1-\gamma)$,
$r^* = r/(1-\gamma)$,
$A^* = A^{(1/1-\gamma)}\gamma^{(\gamma/1-\gamma)}$, and
$\varepsilon_t^* = \varepsilon_t/(1-\gamma)$.

The omission of energy price effects on productivity after 1973 could result in attributing energy-related productivity losses to the decline in the growth of public capital.

The second potential shortcoming of existing tests using production functions is that they omit significant time trends or significant breaks in the time trend found in similar studies.[15] Trends are intended to control for the influence of the pace of technical change; their omission could bias the coefficients and the standard errors for the included variables, especially those correlated with the omitted time trends.[16]

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[12]Eberts (1990) raises the issue of whether there is "reverse causation" in estimates of the effect of public capital on private output; in other words, does a significant positive correlation indicate that public capital raises private output or does a rise in private output raise the demand for and quantity of public capital? He provides regional evidence suggesting that causality runs both ways.

[13]The quantity of energy is assumed to be proportional to stock of energy-using capital and to its services. It is included because conventional measures of the flow of capital services, k (or kg), are not expected to reflect the differential effect of energy price changes on the economic value of the capital stock and its flow of services. Reduced energy usage is only one of several reasons why higher energy prices affect private sector output. The domestic and foreign capital stocks (for example, the pools of oil and gas, beds of coal and hydroelectric power sources) that produce the energy used in U.S. production are not included in the measured domestic nonresidential capital stock. Therefore, if the relative price of energy rises and producers respond by using less of this capital, the reduced flow of services from this capital will not be reflected in k_t. Moreover, the decline in the real value of the rest of the capital stock due to higher operating costs also is not reflected in k_t, since replacement cost rather than market prices are used to measure the value of existing assets in computing the constant dollar net stock. See Rasche and Tatom (1977a), (1977b) and (1981). Also see Helliwell, Sturm, Jarrett and Salou (1986) for an alternative approach.

[14]The use of the constant returns to scale constraint in estimating production functions is quite common because of the intuitive appeal of this property and, more importantly, because the high correlations between hours, the flow of private capital services, the time trend and, in this case, the flow of public capital services, are expected to make it difficult to interpret the coefficient estimates and to raise their standard error estimates without this constraint. When the constraint can be rejected, its imposition trades off some explanatory power in fitting the production function in return for estimates of the coefficients that are more efficiently estimated and more readily interpreted as estimates of the theoretical parameters. The importance of this issue and the inability to reject this constraint is discussed in Tatom (1980).

[15]For example, Munnell (1990) includes no time trends and Aschauer (1989a) includes no shift in the trend.

[16]A decline in the trend rate of technical change in 1967 is discussed in Rasche and Tatom (1977b) and several studies that discuss this trend-break are cited there. A break in the trend rate (r) in 1967 for the business sector was not significant in the data available at the time of Ratner's study, but it is significant in later data. See Tatom (1988), for example, for a discussion of this change in significance. Darby (1984) argues that a declining quadratic trend arises from a post-depression and post-World War II catch-up in the level of technology.

The effect of the first two shortcomings on an estimate of the production function like equation 3 can be seen by including the relative price of energy, as in equation 5, and by allowing for a quadratic trend component t^2. Nearly identical results arise from allowing for a one-time decline in the linear time trend from 1.5 percent per year before 1967 to a 1.0 percent rate afterward.[17] For the period 1948 to 1989, estimate is:

$$(6)\ \ln(Q_t/k_t) = \underset{(15.29)}{1.595} + \underset{(12.88)}{0.614}\ \ln(h_t/k_t)$$

$$+ \underset{(2.77)}{0.132}\ \ln(KG_t/K_t) - \underset{(-6.41)}{0.048}\ \ln p^e_t$$

$$+ \underset{(8.42)}{0.019}\ t - \underset{(-4.23)}{0.0001}\ t^2$$

$$\bar{R}^2 = 0.97 \quad \text{S.E.} = 0.95\% \quad \text{D.W.} = 1.49$$

This estimate indicates a statistically significant, positive effect of the public capital stock on output, but is less than half that given in equation 3 or the estimates obtained by Aschauer and Munnell. Both the relative price of energy and the slowing in the time trend are statistically significant. Updating the equation 3 estimate, but including the energy price and time trend slowing, does not alter the statistical significance of the public capital stock effect, however.[18]

The third potential shortcoming in regression estimates like equations 3 or 6 is that they contain variables that are not stationary, and so are subject to a spurious regression bias.[19] First-differencing typically renders the data stationary and removes the problem of justifying or explaining the existence of a deterministic trend or trends. The evidence concerning this potential difficulty and its implications is explained below.

Are the Production Function Variables Stationary?

Table 1 reports Dickey-Fuller tests for a unit root for the levels of the variables in equation 6— ln(Q/k), ln(h/k), ln(KG/K) and $\ln p^e$—and for their first-differences. The relevant statistic for the unit root test is the t-statistic for the coefficient on the lagged level of the variable (Z_{t-1}) whose first-difference is used as the dependent variable; this coefficient is labeled b in the table. If this coefficient is significantly different from zero when the time trend is statistically insignificant and, therefore, omitted, then the variable Z is stationary. When the time trend is significantly different from zero, its coefficient, d, is included in the reported test equation. In this case, if b is significant, the variable Z is said to be trend-stationary.[20] Only one lagged dependent variable is statistically significant in any of the tests for the levels of the data in the table; these significant instances are reported in the

[17]The standard error of estimate using the time trend shift in 1967 instead of the quadratic trend is 0.99 percent; the estimated output elasticity of the public capital stock is 0.135 in this case. Equation 3 and the Aschauer and Munnell estimates are representative of estimates without a declining time trend and energy price effects. For example, when the quadratic trend term and energy price term are omitted from equation 6, the output elasticity of the public capital stock is 0.306 (t = 5.27), about the same as in equation 3; when a significant first-order autocorrelation term is added, this output elasticity rises to 0.343 (t = 4.91).

[18]Equation 6 contains the 1948 data point, as well, to include all available data. This does not affect the results, however. When the relative price of energy is added to the 1949-73 estimate in equation 3, its coefficient (−0.117) is not statistically significant (t = 1.35). Its inclusion lowers the coefficient on ln(KG/K) to 0.206, and it too becomes statistically insignificant (t = 1.88) at a 95 percent confidence level using a one-tail test. When a first-order autocorrelation correction term is added to equation 6, its coefficient is not statistically significant.

[19]This bias is explained by Granger and Newbold (1974) and (1986). Some analysts refer to this potential bias as arising only when two random walk variables are used in a regression, because this was the example used by Granger and Newbold (1974). Granger and Newbold (1986) use other nonstationary variable combinations. Engel and Granger (1987) explain that a linear combination of stationary and nonstationary variables is nonstationary, unless the nonstationary variables are cointegrated. Thus, the error term in such an equation is potentially nonstationary, giving rise to a potentially spurious regression.

[20]The t-statistics for the b coefficients are estimates of Dickey-Fuller statistics called (τ_μ), when the time trend is omitted (d = 0), and τ_τ, when the time trend is included. The critical values of τ_μ and τ_τ for this size sample are given in Fuller (1976) and equal about −2.95 and −3.53, respectively.

Table 1
Tests for Nonstationarity

Test Equation for Levels of Variable (Z): $\Delta Z_t = a + bZ_{t-1} + dt + e\Delta Z_{t-1} + \varepsilon_t$

Levels of Variable (Z): (Sample period: 1950-89)[1]	a	b	d	e	$\bar{R}^2$	S.E.	D.W.
$\ln(Q_t/k_t)$	0.101 (3.86)	−0.647 (−4.29)*	−0.002 (−3.59)*	---	0.29	0.023	2.00
$\ln(h_t/k_t)$	−0.324 (−2.09)	−0.140 (−1.81)	−0.003 (−1.33)	---	0.12	0.034	2.31
$\ln(h_t/k_t)$	−0.126 (−2.91)	−0.040 (−2.33)	---	---	0.10	0.034	2.44
$\ln(h_t/k_t)$	−0.185 (−4.15)	−0.059 (−3.50)*	---	−0.255 (−1.79)	0.22	0.031	1.75
$\ln(p_t^*)$	0.252 (1.42)	−0.063 (−1.40)	---	0.420 (2.81)*	0.15	0.088	2.03
$\ln(p_t^*)$	0.401 (1.92)	−0.111 (−1.94)	0.002 (1.34)	0.436 (2.94)*	0.17	0.087	2.06
$\ln(KG_t/K_t)$	−0.005 (−0.46)	−0.019 (−1.03)	−0.0005 (−3.52)*	0.602 (6.77)*	0.68	0.007	1.91

Test Equation for Differences (ΔZ): $\Delta^2 Z_t = a + b\Delta Z_{t-1} + dt + \varepsilon_t$

First-difference (ΔZ_t) (Sample period: 1950-89)[2]	a	b	d	$\bar{R}^2$	S.E.	D.W.
$\Delta\ln(Q_t/k_t)$	−0.006 (−1.51)	−1.352 (−9.09)*	---	0.68	0.025	2.03
$\Delta\ln(Q_t/k_t)$	−0.013 (−1.64)	−1.364 (−9.15)*	0.0004 (1.03)	0.68	0.025	2.07
$\Delta\ln(h_t/k_t)$	−0.031 (−4.38)	−1.141 (−7.21)*	---	0.57	0.036	1.57
$\Delta\ln(h_t/k_t)$	−0.062 (−4.99)	−1.266 (−8.41)*	0.001 (2.94)*	0.64	0.032	1.72
$\Delta\ln(p_t^*)$	0.004 (0.28)	−0.612 (−4.09)*	---	0.29	0.089	1.98
$\Delta\ln(p_t^*)$	0.0004 (0.014)	−0.613 (−4.04)*	0.0002 (0.14)	0.27	0.090	1.98
$\Delta\ln(KG_t/K_t)$	−0.001 (−0.99)	−0.323 (−3.53)*	---	0.23	0.008	1.53
$\Delta\ln(KG_t/K_t)$	0.006 (2.35)	−0.425 (−5.00)*	−0.0004 (−3.55)*	0.41	0.007	1.84

* Significant at a 5 percent level.

[1] When e is not significantly different from zero at a 5 percent level of significance, it is constrained to zero and the period used begins one year earlier.

[2] The lagged dependent variable is not significant at a 5 percent significance level for any of these variables, so it is omitted.

Alternative Hypotheses About the Productivity Decline

Several hypotheses have been put forth to explain the slowdown in productivity growth besides the one focusing on the slowdown in public capital formation originally formulated by Eisner (1980), Schultze (1981) and Ratner (1983). These other explanations include a slowing in the trend of resources moving from agriculture to the industrial sector; the return to "normality" from the temporarily rapid postwar growth of output and productivity associated with reversing the adverse effects of the Depression and World War II on the private sector; a slowdown in research and development spending; the costs of increased government regulation; a slowdown in the growth of the private capital stock per worker; and the rise in energy costs in 1973-74 and 1979-81.[1]

Rasche and Tatom (1977a) and (1981) explain how a rise in energy prices reduces the economic capacity of the typical firm and renders capital obsolete. In the short run, firms alter their optimal production techniques, reducing their use of energy and, in some cases, obsolete capital, substituting labor and other capital to economize on higher energy costs. In the long run, reductions in the productivity of labor and capital resources lead, in the case of capital, to a smaller desired capital stock and flow of its services.[2]

Except for an unexplained shift or a slowing in the time trend, only the energy price rise and associated slowing in the growth of the capital-labor ratio provides explanations that are consistent with the timing and magnitude of productivity movements since 1973. Tatom (1982), for example, provides evidence that the entire decline in productivity growth from late 1973 to 1981 resulted from the rise in energy prices and the associated reductions in the capital-labor ratio.[3] Tests of the effects of public capital on private output have not controlled for these effects.

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[1]Kendrick (1979) contains papers dealing with most of these hypotheses. Baily (1986) presents a more recent summary of these hypotheses. Also, see Dennison (1974), (1979) and (1985). Darby (1984) develops the hypothesis about the postwar and post-Depression temporary surge in growth. Griliches (1988) examines the R&D hypothesis. Crandall (1980) and Gray (1980) examine the regulatory hypothesis.

[2]Jorgenson (1988) provides evidence of these adjustments within individual industries, while Baily (1981) and Griliches (1988) have focused on energy price-induced obsolescence of capital and its effects on productivity. Also, see Tatom (1979a) and (1982).

[3]The energy-price hypothesis is not universally accepted. For example, Berndt (1980), Dennison (1974), (1979) and (1985), Darby (1984) and Olson (1988) have been critical of its significance, arguing that the share of energy in costs is too small or, in Darby's case, that a quadratic trend fits the data without any energy price effect, so that the slowing in the 1970s was not a puzzle. With Darby's view, the productivity pick-up in the 1980s becomes a puzzle, however.

table. No lagged value of the dependent variable is significant (or reported) in the bottom half of the table where the presence of a unit root for the first-differences is tested.

The evidence for the levels of the variables shown at the top of the table indicates that ln(Q/k) is trend-stationary. The level of ln(h/k) appears to be stationary when the insignificant lagged dependent variable is included to reduce the extent of autocorrelation indicated by the relatively high Durbin-Watson statistic (D.W.). Without this lagged dependent variable, the hypothesis that ln(h/k) has a unit root, or is not stationary, cannot be rejected. For this reason, ln(h/k) is considered to be nonstationary here. According to the tests, $\ln p^e$ and ln(KG/K) are also nonstationary. The latter has a significant trend term (d), but ln(KG/K) is not stationary when it is included. Based on the level results in the table, nonstationarity cannot be rejected for the four variables entering equation 6.

The bottom panel of the table conducts the same test for unit roots for first-differences of the variables. The test for each of the variables

rejects a unit root, but two variables, Δln(h/k) and Δln(KG/K), are trend-stationary. The levels of ln(Q/k) and $\ln p^e$ are integrated of order 1, I(1), which means that these variables must be differenced once to achieve stationarity. The levels of ln(h/k) and ln(KG/K) are I(2), because they must be differenced twice to achieve stationarity.[21] The presence of a significant trend in the first-differences suggests that there is a significant quadratic trend in the levels of the data.

A first-difference version of equation 5 involves only stationary and trend-stationary variables. The first-difference of the time trend term, rt, in equation 5 is the constant, r, which is the constant term in the first-difference equation. If the time trend consists of broken linear segments, then the average of the coefficients on these linear trends also is captured in the constant term. If there is a deterministic quadratic trend, first-differencing results in a linear trend remaining in the first-difference expression. Since two of the variables in equation 5 are only trend-stationary, however, a time trend must be included in the first-difference regression to maintain the desired stationarity. This is consistent with the presence of a deterministic quadratic trend in the production function, so that differencing does not avoid the consideration of deterministic trends in this case. Estimating a first-difference equation avoids both the problems arising from nonstationarity and the difficulties of selecting *ad hoc* breaks in the time trend in equation 5.[22]

NEW ESTIMATES OF THE EFFECT OF PUBLIC CAPITAL ON PRIVATE SECTOR OUTPUT

The variables used in equation 6 do not appear to be stationary, so the statistical significance of the public capital effect found there is potentially spurious. This problem is avoided by estimating the production function parameters in a first-difference specification with a time trend.[23]

The first-differenced (Δ) estimate of the production function for the period 1949 to 1989 is:

$$(7)\quad \Delta\ln(Q_t/k_t) = \underset{(6.30)}{0.025} + \underset{(0.33)}{0.042}\,\Delta\ln(KG_t/K_t) + \underset{(14.34)}{0.737}\,\Delta\ln(h_t/k_t) - \underset{(-3.23)}{0.058}\,\Delta\ln p^e_t - \underset{(-3.05)}{0.0005}\,t$$

$$\bar{R}^2 = 0.85 \quad \text{S.E.} = 1.05\% \quad \text{D.W.} = 2.25$$

The coefficient on public capital, while positive, is much smaller than in estimates based on the levels of the variables, like that in equation 3 or even in equation 6.[24] More importantly, however,

[21]The evidence that, in one test, ln(h/k) is stationary in table 1, while its first-difference is trend-stationary may appear to be inconsistent. In the level estimate for ln(h/k), the trend term is statistically significant when a statistically significant break in 1967 is included or when the quadratic term is included. In each instance, however, the hypothesis that ln(h/k) has a unit root still is not rejected. When the ln(h/k) equation containing the time trend and its break in 1967 is first-differenced, Δln(h/k) is stationary; that is, the addition of a time trend is not statistically significant and a unit root is rejected. In this case, Δln(h/k) is stationary, not trend-stationary. When the ln(h/k) equation containing the significant quadratic trend term is first-differenced, the result is that given in the table indicating trend-stationarity. Whether the appropriate inference is that Δln(h/k) is trend-stationary or stationary is not essential for the analysis below, however, because another variable, ln(KG/K), also has a trend-stationary first-difference.

[22]The first-difference of the variable ln(KG/K) is not trend-stationary for the sample period used in equation 3, 1949-73, or in 1949-89. In particular, for data from 1949 to 1989, the coefficient on its lagged growth rate in a regression of its second difference, including a significant trend, is −3.42, which is smaller in absolute value than the critical value of −3.50 (5 percent significance).

[23]The standard errors and t-statistics have been corrected for the time trend in Δln(KG/K) and Δln(h/k) in the estimation by detrending these measures. This adjustment only affects the t-statistic for the trend, which was −3.05 without the correction. A slight rise in the trend coefficient does not show up in the rounded value of the coefficient.

[24]When equation 3 for the earlier period (1949-73) is first-differenced and t is added, the government capital stock coefficient reverses sign (−.004) and is not statistically significant (t = −0.03). When the first-difference of the logarithm of the relative price of energy is included, its coefficient (−0.023) is not significant (t = −0.28) and the public capital stock result is unaffected. In both cases, the time trend is not statistically significant (−1.44 and −1.22, respectively).

this coefficient is not statistically significant.[25] The coefficient on energy prices is significantly negative, and that on hours per unit of capital remains significantly positive and rises to a value that is closer to its theoretically expected level.[26] Thus, equation 7 indicates that the public capital stock has no significant influence on business sector output, given the capital-labor ratio and the relative price of energy.[27]

The statistical insignificance of the public capital stock arises from first-differencing the data; it does not arise from the inclusion of energy prices in the estimation of equation 7 or from allowing for a trend.[28] The omission of the significant energy price term does not produce a significant public capital stock effect either. When it is omitted in equation 7, the coefficient on the public capital stock variable, $\Delta\ln(KG/K)$, rises to 0.108; however, it remains statistically insignificant ($t = 0.77$).[29]

The inferences from equation 7 are not subject to the spurious regression problem. Since tests of the variables in equation 6 generally fail to reject nonstationarity, the results in equation 7 offer the strongest evidence on the factors influencing, or not influencing, business sector output. This estimate rejects the public capital hypothesis.

An Alternative Approach: Are Private Sector Output and Public Capital Cointegrated?

According to the evidence in table 1, the variables in equations 6 are not stationary; two of them are I(1) and two are I(2). Engel and Granger (1987), Johansen (1988) and Johansen and Juselius (1989) develop procedures for examining whether I(1) variables have long-run relationships or are cointegrated. These methods cannot be used here because two of the variables in equations 6 are I(2). Neither procedure addresses the problem of how to incorporate a linear time trend, trend shift or quadratic trend in a cointegration test.

Stock and Watson (1989) have developed a method for testing cointegration among higher-order integrated variables, including variables that are integrated of different orders. They explain that one approach to the problem of nonstationarity is to include significant lags and leads of first-differences of the dependent and independent variables as right-hand-side variables in tests of functional relationships. They argue that this practice avoids the spurious regression problem for nonstationary variables pointed out by Granger and Newbold (1974) and that it indicates the presence of long-run (or

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[25] If the insignificance of ln(KG/K) arose from over-differencing an appropriate test equation, then the problem could be corrected by estimating equation 7 with a significant MA1 error process; the MA1 coefficient should be equal to minus one in this case. When equation 7 is estimated with an MA1 error process, the MA1 parameter is only -0.369; it is not statistically significant ($t = -1.95$). More importantly, it is significantly less than one ($t = 3.34$). The coefficient on ln(KG/K) is reduced (0.021) and it remains statistically insignificant ($t = 0.22$) when this term is included.

[26] This theoretical value is derived in equation 5; it is conditional on the share of labor in total cost and the coefficient on the relative price of energy. For values of these parameters of 0.667 and -0.058, respectively, this theoretical value is 0.706.

[27] Rubin (1990) regresses the growth rate of multifactor productivity in manufacturing and 11 two-digit SIC code industries on a constant, the growth rate of the Federal Reserve Board's measure of the industry's capacity utilization rate, and the growth of core infrastructure. Core infrastructure includes highways, streets, sewers and water systems in her analysis. The period she uses is generally from 1956 to 1986. She finds that there is no statistically significant effect for core infrastructure in any industry except petroleum refining, where a significant positive relationship is observed. Her result is consistent with the view suggested above, that the decline in public capital growth is, in part, a proxy for the pattern of increased energy prices.

In papers prepared after this research was completed, Hulten and Schwab (1991) and Jorgenson (1991) note the fragility of estimates of the marginal product of public capital. Hulten and Schwab provide evidence of this fragility, but in their first-difference estimates, the private sector input coefficients are fragile as well.

[28] Without the trend term in equation 7, the coefficient on the public capital stock variable is 0.147, about the same as in equation 6, but it is not statistically significant ($t = 1.07$). The trend term is necessary to ensure that the error term in equation 7 is stationary. A regression of the first-difference of the residuals from equation 7 on the lagged level of the residual, with no constant, yields a coefficient on the lagged residual equal to -1.152 ($t = -7.32$). Even without the trend term in equation 7, the t-statistic on the resulting lagged residual is -5.86. Engel and Granger (1987) indicate that the critical value for these t-statistics is -3.37. Thus, the residuals are stationary in either case.

[29] Production function estimates are subject to simultaneous equation bias, but this has no effect here. Virtually the same results are obtained using a two-stage least-squares estimation procedure. The instruments for the right-hand-side variables include the first-difference of the logarithms of real wages, the AAA bond yield, and the relative price of private capital goods, as well as lagged dependent and independent variables.

cointegrating) relationships between variables as the coefficients on the levels of the variables.

This approach was taken in estimating the level of the production function in equation 5.[30] Up to two leads and lags of first-differences of each variable in equation 5 were examined. The equation estimate containing only significant leads or lags, estimated over the period 1950-88 is:

$$(8)\ \ln(Q_t/k_t) = \underset{(10.76)}{0.489} + \underset{(9.86)}{0.105}\ \ln(h_t/k_t) - \underset{(-2.95)}{0.046}\ \ln p^e_t - \underset{(-1.47)}{0.075}\ \ln(KG_t/K_t) + \underset{(2.85)}{0.762}\ \Delta\ln(KG_{t+1}/K_{t+1}) + \underset{(2.11)}{0.064}\ \Delta\ln p^e_{t-1} - \underset{(-2.40)}{0.065}\ \Delta\ln p^e_{t+1}$$

$$\bar{R}^2 = 0.93 \quad \text{S.E.} = 1.36\% \quad \text{D.W.} = 1.69$$

In this estimate, the coefficient on the nonmilitary net stock of public capital per unit of private capital (−0.075) has the wrong sign and is not statistically significant.[31] Like the result reported above, the nonmilitary public capital stock has no statistically significant relationship with business sector output. The levels of business sector output or productivity are uncorrelated with the level of the nonmilitary public capital stock. The statistically significant t-statistics on the coefficients for the levels of ln(h/k) and $\ln p^e$ in equation 8 suggest that only the variables (lnQ/k, lnh/k, $\ln p^e$) are cointegrated.

CONCLUSION

An increasing number of people are advocating increased government capital spending to raise private sector output, productivity and private capital formation. The evidence presented here, based on the post-World War II experience, suggests that a rise in public capital spending would have no statistically significant effect on these measures.

Earlier claims of a positive and significant effect of public capital on private sector output have arisen from spurious estimates. In fact, most of these earlier estimates have ignored a trend or broken trends in productivity, as well as the statistically significant influence of energy price changes. Simply accounting for these two factors reduces the conventional estimates of the elasticity of private output with respect to public capital of about 30 to 40 percent, to about 13 percent. More importantly, however, both the earlier estimates and those reported here that find a statistically significant public capital effect use equation estimates that contain nonstationary variables. Thus, these estimates are likely to be spurious.

When all of these problems are addressed using a first-difference estimate of the production function, the public capital stock effect on private sector output is not statistically different from zero. Appropriately estimated, the hypothesis that public capital has a positive marginal private sector product cannot be supported. The same result is found using a method that allows testing a long-run relationship among nonstationary variables.

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[30]The quadratic trend is omitted because it is not an integrated stochastic process; thus, production cannot be cointegrated with it. See Stock and Watson (1988), p. 168, for example.

[31]A first-order autocorrelation term is not statistically significant and its inclusion does not alter the statistical insignificance of ln(KG/K).

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R. Alton Gilbert

R. Alton Gilbert is an assistant vice president at the Federal Reserve Bank of St. Louis. Richard I. Jako provided research assistance.

Supervision of Undercapitalized Banks: Is There a Case for Change?

THE RECENT REPORT on deposit insurance reform by the Department of the Treasury (1991) calls for stronger enforcement of bank capital requirements. Among the recommended changes is "prompt corrective action" by supervisors in dealing with undercapitalized banks.[1] Under the Treasury's plan, banks would be divided into five groups, based on their capital ratios. Those with the highest capital ratios would be subject to the fewest restrictions. As an incentive to maintain relatively high capital ratios, holding companies with banks in this first group would be permitted to engage in nonbanking activities. As banks move downward into groups with lower capital ratios, they would be subject to increasingly stringent sanctions, including restrictions on their dividends and the growth of their assets. Banks in the lowest group, with relatively low but still positive capital ratios, would be closed unless their shareholders promptly injected new capital.[2]

Prompt corrective action by bank regulators is intended to reduce both the number of bank failures and the losses by the deposit insurance fund. The Treasury proposal would reduce the discretion that bank supervisors have in handling troubled banks, making the sanctions against banks with relatively low capital ratios mandatory. The policy is designed to give healthy banks the incentive to keep their capital ratios above the critical levels at which they would be subject to mandatory sanctions. Prompt corrective action also would constrain the actions of undercapitalized banks which might increase exposure of the deposit insurance fund to losses and give the owners of banks with relatively low capital ratios the incentive to inject capital into their banks promptly, if they wish to retain control of their banks.

The effectiveness of the proposed policy in achieving its goals of lower bank failure rates and reduced losses to the deposit insurance

[1]Department of the Treasury (1991), pp. 38-42, and Chapter X. The U.S. General Accounting Office (GAO, 1991) recently recommended a different system of prompt corrective action by bank supervisors. The GAO's proposal requires that the actions of supervisors be tied to specific unsafe banking practices, defined more broadly than capital ratios below some required level. The GAO study criticizes the Treasury proposal for focusing too narrowly on these ratios.

[2]The Treasury proposal is not as specific as some earlier proposals. For instance, it does not specify the criteria for classifying banks into the five groups nor does it provide details about the sanctions to be imposed on banks in each group. For a similar, but more detailed proposal, see Benston and Kaufman (1988).

fund depend on whether the actions to be taken by supervisors under the new policy differ substantially from the actions taken by supervisors in recent years in dealing with undercapitalized banks. The case for the policy of prompt corrective action rests on the assumption that, for a given capital ratio of a bank, sanctions under the proposed policy would be more severe than those imposed by supervisors in recent years. In essence, the Treasury proposal is based on the view that supervisors in the past have permitted banks to remain undercapitalized for overly long periods and that undercapitalized banks have been permitted to engage in activities that made them more likely to fail and more likely to increase the deposit insurance fund's losses.

The purpose of this paper is to investigate whether the behavior of troubled commercial banks in recent years is consistent with these assumptions. The paper looks at banks whose capital ratios fell below the minimum required level for periods longer than one year. It examines whether these undercapitalized banks violated the types of constraints that would be imposed under the Treasury's scheme for prompt corrective action. The paper also considers whether such violations reduced the chances that the banks would, once again, achieve acceptable capital ratios.

ENFORCEMENT OF CAPITAL REQUIREMENTS

In 1985, federal supervisory agencies established minimum capital requirements for all commercial banks. The minimum ratio of primary capital to total assets was set at 5.5 percent. This minimum remained in effect until the end of 1990, when supervisors began phasing in new risk-based capital requirements. The shaded insert lays out the components of primary capital and total assets used to calculate the primary capital ratio and indicates the effects of loan losses on this ratio.

Because the objective of this paper is to examine how rigorously and consistently supervisors have enforced capital requirements in recent years, it is necessary to identify undercapitalized banks in terms of the capital requirements in effect at the time. This paper defines undercapitalized banks as those with primary capital ratios below 5.5 percent. The proposed policy of prompt corrective action might specify higher capital levels as the critical levels for mandatory actions.

This paper examines the behavior of banks whose primary capital ratios remained below 5.5 percent for more than four consecutive quarters between 1985 and 1989. This choice of period reflects the fact that most capital injections occur in the fourth quarter of each year, perhaps because of the practice of "window dressing," where banks devote special attention to the capital ratios that appear on their year-end balance sheets. By focusing on more than four consecutive quarters, we include only those banks whose primary capital ratios remained below 5.5 percent through the fourth quarter of the year in which they first became undercapitalized.

Figure 1 illustrates some of the characteristics of the banks included in this study. Undercapitalized banks fall into three groups. Those in one group quickly raised their capital ratios by increasing their capital and/or reducing their assets. Another group consists of those that were closed quickly by their supervisors. Clearly, no banks in these two groups remained undercapitalized for long. This study focuses on a third group of banks — those that remained undercapitalized for more than four consecutive quarters.

Slow Response to Enforcement Actions

There are several reasons why banks can remain undercapitalized for more than a year. Some banks respond more slowly than others to directives from supervisors to raise their capital ratios, in part because they know that supervisors lack the authority to close them because of their low capital ratios alone. Instead, banks must be judged insolvent (that is, with zero or negative net worth) or nonviable by their chartering agencies to justify closure.

Supervisors do have a variety of enforcement actions that they can take against undercapitalized banks short of closing them down. Among the more severe are the removal of their officers, the imposition of fines and the termination of insurance coverage on the banks' deposits. Supervisors generally try first to induce a bank to comply with banking regulations with less formal or severe enforcement actions, like writ-

An Introduction To Bank Capital Accounting

The text assumes a basic understanding of accounting principles applied to the balance sheets of commercial banks and the items in the capital accounts of banks. This insert provides an introduction to these topics. This introduction abstracts from some of the detail of bank capital accounting.[1]

The accounting principles can be illustrated by referring to the balance sheets of a hypothetical bank in tables A1 and A2, constructed as of December 31, 1986. Table A1 indicates the values of balance sheet items under the assumption that there are no loan losses in 1986. Table A2 is a revised balance sheet for the same period, indicating the effects of $1 in loan losses.

Table A1 provides definitions of items in the balance sheet. One of the key items for our purposes is the allowance for loan and lease losses. The position of the allowance for loan and lease losses on the balance sheet, as a negative item on the assets side, reflects its position in the Report of Condition, which banks file with their supervisors. Increases in the allowance, called provision for loan and lease losses, are expense items in the calculation of profit and loss. Through periodic provisions, the bank increased its allowance for loan and lease losses to $3. Loan losses are charged against that allowance, rather than against current income or equity capital directly.

At some time in the past, the bank purchased another firm for more than its book value, with the difference of $1 recorded as "goodwill." The bank's $4 in equity capital reflects the dollar value of shares sold to stockholders and accumulated retained earnings. The items under "Capital Accounts" other than equity capital, that is, limited life preferred stock and subordinated notes and debentures, have fixed maturity dates. Supervisors consider these items less desirable forms of bank capital than equity because of their fixed maturity dates. Funds raised by selling stock, in contrast, are not scheduled to be returned to shareholders at any particular point in time and, to conserve capital, banks can forego dividend payments to shareholders. Within limits, the limited life preferred stock and subordinated notes and debentures are included in total capital, but not primary capital. In 1985, the federal bank supervisors set the minimum requirement of total capital to total assets at 6 percent.

Based on the values of the items in table A1, the hypothetical bank has a primary capital ratio of 6 percent. Table A2 indicates the impact on the primary capital ratio if the bank had a loan loss of $1 in 1986. To simplify the example, suppose the bank pays no dividends or income taxes. After recognizing the $1 loan loss, the bank wants to keep its allowance for loan and lease losses equal to $3, to cover potential losses on the remaining $50 in gross loans.

The effects on the balance sheet can be illustrated in two steps. First, the provision for loan and lease losses in 1986 is increased by $1, temporarily raising the allowance for loan and lease losses to $4. The increase in the provision for loan and lease losses reduces net income for 1986 by $1, relative to the case illustrated in table A1. The reduction in net income of $1 reduces equity capital from $4 to $3, reflecting lower retained earnings. In the next step, gross loans are reduced by $1, and the allowance for loan and lease losses is reduced by $1, back to $3. Primary capital is reduced to $5 and the primary capital ratio to 5.05 percent. These entries illustrate how the loan losses of a bank can reduce its primary capital below the minimum required level.

The nature of the change in balance sheet items from table A1 to table A2 can also illustrate how losses can make the equity of a bank negative. Suppose the loan loss were $5, instead of $1. A provision for loan and lease losses of $5 would make equity capital equal to negative $1.

[1]For additional detail on the minimum capital requirements adopted by the federal bank supervisors in 1985, see Gilbert, Stone and Trebing (1985).

Table A1

Balance Sheet of a Hypothetical Bank, December 31, 1986
Status of loan losses: none in 1986

ASSETS			LIABILITIES AND CAPITAL	
Cash		$ 5	Liabilities	
Securities		45	Deposits	$92
Loans				
Gross loans	$50		Capital Accounts	
Reserve for loan and lease losses	3		Equity capital	4
Net loans		47	Limited life preferred stock	1
			Subordinated notes and debentures	1
Goodwill		1		
		$98		$98

Definitions:

Allowance for loan and lease losses: the amount set aside to absorb anticipated losses. Increases in the allowance are an expense item in calculating profit and loss. All charge-offs of loans and leases are charged against this capital account, and recoveries on loans and leases previously charged off are credited to this capital account.

Goodwill: Purchase price of firms that have been acquired in excess of their book value.

Equity capital: Includes the following components:

a. Perpetual preferred stock
b. Common stock: the par or stated value of outstanding common stock
c. Surplus: amount received from the sale of common stock in excess of par or stated value
d. Undivided profits: accumulated value of retained earnings

Limited life preferred stock: Preferred stock with maturity dates.

Subordinated notes and debentures: Debt obligations with fixed maturity dates. They are subordinated to deposits. If a bank fails, the holders of its subordinated notes and debentures receive payment only if depositors are paid in full.

Primary capital: Equity capital, plus allowance for loan and lease losses, minus goodwill = 4 + 3 − 1 = 6.

Total capital: Primary capital plus limited life preferred stock plus subordinated notes and debentures = 6 + 1 + 1 = 8.

Primary capital ratio: Primary capital divided by total assets plus allowance for loan and lease losses minus goodwill = 6 ÷ (98 − 1 + 3) = 0.06

Table A2

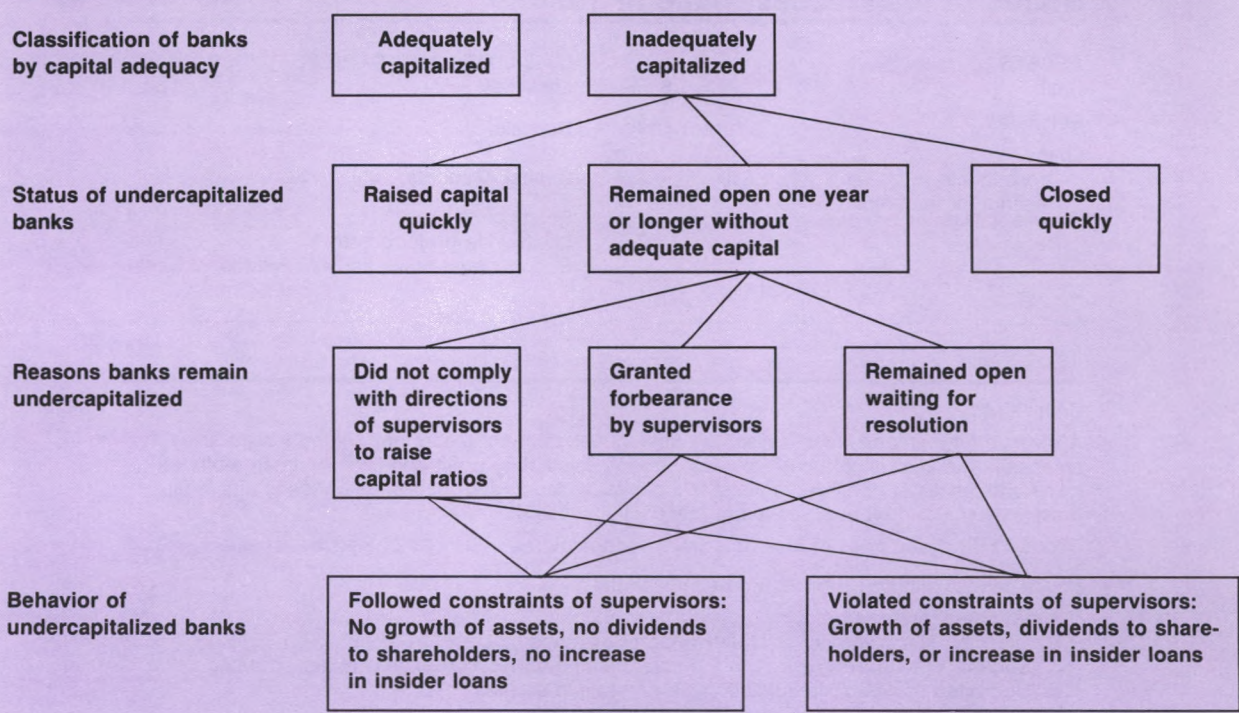
Balance Sheet of a Hypothetical Bank, December 31, 1986
Status of loan losses: loss of $1 in 1986

ASSETS			LIABILITIES AND CAPITAL	
Cash		$ 5	Liabilities	
Securities		45	Deposits	$92
Loans				
Gross loans	$49		Capital Accounts	
Reserve for loan and lease losses	3		Equity capital	3
Net loans		46	Limited life preferred stock	1
			Subordinated notes and debentures	1
Goodwill		1		
		$97		$97

Primary capital: 3 + 3 − 1 = 5.

Primary capital ratio: 5 ÷ (97 + 3 − 1) = .0505.

Figure 1
Classification of Undercapitalized Banks



ten or verbal agreements with the bank's officers and directors.[3] Thus, considerable time can pass before supervisors feel the need to resort to more severe enforcement actions.

The terms of such actions—whether formal or informal—depend on the conditions and circumstances at each bank. Most enforcement actions require the banks' officers and directors to submit a plan to restore their banks' capital ratios to adequate levels. Other actions include restrictions on growth of total assets, dividends, and loans to officers and directors. Enforcement actions may also address violations of specific regulations.

The various restrictions typically imposed on bank behavior are similar to those that would be imposed under the Treasury proposal. This proposal, therefore, does not involve *new* types of restrictions on undercapitalized banks. Rather, it calls for more rigorous and less discretionary enforcement of these restrictions, facilitated by legislation that would limit the ability of banks to impede prompt action by supervisors through litigation.

Slow to Close Due to Problems with Finding Buyers

Another reason why banks may have primary capital ratios below 5.5 percent for extended periods is if they were kept open while their supervisors searched for other banks to buy them. Such cases were especially common in Texas, where considerable time passed before buyers could be found for some troubled bank holding companies.[4]

[3]Spong (1990), pp. 90-93. For descriptions of specific enforcement actions by the Office of the Comptroller of the Currency in recent years, see articles entitled "Special Supervision and Enforcement Activities" in various issues of the *Quarterly Journal* of the Comptroller of the Currency.

[4]Bovenzi and Muldoon (1990), p. 4.

Capital Forbearance

Still other undercapitalized banks were granted official forbearance by their supervisors. Forbearance occurs when supervisors decide to forego enforcement of some regulations, including capital requirements, under special circumstances. As their losses on agricultural and energy loans rose in the 1980s, many banks turned to Congress for relief from capital requirements. In the Competitive Equality Banking Act (CEBA) of 1987, Congress mandated capital forbearance for agricultural banks. Banks in this program were permitted to defer formal acknowledgement of losses on agricultural loans for several years. The typical rationale for capital forbearance is that the economic forces responsible for the declines in capital ratios, such as lower farm income and reduced prices of farm land, are only temporary.

In response to this evidence of congressional intent, the federal supervisory agencies established capital forbearance programs that set broader terms for participation than those specified in CEBA. Cobos (1989), for example, describes the capital forbearance program of the Federal Deposit Insurance Corporation (FDIC) and gives his perspective, as an FDIC official, on the objectives of the program and the actions that banks granted forbearance are expected to follow. According to Cobos, banks granted forbearance should be considered viable by their supervisors; they also should be expected to:

1. limit the growth of their total assets and relatively high risk investments.
2. restrict dividends to their shareholders.
3. limit the benefits of forbearance to insiders, including insider loans.[5]

There is virtually no way to tell which of these three reasons explains why any particular bank remained undercapitalized for an extended period. In fact, more than one of these reasons may apply. Knowing why these banks remained undercapitalized is unimportant, however, if bank supervisors generally expect them to conform to similar constraints on their behavior. That is, regardless of why they were allowed to remain undercapitalized for so long, these banks should at the very least not have experienced rapid asset growth, paid dividends to shareholders or increased their loans to insiders. This paper investigates whether banks that were undercapitalized for more than a year indeed conformed to these constraints.

THE CHARACTERISTICS OF UNDERCAPITALIZED BANKS

Table 1 indicates that 531 federally insured commercial banks were undercapitalized for more than a year, about 4 percent of the average number of banks operating in the years 1985-89.[6] The vast majority (87 percent) of these inadequately capitalized banks were relatively small, with total assets of less than $100 million. Undercapitalized banks whose assets exceeded $100 million were concentrated in the energy-producing states of Louisiana, Oklahoma and Texas (63 percent). Only one undercapitalized bank (located in California) had total assets greater than $1 billion.

Outside Texas, a majority of the undercapitalized banks (60 percent) were state nonmember banks, supervised by the FDIC. In Texas, in contrast, 73 percent were national banks, supervised by the Office of the Comptroller of the Currency (OCC).[7]

As table 1 shows, a sizable proportion of the 531 banks had primary capital ratios below 5.5 percent for two years or more. In this 20-quarter period (1985-89), 178 banks had primary capital ratios below the minimum level for eight or more consecutive quarters, and six had capital ratios below this level for 16 or more quarters.

Table 1 also shows that banks in 22 states had *negative* equity capital for at least one quarter.[8] Some of these observations may reflect lags in the process by which supervisors get information on banks and arrange for their resolution; they are not necessarily evidence of supervisory policies that permit banks with negative equity to remain in operation. Indeed, for most of these banks, the period of negative equity lasted only one or two quarters. Some banks, however, had

[5]Cobos (1989).

[6]The banks included in this study are domestically owned commercial banks. Savings banks and foreign owned banks are excluded, as are several special purpose banks, including bankers' banks.

[7]The undercapitalized banks included in this study remained under the same federal supervisory authorities in the years 1985-89.

[8]See the shaded insert for a description of equity capital and the type of accounting entries that can make equity capital negative.

Table 1

Characteristics of Banks with Primary Capital Ratios Below 5.5 Percent for Over Four Consecutive Quarters, 1985-89

State[1]	Number of under-capitalized banks	Banks with assets greater than $100 million	Federal supervisory agency			Banks with capital ratios below the required level for eight or more consecutive quarters	Banks with negative equity capital for:		Banks that recover[2]
			OCC	FR	FDIC		At least one quarter	Four or more quarters	
Alaska	2	2	0	0	2	0	2	1	0
Arizona	1	1	0	0	1	0	1	0	0
California	25	5	5	2	18	11	4	1	10
Colorado	15	4	10	4	1	4	7	1	7
Connecticut	1	0	1	0	0	0	1	0	0
Florida	9	1	4	4	1	1	6	1	4
Idaho	1	0	0	0	1	1	0	0	1
Illinois	11	0	5	0	6	4	0	0	9
Indiana	8	0	3	0	5	3	3	0	4
Iowa	12	0	2	1	9	5	2	0	7
Kansas	26	0	4	0	22	10	5	1	7
Kentucky	4	0	0	0	4	0	0	0	4
Louisiana	43	9	8	0	35	13	18	4	2
Massachusetts	3	0	2	0	1	0	0	0	3
Michigan	3	0	0	1	2	1	0	0	2
Minnesota	23	0	5	1	17	12	4	2	9
Missouri	10	0	0	2	8	2	4	1	4
Montana	6	0	3	3	0	2	2	1	2
Nebraska	7	1	2	0	5	4	0	0	4
New Hampshire	1	1	0	0	1	0	0	0	1
New Jersey	3	1	3	0	0	1	0	0	2
New Mexico	5	2	3	0	2	3	2	1	1
New York	3	2	2	1	0	1	0	0	1
North Dakota	1	0	1	0	0	0	0	0	0
Ohio	6	1	3	1	2	2	1	1	3
Oklahoma	54	7	24	4	26	18	29	10	5
Oregon	6	2	0	0	6	3	0	0	4
Pennsylvania	1	0	1	0	0	0	1	0	0
Rhode Island	1	0	0	0	1	0	0	0	1
South Dakota	2	1	2	0	0	0	1	0	1
Tennessee	6	1	1	0	5	2	1	0	4
Texas	223	27	162	7	54	73	117	46	26
Virginia	4	0	2	1	1	2	1	1	1
West Virginia	2	0	0	0	2	1	1	0	0
Wisconsin	1	0	0	0	1	0	0	0	1
Wyoming	2	0	1	0	1	0	0	0	0
Totals	**531**	**68**	**259**	**32**	**240**	**178**	**213**	**72**	**130**

[1]States that are not listed had no banks that were undercapitalized for five or more consecutive quarters during 1985-89.

[2]Banks that recover are identified as those whose primary capital ratios were consistently above 5.5 percent by IV/1989.

Note: Identification of federal supervisory agencies:
OCC = Office of the Comptroller of the Currency
FR = Federal Reserve
FDIC = Federal Deposit Insurance Corporation

negative equity for extended periods of time. Of the 72 banks with negative equity for four or more quarters, 83 percent were in Louisiana, Oklahoma and Texas; two national banks in Texas had negative equity for nine quarters.

The last column of table 1 shows the number of undercapitalized banks that recovered, that is, had primary capital ratios consistently above 5.5 percent, by the fourth quarter of 1989.[9] Only 130 of the 531 banks had recovered by IV/1989, an average recovery rate of only 24 percent. The 46 percent rate of recovery for banks outside of Louisiana, Oklahoma and Texas is much higher than the 10 percent recovery rate for banks undercapitalized for more than a year in these energy-producing states.

As might be expected, the recovery rates were significantly lower for banks with negative equity. Of the 213 banks with negative equity for at least one quarter, the recovery rate was only 6.57 percent, compared with a recovery rate of 36.48 percent among the remaining 318 banks.[10]

The geographic distribution of the 531 undercapitalized banks is quite uneven. For instance, 14 states and the District of Columbia had no banks that were undercapitalized for more than a year. While these 14 are not clustered in any particular part of the country, they have one characteristic in common—relatively liberal branching laws (see table 2). Eleven of the 14 states permit statewide branching and the three

Table 2

Relationship between Number of Undercapitalized Banks and Bank Failures, 1985-89

States grouped by number of banks undercapitalized for more than one year	Number of undercapitalized banks	Number of failed banks
None[1]	0	17
1 or 2[2]	16	45
3-6[3]	49	40
7-26[4]	146	258
More than 26[5]	320	483
Total	**531**	**843**

[1] Alabama, Arkansas, Delaware, Georgia, Hawaii, Maine, Maryland, Mississippi, Nevada, North Carolina, South Carolina, Utah, Vermont and Washington.

[2] Alaska, Arizona, Connecticut, Idaho, New Hampshire, North Dakota, Pennsylvania, Rhode Island, South Dakota, West Virginia, Wisconsin and Wyoming.

[3] Kentucky, Massachusetts, Michigan, Montana, New Jersey, New Mexico, New York, Ohio, Oregon, Tennessee and Virginia.

[4] California, Colorado, Florida, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri and Nebraska.

[5] Louisiana, Oklahoma and Texas.

[9] One objection to this definition of recovery is that it understates the actual recovery rate, because many banks' capital ratios fell below 5.5 percent only near the end of the 1985-89 period. This possibility is investigated by examining capital ratios in the first three quarters of 1990 for those banks whose primary capital ratios were below 5.5 percent in the fourth quarter of 1989. Reclassifying these banks as recovered if their primary capital ratios rose consistently above 5.5 percent in the first three quarters of 1990 raises the recovery rate from 10 percent to 12.5 percent in the energy-producing states and from 46 percent to 55.5 percent in the other states. The significance of these increases in recovery rates may be offset by the possibility that some other banks, previously classified as recovered, might be reclassified if their capital ratios for 1990 were examined. Since examination of 1990 data did not change the recovery rates substantially, the recovery rates cited in the text are those based on observations through IV/1989.

[10] The difference between these proportions is significant at the 1 percent level. See, for example, Wonnacott and Wonnacott (1990), pp. 273-75, for the equation to test the statistical significance of the difference between two proportions.

others permit limited branching. Only 12 of the other 36 states are classified as statewide branching states.[11]

As table 2 indicates, many of the banks that failed during 1985-89 were *not* undercapitalized for a year or longer. Instead, they were closed within a year after their capital ratios fell below the minimum required level. For instance, 17 banks failed in the 14 states that had no banks undercapitalized for more than a year. In the nation, the number of banks that failed exceeded the number that were undercapitalized for more than a year. These observations suggest that many bank failures in recent years cannot be attributed to actions taken by banks *while undercapitalized for extended periods of time*; many banks failed before their primary capital ratios had fallen below the minimum required level for a year or longer, and many banks that were undercapitalized for extended periods of time did not fail.

ENFORCEMENT OF CONSTRAINTS ON UNDERCAPITALIZED BANKS

The Treasury proposal for prompt corrective action is based on the view that supervisors have delayed too long in imposing constraints on undercapitalized banks. This section investigates whether the banks that were undercapitalized for over more than a year violated the types of constraints that would be imposed under the Treasury proposal.

Two constraints on the behavior of undercapitalized banks mentioned in the Treasury proposal are examined here: constraints on asset growth and dividend payments.[12] A third constraint is also investigated: no increase in loans to bank officers and directors (the bank insiders) while a bank is undercapitalized. An examination of insider loans is included because supervisory authorities often focus on such loans when monitoring the condition of undercapitalized banks. Also, undercapitalized savings and loan associations in the recent past were found to have increased the losses to their deposit insurance funds through loans to insiders, and one study has found that banks with relatively high ratios of insider lending to total assets had lower earnings and higher bank failure rates than other banks.[13]

Table 3 presents selected information about the behavior of undercapitalized banks. The results are divided into regions, except for Louisiana, Oklahoma and Texas, which account for most of the undercapitalized banks. This method of presentation highlights both regional concentrations of undercapitalized banks and differences in bank behavior.

Asset Growth

When the capital ratio of a bank falls to a relatively low level, its shareholders have less to lose and, correspondingly, more to gain by assuming additional risk, in the hope of a sufficiently large turnaround in income to eliminate the capital deficiency. One way that a bank assumes additional risk is to increase its assets. Bank supervisors, of course, prefer to see undercapitalized banks reduce their assets, to raise their capital ratios.

Most of the 531 banks reduced their assets substantially while undercapitalized, consistent with the desires of bank supervisors. A sizable number, however, actually experienced rapid asset growth. At 84 banks (16 percent of the total), asset growth exceeded 10 percent while primary capital ratios were below 5.5 percent; in fact, asset growth exceeded 25 percent at 44 undercapitalized banks.[14] Most banks whose asset growth exceeded 25 percent were Texas national banks supervised by the OCC—26 of the 28 Texas banks in this study with asset growth in excess of 25 percent were national banks.[15]

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[11]See Conference of State Bank Supervisors (1986), p. 83. This classification is based on state laws as of January 1986.

[12]Department of the Treasury (1991), p. 39.

[13]Kummer, Arshadi and Lawrence (1989).

[14]Twelve banks with asset growth in excess of 10 percent were involved in mergers during the periods in which their primary capital ratios were below 5.5 percent. Mergers distort the measure of asset growth for the purposes of this paper, because they increase capital and assets. Asset growth of banks engaged in mergers does not necessarily reflect greater leverage. Some mergers, for example, involve subsidiaries of the same holding companies, which do not change the leverage of these holding companies. For each of these 12 banks, asset growth in the period in which their primary capital ratios were below 5.5 percent is measured as the percentage change in the period before or after the merger, whichever is the longer.

[15]See O'Keefe (1990) for a thorough discussion of the performance problems of Texas banks and the problems with bank supervision in Texas in recent years.

Table 3

Behavior of Undercapitalized Banks

Census Region	Number of banks	Banks with growth in assets while capital ratios below the required level: Asset growth in excess of 10 percent	Banks with growth in assets while capital ratios below the required level: Asset growth in excess of 25 percent	Banks that paid dividends while undercapitalized	Banks with their highest levels of insider loans when undercapitalized
New England	6	4	2	2	1
Middle Atlantic	7	4	0	2	1
South Atlantic	15	3	2	3	3
East South Central	10	1	0	3	3
West South Central[1]	320	53	28	46	71
Louisiana	43	0	0	11	10
Oklahoma	54	3	0	7	14
Texas	223	50	28	28	47
East North Central	29	2	0	3	9
West North Central	81	9	6	14	20
Pacific Northwest	17	2	2	2	1
Pacific Southwest	46	6	4	5	17
TOTAL	**531**	**84**	**44**	**79**	**126**

[1]The West South Central Region also includes Arkansas, which had no banks that were undercapitalized for more than four consecutive quarters.

Note: States in census regions:
New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont
Middle Atlantic: New Jersey, New York and Pennsylvania
South Atlantic: Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia and West Virginia
East South Central: Alabama, Kentucky, Mississippi and Tennessee
East North Central: Illinois, Indiana, Ohio, Michigan and Wisconsin
West North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota
Pacific Northwest: Alaska, Idaho, Montana, Oregon, Washington and Wyoming
Pacific Southwest: Arizona, California, Colorado, Hawaii, Nevada, New Mexico and Utah.

Dividends

A bank's capital absorbs its losses, thereby protecting uninsured depositors and the deposit insurance fund from the prospect of the bank's failure. Dividends reduce this capital cushion. Thus, a bank must obtain permission from its supervisors to pay dividends that exceed its current earnings, and supervisors can restrict the payment of dividends if a bank's capital ratio is below the required level.[16] About 15 percent of the banks in this study, however, paid dividends on their common stock while their primary capital ratios were below the minimum level.

The recent Treasury study reports similar findings on dividends paid by undercapitalized banks. In 1989, for instance, about 14 percent of the 525 banks with ratios of equity capital to assets below 4.5 percent paid dividends.[17]

Loans to Insiders

Banks are permitted to make loans to their officers and directors (or "insiders").[18] If a bank's shareholders and insiders are not exactly the same group, the shareholders have an incentive to limit insider loans, because of the "moral hazard" of having insiders assess their own

[16]Spong (1990), pp. 64-71.

[17]Department of the Treasury (1991), pp. X-12 through X-14.

[18]See Spong (1990), pp. 60-63, for a description of insider lending regulations.

creditworthiness. If, however, a bank's capital (and, hence, its capital ratio) has fallen to a relatively low level, shareholders may exert less constraint on insider lending simply because they have less to lose. Therefore, when banks become undercapitalized, supervisory actions to limit insider loans take on greater importance in limiting the deposit insurance fund's losses.

Table 3 displays information on the number of undercapitalized banks that reported their *highest* levels of insider lending while undercapitalized. This measure is important because it reflects the maximum exposure by these banks to losses on such loans. A sizable minority of the banks (about 24 percent) reported their highest levels of insider loans when their capital ratios were below the minimum required level.[19]

Differences in Constraints Across Supervisors

Differences in practices among the supervisors of commercial banks may explain some of the variation in behavior among the undercapitalized banks. As noted above, most undercapitalized banks with rapid asset growth were national banks located in Texas. In Texas, however, national banks are a majority of all commercial banks in the state. The concentration of national banks in Texas among the various groups of undercapitalized banks may reflect simply the relatively large share of national banks in Texas.

Table 4 examines the behavior of Texas banks by federal supervisory agency. The first row presents the distribution of these banks by their federal supervisory agency. The following rows show the numbers of undercapitalized banks in various categories by federal supervisory agency. Below the numbers of undercapitalized banks are their percentages of the total number of Texas banks supervised by the same federal agency. Asterisks indicate whether the proportions for national banks are significantly different from those for state-chartered insured banks.

Table 4 shows substantial differences in the representation of national and state-chartered banks among the undercapitalized banks in Texas. Almost 18 percent of the national banks had primary capital ratios below 5.5 percent for more than four consecutive quarters, compared with about 8 percent for state-chartered banks. Over 6 percent of national banks were undercapitalized for eight or more consecutive quarters, compared with 1.8 percent for state-chartered banks. Most of the banks with negative equity are national banks, especially those with negative equity for four or more quarters. National banks also account for most of the undercapitalized banks with rapid asset growth.

Table 5 makes the same comparisons among national and state-chartered insured banks outside of Texas. The only significant differences in proportions for banks outside of Texas involve undercapitalized banks with negative equity. Significantly higher proportions of national banks had negative equity than for state-chartered banks. The other differences in proportions are not significantly different from zero. Thus, the relatively high concentrations of national banks among the various groups of undercapitalized banks were primarily in Texas.

The Behavior of Undercapitalized Banks and their Recovery Rates

Because some undercapitalized banks violated the constraints that would be imposed under the Treasury proposal for prompt corrective action, we can test whether these constraints would have had a positive effect on bank capital recovery rates. If such constraints tend to increase the recovery rate, we should expect lower recovery rates among the banks that violated these constraints.[20]

[19]The 12 banks involved in mergers while undercapitalized may have had their insider loans rise while undercapitalized because they merged with banks that had insider loans before the mergers. To avoid such biases, these 12 banks are classified among those that did not have their highest level of insider loans while undercapitalized.

[20]This paper compares recovery rates across banks rather than failure rates because the distinction between failed and surviving banks is rather arbitrary in some cases. For example, banks with negative equity for several consecutive quarters would be classified as survivors simply because they remained in operation.

Table 4

Distribution of Federally Insured Commercial Banks in Texas by Their Primary Supervisory Agency

	Federal supervisory agency			Total number of banks
	OCC	FR	FDIC	
Average number of banks 1985-89	916	76	705	1,697
Banks with primary capital ratios below 5.5 percent for more than four consecutive quarters	162** (17.69%)	7 (9.21%)	54 (7.66%)	223
Of these undercapitalized banks, number with the following characteristics:				
Primary capital ratios below 5.5 percent for eight or more consecutive quarters	59** (6.44%)	2 (2.63%)	12 (1.70%)	73
Negative equity for at least one quarter	97** (10.59%)	2 (2.63%)	18 (2.55%)	117
Negative equity for four or more consecutive quarters	45** (4.91%)	0 (0.00%)	1 (0.14%)	46
Asset growth in excess of 10 percent while undercapitalized	40** (4.37%)	4 (5.26%)	6 (0.85%)	50
Asset growth in excess of 25 percent while undercapitalized	26** (2.84%)	2 (2.63%)	0 (0.00%)	28
Paid dividends while undercapitalized	13 (1.42%)	0 (0.00%)	15 (2.13%)	28
Highest level of insider loans while undercapitalized	30** (3.28%)	3 (3.95%)	14 (1.99%)	47

Note: Figures in parentheses are percentages of the total number of banks supervised by that agency.

Single asterisk (*) indicates that the proportion of banks supervised by the OCC is significantly different from the proportion of state-chartered insured banks at the 5 percent level.

Double asterisk (**) indicates that the proportion is significantly different at the 1 percent level.

Table 5

Distribution of Federally Insured Commercial Banks Outside Texas by Their Primary Supervisory Agency

	Federal supervisory agency			Total number of banks
	OCC	FR	FDIC	
Average number of banks 1985-89	3,689	1,018	7,261	11,968
Banks with primary capital ratios below 5.5 percent for over four consecutive quarters	97 (2.63%)	25 (2.46%)	186 (2.56%)	308
Of these undercapitalized banks, number with the following characteristics:				
Primary capital ratios below 5.5 percent for 8 or more consecutive quarters	31 (0.84%)	8 (0.79%)	66 (0.91%)	105
Negative equity for at least one quarter	47** (1.27%)	7 (0.69%)	42 (0.58%)	96
Negative equity for 4 or more consecutive quarters	15* (0.41%)	0 (0.00%)	11 (0.15%)	26
Asset growth in excess of 10 percent while undercapitalized	12 (0.33%)	4 (0.39%)	18 (0.25%)	34
Asset growth in excess of 25 percent while undercapitalized	3 (0.08%)	3 (0.29%)	10 (0.14%)	16
Paid dividends while undercapitalized	18 (0.49%)	0 (0.00%)	33 (0.45%)	51
Highest level of insider loans while undercapitalized	28 (0.76%)	6 (0.59%)	45 (0.62%)	79

Note: Figures in parentheses are percentages of the total number of banks supervised by that agency.

Single asterisk (*) indicates that the proportion of banks supervised by the OCC is significantly different from the proportion of state-chartered insured banks at the 5 percent level.

Double asterisk (**) indicates that the proportion is significantly different at the 1 percent level.

Table 6

Recovery Rates of Undercapitalized Banks

	Total number of banks	Percentage that recovered by IV/1989
Banks with asset growth exceeding 10 percent	84	23.81%
Other banks	447	24.61
		(0.16)
Banks with asset growth exceeding 25 percent	44	22.73
Other banks	487	24.64
		(0.29)
Banks that paid dividends while undercapitalized	79	32.91
Other banks	452	23.01
		(1.75)
Banks that increased insider loans while undercapitalized	126	24.60
Other banks	405	24.44
		(0.04)

Note: Absolute values of t-statistics for tests of differences in proportions are in parentheses.

Table 6 compares the recovery rates of banks that violated the constraints with those that did not. The recovery rates of the two groups of banks are not significantly different. The recovery rate for banks that paid dividends is slightly *higher* than that for the other undercapitalized banks, although this difference is not statistically significant at the 5 percent level. Similarly, the other observed differences are not significantly different from zero.

A comparison of recovery rates in table 6 shows that asset growth, dividends and insider loans are not important determinants of recovery. These results imply that imposing constraints on this behavior should not significantly affect the recovery rates of undercapitalized banks.[21]

CONCLUSIONS

Bank supervisory reform is a major component of the overall plan for deposit insurance reform recently proposed by the U.S. Department of the Treasury. Under this proposal, supervision would be based on the capital ratios of banks. If a bank's capital ratio fell below the level acceptable to supervisors, it would be subject to mandatory constraints on its behavior. This proposal for prompt corrective action would limit the discretion of supervisors in dealing with undercapitalized banks.

The proposal's objective is to reduce the number of bank failures and the losses by the deposit insurance fund. Advocates of the proposal assume that imposing sanctions on banks whose capital ratios fall below critical levels would give the managers of healthy banks the incentive to keep their capital ratios above the critical levels at which the sanctions become mandatory. By authorizing the closing of banks with low but positive capital ratios, the proposal gives shareholders of undercapitalized banks incentive to inject capital promptly, if they wish to retain control of their banks. Finally, the sanctions are assumed to constrain the types of behaviors that make undercapitalized banks more likely to fail and to increase the losses of the deposit insurance fund.

[21] Dahl and Spivey (1991) report similar results. They examine the characteristics of undercapitalized banks that help distinguish between those that once again have capital ratios above the required level and those that do not recover. They find that asset growth and dividends do not help distinguish between the banks that recover and those that do not.

In the years 1985-89, many banks remained in operation for extended periods of time with primary capital ratios below the minimum required level. Substantial minorities of these undercapitalized banks violated the constraints that would be imposed under the proposed policy of prompt corrective action. This behavior, presumably, would not be permitted under the proposed policy.

The evidence does not support the hypothesis that once the capital ratio of a bank falls below the minimum required level, enforcing the sanctions specified in the Treasury proposal would increase the chances that the undercapitalized bank will recover. The recovery rates of undercapitalized banks that violated these constraints were no lower than the recovery rates of other undercapitalized banks. Data are not available to test the hypothesis that the failures of the banks violating the constraints specified in the proposal for prompt corrective action imposed relatively large losses on the deposit insurance fund.

Thus, if the proposed policy of prompt corrective action can be expected to reduce the rate of bank failure, this effect must work through the incentives for healthy banks to keep their capital ratios relatively high. To draw conclusions about the strength of this incentive, it is necessary to make assumptions about how bank management would view the penalties to be imposed on banks with and without legislation requiring prompt corrective action by supervisors. Evidence presented in this paper indicates that the sanctions imposed on undercapitalized banks in recent years have been similar to those to be imposed under the proposed policy.

First, several hundred banks were closed in recent years shortly after their capital ratios fell below the minimum required level. Their failure did not result from violation of the types of constraints that would be imposed under the Treasury proposal. Resolutions of these cases appear to have been handled much as they would under the policy of prompt corrective action.

Second, while a large number of banks had capital ratios below the required level for more than a year, most of them did not violate the constraints to be imposed under the policy of prompt corrective action.

Indeed, the fact that a large share of the cases in which undercapitalized banks violated these constraints involves banks in one state under the jurisdiction of one supervisory agency suggests that such cases are the exception, rather than the norm. Thus, there is some evidence that the nature of bank supervision in recent years provided banks with the incentive to keep their capital ratios above the required level without additional legislation.

The evidence on recovery rates of the banks that were undercapitalized for more than a year provides empirical support for one element of the Treasury proposal: the prompt closing of banks with low but positive capital ratios unless their shareholders act promptly to raise their capital ratios. As this paper shows, only 24 percent of the undercapitalized banks recovered in the period examined. Thus, the Treasury proposal would not result in premature closings of large numbers of banks that ultimately would recover if given enough time.

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James B. Bullard

James B. Bullard is an economist at the Federal Reserve Bank of St. Louis. David H. Kelly provided research assistance.

The FOMC in 1990: Onset of Recession

THE FOURTH QUARTER OF 1990 marked the end of a long expansion of the U.S. economy, extending almost continuously from the final quarter of 1982. In November, industrial production plummeted at an annual rate of 19.8 percent, and civilian employment fell by nearly 450,000. The most recent estimate of real gross national product (GNP) indicates that it fell at an annual rate of 1.6 percent in the fourth quarter, and the unemployment rate climbed from 5.3 percent in June to 6.1 percent by the end of the year. By all accounts, recession had arrived.[1]

Because the U.S. economy entered the recession in the latter portion of the year, calendar 1990 is an interesting period in which to summarize the actions of the Federal Open Market Committee (FOMC).[2] By considering FOMC directives chronologically, this paper will develop a case study of monetary policymaking during the onset of a recession. Within the context of the chronology, emphasis will be placed on two types of uncertainty faced by the Committee. First, there is uncertainty about the immediate past, current and future path of real output, a primary measure of economic activity. Second, there is uncertainty about the thrust of monetary policy at a point in time, because of the various ways the policy stance can be measured. While many other considerations enter into FOMC policymaking, as will be shown, these two factors loom large in the Committee's attempts to react swiftly and effectively to economic events.

The next section provides the background for understanding Committee decision-making in 1990. It introduces the FOMC's stated objectives and illustrates briefly how the Committee might hope to bring them into balance. This background is crucial to an understanding of the bulk of the paper, the chronology of FOMC decision-making contained in the subsequent section. The final portion of the paper provides summary comments.

A FRAMEWORK FOR ANALYZING FOMC POLICY ACTIONS

No analysis of FOMC actions can take place until some context for the decision-making is provided.[3] To make sense of the subsequent chronology, it is essential to understand what

[1]According to the Federal Reserve Board's *1991 Monetary Policy Objectives* (p. 3), "The [U.S.] economy . . . fell into recession in the latter part of 1990, and . . . that recession has clearly continued into the early part of 1991." The National Bureau of Economic Research (NBER), which makes official decisions on dating business cycle peaks and troughs, recently announced that the expansion peaked in July 1990.

[2]See the shaded insert, "The Organization of the FOMC," for a description of the Committee.

[3]The terms "decision-making" and "policy actions" are used interchangeably in this article.

The Organization of the FOMC

The Federal Reserve Board of Governors consists of seven members, and each of these members has voting rights on the Federal Open Market Committee (FOMC). The president of the New York Federal Reserve Bank also is a permanent voting member of the FOMC. The remaining 11 Federal Reserve Bank presidents attend meetings and present views, but only four of these 11 have voting privileges at any one meeting. The voting rights are held for terms of one calendar year and rotate among these presidents annually.

The Committee typically meets eight times per year, as it did in 1990, and sometimes consults by telephone between scheduled meetings. At the end of each meeting, the Committee agrees on a directive to issue to the Federal Reserve Bank of New York. The directive contains instructions for the conduct of open market operations until the next regularly scheduled meeting.

A summary of each FOMC meeting is released to the press within a few business days following the next regularly scheduled meeting and is subsequently published in the *Federal Reserve Bulletin.* The summary, known as the "Record of Policy Actions of the Federal Open Market Committee," is prepared by the Board staff and reviewed by the Committee. It typically contains: (1) A synopsis of recent economic data, (2) A review of recent open market operations and money market conditions, (3) A Board staff projection of likely near-term economic developments, (4) A summary of Committee deliberations, (5) The policy directive along with a record of votes and dissenting comments, and (6) A summary of any other business conducted.

the Committee is trying to do and how it might hope to achieve its desires. These are matters of controversy in macroeconomics, and the controversy will not be resolved in this article. Instead, the following framework for understanding FOMC decision-making relies primarily on official Committee statements and simple empirical illustrations.[4] Potential interpretations or conclusions are left to the reader.

FOMC Monetary Policy Objectives

The FOMC stated its goals for monetary policy in each of the eight directives it issued in 1990. Specifically, the objectives of the Committee were to foster progress toward price stability and to promote sustained real output growth.[5] Implementation of these objectives was generally achieved by Committee-ordered intervention in the market for reserves or, in Committee parlance, by altering the ". . . degree of pressure on reserve positions."[6]

Committee members sometimes reconcile the two policy objectives by viewing price stability as a long-run goal and, correspondingly, sustained real output growth as a short-run goal. For instance, one summary of a Committee discussion cites some members arguing that "an easing of short-run policy if such were needed to help avert a cumulative deterioration in economic activity . . . would not be inconsistent with the Committee's long-term commitment to price stability."[7] Similarly, references are sometimes made to "the Committee's long-run, anti-inflation strategy."[8] The next section illustrates, via a simple empirical exercise, one sense in which price stability is a long-run goal.

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[4]The official summary of Committee deliberations is contained in the "Record of Policy Actions of the Federal Open Market Committee" for each meeting, released to the press shortly after the subsequent regular meeting and later published in the *Federal Reserve Bulletin* and the Board's Annual Report. References to "the Record" and to press releases in this article refer to this document.

[5]The following sentence appears in every 1990 directive: "The [FOMC] seeks monetary and financial conditions that will foster price stability, promote growth in output on a sustainable basis, and contribute to an improved pattern of international transactions." The third objective, more ambiguous than the first two, also plays a role in the analysis to follow.

[6]This terminology appears in every FOMC directive in 1990. The market for reserves is discussed in more detail below.

[7]March Press Release, pp. 12-13.

[8]August Press Release, p. 13.

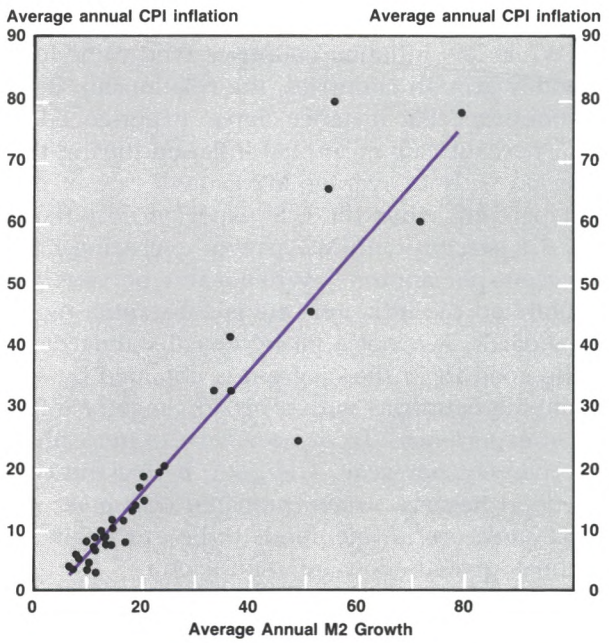
Controlling Inflation

The FOMC's objective of controlling inflation arises out of a generally accepted proposition that the Committee has considerable influence over the long-run rate of price level change. For instance, at the February 1990 meeting "the Committee recognized that over time . . . slower M2 growth would be compatible with price stability . . ."[9] Since all Committee decision-making needs to be understood with this proposition in mind, some evidence on long-run inflation will be considered here.[10]

Following Lucas (1980), consider a version of the quantity theory of money with the key implication stated as follows: over the long term, an increase in the quantity of money, appropriately defined, is reflected in an equal and proportionate increase in the price level.[11] The proposition can be investigated in an atheoretical way, since there is a wealth of available international cross-section evidence. The evidence presented below constitutes an updated version of that marshaled by Vogel (1974) and analyzed in Lucas (1987, 1980) and Dwyer and Hafer (1988).

Figure 1 provides a plot of 20-year averages of growth rates of M2 and the associated 20-year averages of annual changes in the consumer price index for 23 OECD countries, 11 Latin American countries and Mexico.[12] The period covered is 1970 to 1989; each country is a single observation in the figure. The quantity theory predicts that the observations will lie on a 45° line, that is, that changes in money stocks and price levels will be proportional. The 45° line in the diagram is adjusted to pass through the mean of the data, but it has a slope of positive one. It is not a regression line; no attempt has been made to fit the line to the data. The fact that the observations lie near the 45° line provides some evidence of the validity of the quantity theory.[13]

Figure 1
The Quantity Theory and International Evidence 1970-1989



Lucas (1987) was happy enough with this type of evidence to pronounce the inflation problem "successfully solved in a scientific sense."[14] The figure does seem to reflect what many economists and market participants have in mind when they think about the relationship between central bank actions and inflation. The theory appears to work surprisingly well, as the figure contains information derived from countries

[9]March Press Release, p. 12.

[10]See also the work on money and inflation in the P* model, such as Hallman, Porter and Small (1989).

[11]For a discussion of the quantity theory and its variants, see Laidler (1985).

[12]The countries are: Australia, Austria, Belgium, Brazil, Canada, Denmark, Finland, France, (West) Germany, Greece, Iceland, Ireland, Italy, Japan, Norway, The Netherlands, New Zealand, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States, Argentina, Chile, Columbia, Guyana, Suriname, Paraguay, Mexico, Peru, Bolivia, Venezuela, Ecuador and Uruguay. Some observations were missing: Brazil, 1985-1989; Columbia, 1986 and 1989; Chile, 1985-1989; Guyana, Suriname, Paraguay, Peru, Bolivia and Ecuador, 1989. Where data are missing, averages are over available years. M2 is used because the FOMC sets target ranges for this aggregate and because information on this aggregate is collected for all countries in the sample.

[13]One possible objection to this evidence is that the relationships between monetary growth and inflation have changed in the 1980s. However, the plots of recalculated averages using only 1980s data tell, by and large, the same story as figure 1. See also Dwyer and Hafer (1988). Recalculating the averages using M1 also does not alter the general conclusion.

[14]Lucas (1987), p. 221.

with very different social and economic structures. Most importantly for the purposes of analyzing FOMC decisions, the figure provides a basis for the Committee's concern about inflation because it relates inflation to money growth, and the Committee sets target ranges for certain monetary aggregates.

While low inflation countries tend to be low money growth countries, the relationship is far from exact. For instance, Japan experienced a 5.5 percent rate of annual inflation during the period with an average M2 growth rate of over 11 percent, while the U.S. experienced inflation of 6.1 percent with M2 growth averaging 8.3 percent per annum.[15] While a few percentage points on the inflation rate is substantial by U.S. standards, it is not a lot by world standards. The good fit in the diagram is obtained by examining countries with a broad range of inflation experiences, from near zero to more than 80 percent per year. The point is that the U.S. Federal Reserve, *when compared with other central banks worldwide,* tends to be in the low money growth—low inflation group.

Another important consideration, emphasized by Lucas (1980), is that the FOMC's influence on inflation appears to be the product of a great many decisions over a very long time frame. The evidence presented says nothing about the relationship between money growth and inflation on a quarter-by-quarter basis.[16] Thus, even when inflation control is taken very seriously, the FOMC may have considerable room to maneuver on a meeting-by-meeting basis and still meet its stated long-run inflation objective.

Sustaining Real Output Growth

The nature of the relationship between monetary policy and real activity is controversial and remains an unresolved issue in macroeconomics.[17] Nevertheless, FOMC meeting summaries indicate that Committee members believe an easier policy can mitigate declines in real output, at least in the short term. In November 1990, for instance, "the members agreed that a limited degree of easing at this juncture would provide some insurance against a deep and prolonged recession. . . ."[18] Similarly, in December, "Members noted that monetary policy had been eased . . . [and that] a limited further move would provide some added insurance in cushioning the economy against the possibility of a deepening recession. . . ."[19] At the same meeting, reference is made to "The stimulus provided by the recent easing. . . ."[20] In August 1990, Committee discussion noted that "a tightening move . . . might stall an already weak economic expansion."[21] Therefore, while due note is taken of the theoretical controversy, for the purposes of this article, the real effects of monetary policy are simply taken as given.

The Role of Forecasts in Short-Run Policy Actions

The FOMC's stated short-run policy objective necessarily emphasizes the role of forecasting. The Committee must make an assessment of the likely direction of the economy in the near term if it wants to cushion changes in real output when warranted. In addition, the Committee also must assess the current and immediate past position of the economy, since reliable data on real GNP are not available for several quarters. As will become clear in the next section, however, economists have a difficult time forecasting even a few quarters ahead. By proxying the information on real GNP available to the Committee with the Blue Chip Consensus forecast, and by using only data available at the time of the meeting, an appreciation of the uncertainty the Committee faced in 1990 meeting by meeting will be developed.[22]

The Blue Chip Consensus is not the only indicator of the perception of economists regarding real activity. The Board staff prepares a forecast especially for each meeting, and that projection is probably the most relevant one

[15]Simple measurement error is one possible reason for such discrepancies.

[16]See Lucas (1980) for a method of recovering the close fit for U.S. quarterly data.

[17]For a recent survey, see Blanchard (1990).

[18]December Press Release, p. 12.

[19]February Press Release, p. 12.

[20]February Press Release, p. 12.

[21]October Press Release, p. 12.

[22]The *Blue Chip Economic Indicators* is a monthly survey of about 50 mostly private sector economic forecasting firms. The *Blue Chip* forecast for a variety of economic variables is the average forecast of these firms.

How Much Uncertainty Exists in Forecasts of Quarterly Real GNP?

Forecasts of quarterly changes in real GNP tend not to be very accurate, as is well known. To get some idea of the uncertainty involved, consider the forecast errors based on the Blue Chip Consensus for the time period IV/1982 to IV/1989.

Each month, Blue Chip publishes a consensus forecast for the annualized rate of real GNP growth in the current quarter and each quarter ahead for at least one year. Although actual data are sometimes revised many years after they are first published (so-called *benchmark* revisions), changes in real GNP are often considered final within about three months of the end of the quarter. Taking the published forecast at the midpoint of the quarter (e.g., February 10 for the first quarter) and subtracting the final figure gives the forecast error at various time horizons. The mean error and the mean absolute forecast error at these horizons are as follows (32 observations):

Forecast Horizon	Mean Forecast Error	Mean Absolute Forecast Error
Contemporaneous	-.43	2.03
1 quarter ahead	-.29	2.04
2 quarters ahead	-.24	2.00
3 quarters ahead	-.48	1.74
4 quarters ahead	-.55	1.76

Of primary concern are the relatively large mean absolute deviations. They suggest that outcomes far from what is forecast often occur, as an *average* error at any horizon is at least 1.74 percent. Also interesting is that, for this set of forecasts, there is at least as much uncertainty surrounding the current quarter forecast as the four-quarter-ahead forecast.

The difficulty of aggregate economic forecasting will come as no surprise to many readers, and it is not hard to identify plausible reasons for the problem. There may simply be considerable random variation in real activity. Similarly, it may be that real output reacts quite quickly to unpredictable economic and political events. In 1990, one such event stands out: the Iraqi invasion of Kuwait and the subsequent large variations in the price of oil. In addition, all forecasts are conditional on policy, and actual policy may differ from that built in at the time of the forecast.

for Committee decision-making.[23] Unfortunately, it is not declassified until five years after the meeting. Using the Blue Chip forecasts as a proxy for information available to the Committee is not much of a concern for the analysis to follow, however, because in every case, the qualitative description of the Board projection given in the Record of Policy Actions is consistent with the Blue Chip Consensus. Furthermore, in only one case did the Committee's assessment differ qualitatively from that of the Board staff; that case (the October meeting) will become apparent. Finally, the forecasting difficulties discussed in detail below are not a matter of decimal points but of qualitative direction; the Blue Chip forecasts will serve to illustrate this point.[24]

[23]According to Meltzer (1990), p. 31, "Fed forecasts of GNP are as accurate as the forecasts from other models . . ." See also Karamouzis and Lombra (1989) and Meltzer (1987).

[24]See the shaded insert, "How Much Uncertainty Exists in Forecasts of Quarterly Real GNP?" for a description of the uncertainty surrounding these forecasts.

Measuring the Policy Stance

Any summary of FOMC monetary policy actions requires some measurement of the policy stance at a point in time. One of the problems of monetary policymaking is that various measures can yield conflicting signals, sometimes making it difficult to discern the thrust of policy. Consideration in this paper will be given to four possible measures, or "indicators," of the monetary policy stance: the language of the directive, the federal funds rate, the monetary aggregate M2, and total reserves.[25] Of these, the simplest and most straightforward measure, relied on heavily in the following chronology, is to examine the Record to find out the language of the directive. The other indicators are based on a simple analysis that associates "easing" or "tightening" with movements in measured variables.

The implementation of monetary policy typically occurs via intervention in the market for reserves, which are actively traded among banks. The interest rate in this market is the federal funds rate, and the total reserve supply is subject to control by the Federal Reserve. For a given downward-sloping demand, the Federal Reserve can increase (decrease) the federal funds rate by decreasing (increasing) the supply of total reserves. A common simple analysis relates the sum of total reserves and currency (the monetary base) to measures of money such as M2 by a proportional factor greater than one known as the money multiplier.[26] Generally speaking, therefore, a decrease in the federal funds rate, an increase in M2 and an increase in total reserves can be indications of easier monetary policy, while movements in the opposite directions can be indications of tighter policy. In practice things are not so clear because the demand for reserves (and also the demand for M2) may fluctuate over time, perhaps swamping the effect of a change in reserves on the federal funds rate or on M2.[27]

Nevertheless, because total reserves are subject to control by the Committee, they constitute a logical indicator of policy. In addition, because the Committee set target ranges for both the federal funds rate and M2 in 1990, they are also logical indicators of the policy stance.[28] Generally, however, one's assessment of the policy stance at a point in time can differ depending on which indicator is used. As will be shown below, the indicators can give conflicting signals, differing not only from the language of the directive but also from each other.

The data on indicators referenced in the subsequent chronology are plotted in figures 2 through 6. The primary reference for the federal funds rate that will be used is the weekly time series for 1990 presented in figure 2.[29] The 1990 weekly series for M2 is plotted in figure 3; the annualized weekly growth rates are plotted in figure 4.[30] The interpretation of M2 is typically within the context of the target cone, which is reviewed by the Committee twice yearly and represents the FOMC's long-term target. Within the target cone, however, is some leeway to alter M2 growth rates meeting by meeting. As can be seen from figure 4, growth rates of monetary aggregates tend to be fairly noisy. The time series for total reserves in 1990 is given in figure 5. Unfortunately, these data also tend to be noisy; in addition, the Committee does not set a target growth cone for total reserves. These facts sometimes combine to make interpretation difficult. Figure 6, however, plots the annualized intermeeting growth rates of total reserves, based on the nearest available data point (since total reserve data are biweekly).

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[25]This list is by no means exhaustive. There are many other indicators that receive attention from economists, including various monetary aggregates, reserve components, interest rate spreads, commodity prices and so on. Reference to these alternative indicators is suppressed in this article in the interest of streamlining the discussion.

[26]See Papademos and Modigliani (1990) for a recent exposition.

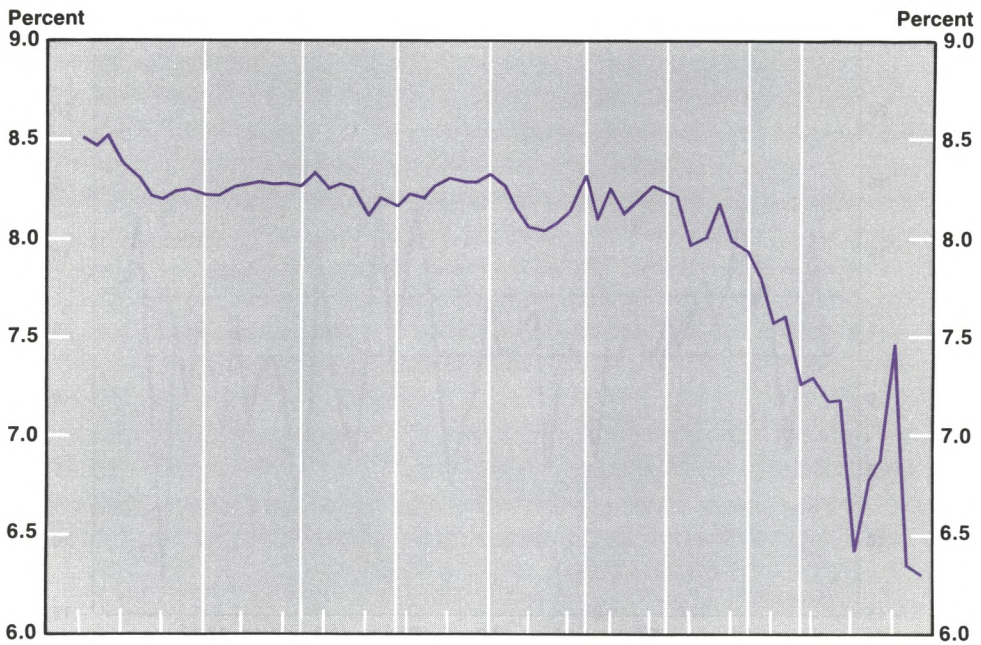
[27]In the Record these fluctuations in demand are sometimes referred to as short-run technical factors.

[28]The range for the federal funds rate was set primarily for consultative purposes; that is, if the actual rate fluctuated persistently outside the range during an intermeeting period, the Committee agreed to discuss the situation. The Committee did not set a range for the federal funds rate at its November or December meetings, saying it no longer "served [any] real purpose." See the December Press Release, pp. 15-16. Mention of the target ranges for the federal funds rate and M2 is made only to show that the Committee gives these indicators some official status. Total reserves, on the other hand, does not have such a status.

[29]For an assessment of this interest rate as an indicator of monetary policy and a predictor of future real sector activity, see Bernanke and Blinder (1990).

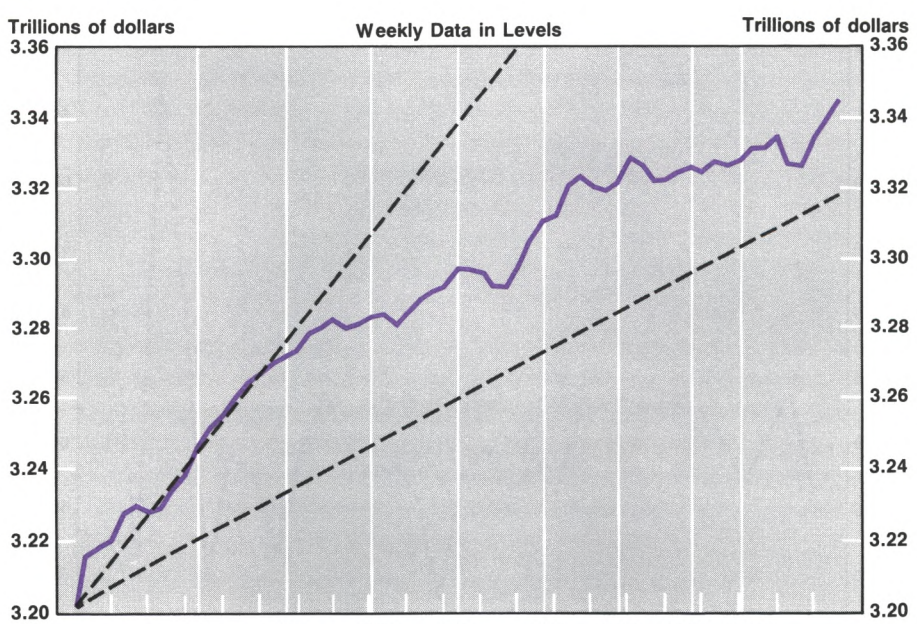
[30]For discussions of monetary aggregates and their relationship to real activity, see Christiano and Ljungqvist (1988) and Stock and Watson (1987).

Figure 2
The Weekly Federal Funds Rate in 1990



Vertical lines represent FOMC meeting dates

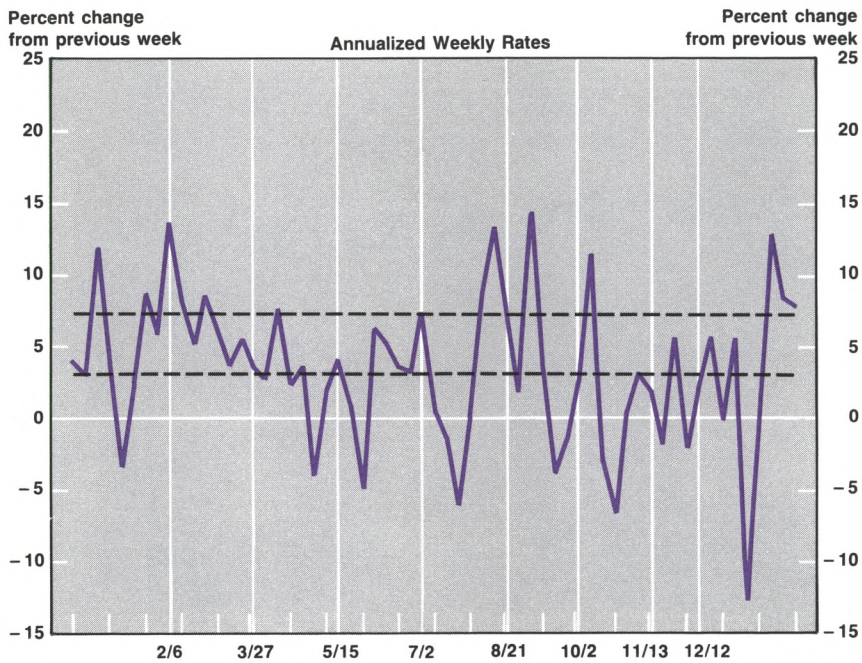
Figure 3
M2 in 1990



Source: post 1991 benchmark data

Vertical lines represent FOMC meeting dates

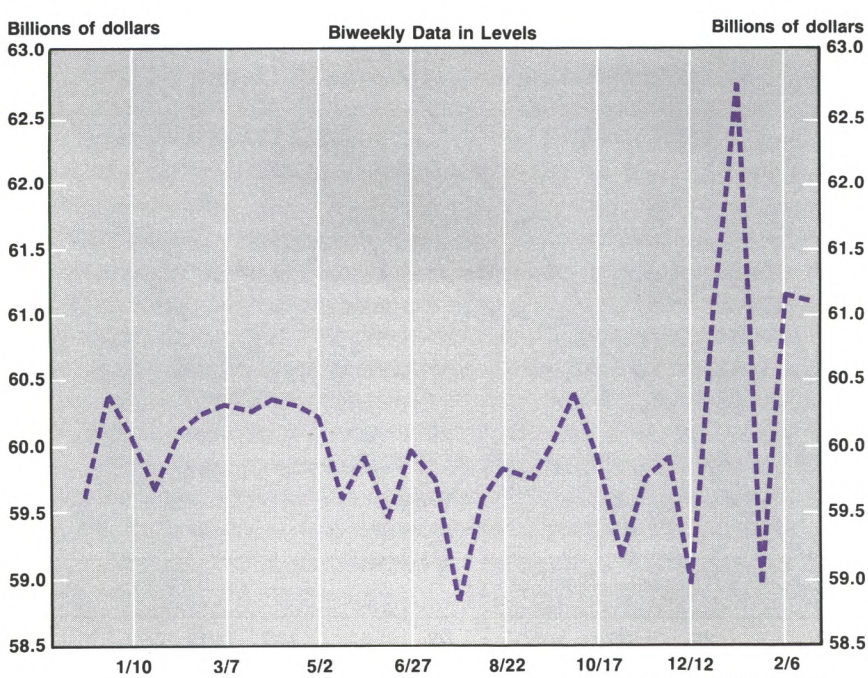
Figure 4
M2 Growth in 1990



Source: post 1991 benchmark data

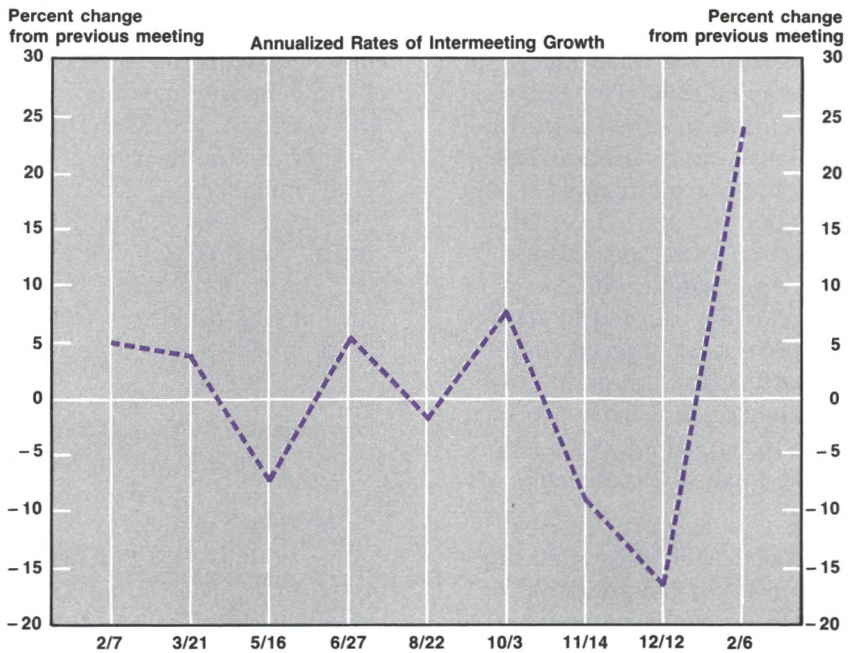
Vertical lines represent FOMC meeting dates

Figure 5
Total Reserves in 1990



Source: post 1991 benchmark data

Figure 6
Intermeeting Growth of Total Reserves[1]



Source: post 1991 benchmark data

Vertical lines represent data point nearest meeting date

[1]Data are Board series, adjusted for reserve requirements

For all indicator data, vertical lines represent FOMC meeting dates.

The framework that will be used in this paper to summarize FOMC decision-making is now complete. The Committee states its major objectives in every directive, and they are to control inflation and to maintain sustained growth in real output. International evidence suggests that low inflation rates can be achieved by maintaining low rates of money growth. The real output effects of monetary policy are theoretically less certain, but summaries of Committee deliberations indicate that members believe temporary easing can mitigate downturns in economic ac tivity. Pursuit of this objective requires an assessment of the current and future time path of real output, but knowing whether the incoming data signal a change in direction for the economy is complicated by lags in data releases and errors in even the best economic forecasts. To summarize FOMC policy actions, some measure of the monetary policy stance is required. Since various measures sometimes suggest differing interpretations of the thrust of monetary policy, several indicators will be employed.

CHRONOLOGY OF FOMC DECISION-MAKING IN 1990

Meeting of February 6-7, 1990

The February meeting was one of two during 1990 when the Committee reviewed its long-term objectives for growth in the monetary aggregates. Much of the discussion focused on the growth range for M2.[31] A staff report suggested that, given the current forecasts for nominal GNP, the rate of growth of M2 in 1990 was likely to be in the "upper end of the tentative range" of 3 to 7 percent set the previous July.[32] In this view, the Committee could retain "considerable leeway" to make "faster progress against inflation without impairing the forward momentum

[31]March Press Release, p. 11.

[32]March Press Release, p. 12.

of the economy . . ." by retaining the tentative range.[33]

After contemplating the staff report and other pertinent information, the Committee agreed on a range of 3 to 7 percent growth for M2 during the year, as computed from the final quarter of 1989 to the final quarter of 1990. The range set for M3 was 2.5 to 6.5 percent, down from the 3.5-to-7.5 percent tentative range used in 1989.[34] One interpretation of these growth rates is suggested by the information in figure 1. In particular, if maintained over a long period of time, these growth rates are consistent with low average rates of inflation relative to a world standard. In this sense the Federal Reserve continued to maintain its posture for preferring low inflation relative to other central banks. In fact, the Committee hoped to "signal a [continued] determination to move toward the objective of price stability."[35]

The Committee also discussed policy for the period until the next meeting. The outlook for real GNP at the time of the February meeting is given in figure 7, which illustrates the beliefs of private forecasters on February 10. In the figure, the boxes represent the most recently revised data available at the time for points in the past, plus the Blue Chip Consensus forecast at the time for points in the future. The crosses represent the evolution of real GNP based on revised data and the Blue Chip Consensus forecast for 1991 and 1992 available as of April 1991.[36]

Considering the figure from the perspective at the time, real GNP growth appeared to be near 3 percent in the third quarter of 1989, but approached zero in the fourth quarter. The forecast called for increasing rates of growth throughout 1990. In retrospect, the second and third quarters of 1989 were actually much weaker than they appeared at the time.[37] While the prediction that the economy would rebound slightly in the first quarter of 1990 appears by present estimates to have been correct, the private sector forecasts of a generally strengthening economy throughout 1990 turned out to be erroneous.

The Board staff projections were qualitatively consistent with the private forecasts at the time of the February meeting, as they predicted that "the economy was likely to expand relatively slowly over the next several quarters."[38] The FOMC membership generally concurred with this view, seeing "continuing growth in economic activity [as] a reasonable expectation for the year ahead" and "some assurance that the expansion was no longer weakening and indeed that a modest acceleration might be under way. . . ."[39]

Among the plethora of other information considered by the FOMC in February, the Record indicates that, internationally, Japan was experiencing strong growth in real GNP and that, while Germany, Italy and France appeared to be gaining strength, the United Kingdom and Canada remained sluggish. The trade-weighted value of the dollar in terms of foreign currencies had recently fallen, and most of the depreciation was against the German mark. U.S. civilian unemployment was unchanged at 5.3 percent.[40]

At the conclusion of the meeting, the FOMC issued a policy directive to "maintain the existing degree of pressure on reserve positions."[41] The policy for possible adjustments during the intermeeting period was to be symmetric, with no bias toward tightening or easing.[42]

Meeting of March 27, 1990

Considering figure 2, policy was indeed steady in the six weeks following the February meeting, as the federal funds rate remained unchanged at about 8.25 percent through late March. While figure 3 shows that M2 was slightly above the upper end of the target cone during

[33]March Press Release, p. 12.

[34]According to the Record, the change in the M3 range was viewed as consistent with an unchanged M2 range for "technical reasons." See the March Press Release, p. 13.

[35]March Press Release, p. 12.

[36]Blue Chip forecasts are released on the 10th of each month.

[37]The problem of data revision is acute, and an important consideration to keep in mind is that the view of the data today is itself subject to revision in the future. See also Mankiw and Shapiro (1986).

[38]March Press Release, p. 6.

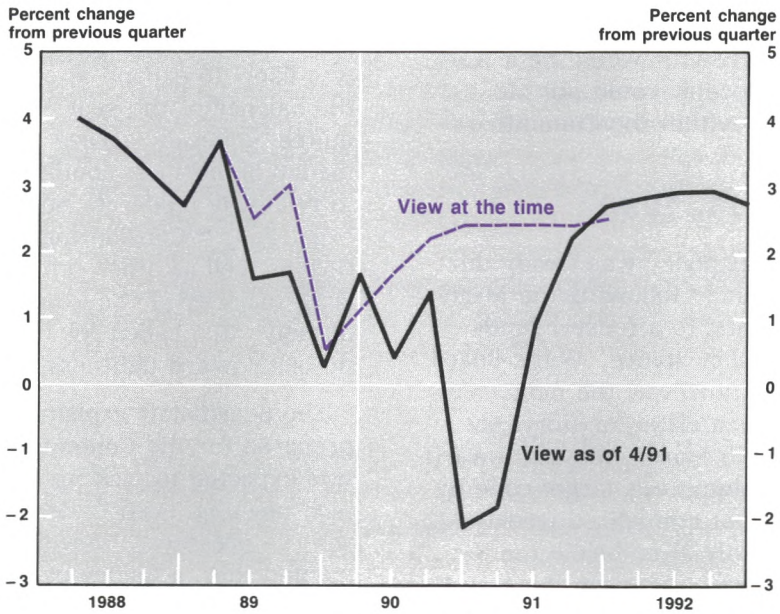
[39]March Press Release, p. 7. The Committee also discussed the risk of a downturn.

[40]March Press Release, pp. 1-4.

[41]March Press Release, p. 21.

[42]March Press Release, p. 18. The Committee sometimes issues asymmetric directives, which augment the basic directive by stating a direction of bias. In some cases, the Committee ties the direction of bias to data or other information forthcoming during the intermeeting period.

Figure 7
Private Forecasters' View of Real Output, February 1990



Source: Blue Chip Forecasts and Data Revisions

February and into March, figure 4 indicates that most of the weekly growth rates were within a range consistent with a 3 to 7 percent growth rate for the year. It does not appear, therefore, that there was any change in policy according to an M2 measure of the policy stance during the period immediately following the February meeting. Finally, figure 6 also shows little indication of a change in the thrust of policy, as reserves continued to grow. All considered, policy appeared to be steady as the Committee convened in late March.

Figure 7 indicates that the four quarters beginning April 1990, only a week after the March meeting was held, appear from today's perspective to be one of the weakest sequences of quarters since 1982. Nevertheless, at the time the FOMC met, there was no indication, according to the Blue Chip Consensus, that the national economy would be entering a recession later in the year. The private forecasters' outlook for real GNP growth changed little between the February and March meetings.

The Board staff projection was qualitatively consistent with the Blue Chip forecast, suggesting "the economy was likely to expand at a somewhat faster pace over the next several quarters than in the fourth quarter of 1989."[43] Growth in that quarter was reported to have been less than 1 percent at an annual rate. The Committee concurred, as "on balance . . . the members viewed sustained growth in business activity as a reasonable expectation for the next several quarters."[44] In addition, the Committee "expressed a great deal of concern about the apparent lack of improvement in underlying inflation trends."[45] Considering the forecast for real output, in addition to other pertinent information, the majority of the Committee voted to maintain the "current degree of pressure on reserve positions."[46] No direction of intermeeting bias was specified.

[43]May Press Release, p. 6.

[44]May Press Release, p. 7.

[45]May Press Release, p. 7.

[46]May Press Release, p. 13.

The Board staff warned at the March meeting that M2 growth might be slow or non-existent over the spring and early summer, partly for special technical reasons and partly because of the general slowing in the rate of nominal GNP growth. A number of Committee members, commenting on the Board staff report, felt a slowing in the rate of M2 growth "would be a welcome development," since it would put M2 growth more squarely within the Committee's target range.[47]

Meeting of May 15, 1990

Figure 2 suggests that policy was steady during the period immediately following the March FOMC meeting, according to a federal funds rate measure of the policy stance. As the Board staff report predicted, however, the monetary aggregate measure tells a different story: M2 growth began to slow in March, moving toward the midpoint of the Committee's target cone by July. Figure 4 shows that annualized weekly M2 growth rates were mostly at or below the 3 percent mark in the weeks between the March and May meetings. Of course, the March staff report had predicted a slowing in M2 growth, and in addition, the data on monetary aggregates simply tend to be noisy. Figure 6, however, shows that reserve growth was negative between the March and May meetings, which might be construed as a relatively tight policy immediately following the March meeting. Therefore, as the Committee convened in May it was not clear by some measures that policy had been constant during the intermeeting period. By one measure, policy remained steady; by another, policy tightened beginning at about the time of the March meeting.

The outlook for real GNP at the time of the May meeting, as summarized by the Blue Chip Consensus forecast, was again virtually unchanged from February 10. Generally speaking, the view at the time was much more optimistic than the view from the present. Private forecasters at the time viewed real GNP growth as being faster for virtually every quarter in 1989, 1990 and 1991 relative to the view today. The Blue Chip Consensus indicated a virtually flat growth rate of 2 percent a quarter through 1990, increasing slightly in 1991.

The Board staff projection concurred with private forecasts, suggesting "that the economy was likely to expand at a moderate pace over the balance of the year."[48] In addition, the Committee "generally agreed that the current information on business conditions pointed on balance to relatively moderate but sustained economic expansion."[49] Considering the outlook for real GNP as well as other economic information, a large majority of the Committee supported a directive that called for unchanged policy with no bias toward tightness or ease.[50]

The Board staff explained in an analysis prepared for the Committee that M2 growth was expected to pick up somewhat before the next meeting, even under a policy of "steady reserve pressure."[51] Several members commented that "a failure of such growth to pick up would be a matter of increasing concern" and might be taken as a reflection, among other things, of "growing constraints on the availability of credit to potential borrowers."[52] Generally, however, the Committee felt it was too early to reach a definitive conclusion since the observed moderation might merely be a manifestation of the natural volatility in monetary growth rates.[53]

Meeting of July 2-3, 1990

The July meeting was the second of two during the year in which the Committee reviewed its long-term goals, including an assessment of the target cone set at the February meeting for M2 growth. According to the Record, "the Committee took account of the much slower than anticipated expansion of M2 . . . in the first half of the year. . . .[54] Some members noted that any "shortfall from the current ranges should be kept under careful scrutiny to judge whether

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[47]May Press Release, p. 12.

[48]July Press Release, p. 6.

[49]July Press Release, p. 7.

[50]July Press Release, pp. 10-11.

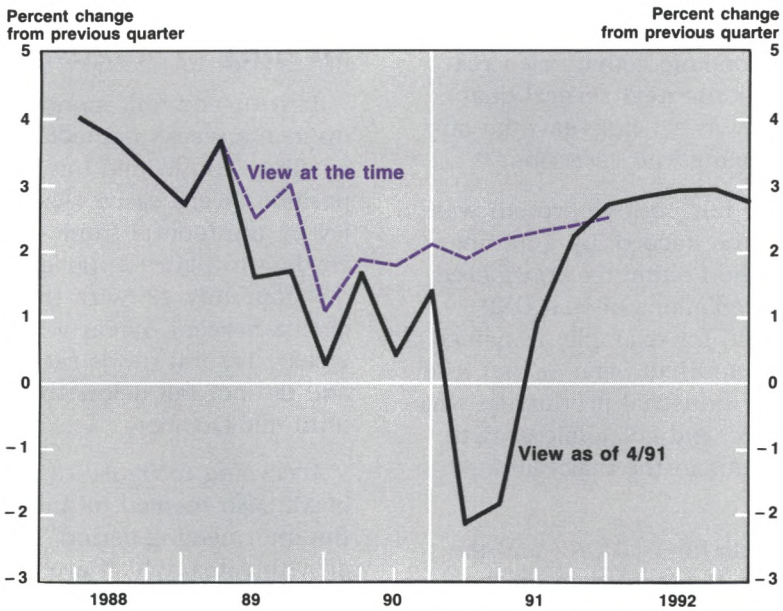
[51]July Press Release, p. 11. This is possible because, while a component of M2 is related to the monetary base by the money multiplier, M2 is a broad aggregate with many other components over which the Federal Reserve has little direct influence.

[52]July Press Release, p. 11.

[53]July Press Release, p. 11.

[54]August Press Release, p. 11.

Figure 8
Private Forecasters' View of Real Output, July 1990



Source: Blue Chip Forecasts and Data Revisions

policy was indeed tighter than intended or desired."[55] After this review, the Committee reaffirmed its range for M2 growth at 3 to 7 percent for the remainder of 1990.[56] One argument that played a role in this decision was that the Committee should avoid making adjustments to target cones, at least at mid-year. Some members suggested, for instance, that "the ranges should not be moved up or down to fit special circumstances. . . .[57]

According to the evidence from a number of countries presented in figure 1, the decision to keep the M2 target range at between 3 and 7 percent continued to place the U.S. squarely in a group of relatively low money growth countries. This is consistent with the Committee's low inflation strategy because these are the countries that have tended to experience the lowest average inflation rates over the last 20 years. In this sense, the Committee continued to maintain its anti-inflation posture at this meeting. Of course, in this context, "low" is relative to world standards, and the relationship between money growth and inflation is not exact even over very long time horizons.

The Committee also contemplated the policy stance for the period until the next meeting. During the intermeeting period, the federal funds rate, M2 and total reserves measures all seemed to indicate a steady policy. The Blue Chip Consensus forecast and the available data for real GNP appeared as the path represented by the boxes in figure 8. A recession was not predicted by private forecasters at the time, and there was simply no way of knowing that Iraq would invade Kuwait during the forthcoming intermeeting period. Available actual data as well as private forecasts continued to be almost uniformly optimistic relative to the actual outcomes for quarterly real GNP growth as viewed from the present.

[55]August Press Release, p. 13.

[56]August Press Release, p. 14.

[57]August Press Release, p. 14.

The Board staff forecast for the remainder of 1990 was again in general agreement with the private forecasts, suggesting "the economy would expand . . . at around the rate estimated for the first half of the year."[58] Committee members concurred with the Board staff and the private forecasters as they "generally saw sustained but subdued growth in economic activity as a reasonable expectation for the next several quarters . . . [T]he economy as a whole gave no current indications of slipping into recession."[59]

The forecast of slow but positive growth was buoyed, according to the Record, by a number of other factors that the Committee considered in addition to point predictions of real GNP growth. Unemployment, for example, remained at 5.3 percent in May and had been at that level for more than a year. Industrial production was up substantially in May, and economic growth seemed to be satisfactory in the major industrialized nations.[60]

Based on the forecasts for real GNP and the consideration of the most recent data on the state of the economy, the FOMC unanimously endorsed an unchanged policy for the seven week period until the next meeting. The majority of the Committee also favored a bias toward "some slight easing" depending on the intermeeting data on M2 growth and inflation. In particular, the majority wanted to ease slightly unless M2 growth picked up appreciably or inflation began accelerating faster than expected.[61] According to the Record, "the marked slowing in monetary growth in the second quarter in particular suggested the possibility of more restraint than the Committee intended."[62]

Figure 9 shows the M2 data available at the time of each FOMC meeting. The crosses represent the revised data available today, while the boxes show the time path as it appeared at the time. At the July meeting, the Committee saw data suggesting a decline in M2 from the level of the previous meeting. The revised data available today show no such decline, however, and indeed generally indicate an increase over the previous 13 weeks. Data revisions can therefore explain, to some extent, the discussion in the Record of the "marked slowing in monetary growth" when it appears from figures 3 and 4 that money growth was picking up in the weeks before the July meeting. The data revision problem for M2 does not seem to have been as acute for other periods during 1990.

Meeting of August 21, 1990

As it turned out, money growth did not pick up in the weeks immediately following the July meeting, and in mid-July "pressures on reserve positions were eased slightly."[63] Measuring policy by the federal funds rate indicates that, according to figure 2, policy did ease slightly on or about July 13, with the rate declining to just over 8 percent by early August. The effective weekly federal funds rate later rose, however, and did not fall below the early August level until mid-October.

According to figures 3 and 4, the growth path of M2 also seemed to indicate some ease during the intermeeting period. The annualized weekly growth rates, which are near zero or negative in the month immediately following the July meeting, are greater than 7 percent in the last three weeks leading up to the August meeting. Of course, these data are noisy and interpretation is difficult. Total reserves reached a low for the year on July 25, reflecting a slight decline overall during the intermeeting period.

The invasion of Kuwait on August 2, 1990, clouded considerably the outlook for the U.S. economy for the remainder of the year and through the first half of 1991. The key economic question was the magnitude and staying power of the resulting crude oil price increases. According to the Record, at the August meeting the Committee ". . . focused on both the state of the economy before the increase in oil prices and the likely consequences for real output and inflation of that rise."[64]

A comparison of the available data and the associated Blue Chip Consensus forecasts for July, August and September, illustrated in figures 8, 10 and 11, respectively, demonstrate the fluidity of the forecasting situation during this two-month period (July 10-September 10). First

[58]August Press Release, p. 6.

[59]August Press Release, p. 7.

[60]August Press Release, pp. 1-4.

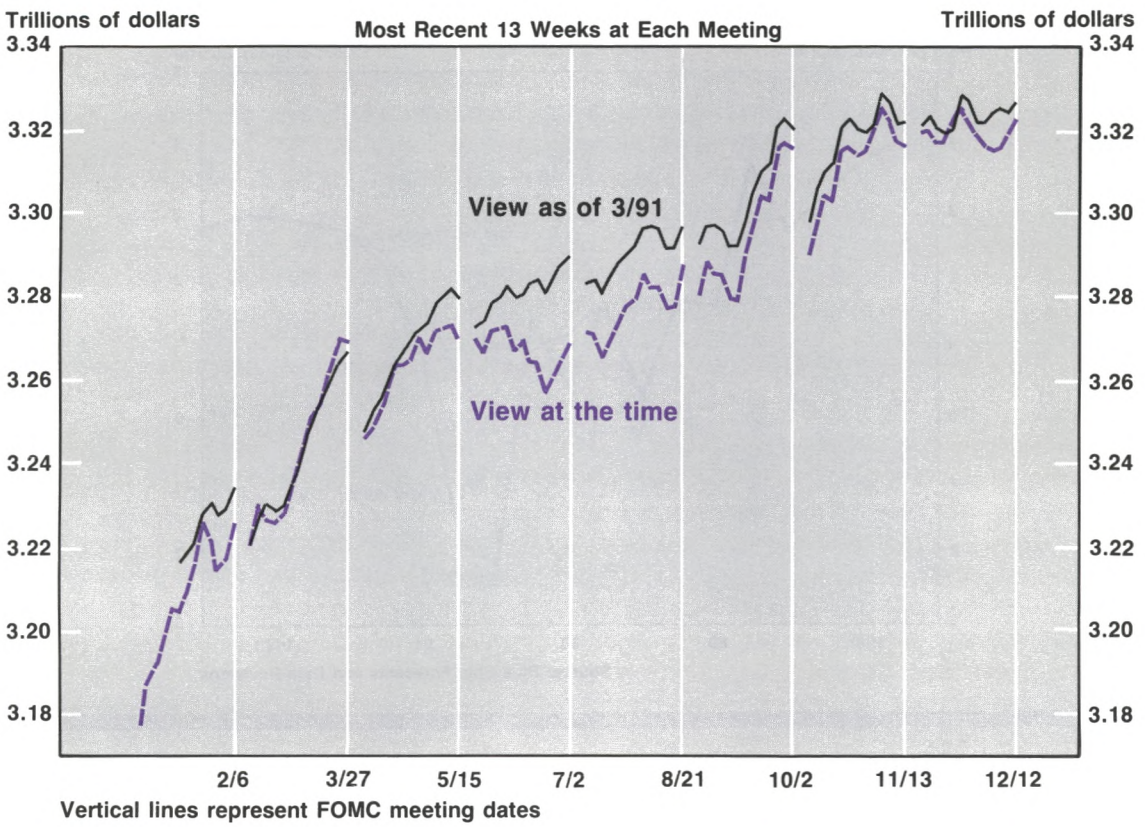
[61]August Press Release, p. 18.

[62]August Press Release, pp. 18-19.

[63]October Press Release, p. 4.

[64]October Press Release, p. 7.

Figure 9
M2 Data Available at FOMC Meetings



of all, in July, the data for all of 1989 and the first quarter of 1990 were revised downward, revealing greater sluggishness in real GNP growth than had previously been estimated. Secondly, the situation in the Middle East was evolving on a daily basis, and the eventual outcome simply could not be predicted. As figure 11 shows, by September 10, about three weeks after the August FOMC meeting, the Blue Chip survey put the consensus forecast for real GNP growth at zero for the fourth quarter of 1990; this reflects a downward revision for fourth quarter output growth from over 2 percent as the year began.

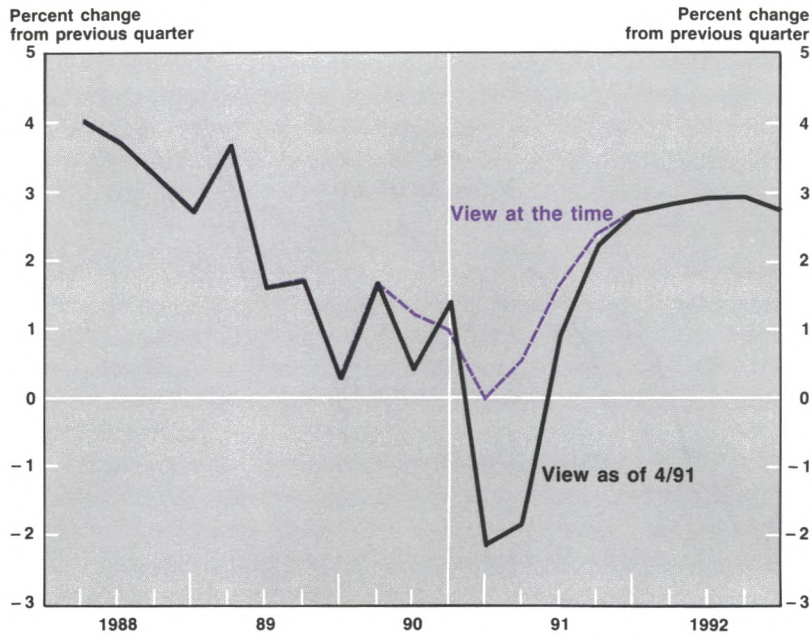
Once again, the Board staff projection reflected that of the private forecasters. While the staff "recognized that the recent steep rise in oil prices could have important adverse effects . . . [It also recognized that] it was not possible to determine with any confidence how oil prices might evolve over time. . . ."[65] Nevertheless, it seemed to the staff that slow expansion of real output was likely over the balance of the year, albeit at a reduced rate from that previously projected.[66] The staff forecast was based, in part, on substantial growth in exports in the quarters that lay ahead, because foreign industrial economies were viewed as relatively strong and a considerable depreciation had already occurred in the foreign exchange value of the dollar.[67]

[65]October Press Release, p. 6.

[66]October Press Release, p. 6.

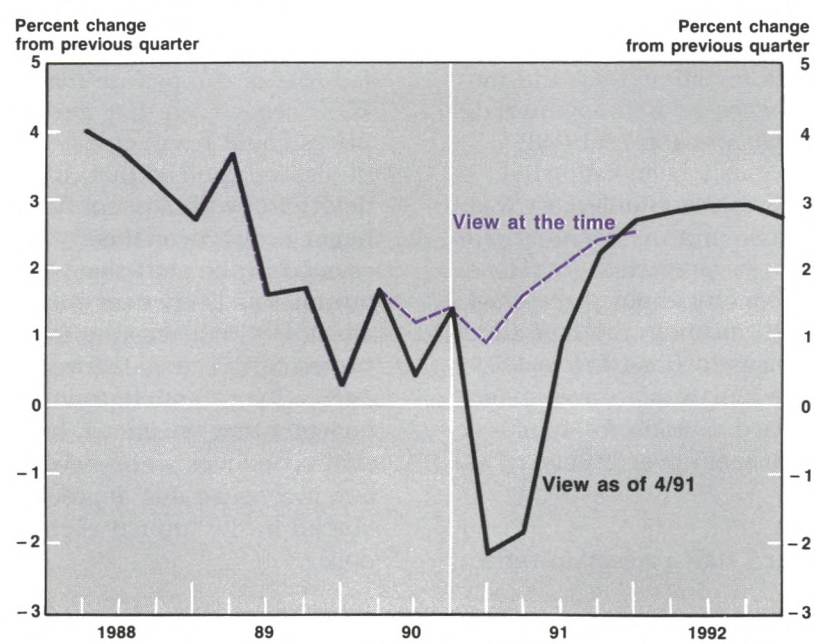
[67]October Press Release, pp. 6-7.

Figure 10
Private Forecasters' View of Real Output, August 1990



Source: Blue Chip Forecasts and Data Revisions

Figure 11
Private Forecasters' View of Real Output, September 1990



Source: Blue Chip Forecasts and Data Revisions

FOMC members again concurred with the staff and private forecasters that "limited growth in economic activity remained a reasonable expectation."[68] The Committee recognized that most of the available data on the economy pertained to a period before the Iraqi invasion. The Record notes that unemployment rose from 5.3 percent to 5.5 percent in July and that domestic industrial production was flat. Overseas, real output growth in both Japan and Germany remained robust. In addition, the trade-weighted value of the dollar had fallen substantially during the intermeeting period in terms of other G-10 currencies.[69]

In the Committee's view, the oil price shock would tend to "weaken economic activity while also intensifying inflationary pressures."[70] Committee members tended to see changes in policy as counterproductive, an easing probably fueling inflation, a tightening probably stalling a weak economy.[71] Accordingly, the Committee elected to maintain the current policy stance, "fostering a stable policy environment." But several members stated that they wanted "to avoid any paralysis of policy . . . in the weeks ahead." Some saw a likely need to ease "at some point," weighed against continuing decline in the dollar in markets for foreign exchange.[72] Therefore, while there were "some differences in views," the majority of the Committee membership supported a bias toward ease in the intermeeting period.[73]

Meeting of October 2, 1990

According to the Record, the bias in the directive was not acted on in the intermeeting period because inflation was "not abating and the economy [was] continuing to advance, albeit slowly. . . ."[74] Measures of the policy stance in the weeks immediately following the August meeting, in general, seemed to indicate a steady policy without any bias toward ease. As figure 2 indicates, federal funds traded at 8-8.25 percent over the period, which represented no change from the previous intermeeting period. Total reserves grew somewhat during the intermeeting period. Money by an M2 measure displayed, according to figure 4, considerable volatility in annualized weekly growth rates in the weeks following the August meeting, to the point where an assessment of the intermeeting policy stance by this measure is quite difficult.

The private forecasts for July, August and September indicate rapidly deteriorating expectations for real output. Still, no recession was forecast at the time of the August meeting—or even three weeks later on September 10—and the private forecasters appeared to view the slow growth as temporary, predicting annualized gains in real GNP of more than 2 percent by the third and fourth quarters of 1991. The October meeting of the FOMC occurred eight days before the Blue Chip Consensus forecast illustrated in figure 12 was officially released. October, the first month of the fourth quarter, was the first time this set of forecasters envisioned negative growth on the horizon. By October 10, the Blue Chip Consensus forecast was actually two consecutive quarters of negative growth in real GNP—but just barely. A recession was not definitively predicted by Blue Chip until November.[75]

Figure 13 illustrates the dramatic change in the outlook for real GNP as forecast by the Blue Chip Consensus from July 1990 to October 1990. In the space of only three months, the forecast changed from one of sluggish but increasing rates of real growth to near zero and even negative growth rates. In terms of time for policy reaction, this change was quite fast. If one accepts research evidence that monetary actions affect real activity only with a lag of several quarters, this rapid deterioration in the expected performance of real output underscores the difficulty of making timely short-run adjustments in the stance of policy.

The Board staff, acknowledging a great deal of uncertainty linked to developments in the Middle East, projected "a mild downturn in economic activity . . . for the near term."[76] The staff

[68]October Press Release, p. 8.

[69]October Press Release, pp. 1-3.

[70]October Press Release, p. 11.

[71]October Press Release, pp. 11-12.

[72]October Press Release, p. 12.

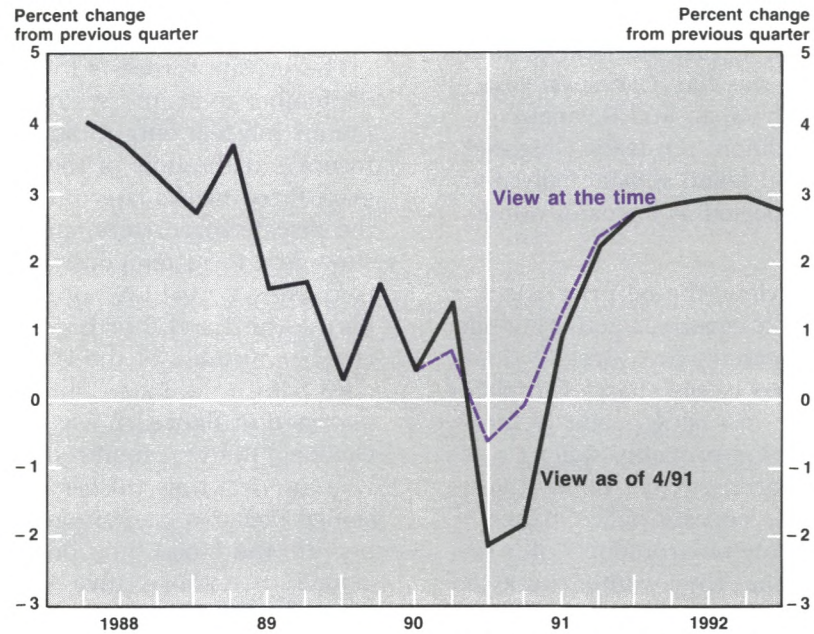
[73]October Press Release, pp. 13-14 and p. 16.

[74]November Press Release, p. 4.

[75]See the *Blue Chip Economic Indicators*, October 10 and November 10, 1990. The October consensus forecast called for two consecutive quarters of negative real GNP growth, but the second of these quarters was nearly flat.

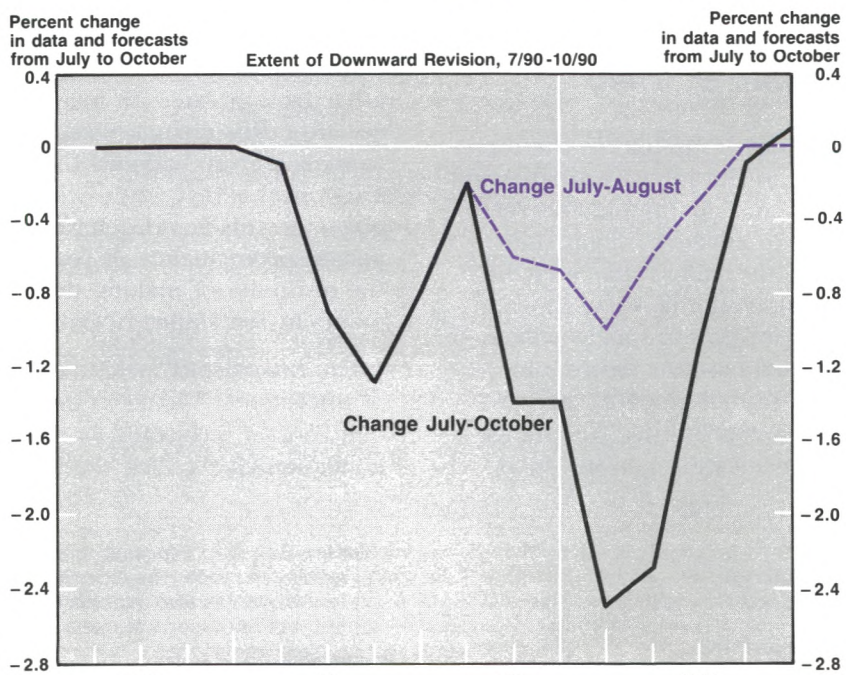
[76]November Press Release, p. 6.

Figure 12
Private Forecasters' View of Real Output, October 1990



Source: Blue Chip Forecasts and Data Revisions

Figure 13
Private Forecasters' Changing Perceptions



Source: Blue Chip Forecasts and Data Revisions

continued to see strong exports as a mitigating factor, propelled by the projection of continuing growth in several other major industrialized nations, especially Germany and Japan. The staff forecast also relied to some extent on a drop in oil prices during the first half of 1991.[77]

For the first time in 1990, the FOMC membership dissented qualitatively from both private forecasters and the Board staff in their view of the likely future path of real output. The Record reports a sense of the meeting concluding that, while the Committee felt the risk of negative real output growth had increased, "overall economic activity appeared to be continuing to expand, although at a slow pace. . . . [T]he available data did not point to cumulating weakness and the onset of a recession."[78] Many members were concerned that surveys of business confidence seemed to indicate a declining faith in a continued expansion, while traditional indicators continued to suggest sluggish growth.[79] Some members suggested that inflation was getting worse even after accounting for the effect of higher crude oil prices.[80] According to the Record, "A major concern was that the rise in oil prices would become . . . firmly entrenched in the cost structure of the economy . . . and [delay] progress toward price stability."[81] Nevertheless, most members felt that "an easing move was warranted in light of the indications that there was a significant risk of a much weaker economy."[82]

The Committee also expressed concern about an easing in response to the impending budget deal being crafted by Congress and the White House. The timing of any move needed to be considered carefully, as action before any budget accord might create the expectation of more action after the deal was struck.[83] In the discussion, some members suggested that "associating an easing move too closely with a fiscal policy action might set an undesirable precedent in terms of producing expectations of similar monetary policy adjustments in the future."[84] The advocates of easing on the Committee agreed that the "reasons for the easing were not keyed to the enactment of the new federal budget alone but more broadly to developments in credit markets and the economy. . . ."[85] The crux, according to the Record, was simply that "market participants expected a monetary policy response to the fiscal policy actions. . . ."[86]

The Committee issued an unusual directive in response to the concerns about declining output, accelerating inflation and fiscal policy. The directive called for no change in the degree of pressure on reserve positions initially, but assumed "some slight easing would be implemented in the intermeeting period, assuming passage of a federal budget resolution . . . and the absence of major unexpected . . . developments."[87] Thus, the directive was biased toward ease. However, the Record indicates that an additional proviso was added; in particular, the Committee agreed to ease further if real output showed further signs of deterioration.[88] The Record also notes that "some slight firming" was not ruled out, should inflation appear to pick up.[89]

Meeting of November 13, 1990

During the intermeeting period, policy was initially unchanged. The contingencies in the directive were exercised late in October, when "pressures on reserve conditions were eased slightly." The Record cites both the "background of a weakening economy" and "the conclusion of a budget agreement" as factors influencing the decision and the timing of the easing.[90] Other indicators of the thrust of policy, however, do not provide evidence of an easing during the weeks leading up to the November meeting. The weekly average federal funds rate, plotted in figure 2, had drifted up to a level near 8.25 percent by the time of the October meeting. As the figure shows, federal funds had been trading near 8.25 percent for most of the year, except for the period immediately following the mid-July easing. The rate had fallen to a

[77]November Press Release, pp. 6-7.
[78]November Press Release, p. 7.
[79]November Press Release, p. 10.
[80]November Press Release, pp. 11-12.
[81]November Press Release, p. 12.
[82]November Press Release, p. 12.
[83]November Press Release, pp. 13-14.
[84]November Press Release, p. 14.
[85]November Press Release, p. 13.
[86]November Press Release, p. 14.
[87]November Press Release, p. 15.
[88]November Press Release, p. 15.
[89]November Press Release, p. 15.
[90]December Press Release, p. 5.

point just below its early August level during the intermeeting period. Based on a cursory look at the level of the federal funds rate, therefore, the policy stance seemed to be about the same as it was after the mid-July easing.[91] Total reserves fell substantially between the October and November meetings, suggesting a tight policy instead of an easy one. Finally, beginning at about the time of the October meeting, M2 growth nearly slowed to a standstill, reaching a level it would not again attain until the final weeks of 1990. Figure 4 indicates that most of the annualized weekly growth rates for the remainder of the year were below 3 percent, and many were negative. By an M2 indicator, then, policy tightened considerably in the fourth quarter.[92]

Private forecasters, as surveyed by Blue Chip, reached a consensus view that the economy was entering a recession in November, according to the forecast illustrated in figure 14. Relative to current projections, however, the forecast remained optimistic about the depth of the downturn. The Board staff also projected a mild recession with recovery occurring in the first half of 1991. The staff assumed a drop in crude oil prices early in 1991 and export growth driven by the expansion in foreign industrialized nations. The staff forecast also emphasized the uncertain environment prodded by the military standoff between the U.S. and Iraq on the Kuwaiti border.[93]

The FOMC membership saw a relatively mild recession ahead, thus establishing general qualitative agreement with private forecasters and the Board staff. They also viewed a slow expansion in 1991 as a reasonable expectation.[94] Accordingly, the Committee agreed to some slight easing immediately and to some bias toward further easing during the intermeeting period. Whether the option to ease further was exercised depended in part on "market reactions to the initial action. . . ."[95]

The November directive of the FOMC is the first to indicate a substantial commitment to ease. At the time of the November meeting, the economy was in the middle of what appeared to be the onset of recession. No amount of easing was likely to change fourth-quarter real output —industrial production was already in the midst of dropping 19.8 percent on an annualized basis in November. Instead, according to the Record, the Committee viewed the easing as providing "some insurance against a deep and prolonged recession. . . ."[96]

Meeting of December 12-13, 1990

As the Committee convened in mid-December, the indicators of policy were again sending conflicting signals. In the period between the November and December meetings, the federal funds rate dropped substantially, suggesting dramatic easing relative to earlier actions (see figure 2). As reflected in figure 6, however, the data on total reserves pointed instead to a further tightening of policy, as the previous negative intermeeting growth rate is followed by a steeper decline in reserves after the November meeting. The annualized weekly growth rates of M2 plotted in figure 4 also do not offer evidence of substantial ease during this period. Money growth simply continued at a near zero pace, on average, through to the December meeting.

Figure 15 reflects the outlook for real GNP at the time of the FOMC's December meeting. The assessment of the private forecasters in the Blue Chip survey continued to grow more pessimistic by the month. In fact, one of the striking features of the evolution of Blue Chip forecasts in 1990 is that they fairly consistently overpredicted real output growth.

The Board staff continued to project a mild recession with a rebound before mid-year 1991.[97] Committee members concurred that a short downturn followed by modest recovery seemed reasonable, but they emphasized the risks of a prolonged downturn. Some Committee members also recognized, however, the possibility of pro-

[91] According to the Record, the reason federal funds traded at 8.25 percent early in the intermeeting period was "more cautious reserve management policies at some banks and some carryover of end-of-quarter pressures. . . ." See the December Press Release, p. 5.

[92] By the November meeting, "the recent weakness in monetary growth was becoming a matter of increasing concern and was an important consideration for some members in their support of some easing of reserve conditions." See the December Press Release, p. 12.

[93] December Press Release, pp. 6-7.

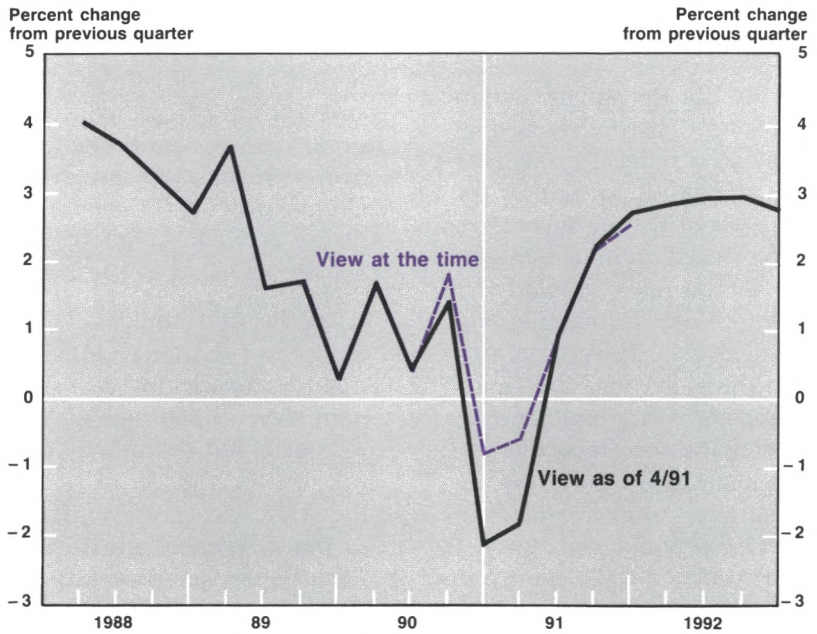
[94] December Press Release, p. 8.

[95] December Press Release, p. 13.

[96] December Press Release, p. 12.

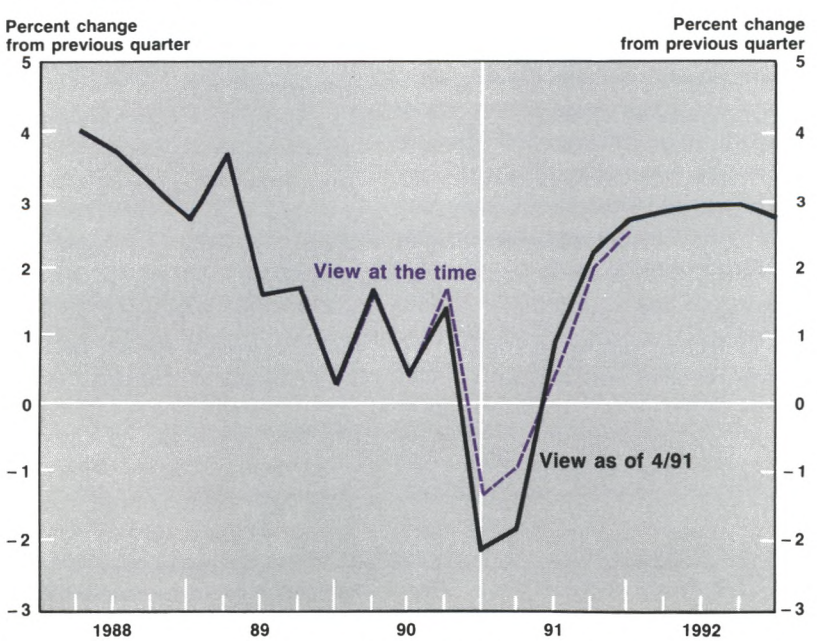
[97] February Press Release, p. 6.

Figure 14
Private Forecasters' View of Real Output, November 1990



Source: Blue Chip Forecasts and Data Revisions

Figure 15
Private Forecasters' View of Real Output, December 1990



Source: Blue Chip Forecasts and Data Revisions

cyclical policy, noting that because of "the lags involved, there was some risk of overdoing the easing of policy at some point. . . ."[98] Nevertheless, members unanimously supported additional easing in the directive in order to "provide some added insurance in cushioning the economy against the possibility of a deepening recession and an inadequate rebound."[99]

In the weeks following the December meeting, policy indicators suggested that further easing occurred, if one considers a federal funds rate measure of the policy stance. In particular, the rate dropped to 6.25 percent by the time of the February 1991 meeting. In addition, the intermeeting growth rate of total reserves plotted in figure 6 seems also to indicate dramatic easing, as reserves increased nearly 25 percent on an annualized basis from the December meeting. There was little evidence of M2 growth in the weeks immediately following the December meeting, but then the aggregate began to show substantial growth beginning in late January 1991.[100] By an M2 measure, policy remained tight through the first weeks of 1991 before indicating signs of ease. All measures seemed to indicate ease by the first week of February 1991.

SUMMARY

This article has presented a case study of FOMC actions during a year in which a recession began. The Committee states its goals in each directive, and they are to provide for stable prices and to promote sustained real output growth. The article has emphasized, within the context of a chronology of 1990 FOMC policymaking, some problems of implementing a policy to meet these stated objectives.

Evidence is presented early in the article regarding the relation between money growth rates and inflation rates across countries and time. An argument is made that over very long time periods, average inflation tends to reflect average rates of money growth. If this evidence is used as a guide, the Federal Reserve in 1990 recorded stellar success in maintaining growth rates of money stocks that are much lower than those achieved by many other central banks. Coupled with other similar decisions over a long period, this will continue to place the U.S. in a small group of countries that will likely continue to experience, relative to other countries in the world, very low inflation rates. This article has provided, therefore, one interpretation of the FOMC's "long-run, anti-inflation strategy" sometimes cited in the Record.[101]

The FOMC's ability to achieve its real output objective is hampered, however, by the difficulty of forecasting real output changes far enough ahead to take corrective action. The article assessed the information available on the projected evolution of real output at the meetings by presenting the unrevised data available at the time along with the most current Blue Chip Consensus forecast. According to the Record, the Committee's views rarely differed substantially, at least qualitatively, from the private sector forecast. This, along with evidence in the Record, indicates that a negative quarter of real output growth was not anticipated until October, and a recession forecast did not come until November, already well into the first quarter of the downturn.

Another feature of short-run policymaking is that it requires some measurement of the monetary policy stance. This article has emphasized how different indicators on some occasions imply different assessments of the thrust of monetary policy. In particular, the total reserves and M2 indicators suggested that policy was tight in the fourth quarter, while an interest rate indicator suggested the opposite. By the first quarter of 1991, however, all measures suggested that the policy stance had shifted toward ease in response to the onset of recession.

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[98]February Press Release, p. 12.

[99]February Press Release, p. 12.

[100]Committee members showed concern for the flat growth in M2 at the December meeting. The Record suggests that while "the behavior of M2 was not fully understood," it might be due to caps on credit availability as well as the weak growth of the economy. See the February Press Release, p. 13.

[101]August Press Release, p. 13.

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Allan H. Meltzer

Allan H. Meltzer is a professor of political economy and public policy at Carnegie Mellon University and is a visiting scholar at the American Enterprise Institute. *This paper, the fifth annual Homer Jones Memorial Lecture, was delivered at Washington University in St. Louis on April 8, 1991.* *Jeffrey Liang provided assistance in preparing this paper.* *The views expressed in this paper are those of Mr. Meltzer and do not necessarily reflect official positions of the Federal Reserve System or the Federal Reserve Bank of St. Louis.*

U.S. Policy in the Bretton Woods Era

IT IS A SPECIAL PLEASURE for me to give the Homer Jones lecture before this distinguished audience, many of them Homer's friends.

I first met Homer in 1964 when he invited me to give a seminar at the Bank. At the time, I was a visiting professor at the University of Chicago, on leave from Carnegie-Mellon. Karl Brunner and I had just completed a study of the Federal Reserve's monetary policy operations for Congressman Patman's House Banking Committee. Given its auspices, the study caught the attention of many within the Federal Reserve. It was not surprising, then, that Homer invited me to visit. The report had raised issues in which Homer had a long-standing interest. One of these was the issue of monetary control procedures.

Although Homer was sympathetic to our criticisms, he was not easily persuaded about our proposals—such as monetary base control. Later, knowing him much better, I would say he was not easily persuaded about very much. You had to convince Homer with facts. He respected facts much more than clever arguments.

Homer's concern for facts never left him. It is not an accident that under his leadership, the economic staff at St. Louis began publishing those data triangles that economists all over the world now rely on when they want to know what has happened to monetary growth and the growth of other non-monetary aggregates. I am persuaded that the publication and wide dissemination of these facts in the 1960s and 1970s did much more to get the monetarist case accepted than we usually recognize. I don't think Homer was surprised at that outcome. He believed in the power of ideas, but he believed that ideas were made powerful by their correspondence to facts.

When Karl Brunner and I started the Shadow Open Market Committee, we invited Homer to be a member. He was a valuable and conscientious member who came to the meetings for many years armed with the kind of penetrating questions that one learned to expect from him. When he believed that his energy had declined and he could not contribute as fully and forcefully as in the past, he offered to resign. We persuaded him to stay on. He remained through the first ten years, leaving after the September 1983 meeting, only a few years before his death in 1986.

One of the facts about monetary policy during Homer's years at the St. Louis Federal Reserve Bank is that the United States was part of the

Bretton Woods system, in fact at the center of the system. Bretton Woods and international monetary policy were not major concerns of the Federal Reserve however, despite the formal commitment to the system and the responsibility implied by the role of the dollar. The failure to honor the commitment is one part of the inflationary policies of that period. I am pleased to review and interpret the main facts about that experience in this lecture in honor of Homer Jones.

In the 45 years following World War II, there was a remarkable transformation of the international monetary system. At the war's end, the dollar was the dominant currency for international transactions and was universally held as a reserve asset or store of value. The Bretton Woods system recognized this role by making the dollar the principal reserve currency of the international system with the British pound as a second reserve currency. Exchange rates of other currencies were fixed to the dollar but were adjustable under conditions defined by the agreement. But, by 1971 the Bretton Woods system was in shambles, and in 1973 major countries agreed to experiment with fluctuating exchange rates.

This paper is about the history of U.S. international economic policy under Bretton Woods from 1959 to 1973. The period begins with the recognition of a problem that was to become the central problem of the international monetary system for the next decade. At first, the problem was seen as a temporary balance of payments problem—the inability of the United States to balance its trade and payments at the prevailing fixed exchange rates. The end of this historical era is fixed by the decision in March 1973 to abandon fixed exchange rates between principal currencies. The starting point, 1959, is the year major currencies became convertible, subject in many cases to restrictions on capital movements that were increased or relaxed as reserve positions changed.

Soon after the start of the period, and at the end, policymakers expressed concern about the competitive position of the U.S. economy. This concern about competitiveness returns again and again in the next four decades, although the focus of concern and the principal manifestation of the alleged problem shift. The alleged cause in 1959-60 was trade discrimination, which had been accepted by the United States at the end of the war to assist in the recovery from wartime destruction abroad. Soon after, the costs of foreign assistance and foreign military expenditures were added as causes. By the late 1960s these concerns and concern about foreign investment led successive administrations to restrict payments to foreigners by means such as the interest equalization tax, taxes on tourist expenditures, "buy America" programs, and "temporary" controls of foreign investment. Inflationary financing of the war in Vietnam and of domestic social spending more than offset any effect these programs may have had on the equilibrium value of the fixed, nominal exchange rate. Increasingly, the problem came to be seen as an exchange rate problem, specifically an overvalued dollar. As the Bretton Woods system ended, the dollar was first devalued against gold and major currencies, then allowed to fluctuate.

In the U.S. system, principal responsibility for international economic policy rests with the Treasury. The Federal Reserve is formally of secondary importance. Under Bretton Woods the Federal Reserve's main responsibility was to conduct monetary policy so as to maintain the fixed exchange rate agreed to by the administration. There is no specific legislative authorization for the Federal Reserve to buy and sell foreign currencies (Schwartz 1991). But the Federal Reserve had a larger, informal role. Officials and staff participated in international meetings, gave advice and counsel on what were seen to be the principal problems of the Bretton Wood system, and proposed solutions. They participated, as observers, at the regular meetings of the Bank for International Settlements, where central bankers held regular discussions and reviews of U.S. policies. There is little evidence, however, of any systematic effort by the Federal Reserve to conduct monetary policy in a manner consistent with the requirements of a fixed exchange rate system. And, there is no evidence that any of the administrations objected to this neglect. On the contrary, from the Kennedy to the Nixon administrations, domestic economic policy objectives, though frequently changed, were of overriding interest.

THE UNITED STATES IN THE BRETTON WOODS SYSTEM

The Bretton Woods agreement of 1944 established a system of fixed exchange rates based on gold valued at $35 per ounce. The

agreement was the product of extensive negotiations, with much of the work done by the United States and British Treasuries. The intention of the drafters, principally John Maynard Keynes in Britain and Harry Dexter White in the United States, was to establish a set of rules to replace the rules of the international gold standard and to avoid the rigidity of that system. Because the British feared that the United States would return to the protectionist and deflationary policies of the interwar years, there were safeguards against that occurrence. U.S. inflation was considered unlikely or, more accurately, was not considered at all, so there were no rules for adjustment to prevent inflation from spreading to countries in the fixed exchange rate system.

The agreement obligated countries to intervene to keep their currencies within 1 percent of their fixed but adjustable (dollar) parities. As the principal reserve currency, the United States was obligated to buy and sell gold for dollars (or convertible currency) at the $35 price. When the system started, the United States held about ¾ of the world's monetary gold stock. Currencies other than the dollar were inconvertible. By 1960, the U.S. gold stock had fallen, but the U.S. still held $20 billion, almost half of all monetary gold. In the early years, the United States's loss of gold was looked on favorably as a step toward convertibility. By the end of 1958, major currencies had become convertible for current transactions.[1]

The strengthening of foreign economies was a major aim of early postwar U.S. economic policy. At first, balance of payments deficits, foreign accumulation of dollars, and the redistribution of the gold stock were seen as desirable steps toward a viable international monetary system. By 1960, official concern about continued U.S. payments deficits began to be expressed.[2] The President's Economic Report for 1960, the last report prepared by the Eisenhower administration, discusses the competitive problems of the steel and automobile industries in world markets during 1959 and the growth of U.S. investment abroad, problems that were to remain for years to come (ERP, 1960).[3] Suggested remedies are limited to pro-competitive policies, such as the removal of quantitative restrictions against imports from the United States, and to recommendations that foreign governments increase lending to developing countries.

The major problem at the time was not a U.S. current account deficit. Throughout the 1960s, the United States typically had a surplus on current account. The problem was that the trade and current account surpluses were not large enough to finance net private investment abroad plus military, travel, and foreign aid spending abroad. To settle the balance, the United States either had to sell gold or accumulate dollar liabilities to foreigners. As the gold reserve declined and liabilities rose, concern increased that the liabilities would become too large relative to the gold reserve to maintain confidence that the gold price would remain fixed. Under Bretton Woods rules, foreigners had the option of converting dollars into gold; the United States had responsibility for keeping the gold price fixed by permitting conversions and, at a more basic level, adjusting the production of dollars to maintain confidence in future gold convertibility. This part of the agreement was an early casualty. As foreign liabilities rose, restrictions were placed on gold sales to private holders and pressure or persuasion was used to discourage central banks and governments from converting dollars into gold.

Deficits and foreign dollar accumulation was not the only problem in the system as seen by U.S. policymakers at the time. A steady surplus in the U.S. balance of payments would have transferred gold and dollars to the United States. Since dollar balances were part of foreign reserves, but not U.S. reserves, total world reserves would fall. A U.S. surplus was seen as undesirable, therefore. Under a U.S. payments deficit, conversion of dollars into gold left world reserves unchanged but lowered the gold reserves behind the principal reserve currency. With growing foreign trade, and an implicit assumption that imbalances increase with trade, reserves would prove inadequate to finance imbalances at fixed exchange rates and a fixed gold price.

[1]Germany permitted convertibility on capital account at the same time. The Japanese yen did not become convertible on current account until 1964.

[2]For the year 1959 as a whole, the U.S. balance on current account was negative, -$1.3 billion, for the first time since 1953.

[3]I will refer to these reports as ERP (year).

Figure 1
U.S. Gold Reserves and Liabilities to Foreign Central Banks and Governments

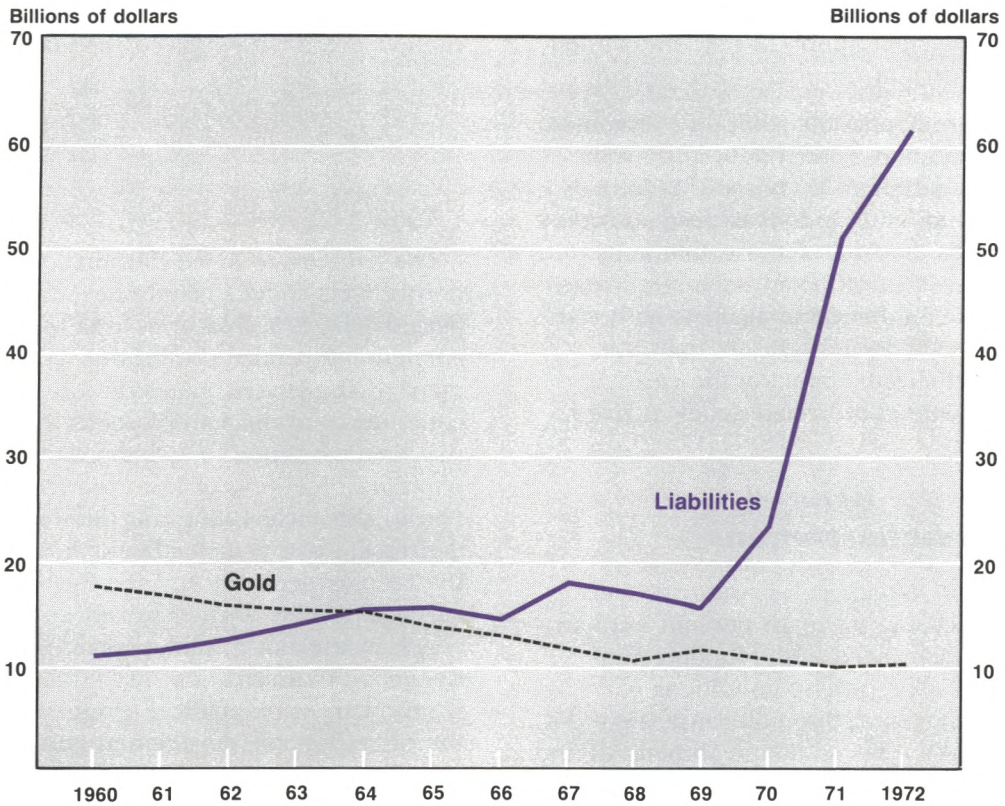


Figure 1 shows U.S. gold reserves and dollar liabilities to foreign central banks and governments for the period as a whole. The dollar liabilities shown in the figure were generally about half the size of total U.S. liabilities to foreigners. Dollar liabilities mounted, at first gradually, then more rapidly. By 1964, liabilities to central banks were equal to the U.S. gold reserve and by 1970 were twice the level of the reserve.

It seems clear in retrospect, as it did to some at the time, that the Bretton Woods system had a serious flaw. If foreign trade and payments imbalances rose with the growth of world income, there would be growth in the demand for world reserves. For a time, the demand could be met, as it had been, by increased foreign holdings of dollars and a decline in U.S. gold reserves. By the time recovery from wartime destruction abroad reached the point that restrictions on convertibility could be removed, the United States was losing gold and accumulating liabilities at rates that threatened the system's long-term stability.

Under the Marshall Plan (1948-52) U.S. policy encouraged foreign governments to rebuild reserves as a step toward convertibility. Countries were permitted, and even encouraged, to export to the U.S. while restricting imports from the United States. When the Marshall Plan ended, military expenditures to support military commitments and aid to developing countries maintained a flow of dollars equal to more than $2 billion a year. This helped western European countries as a group to achieve a current account surplus by the mid-1950s, despite a continuing trade deficit. Convertibility for current account transactions at the end of 1958 (as well as for capital account transactions in Germany)

plus the commitment to reduce internal trade barriers as part of a common market stimulated U.S. investment in Europe.[4] Hence, a capital inflow augmented the stock of foreign exchange reserves in countries outside the United States. In the two years 1958 and 1959, gold and dollar reserves of the principal European countries increased by $5 billion, about 25 percent of total U.S. reserve assets at the end of the period.[5]

There were four possible solutions (Friedman, 1953): (1) devaluation against gold and major currencies, (2) deflation, (3) borrow as long as foreigners would lend, and (4) impose controls of various kinds. Several of these solutions could be achieved in different ways. For example, foreigners could revalue against the dollar. Or, foreigners could inflate faster than the United States, thereby changing the relative prices of domestic and foreign goods at fixed exchange rates.

Policies of the Kennedy and Johnson Administrations

Under Bretton Woods rules countries were permitted to devalue up to 10 percent without consultation when faced with "fundamental disequilibrium." The precise conditions characterizing fundamental disequilibrium were not spelled out, and the International Monetary Fund (IMF) did nothing to clarify the conditions. The drafters had wanted to avoid both the inflexibility of the classical gold standard and the competitive devaluations of the interwar period. The language may have been intended to permit devaluation if the alternative was deflation while avoiding devaluation if a country could expect to restore payments' balance and repay a short- or medium-term adjustment loan.

Devaluations by major countries occurred. In the early years several countries followed the United Kingdom in a 30% devaluation in 1949. France devalued by 29 percent in 1958, and the United Kingdom devalued again in 1967. The United States chose to regard its problem as less than "fundamental." President Kennedy came into office committed to maintain the $35 gold price but also to "get the economy moving" after the relatively slow growth and two recessions in the previous four years. The commitment to a fixed nominal gold price ruled out devaluation of the dollar against gold and all other currencies; the commitment to higher economic growth removed the classical remedy, deflation of domestic prices and costs of production to raise the real dollar value of the U.S. gold stock and lower the relative price of U.S. exports. That left borrowing, controls and foreign inflation as the principal options.

The decision to avoid devaluation and deflation reflects some strongly held views of the period. The $35 gold price was seen as a firm commitment under the Bretton Woods Agreement. If the United States devalued once, it could do so again, with costs to the stability that Bretton Woods was supposed to provide. Avoiding repetition of the experience with deflation in the early 1930s and the decade-long depression was a major factor in the passage of the Employment Act and the Bretton Woods agreement. Few wished to repeat the prewar experience even in milder form. Hence, the Kennedy administration met little opposition from business or political groups in excluding the price options, devaluation and deflation.[6]

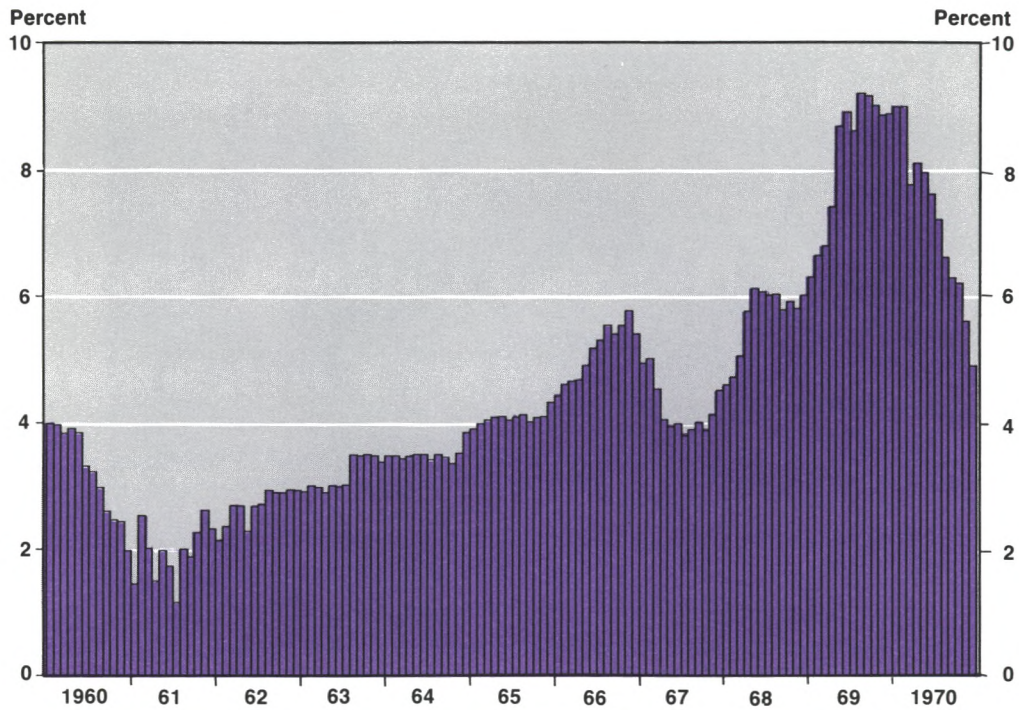
Kennedy's main domestic campaign theme had been getting the economy "moving" after the relatively slow average growth rate of the second Eisenhower administration. The Kennedy administration policies emphasized domestic growth, full employment and price stability as their major aims and relied on a so-called fiscal monetary mix to stimulate output while reducing the capital outflow. In practice, this translated into a series of tax measures—faster depreciation for capital, an investment tax credit and, later, reductions in personal and corporate tax rates. To limit the capital outflow, the administration tried to prevent a sharp counter cyclical decline in interest rates during the early months of the recovery from the 1960-61 reces-

[4]See ERP (1959).

[5]Total U.S. reserve assets include the total U.S. gold stock and its reserve position in the International Monetary Fund. At the end of 1959, these balances were $19.5 and $2.0 billion respectively. ERP (1971).

[6]The Kennedy Treasury led by Douglas Dillon and Robert Roosa was firmly opposed to devaluation. Dillon was an investment banker, and a Republican, who had served as ambassador to France. Roosa had been a senior economist at the N.Y. Fed and was very attracted to activist policies whether in domestic credit markets or international markets. At the Council of Economic Advisers (CEA), Walter Heller was mainly interested in domestic policy. Heller (1966) says very little about the dollar problem other than noting that the balance of payments required higher short-term interest rates. Kennedy saw the problem as a matter of prestige. Sorensen (1965), pp. 405-12.

Figure 2a
Federal Funds Rate During the 1960s



sion.[7] In cooperation with the Federal Reserve, the Treasury attempted to "twist" the yield curve by buying long-term bonds and selling short-term Treasury bills.[8] Since the market for government securities is very active and highly competitive, participants were able to reverse any temporary change in interest rates achieved by the twist.

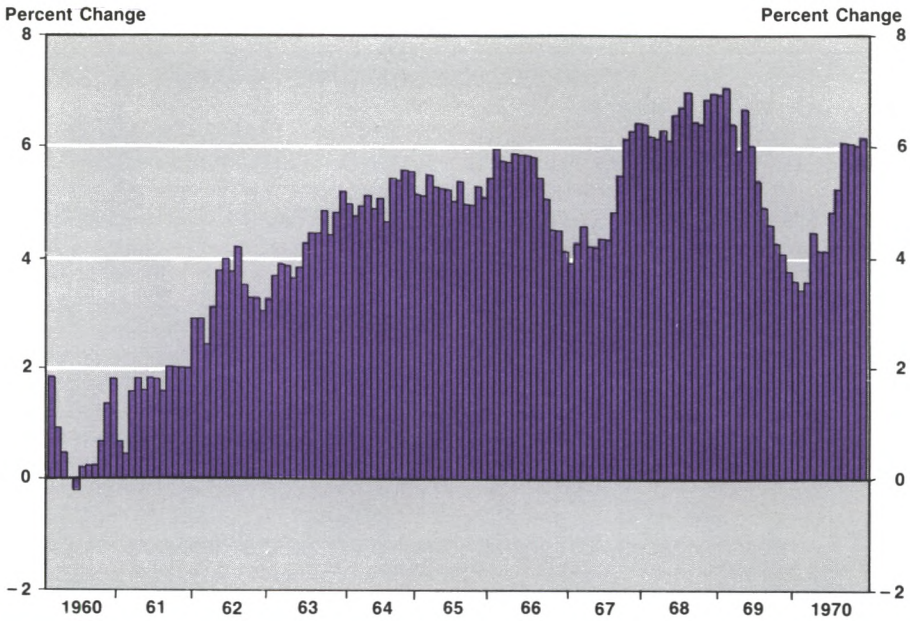
Neither money growth nor interest rates shows evidence of "tight money" in the early 1960s. Figure 2a shows the federal funds rate for that decade. The funds rate is the rate most tightly controlled by the Federal Reserve. From 1961 to 1966, the rate rose slowly, and it did not exceed 3 percent until late in 1963. Figure 2b shows the growth rate of the monetary base for the same period. The growth rate is computed as the percentage rate of change from the corresponding month of the preceding year. Shortly after the Kennedy administration came into office, growth of the base rose to about 1-1/2 to 2 percent. By mid-1963 the growth rate of the base was consistently above the long-term growth of output, 3 percent per annum. Growth of the base continued to rise in 1964.

With the possible exception of 1961-62, base growth shows no evidence that monetary policy was relatively restrictive. In fact, base growth, far from being deflationary, was inconsistent with continuation of the relatively low rate of inflation inherited from the past. To prevent higher inflation, the Kennedy administration introduced informal guidelines for prices and wages. The prevailing view was set out in the

[7]See Heller (1966), p. 5.

[8]The Treasury also auctioned "strips" of bills that required dealers to buy more than one issue at a time on the implausible assumption that the additional distribution cost would be treated by the market as a rise in the effective interest rate instead of a fee for service.

Figure 2b
Annual Growth of the Monetary Base During the 1960s



1962 *Economic Report of the President*. In this view, a relatively stable Phillips curve permitted policymakers to trade higher inflation for lower unemployment. The price and wage guidelines were supposed to improve the trade-off by reducing wage and price increases as the economy approached full employment.

A slow recovery gave way in 1963 to robust real growth. Inflation remained low. Until 1965, the fixed weight deflator rose between 1 percent and 1-1/2 percent annually and the consumer price index between 3/4 percent and 2 percent. Inflation was generally higher abroad, so relative prices of U.S. goods declined. Figure 3 shows the ratio of the U.S. consumer price index to a trade-weighted average of consumer prices abroad, based on the weights in Federal Reserve index of nominal exchange rates. The index shows the sustained relative decline in the U.S. price level during the first half of the decade. With few exceptions, the ratio declined monthly until 1966. CPIs are relatively comprehensive measures but, as is well known, not perfect measures of traded goods and services. Doubtless there are temporal differences between the price ratio in figure 3 and ratios computed using other prices, but the pattern of persistent decline would be little affected.

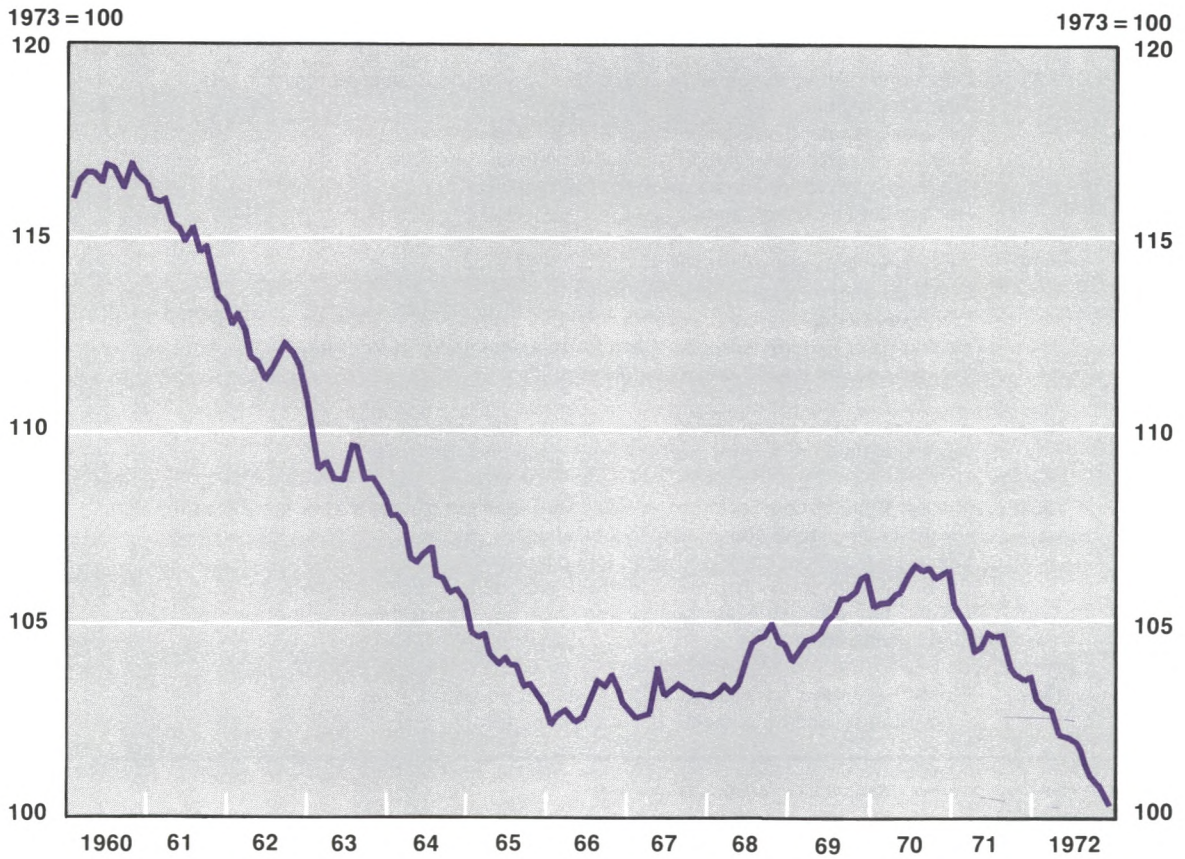
Under the impact of relative price changes and other factors, the merchandise trade balance increased. U.S. capital investment abroad continued to rise and domestic and foreign borrowers used the U.S. market to raise funds for investment abroad, so the capital outflow continued.

Special Measures

From 1960 on, each administration sustained or strengthened controls on trade and payments intended to reduce the balance of payments deficit.[9] At first, the measures consisted of

[9]Various definitions were used but the official settlements balance appears to have been the main concern. This balance consists of current account plus long-term capital flows plus net private short-term capital flows. I report this balance from time to time in the text, but I base my judgments much more on the current account balance. The concern about profitable investment abroad puzzles me; investment of this kind produces a subsequent inflow. Also, the current account balance is more useful for comparison of the fixed and fluctuating rate periods. On the role of the current account see Corden (1990).

Figure 3
Index of the Ratio of U.S. CPI to Trade-Weighted CPI



relatively modest steps to encourage exports (by subsidized loans from the Export-Import Bank) or to purchase military equipment and supplies in the United States even if it imposed higher costs. Within a few years, the list of controls and their efficiency cost increased. Development aid was tied to dollar purchases. An "interest equalization" tax was put on foreign borrowing and later raised. Most tourist expenditures were made dutiable. And guidelines were used to further limit the expansion of bank lending to foreigners and to limit growth of foreign direct investment. Table 1 lists some of the measures proposed or adopted.

The efficacy of the controls varied with the opportunity or ability to substitute uncontrolled for controlled transactions. Tieing military expenditures is inefficient to the extent that it raises costs, but substitution is probably limited. Requiring foreigners to pay the cost of U.S. troops abroad increases exports and the current account and reduces the capital outflow. Tieing foreign aid or military spending reduces the real value of the spending but may lead to higher appropriations, so that over time the actual dollar outflow is not much affected. Restrictions on foreign borrowing in the U.S. market are circumvented if foreigners or domestic citizens sell their holdings of dollar securities to purchase new issues sold abroad. Further, restrictions of foreign lending and investment affect relative rates of interest at home and abroad thereby reducing the effect of the restrictions. And foreign firms import fewer goods from the United States.

Table 1

Selected Balance of Payments Measures (Actual and Proposed)

1960	Expansion of Export-Import Bank lending and guarantees of non-commercial risks. Reduction in military dependents abroad (repealed in 1961). Reduction in defense and non-defense government purchases abroad.
1961	Offsets for military expenditure in Europe and additional procurement at home. Tieing development aid to dollar purchases. Increased taxes on foreign earnings of U.S. corporations. Reduced allowance for tourist purchases abroad from $500 to $100. Treasury intervention in foreign exchange markets. Repayment of German loans.
1962	Expansion of earlier programs. Offset purchases by Germany and Italy. Increased borrowing authority for the IMF. Beginning of Federal Reserve "swap" arrangements for currencies. Treasury issues foreign denominated securities.
1963	An interest equalization tax of 1% on foreign borrowers in U.S. market. Additional tieing of foreign aid to domestic purchases.
1965	Interest Equalization Tax on bank loans with duration of one year or more made to borrowers in developed countries (except Canada). Limits on growth of bank lending to foreigners. Encourage private companies to increase exports and repatriate earnings. Guidelines for direct investment by non-financial corporations to limit growth of foreign direct investment.
1967	Permit higher tax rates (up to 2%) for interest equalization tax. Expansion of lending authority of Export-Import Bank.

Source: *Economic Report of the President,* various years.

Controls and restrictions were, at best, a short-term solution. Most of the controls and restrictions in table 1 were introduced as temporary measures, although several were extended and strengthened when renewed. Even if these measures had succeeded in stemming the balance of payments deficit, they did not offer a permanent solution at a new equilibrium without controls. The problem would have returned when the controls were removed.

To smooth fluctuations in the gold price and short-term capital movements, the Treasury introduced several measures. Eight countries joined a gold pool in 1961 to stabilize the London gold market. Reciprocal credit agreements (called "swaps") with foreign central banks and the Bank for International Settlements provided loans of foreign currencies and dollars. Typically the Federal Reserve borrowed to purchase dollars held abroad instead of selling gold.[10] Swaps are a short-term accommodation. To repay the swaps, the Treasury began borrowing from foreign central banks at longer terms using bonds denominated in foreign currencies. The proceeds from the bond sales (called Roosa bonds) helped to repay the swaps without reducing the U.S. gold stock, again postponing the problem. Lending facilities of the IMF were expanded under the General Agreements to Borrow. The agreements provided that 10 countries would lend under specified conditions to augment the Fund's resources. This is the origin of the group of 10 (G-10).[11] Again, these were mainly short-term measures.

[10]See Solomon (1982), p. 42.

[11]Canada, Japan, Belgium, France, Germany, Italy, Netherlands, Sweden, United Kingdom, United States. Later, Switzerland joined the G-10, but the name remained.

The United States supplied 60 percent of the gold sold in the London gold market; the other members of G-10 were supposed to provide the rest. Foreign countries replaced some of their sales by purchases from the United States, so the U.S. contribution to the pool, direct and indirect, became a major cause of the decline in the U.S. gold stock. In March 1968, with U.S. gold reserves under $11 billion, the gold pool was abandoned. The price of gold for official transactions remained at $35, but the G-10 governments did not attempt to control the price for private transactions. To prevent arbitrage, foreign central banks agreed not to sell in the gold market.

For the years 1960-67 as a whole, the non-U.S. members of the G-10 (including Switzerland) acquired 150 million ounces of gold, an increase of one-third over their holdings at the end of 1960.[12] Every country except Britain and Canada added to its stocks. Britain sold 38 million ounces, the U.S. 164 million ounces. France acquired more than 100 million ounces, two-thirds of the total acquisition by G-10 countries.[13]

The year 1966 is the peak year for gold holdings of the G-10, excluding the United States, and 1965 is the peak year for the eleven countries, measured in ounces of gold. In these years, the value of the stock at $35 per ounce was approximately $15 billion. The value of the U.S. stock was approximately $13 billion, about equal to the non-gold foreign exchange holdings of the other members of the G-10. After 1968, non-U.S. members of the G-10 as a group reduced their stocks slightly until 1971, but several acquired gold in the market. The embargo can be said to have succeeded in this limited sense.

Also in 1961, the Treasury's Exchange Stabilization Fund (ESF) began operations in foreign currencies for the first time since the 1930s. The Federal Reserve joined in these operations in 1962, and in 1963 the Fed began lending dollars to the Treasury secured by Treasury holdings of foreign exchange. These so-called "warehousing" operations permitted the Treasury to expand its purchases of foreign exchange without seeking Congressional appropriations to support the activity. Warehousing remained small in the 1960s but increased substantially in the 1980s.

Proposals for Long-Term Adjustment

The policies of the Kennedy and Johnson administrations may have stabilized the level of foreign official holdings in the years 1963-66 but, as shown in figure 1 above, U.S. gold reserves continued to decline. A popular analogy at the time treated the United States as a bank for the international monetary system. Foreign dollar holdings were considered the analogue of bank deposits and gold the analogue of bank reserves.[14] The analogy suggests that the series of mainly short-term, one-time or allegedly temporary measures, such as the interest equalization tax, had not solved the problem of a future run on the bank. The gold reserve continued to fall absolutely and relative to official (or total) dollar claims.

The Kennedy administration was aware of the long-term problem. In 1962, the administration asked economists at the Brookings Institution to study the longer-term prospects for balance of payments adjustment. The report took the "basic balance"—balance on goods and services, government payments plus long-term capital flow—as its standard.[15] It projected that by 1968 this balance would be between a surplus of $1.9 billion and a deficit of $600 million, depending on the assumptions about growth, prices and costs at home and abroad. This section of the report was greeted warmly by the administration. The projected improvement reflected the assumption of a rise in foreign relative to domestic prices and a slowing of U.S. investment abroad as profit rates rose in the United States relative to abroad. The expected rise in domestic profit rates reflected the direct effect of the Administration's proposed reduction in corporate tax rates and the indirect, stimulative effect of tax rate reductions for households and businesses.[16] As shown in figure 3, a relative increase in prices abroad occurred, but the projections proved optimistic. The recorded 1967 balance was −$2.1 billion.[17]

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[12]All data on gold are from IMF (1990), p. 65.

[13]1967 is the peak for France's accumulation of gold. The following year France sold 40 million ounces to defend the franc's parity following the riots and disturbances.

[14]The analogy neglects the role of the pound as an alternative reserve currency, but its role was small and of declining importance.

[15]See Salant et.al. (1963).

[16]For the tax reduction to improve the basic balance, the rise in expected real returns in the U.S. had to overcome the expected positive effect of tax reduction on imports.

[17]See ERP (1964), p. 131.

The Brookings report also considered the effects of a U.S. surplus in its basic balance on the supply of world reserves and concluded that either a new source of world reserves would have to be found, or there would have to be greater flexibility of exchange rates. The report discussed a dollar-pound bloc and a continental European bloc with fixed rates inside the bloc and fluctuating rates between the blocs.[18] The Council of Economic Advisers summary of the Brookings study has no reference to this discussion.

The Council of Economic Advisers argued that, although the Bretton Woods agreement permitted exchange rate adjustments, "for a reserve currency country, this alternative is not available."[19] And, they added, "for other major industrial countries, even occasional recourse to such adjustments would induce serious speculative capital movements, thereby accentuating imbalances."[20]

With exchange rates adjustments ruled out, only two alternatives were considered. One was increased fiscal expansion by surplus countries and less expansive policies for countries in deficit. The other was introduction of some type of new reserve asset. The latter proposal led eventually to the creation of special drawing rights (SDRs).

This was the heyday of Keynesian policy, so it is not surprising that Keynesian policies have a prominent place in administration proposals. The administration favored a policy mix and what later became known as policy coordination. Under the fixed exchange rate system, countries were expected to buy and sell dollars to maintain their exchange rate. The economic reports of the President for the period assumed, however, that countries can adjust capital flow by varying the mix of fiscal and monetary policies. The ERP argues that "flexible changes in the mix of fiscal and monetary policies can serve to reconcile internal and external policy goals."[21] For the United States, the prescription was tax reduction to expand domestic spending while holding short-term interest rates high to reduce short-term capital outflow. Surplus countries with strong domestic demand were called upon to raise tax rates or lower government spending and expand money growth to lower interest rates. The idea was that the inflationary consequences of domestic monetary expansion would be reduced or avoided by the restrictive fiscal policy.

The International Monetary Fund's annual report for the period offers similar advice, but it warns of an inflationary bias. Surplus countries are subject to upward adjustment of wages and prices, but deficit countries are not subject to downward adjustments.[22] The IMF recognized that world trade had grown faster than the gold stock, but they limited their recommendation to a study of possible future needs.[23]

The Germans, to whom the recommendation for monetary expansion and fiscal restraint was often directed, were skeptical about the policy mix proposals. Their expressed concern was the inflationary consequences of U.S. money growth. They held to a more classical view that the problem was expansionary U.S. monetary policy, so it must be solved by restrictive policies in the United States, not expansive German policies. Their skepticism about "coordination" became a persistent feature of the policy dialogue under both fixed and fluctuating exchange rates.

Initially the German response was to discourage capital inflows. For example, German banks were required to hold relatively high reserve requirements against foreigners' deposits. The Germans argued, against the spirit of the Bretton Woods agreement, that deficit countries should adjust. They opposed revaluation of the mark even more strongly than they opposed domestic expansion, since they could avoid revaluation but could avoid expansive monetary policy only by imposing severe restrictions on capital inflows.

After much delay, and many denials, Germany revalued the mark by 9.3 percent in October 1969.[24] With the revaluation, Germany removed many of the border taxes and special reserve requirements on foreign deposits in German banks that had been used to limit capital in-

[18]See Salant et.al. (1963).

[19]See ERP (1964), p. 139.

[20]Ibid.

[21]See ERP (1964), p. 143.

[22]See IMF (1964), p. 28.

[23]Ibid., p. 32.

[24]The mark had been revalued by 5 percent in 1961. Solomon (1982), p. 162, reports the May 1969 statement given by a German official that the decision to not revalue was "final, unequivocal and for eternity." This is one of many strong denials during the period.

flows to Germany.[25] After the revaluation German prices rose more slowly than U.S. prices.

The experience of the late 1960s had a lasting effect on German monetary policy. After the mark re-entered a fixed exchange rate system with the principal continental European countries in the late 1970s, Germany revalued more frequently to avoid inflation and exchange controls. In the late 1960s, however, revaluation was delayed too long and was much too small to offset the effects of inflationary U.S. monetary policy.[26]

While urging German revaluation, the United States increased money growth in 1968. After the German revaluation, the Federal Reserve shifted to a more restrictive policy, raising the Federal funds rate (figure 2a) and slowing the growth of the monetary base. The sharp contraction in the growth of the base was followed by the start of a recession in the fourth quarter. The reduction in money growth, the increase in U.S. real rates of interest, and the recession helped to shift the current account balance toward surplus. By the middle of 1970 the quarterly balance had returned to a level not reached since the latter part of 1965.

Proposals to Increase Liquidity

"Adjustment" was one of a triad of topics discussed at numerous official and unofficial international meetings. The other topics were "liquidity" and "confidence." Liquidity received the most attention.

Proposals for additional liquidity differed. The French position was one extreme, the U.S. position the other. The International Monetary Fund took a position close to that of the United States. Positions did not remain fixed, but they were never fully reconciled.[27]

The U.S. position was that a new reserve asset was needed to supplement the stock of gold and dollars. Sales from official holdings in the London gold market had reduced official holdings during the middle 1960s, and dollar liabilities had continued to rise relative to the U.S. gold stock. The United States argued that it expected to bring its payment deficits to an end. When this happened, the world trading system would lack an adequate supply of reserves to finance future demand for reserve assets at the fixed gold price. Hence, the United States favored creation of a new reserve asset that could be increased with world trade or world demand for reserves.

This argument is, at best, incomplete. If the United States had a payments surplus, other countries would have deficits. The United States could add to reserves by buying other stable currencies, just as these countries bought dollars. The *Economic Report* recognizes that this argument is correct. Even if each country was in balance, the United States could buy foreign exchange for dollars to augment its reserves.[28]

The IMF combined the liquidity and adjustment issues. They argued that the creation of a new reserve asset and additional reserves reduced the need for deficit countries to adjust and increased the pressure on surplus countries to adjust.[29] This is, of course, an argument for inflation as a solution to the adjustment problem for the deficit countries and revaluation as the remedy for the surplus countries. This program was asymmetric; world inflation would increase but not decline.

Data in the IMF report, however, do not show a general problem of liquidity at the time. The IMF used reserves as a percentage of imports to measure liquidity—on the usual assumptions that reserves are used to finance imbalances and imbalances increase with trade. The data show that there was no general shortage of liquidity on this measure. The problem was limited mainly to the United States and the United Kingdom. Table 2 shows these data. Reserves include gold, foreign exchange and reserve position at the IMF.

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[25]See Solomon (1982), p. 164.

[26]Other parity changes during the second half of the 1960s include an 11.1 percent devaluation of the French franc in 1968 and a 14.3 percent devaluation of the British pound in 1967. Many of the sterling bloc devalued following Britain.

[27]Solomon (1982) gives a thorough account of the discussions, proposals and the meetings of various official groups. Solomon was a senior civil servant at the Federal Reserve with responsibility for international finance and an active participant or observer at most of the discussions.

[28]See *Economic Report* (1964), p. 145.

[29]See IMF (1966), p. 10.

Table 2
Ratio of Reserves to Imports

	1951	1959	1965
All countries[1]	67%	58%	43%
All countries except U.S.	39	44	49
G-10	73	63	43
Japan		40	26
Germany	14	34	42
United Kingdom	22	25	19
United States	204	126	67

[1]approximately 60 countries

Source: IMF, 1966, p. 13

The United States aside, world reserves were a larger percentage of imports in 1965 than in 1951 and not very different in 1965 than in 1959. The IMF notes that the ratio of reserves to imports fluctuated around a constant value.[30] Among major countries, only the United Kingdom shows a relatively low ratio. For many countries, the ratio had converged to 40 to 50 percent.[31]

The French complained about the special role of the dollar, the opportunity given to the United States to use domestic inflation to acquire foreign assets (at fixed exchange rates), and what they called U.S. hegemony. As a first step, they proposed to limit the size of U.S. payments deficits that other countries were obligated to finance, but they also sought a permanent arrangement under which reserve assets would be tied to gold. Later, they urged an increase in the price of gold. Jacques Rueff (1967) proposed a doubling of the price of gold accompanied by commitments by the United States and the United Kingdom to use part of the profit from revaluation to retire some of the dollar and sterling reserves held by foreign central banks.[32]

In its official proposals, the French government did not at first go as far as Rueff in favoring an increase in the gold price. Nor did it insist on a return to the gold standard. It favored a larger role for gold, restrictions on the financing of U.S. deficits, and a refunding of the sterling and dollar balances, particularly the latter.[33] In early discussions, France wanted to circumvent the IMF by creating a reserve asset for use by the Group of 10. The new asset would have a permanently fixed relation to gold. The effect of this proposal was to increase the effective gold stock and to devalue the dollar against gold.

The French proposal was not accepted. The alternative chosen was to create a new asset. In September 1967, at the Rio de Janeiro meeting of the International Monetary Fund, agreement was reached on the general principles governing creation of a supplementary reserve asset called Special Drawing Rights (SDRs). The new asset was to be a supplement to gold and dollars. The United States was not required to redeem dollar balances, and the gold price remained fixed. SDRs could be issued only if an 85 percent majority approved, and they would be held only by official holders, central banks and international monetary institutions. Finally, in July 1969, the amendments to the IMF agreement were ratified by a sufficient number of members to come into effect. At the Rio meeting of the IMF, the first allocations were agreed to but not issued.

In the IMF view, reserves were "less than adequate."[34] The report acknowledged that "the signals were conflicting."[35] The principal argument for more reserves is that non-tariff barriers, aid-tying, domestic preference and other trade restrictions had increased. At the time, no argument was made about the relation of reserves to trade or imbalances. And the argument about trade restrictions makes no effort to link trade restrictions to the liquidity problem. In fact, the restrictions continued in many countries after 1973.

SDRs were issued in 1970-72 and again in 1979-81. The 1970 issue added $3.1 billion to reserves. In the same year foreign exchange reserves increased by $14 billion, and total reserves reached $91 billion, a 50 percent increase for the decade and a 22 percent increase for 1970.[36] In total, 21.4 billion SDRs (valued in SDR units) were issued through 1985 when new

[30]See IMF (1966), p. 12.

[31]Ibid., p. 14.

[32]Rueff was Economic Adviser to President DeGaulle.

[33]See Solomon (1982), p. 73.

[34]See IMF (1969), p. 27.

[35]Ibid., p. 26.

[36]See IMF (1971), p. 19.

issues ceased. SDRs never became an important means of settlement. By the time the agreement to create SDRs had been reached, the Bretton Woods system was in its last days.

It seems doubtful that the SDR would have become a dominant medium of exchange or store of international reserves if the fixed exchange rate system had survived. The SDR was a specialized money but did not dominate alternatives as a means of payment or store of value. Gold is an established store of value with a long history. SDRs had to compete also with the dollar and later the mark, the yen and other currencies as a reserve asset. Balances held in each of these assets earn interest. At first, SDR balances did not earn interest, so they were less attractive than balances held in short-term government securities of the principal countries. There was no source of revenue or earnings; interest payments could only be made by creating additional SDRs.

After 1973, flexible exchange rates removed any need for a large stock of reserves for settling balances between principal countries, although countries continued to accumulate reserves and to intervene in the foreign exchange markets. The SDR could not be held by private wealthowners, so it could not be used for intervention. Further, the introduction of SDRs did not adjust relative prices or real exchange rates. Failure to solve the adjustment problem meant that the major effort to sustain the system by producing a supplementary reserve asset was largely wasted effort.

Additional creation of SDRs in 1972 was again divorced from events. World reserves (net of gold) had doubled in two years (from SDR 56 in 1970 to SDR 112 in 1972). Reserves in relation to imports were at the highest level in the postwar period before or after; countries held reserves equal to more than 14 weeks of imports at the end of 1972. In 1963, at about the time that the discussion of additional reserves began, the ratio was equal to nine weeks. In the same period, 1963-72, total reserves (net of gold) quadrupled in nominal value.[37]

The French were correct on two points that U.S. officials (and others) refused to acknowledge. First, the Bretton Woods system based on the dollar permitted the United States to export inflation to the rest of the world. Countries were obligated to buy all dollars offered at a fixed price. Sterilization of the inflow could be successful for short-periods, but as Switzerland, Germany and others discovered at the time, the fixed exchange rate gave speculators an opportunity to invest in one-way gambles with low risk and relatively high expected return. The Swiss franc or the mark were unlikely to depreciate, more likely to appreciate. Investors and speculators knew this. Hence, flows into these currencies became difficult to curtail.

Table 3

Rates of Growth of Money, 1969-71, Selected Countries

Country	1969	1970	1971
United States	5.9	3.8	6.8
France	6.1	−1.3	13.7
Germany	8.2	6.4	12.0
Italy	15.0	21.7	22.9
Japan	18.4	18.3	25.5
Netherlands	9.4	10.6	16.7
United Kingdom	−0.3	6.8	12.9

Source: *International Economic Conditions*, Federal Reserve Bank of St. Louis, June 1982.

Table 3 shows the pattern of money growth for a sample of countries. Many countries show a decline in money growth from 1969 to 1970 and all show a rise from 1970 to 1971, corresponding to the pattern in the United States, as France claimed. The size of the changes differs by country. All countries did not have the same trade pattern, so they did not receive the same proportional increase in base money. Some sterilized part of the increase for a time, and some countries adopted controls to reduce the inflow. In the winter of 1971, Germany allowed its exchange rate to appreciate relative to the dollar, slowing the inflow of dollars. This action recognized, as France has insisted, that countries could not prevent inflation while maintaining their dollar parities.

The second point on which the French position was correct was that revaluation of gold would solve the liquidity problem. Their various proposals would have devalued the dollar against

[37]Data are from International Financial Statistics, Yearbook 1990.

other currencies, thereby providing the addition to the stock of reserves that the SDR was supposed to provide. French proposals did not limit future changes in the price of gold, so they are open to the charge that expectations of future devaluation would lead to a run on the dollar once it had been devalued. Much earlier, Keynes (1923) had proposed a type of commodity standard in which gold served as a medium of exchanges. In this proposal, the gold price was tied to an index of commodity prices. Had a scheme of this kind been adopted, it seems likely that the Bretton Woods system would have lasted longer.

A devaluation of the dollar against gold, with other currency values unchanged, would have removed the liquidity problem in the 1960s. At the end of 1968, the U.S. price level was approximately 2-1/2 times the 1929 level. If the gold price had been raised proportionally from its 1929 value ($20.67), the 1968 price would have been approximately $52. At that price, the U.S. gold reserve would have been $17.6 billion, $1.6 billion more than U.S. liabilities to central banks and governments.

Although adjustments in the price of gold would have extended the life of the Bretton Woods system, it is unclear whether the system would have survived for more than a few additional years without some restriction on U.S. monetary policy, restrictions that the United States was unlikely to accept. Inflationary policies in the United States continued through the 1970s with only brief interruptions. Countries that chose to lower inflation in the 1970s would have had to leave the system. Further, inflation was not the only problem. The oil shocks of 1974 and 1979 changed the terms of trade, requiring changes in exchange rates that Bretton Woods system found difficult to accommodate. At best, devaluation of the dollar against gold would have corrected for differences in productivity growth and changing costs of production between the United States and the principal surplus countries, Germany and Japan. U.S. devaluation and the oil shocks would have changed the relative positions of other countries. Some would have found their trade balances in persistent deficit, requiring adjustment of their relative prices and costs or devaluations and revaluations of bilateral and multilateral rates, adjustments that were difficult to make and which would, in turn, have required further adjustments.

There is a plausible case to be made on the other side—that devaluation of the dollar would have prolonged the life of the Bretton Woods system. The key assumption is that the oil producing countries raised the price of oil in response to the decline in their real incomes after the dollar floated. A modest devaluation to a new fixed parity might have avoided the first oil shock. If so, the mistaken policies in the United States, attempting to offset the real effects of the oil price rise by inflation, would have been avoided. Inflation would have been lower and U.S. nominal gold reserves larger. It seems unlikely, however, that other countries would have accepted a U.S. policy of inflation and repeated, periodic devaluation against gold. Without a lower rate of inflation in the United States, the Bretton Woods system would have failed sooner or later.

Nevertheless, the French proposal was a straightforward solution to the liquidity problem of the 1960s. It would have resolved the liquidity problem at least for a time but would not have resolved the more difficult "adjustment problems" arising from changes in countries' prices, productivity, and costs of production. This was not the main reason for rejecting the proposal, however. Representatives of the governments and central banks claimed that any change in the $35 gold price or devaluation by a reserve currency country would damage "confidence."

Confidence

Throughout the 1960s, there were concerns about whether the United States could avoid default on its obligation to convert dollars into gold at the $35 gold price. Expressions of lack of confidence in the dollar often brought forth speeches by Presidents, Treasury secretaries and others to bolster "confidence." Words were not the only response. Actions were taken to strengthen or restore confidence.

The dollar and, to a lesser extent, the pound had a special role in the Bretton Woods system. They were "reserve currencies."[38] Central banks held dollar or pound securities as reserves in

[38]The use of reserve currencies was not part of the Bretton Woods plan. Britain's role evolved from its prewar position and the holding of sterling balances by countries in the sterling bloc. The dollar's role evolved from the dollar bloc and the unique position of the United States in the early postwar years.

place of gold to earn interest on their balances. Devaluation reduces the real value of these reserves, so anticipation of a devaluation could lead to a run on the dollar or the pound. Once total claims against the reserve currencies exceeded the gold reserves held by the United States and Britain, discussion of the confidence problem intensified.

The first evidence of a lack of confidence in the dollar was a temporary rise in the gold price in 1960. In October, the gold price on the London market moved above the official intervention price, $35.20 an ounce. Speculators said that the market was concerned about the possible election of John F. Kennedy as president and the continued capital outflow from the United States. Kennedy's talk of "getting the economy moving" may have seemed inflationary. To counter these concerns, Kennedy made a strong commitment to maintain the gold value of the dollar, and the Eisenhower administration took the first steps (discussed above) to reduce the U.S. payments deficit.

The temporary increase in the London gold price reflected both a rising demand for gold from European central banks and private holders and a refusal by the United States to supply gold to the market. The London gold price was set to clear trading. To maintain the price within its band, the Bank of England bought or sold gold for dollars, replacing the dollars or gold in an exchange with the U.S. Treasury. In October 1960, the Treasury appeared unwilling to restore the Bank's gold holdings, so the Bank refused to buy dollars for gold. With the residual buyer of dollars inactive, actual and prospective supply was reduced; the price of gold rose to $40 on October 27. The Treasury resumed sales, and the price returned to $35.

Two changes were introduced as a result of this experience. European central banks agreed not to buy gold on the London market if the price rose above the U.S. price plus shipping cost, $35.20. In October 1961, seven European governments and the United States created a gold pool. Each member of the pool agreed to let the Bank of England buy and sell for the group, and each received a pro-rata share of any gold purchases and supplied a share of gold sales. During the years that the pool functioned, member countries sold gold worth (net) $2.5 billion on the London market. The U.S. share was $1.6 billion.[39] As shown in figure 1, during approximately the same period, 1961-67, U.S. gold reserves fell more than $5 billion, the difference reflecting direct sales from the U.S. gold stock. But, as noted earlier, during the same period, the countries in the G-10, and especially France, added more than 100 million ounces ($3.5 billion) to their official gold reserves. The amount added by the G-10 represents 97 percent of the sales by the United States outside the gold pool. These data suggest that the pool did not function as intended; the G-10 replaced their sales from U.S. stocks.

The years 1962-64 saw a substantial increase in the U.S. current account surplus and reduction in the payments imbalance. The gold outflow, figure 1, slowed. Part of the improvement resulted from the restrictions on military and other purchases abroad, but part was the result of rising exports, achieved despite the relatively robust economic expansion in 1963 and 1964.

Figure 4 shows quarterly data on the current account balance (in billion of dollars) from 1960 to the end of the Bretton Woods system. After the increase in the surplus, to 1964, there is a steady decline interrupted by the recession of 1969-70. The temporary surplus of 1970 was soon replaced by a deficit that eliminated the effects of the surplus; the observations for 1972 are on a straight line fitted to the data for the second half of the 1960s.

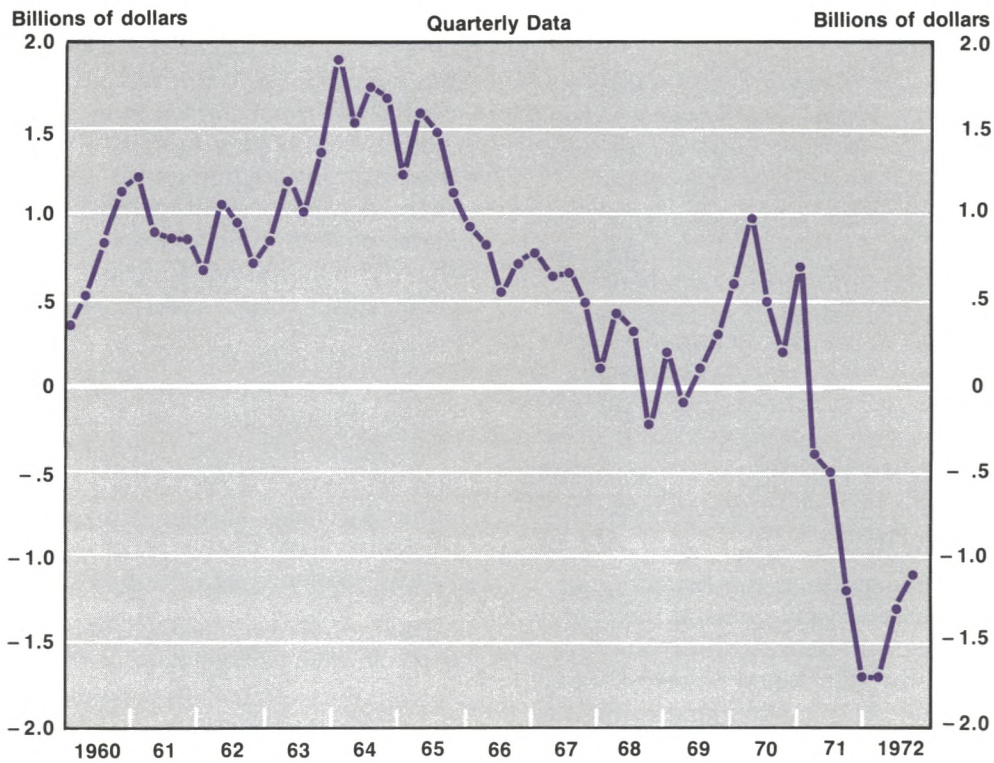
To slow the growth of dollar reserves abroad, the United States had to reverse the current account balance sufficiently to cover private investment abroad, transfers, and other capital flows, not in any particular year, but over time. By this standard, policy can be said to have failed to offset the negative trend in the current account balance after 1964.

One reason for the rising surplus in the U.S. current account balance in the early 1960s is that foreign costs rose relative to U.S. costs. Figure 5 shows the unit labor costs (ULC) for the United States relative to unit labor costs abroad.[40] The ULC ratio reaches a trough in

[39]See Schwartz (1987), p. 342.

[40]Unit labor costs (ULC) are available for Canada, Japan, Germany and the United Kingdom from 1963 to date. The index of foreign ULC is based on these countries. All data are from OECD, *Main Economic Indicators*, Historical Statistics, 1990. The weights are Federal Reserve trade weights normalized to sum to unity. 1985 is taken as the base year for United States and the trade weighted ULC.

Figure 4
Current Account Balance



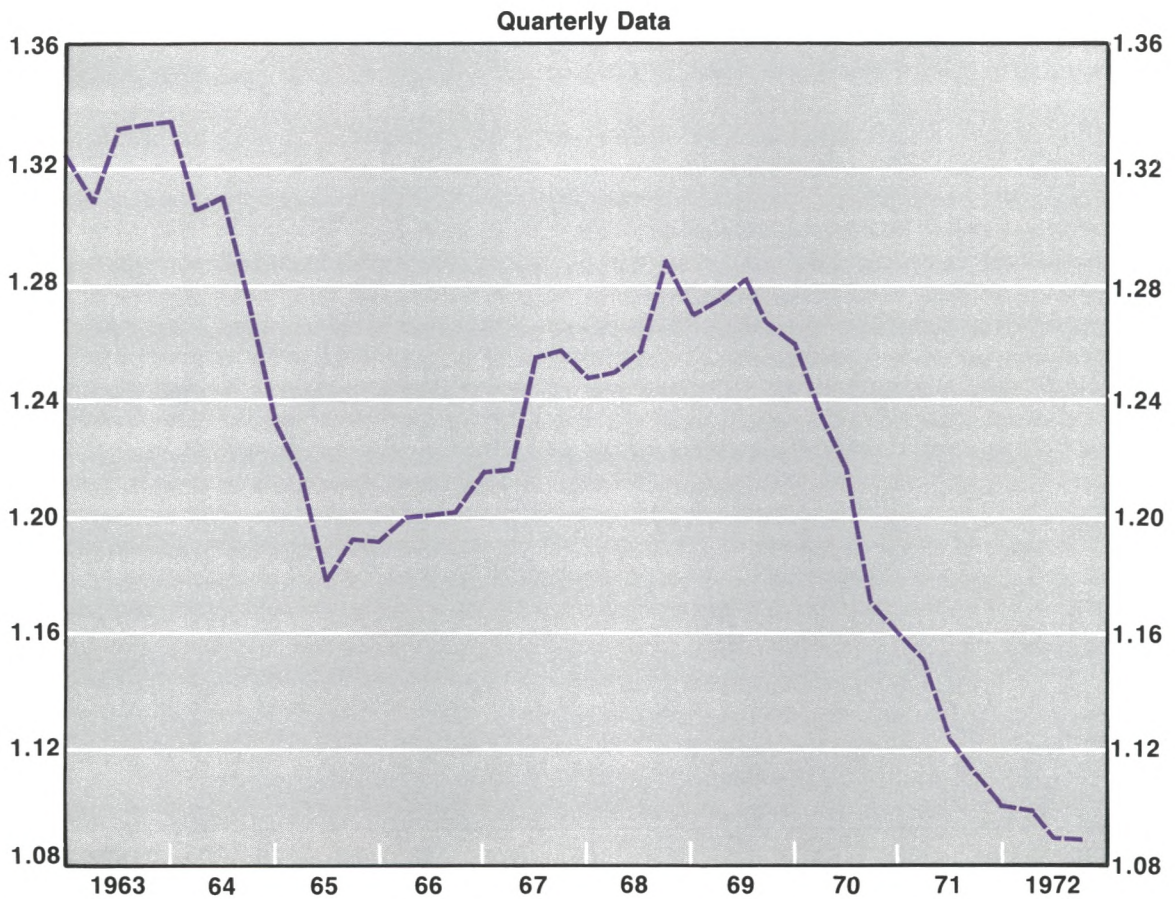
third quarter 1963, then reverses to reach a local peak in fourth quarter 1968. The current account (figure 4) has a similar movement; although its local peak is a bit earlier, the balance remains relatively higher until second quarter 1965. The trough of the current account is also in second quarter 1968. The next swing continues the negative relation. The current account rises until early 1970 while the ULC ratio falls. Thereafter, the two charts move together, falling until the end of Bretton Woods. A sharp decline in the ULC ratio accompanied the decline in the trade balance until 1972.

The comparison suggests that until 1970 or 1971, changes in the current account balance are consistent with the movements of relative costs. After 1970 the situation changed. The fall in the current account is not the result of a worsening of the competitive position of the United States as reflected in relative costs of production. The fall in relative costs may have continued to increase the current account balance, but their influence was more than offset by pressures in the opposite direction.

One possible explanation of the change in 1970-71 is that relative real rates of return to capital moved against the dollar. Such movements should be reflected in relative real rates of interest. Figure 6 shows the ratio of the ex post U.S. real interest rate to a trade weighted average of real interest rates using Federal Reserve trade weights.[41] The figure shows the

[41]The Federal Reserve uses shares of world trade to set individual country weights. The real interest rate index for foreign countries is based on Treasury bills for Canada and the United Kingdom and call money rates for Germany and Japan. The Federal Reserve trade weights are standardized for the four countries to sum to unity. Inflation is measured by the consumer price index for each country. The ratio shown uses three-month moving averages (not centered) for both series.

Figure 5
Ratio of U.S. Unit Labor Costs to Trade-Weighted Unit Labor Costs

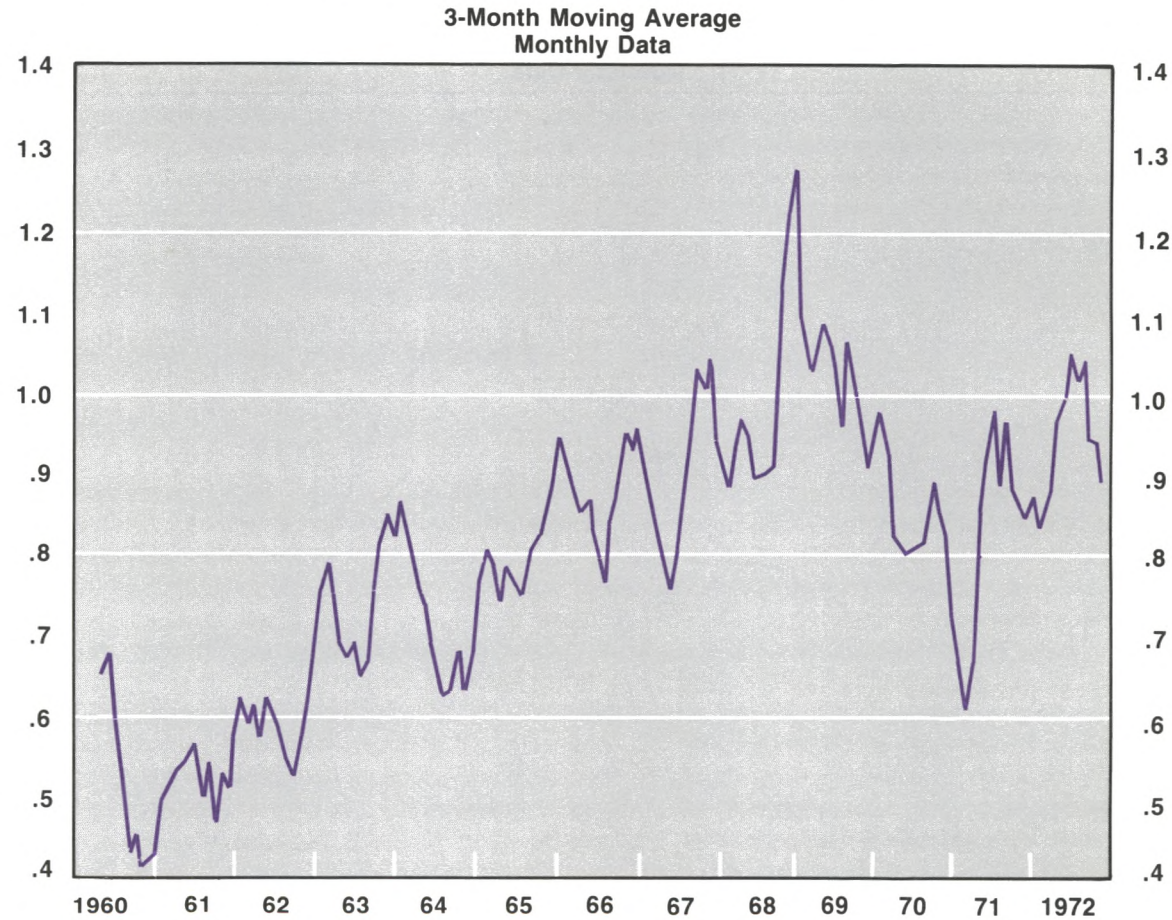


ratio of a three-month, non-centered, moving average of the U.S. short-term interest rate to a three-month moving average of short-term rates abroad. All rates have been adjusted for inflation in the particular country.

These data show that from 1960 to 1969, U.S. real interest rates rose on average relative to rates abroad. The sharp rise in U.S. rates from 1962 to 1964 contributed to the reduction in the net capital outflow and is reflected in the rise in current account surplus. The movement of relative interest rates, on average, reinforced the effect of falling relative costs of production during this brief period. After 1965, the relative rate of interest continued to rise, but the rise was too small to reverse the falling current account balance. And the increase in relative interest rates in the United States was apparently too small to prevent the very large capital outflow in that period. The path of relative interest rates does not explain the collapse of the current account balance and the large capital outflow in the early 1970s.

Relative interest rates give little evidence of a growing lack of confidence in the dollar in the late 1960s. A flight from the dollar would have pushed real U.S. interest rates above rates in world markets to compensate for the risk of

Figure 6
Ratio of U.S. Real Interest Rate to Trade-Weighted Real Interest Rate



devaluation and a run on the dollar. With few exceptions real rates in the United States were below rates abroad, on average about 10 percent below from 1966 to 1972. There is no evidence of a sustained rise in U.S. rates. The Federal Reserve pumped out monetary base to hold down interest rates. The rest of the world absorbed the dollar outflow with little change in real U.S. rates relative to rates abroad. The main exception is a spike in 1968-69 that mainly reflects a decline in the weighted average of real rates abroad.

The data on relative real rates of interest suggest that the Federal Reserve made little effort to slow or stop the capital flow. During the winter of 1971 relative real rates in the United States fell until March along with U.S. real rates, despite the large dollar outflow. The rise in relative rates in the spring and summer reflects both a decline in foreign rates and a rise in U.S. rates.

The gold and foreign exchange markets also give little evidence of a lack of confidence leading to a flight from the dollar during the 1960s. An exception is the winter of 1968 when the gold price rose and the two-tier market began. By 1969, the gold price in the free London market had fallen back to $35.2 per ounce. The same cannot be said for the other reserve currency, the pound sterling. By 1964, the pound was subject to market pressure to devalue rela-

tive to gold and the dollar. Repeated attempts to reduce the pressure each succeeded for a short time, then failed. Finally in November 1967, Britain devalued by 14.3 percent (from $2.80 to $2.40). Members of the old sterling bloc followed.

Pressure to devalue sterling occurred against a worsening problem of U.S. domestic inflation and a deteriorating relative cost position (figure 5). The Johnson administration's main efforts to slow price and wage increases were limited to exhortation (jawboning). These efforts extended to interest rates. With short-term interest rates fixed by the Federal Reserve (figure 2a), rising demand for goods and services and anticipations of higher inflation encouraged increased borrowing and higher money growth. As shown in figure 2b, the annual growth of the monetary base rose in 1965. Base growth reached the highest rate experienced in the postwar years to that time. Efforts to hold down rates paid on time deposits under Regulation Q ceilings added to the pressure on the banks. Depositors drew on balances to purchase securities in the open markets at home or abroad.

Early in December 1965, the Federal Reserve raised the discount rate from 4 to 4-1/2 percent and raised ceiling rates on time deposits. Although President Johnson criticized the change publicly, the higher rates remained in effect. As is often the case, however, the increase was too little and too late. Annual growth of the monetary base from the same month a year earlier did not decline until the second half of 1966, as shown in figure 2b. Inflation rose early in 1966. U.S. interest rates, after adjusting for inflation, fell relative to foreign rates (figure 6). Declines in relative unit labor costs and relative consumer prices ended. Reflecting these changes, the nominal current account balance plunged in the five quarters following the December 1965 decision, eliminating most of the increase achieved in the previous six years.

The Federal Reserve made a short-lived effort to slow the inflation in 1966. The federal funds rate rose and the growth of the monetary base contracted in the second half of the year. Responding to the less inflationary policy, sensitive measures of prices, such as the producer price index, reversed direction of change, falling from the local peak in third quarter 1966 to a local trough in second quarter 1967. A six-month average of consumer prices fell from a 4 percent annual rate in January 1966 to 1.3 percent in February 1967. Given the upward bias in consumer prices, resulting from the heavy weight on service prices (that are not adjusted for productivity and quality changes in inputs and outputs), it appears that the Federal Reserve had stopped the inflation. But, as figures 2a and 2b show, the Federal Reserve did not continue the policy. Federal funds remained at 4 percent for most of 1967 despite clear evidence of recovery.

By early 1968, consumer prices were rising at a 3 to 4 percent annual rate and, more importantly for the payments problem, rising relative to a weighted average of foreign prices. Relative unit labor costs rose sharply. The effects of changes in relative costs and prices on the U.S. payments position were partially hidden at first by a capital inflow from Europe; U.S. banks had began borrowing from the Eurodollar market. In part, this reflected the rise in relative rates of interest by 0.25 in the United States (figure 6), in part efforts to circumvent ceilings on time deposits including, at the time, all certificates of deposit (regardless of denomination). The result was a payments surplus in 1966, the first since 1957, and repayment of earlier Treasury and Federal Reserve borrowing from central banks and governments.[42]

Confidence in the administration's ability to maintain convertibility into gold or avoid devaluation reached a temporary low early in 1968. The immediate problem began with a run on gold when Britain devalued. The gold pool sold $800 million in November 1967. The run subsided in January, following the announcement that President Johnson had placed new controls on foreign investment by businesses, banks and financial institutions.

Demands for gold rose again in March. Rumors that the gold pool would end and the low cost of speculating against a price that could fall very little encouraged renewed speculation. After sales of $400 million on March 14, the London gold pool closed the next day. That marked the end of the gold pool. The market did not reopen until April. When it did, central banks no

[42]See Solomon (1982), p. 102.

[43]Haberler (1965) was one of the first to emphasize the greater importance of the adjustment problem relative to the liquidity problem, but neither his remonstrance nor others had much effect on official proposals. See also Friedman (1953).

longer supported the market price. There was now a two-tier market. Private transactors could buy and sell at the market determined price, although the 1934 ban on U.S. citizens' ownership of gold remained. Transactions between central banks were placed outside the market and continued at the $35 price. Also, the governments agreed that gold would not be sold by the members of the former pool to replace any central bank sales to the private market.

The central bank governors' communique' put a positive interpretation on their announcement, repeated their intention to maintain existing parities, and referred to the then forthcoming agreement to establish the SDR. It made no mention of adjustment of parities.[43] The central banks agreed to "no longer supply gold to the London gold market or any other gold market," but they hedged their statement to retain the possibility of buying gold.[44] The two-tier agreement remained in effect until November 1973.

The free market gold price went to $38 per ounce, suggesting that the market would have been satisfied by 10 to 15 percent devaluation of the dollar. For the rest of the year, the free market price remained between $38 and $43. Then the price fell back to $35 to absorb an increased supply of South African gold.[45]

For the year 1968 as a whole, the United States had a surplus in the balance of payments. The reason is that banks continued to borrow in the Eurodollar market and, following the Soviet invasion of Czechoslovakia, foreign investors purchased U.S. assets.[46] These decisions and events produced a payments surplus in 1968 despite a further decline of $2 billion to $0.6 billion in the current account surplus.

One lasting effect of the winter's events was the elimination of the gold reserve requirement for Federal Reserve notes. On March 12, Congress abolished the 25 percent gold reserve behind Federal Reserve notes. The legislation removed one of the last links between gold and the dollar in the original Federal Reserve Act. The initial requirement ratios, or backing, for bank reserves and currency had first been reduced, then eliminated for bank reserves and, finally, eliminated for currency. The stated purpose was to make the gold stock available to defend the $35 price. In fact, central banks did not again convert dollars into gold until 1971.

The two-tier system and the decision by central banks to refrain from converting dollars into gold had an unanticipated effect on the soon to be created SDRs. The United States had sponsored SDRs and urged their use as a substitute for gold in central bank reserves. Since central banks refrained from selling gold, and bought newly mined gold from South Africa and the Soviet Union, issues of SDRs served as a substitute for dollars in central bank reserves.

Looking back after the fact, it is surprising how small was the loss of confidence in the dollar as a reserve currency before 1971. Central banks and governments preferred to absorb dollars rather than revalue their currencies. Some private speculators purchased gold or other assets, but the purchases were not large enough to move the equilibrium gold price persistently above the fixed price until 1970.

Meeting after meeting during the last five years of Bretton Woods mentioned the three problems: confidence, liquidity, and adjustment. Central bank governors, ministers and their staffs gave most of their attention to liquidity and then to confidence. Aside from a few relatively small changes in parities, little was done about adjustment. The attitude of the IMF is representative of the period. Their 1969 report mentions adjustment of par values, following the French devaluation. The discussion reached only one conclusion: the par value system should be retained.[47]

THE END OF BRETTON WOODS

Concern about the rising budget deficit, the payments problem and inflation led Congress in June 1968 to accept the Johnson administration's proposed 10 percent income tax surcharge and, in return, to require the administration to reduce the growth of government spending. The response of the Federal Reserve was almost immediate; they reduced the federal funds rate in an attempt to mix easier monetary policy with tighter fiscal policy. Growth of the monetary base declined briefly, then rose to a 7 percent annual rate of increase (figure 2b). The six month average rate of increase of consumer

[44]See Solomon (1982), p. 122.

[45]Ibid., p. 124.

[46]Ibid., p. 105.

[47]See IMF (1969), p. 32.

prices rose at a 4 percent rate in 1968 but the annualized rate of increase was 6.5 percent at the end of the year.

U.S. consumer prices now began to rise relative to a trade weighted average of prices abroad (figure 3), reversing the trend decline of the early 1960s. Unit labor costs rose sharply relative to costs abroad (figure 5). The trade and payments position deteriorated; real net exports (1982 dollars) fell to −$30 billion in 1968 and −$35 billion in 1969 from −$17 billion in 1967 after a $6 billion surplus in 1964. As shown in Figure 4, the nominal current account balance continued to fall in 1968, reversed briefly during the 1969-70 recession, then resumed its decline.

The official settlements measure of the balance of payments shows the United States in surplus in 1968 and 1969 for the first time in the decade.[48] This was misleading, much of it the proximate result of Regulation Q ceilings on personal and corporate time deposits. As U.S. interest rates rose above the legal ceiling rates, commercial banks lost time deposits to the Eurodollar market.[49] The U.S. banks then borrowed in the Eurodollar market acquiring many of the deposits they had lost and some additional funds. The effect was to have a large inflow of short-term capital, $4.3 billion on the official settlements basis for the two years.

Interest rates fell during the 1970 recession, real rates declined on average relative to rates abroad, and the capital flow reversed with a vengeance. The official settlements deficit of −$9.8 billion was by far the largest to that time. But this flow was soon dwarfed by the −$31 billion outflow in the first three quarters of 1971.[50]

Figure 1 shows the surge in liabilities to foreign central banks and governments. These liabilities more than doubled to $50 billion in 1970, then rose another $11 billion in 1971. The classic response to a capital outflow for a country on a fixed exchange rate is to raise interest rates and reduce money growth. The Federal Reserve did the opposite, the federal funds rate fell from a peak of 9 percent early in 1970 to less than 4 percent the following year. Growth of the monetary base rose from 4 to 8 percent annual rate in the same period.

To any outside observer, it must have been clear that the United States did not intend to follow the classical rules or the policies of a country that intended to maintain a fixed exchange rate. The run from the dollar began. Foreign central banks experienced large increases in dollar reserves. Germany added $3.1 billion in the first six months of the year. German money growth rose from 6.4 percent in 1970 to 12.0 percent in 1971. German consumer prices, which had increased 1.8 percent in 1969 rose 5.3 percent in 1971. Despite rigid exchange controls, Japan could not escape the direct effect of U.S. money growth through the trade account. Japan's reserves nearly tripled in the first nine months of 1971, rising $8.6 billion. The Japanese money stock (M_1) rose more than 25 percent in 1971. Other countries had qualitatively similar experience.

In 1969, after much delay, Germany had closed the foreign exchange market, allowed the mark to float, then revalued by 9.3 percent on October 24. Within two years, three major currencies—the British pound, the French franc and the German mark—had been forced to change exchange rates.[51] The belief that economic stability required exchange rate stability began to erode.

The 1971 capital flow dwarfed previous experience. The U.S. deficit on capital account was almost $30 billion for the full year 1971 and $42 billion for the two years 1970-71. Of this amount, $40 billion became dollar reserves of other countries. Japan and Germany accumulated $11 billion each, more than half the total, and the United Kingdom acquired nearly $10 billion.[52] On May 5, seven European countries closed their foreign exchange markets. The German Finance Minister, Schiller, tried to persuade principal European countries to agree to a joint float, but France and Italy opposed. Four days later the mark and the Dutch guilder began to float. Switzerland revalued by 7 percent and Austria by 5 percent.[53] Belgium, with a split ex-

[48]The official settlements balance measures the change in reserve assets minus the change in short- and long-term liabilities to foreign official institutions (central banks or international agencies).

[49]A Eurodollar is a dollar deposit liability of a European based bank, including European branches of U.S. banks.

[50]See ERP (1972), p. 150.

[51]France devalued by 11.1 percent on August 10, 1969. Canada floated its currency against gold in May 1970.

[52]See IMF (1972), p. 15.

[53]See Solomon (1982), p. 180.

change rate, allowed the financial rate to float up. Early in August, faced with slow recovery from the recession, rising inflation, a persistent payments deficit, and fifteen months to election day, President Nixon decided to change economic policy. After meeting at Camp David on the weekend of August 13 to 15, he ended the fixed exchange rate system by suspending "temporarily the convertibility of the dollar into gold or other reserve assets."

The plan announced on August 15 included much more than the suspension of gold convertibility. Wages and prices were frozen for 90 days, allegedly to stop inflation then running at an annual rate of 3 percent for the six months ending in July. Tax credits to increase employment and investment were introduced to increase demands for output and labor and to reduce unemployment below 6 percent. A 10 percent surcharge was put on imports.[54] By the end of August, all major currencies except the French franc floated against the dollar.[55] The last remaining tie of the dollar to gold had been severed, at least temporarily.

Many of the changes announced on August 15 had been discussed for some time in advance. Chairman Burns of the Federal Reserve had advocated a price-wage policy for months. John Connolly, the secretary of the Treasury, favored strong action on trade and inflation. Stein reports that President Nixon and Connolly had agreed in the spring that they would impose price and wage controls if foreign demand for gold required them to close the gold window.[56]

The triggering event was renewed demands for gold from France and Britain. On August 8, the press reported that France would ask for $191 million in gold to make a scheduled repayment to the IMF. Later in the same week, on August 13, Britain also requested to exchange dollars for gold. The combined requests were small in comparison with the $12 billion increase in foreign holdings of dollars in the first nine months of 1971. Reports of demands for gold, however, generated fears of a run against the remaining U.S. gold reserve.[57] President Nixon and his principal advisers met at Camp David on the weekend of August 13 to 15 to adopt the program based on the agreement reached by Nixon and Connolly in the spring.[58]

The earlier policy had been called "steady as you go." In fact, U.S. monetary policy had been far from steady in 1970-71. The federal funds rate was driven down from 9 percent early in 1970 to 3.7 percent in March 1971, then increased 5.3 percent in July. During the same period, growth of the monetary base increased from 4 percent to 8 percent. The effect, given policies abroad, was to lower U.S. short-term interest rates relative to a trade-weighted average of rate abroad as shown in figure 6.[59] The decline in relative real interest rates ended in March, then reversed but, by March, the dollar's fixed exchange rate was falling, reflecting growing fears of devaluation. These fears strengthened as currencies began to float or revalue against the dollar.

When asset markets opened on Monday August 16, traders greeted the new economic policy enthusiastically. U.S. interest rates fell and stock prices rose. Many of the foreign exchange markets abroad were closed, but in the United States and, later in markets overseas, the dollar depreciated against most currencies. An exception is the Canadian dollar which remained in a narrow band for the rest of the year. The Japanese yen was at the other extreme; it revalued by about 5 percent initially and rose 10 percent by the end of September despite much intervention by the Bank of Japan. Between December 1970 and July 1971, the trade weighted index of the real U.S. exchange rate

[54]More precisely, the surtax was used to raise import duties no higher than their statutory level from which tariff reductions had been made. For autos, the increase was, therefore, 6.5 percent (ERP, 1972, p. 148). Shultz and Dam (1977), p. 115 explain that the surcharge was to be used as a bargaining chip to keep other countries from following the U.S. devaluation against gold. U.S. policy was to devalue against gold and other currencies. The surcharge raised the price of U.S. imports, so devalued the dollar against other currencies until they agreed to a formal devaluation.

[55]France adopted a dual exchange rate with financial transactions at a floating rate.

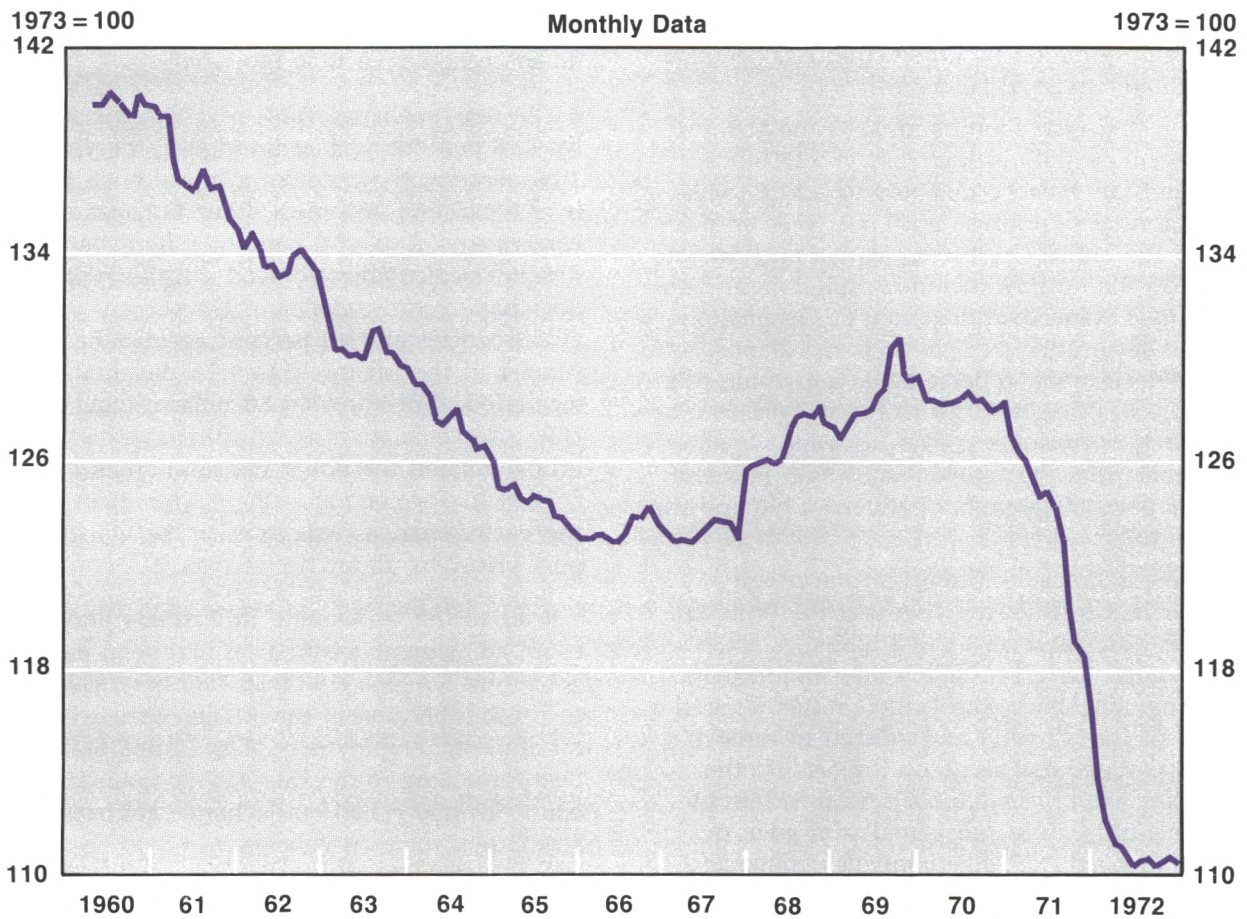
[56]See Stein (1988), p. 166. Herbert Stein was a member and later chairman of President Nixon's Council of Economic Advisers. The decision was told only to George Shultz, director of the Office of Management and Budget and Paul McCracken, chairman of the Council of Economic Advisers.

[57]See Shultz and Dam (1977), p. 110; Stein (1988), p. 166.

[58]Arthur Burns, chairman of the Board of Governors, participated in the meeting despite the independence of the Federal Reserve. Burns also participated in the administration's program as chairman of the Committee on Interest and Dividends.

[59]The local peak in the relative rate is 1.27 in January 1969. By March 1971 the relative rate reached 0.6.

Figure 7
Dollar's Real Exchange Rate Index



declined by approximately 3 percent; between July and the end of December 1971 the rate fell an additional 6.5 percent, so real devaluation for the year was approximately 9.4 percent.

Figure 7 shows the real exchange rate for the dollar against a trade-weighted basket of currencies using Federal Reserve weights. Since there are few parity changes prior to 1971, the real exchange rate reflects mainly relative price changes. Hence, figure 7 for the most part duplicates figure 3 until 1971. Thereafter, the two charts differ; the real exchange rate reflects both the devaluation of the nominal exchange rate and the change in relative prices.

What Next?

The price-wage freeze, the surtax on imports and the floating dollar were thought to be temporary measures. There is no evidence that the administration had developed a long-term program by August 15, but they began to do so.

The 1972 *Economic Report* summarizes some of their thinking by discussing three questions. Should realignment occur through market adjustment or negotiation? How large is the structural or permanent deficit? How should the reduction in the U.S. payments deficit be distributed among other trading countries? In practice, the distribution would be determined by the choice

of exchange rates, so the issue was the size of relative revaluations against the dollar.[60] Other countries, particularly France, wanted acknowledgment by the United States of its past inflation in the form of a devaluation against gold. Perhaps more important was the effect on country wealth. A devaluation by the United States raised the value of country gold stocks while a devaluation by other countries reduced the value of their dollar assets.

In the first nine months of 1971 the U.S. short-term capital outflow rose to $23 billion, and the basic balance declined to −$10.2 billion. At an annual rate, these outflows were equivalent to the entire short-term capital outflow for 1960-69. The outflow includes capital flight from the United States in anticipation of devaluation and a deteriorating current account balance. In part, deterioration reflected the worsening relation in U.S. prices relative to foreign prices. The ratio of U.S. consumer prices to trade weighted consumer prices in figure 3 shows an increase of four percentage points between 1966 and the end of 1970.

Although Treasury Undersecretary Paul Volcker had testified in June that the basic imbalance was about $2.5 to $3 billion, Volcker now argued for a $13 billion adjustment to reach equilibrium.[61] The United States favored a period of free floating and offered to remove the 10 percent surcharge on imports if other countries would remove barriers to trade. Instead central banks intervened, and governments imposed exchange controls. Exchange rates were not permitted to adjust freely; new rates were negotiated.

The Smithsonian Agreement

In December, finance ministers and central bank governors met at the Smithsonian Institution in Washington to agree on a new set of exchange rates. Gold was repriced at $38 per ounce, and bands on exchange rates were raised from 1 percent to 2.25 percent of central rates. The United States eliminated the 10 percent surcharge on imports, and the principal countries agreed to discuss reductions of trade barriers.[62]

The agreement on devaluation of the dollar against gold raised, or more accurately, continued a problem. The official gold price remained below the open market price that had now reached $42. Central banks, therefore, had an incentive to convert dollars into gold and sell the gold on the open market. The "solution" was to raise the official price but not require the dollar to be convertible into gold!

The new exchange rates revalued the mark by 13.6 percent against the dollar, the yen by 16.9 percent, the pound and the French franc by 8.6 percent, and most other European currencies by 7.5 to 11.6 percent. The Federal Reserve's calculation showed a trade weighted devaluation of the dollar of 6.5 percent against all currencies and 10 percent against the currencies of the Group of 10. The devaluation was estimated to produce an $8 billion swing in the U.S. trade balance in two to three years.[63] The IMF estimated the dollar devaluation as 7.9 percent of its former par value.[64] The effect of all the parity changes was to raise the world import prices by about 7.5 percent.[65]

Prior to the agreement, inflexibility and lack of an adjustment mechanism had been major problems. Surplus countries had been reluctant to revalue because of the effects of their exports on domestic employment. The United States had been unwilling to devalue against gold. Many countries had relied on exchange controls to strengthen their currencies.

The Smithsonian agreement took two steps to improve adjustment. The gold price changed, opening the possibility of further changes, and the dollar was devalued against the leading currencies. In addition, cross rates of exchange were altered to reflect, partially, the changes in the world financial system. Also, the 2-1/4 percent band on exchange rates permitted divergence of up to 4.5 percent. But, nothing was done to provide an orderly procedure for changing parities when there were persistent deficits or surpluses. The system remained relatively inflexible and poorly designed for the event which it soon faced.

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[60]See ERP (1972), p. 149.

[61]See Solomon (1982), p. 192-93; ERP (1972), p. 154. The $13 billion included a $6 billion surplus to provide for lending to developing countries.

[62]Secretary Connally's initial position included renegotiation of defense costs, but this issue was dropped. The discussion of trade barriers produced very few changes. (Solomon, 1982), p. 191.

[63]See Solomon (1982), p. 211.

[64]See IMF (1972), p. 38.

[65]Ibid., p. 22.

President Nixon called the agreement "the most significant monetary agreement in the history of the world."[66] In fact, it was a modest agreement that lasted less than fifteen months. Within a few months stresses reappeared in the international monetary system. In June, Britain decided to let the pound float. Within a month 17 members of the sterling bloc followed. In the same month, Germany imposed controls on capital inflows for the first time since the 1950s.[67]

The underlying problem was that U.S. policy remained inconsistent with maintenance of a fixed exchange rate system. Despite the price controls introduced in August 1971, the reported rate of change in consumer prices in 1972 was only 1 percent lower than in 1971. More importantly, the future did not look promising. The Federal Reserve made no effort to restrict money growth. Despite a surge in aggregate demand and industrial production, the federal funds rate was reduced to below 3-1/2 percent early in the year and was held below 5 percent until the November election. Growth of the monetary base remained above 6-1/2 percent, and growth of M_1 increased to 7 percent. Nominal imports surged, reflecting the devaluation and the strong economic expansion. For the year as a whole, real net exports were −$49 billion, a 20 percent rise in a single year and the largest deficit to that time. The nominal current account balance remained negative, −$5.8 billion, more than four times the deficit of the previous year.

For a few months in the summer and fall, the dollar stabilized. Prices in the United States declined relative to trade weighted prices abroad (figure 3) and, until September, U.S. real interest rates rose relative to trade weighted real rates abroad (figure 6). The rise in the relative real interest rate during the fall and early winter was small, however, in relation to the capital outflow.

In late January 1973, a new foreign exchange crisis began. Italy announced a two-tier exchange market to discourage capital outflows. Switzerland floated to reduce the flow from Italy and to control money growth. Pressure shifted to Germany and Japan. Within two weeks, Japan floated, and the Europeans closed their foreign exchange markets to halt the inflow of dollars.[68]

The United States made its last attempt to retain the par value system. On February 12, the dollar was devalued by 10 percent (to $42.22). Since the United States did not intervene to maintain the new price, the action was more symbol than substance. Secretary Shultz (who had replaced Connally the previous summer) also announced an end to U.S. exchange controls, including the interest equalization tax and restrictions on foreign loans and investments scheduled for December 1974.[69]

Within a few weeks, there was a renewed flight from the dollar, requiring additional purchases by foreign central banks under the rules. During the first quarter of the year, foreign central banks, mainly in the G-10, bought an additional $10 billion. The addition was more than 17 percent of total G-10 foreign exchange balances at the end of 1972.[70] The new purchases were sufficient to convince most countries to bring the Bretton Woods system to an end. The Europeans agreed on a joint float against the dollar and other currencies. The yen had floated earlier. De facto fluctuating exchanges rates became the norm for major currencies.

WHY BRETTON WOODS FAILED

In retrospect, the Bretton Woods system of fixed but adjustable exchange rates appears to have failed for two main reasons. First, the system was poorly designed, and the flaws became more apparent as time passed. Second, the United States did not pursue the monetary policy necessary to maintain a fixed exchange rate. On a few occasions, interest rates may have been raised to support the exchange rates (or to slow the capital flow), but monetary policy concentrated almost exclusively on a variety of domestic objectives. This was particularly true when the climax came in 1970-72.

The Flaws in Bretton Woods

The designers of the Bretton Woods system wanted to reduce the role of gold and make ad-

[66]See the *Wall Street Journal*, December 19, 1971.

[67]Previously Germany used reserve requirements on foreign deposits to reduce capital inflows. In June 1973 sales of German securities to foreigners were prohibited.

[68]The Bundesbank purchased $5 billion in the week ending February 9, 1973.

[69]See Pauls (1990), p. 897-98.

[70]IMF Yearbook (1990).

justment by deficit and surplus countries more nearly symmetrical. One of the designers, John Maynard Keynes, believed that with fixed but adjustable exchange rates and adjustment by both deficit and surplus countries, fluctuations in economic activity would be reduced; deficit countries would not be forced to contract, or would contract less, when faced with a temporary loss of reserves; instead, surplus countries would lend to deficit countries. In this way, fluctuations in output would be damped.

There were two problems with this plan for adjustment. First, surplus countries had no incentive to adjust, and they were generally reluctant to do so. Keynes had proposed a penalty on surplus countries that accumulated reserves, but this proposal was eliminated early in the development of the Bretton Woods system.[71] Second, policymakers could not distinguish a temporary disequilibrium, to be resolved by borrowing and lending, from a permanent disequilibrium requiring a change in par values. In practice, the system became more rigid with the passage of time. Britain delayed devaluation for several years before 1967. France delayed devaluation in 1968. Germany, Japan and other surplus countries delayed revaluations. Japan supported the yen for a few weeks even after August 15, 1971, by intervening sizably to slow the yen's appreciation.[72]

The flaws in the system appeared quickly, although they were not always recognized as such. A starting point for the full operation of the system is 1959, when currencies became convertible. By 1968, the dollar was *de facto* inconvertible into gold. Although the Bretton Woods system stumbled through the next several years, foreign central banks and governments, after March 1968, were discouraged from converting dollars into gold and did not do so. When some tried to convert, in August 1971, the U.S. formalized the restriction that had been in effect for more than three years by refusing to sell gold.

During the 10 years, 1959-68, from the move to convertibility to the effective embargo on U.S. gold, restrictions on trade and payments grew. The United States paid considerable costs to avoid buying supplies abroad for its troops in Europe and Asia. Much foreign aid was tied to purchases from the United States. Restriction of capital movements by Britain, the United States and other countries made the payments system highly illiberal and complex.

The ideal of Bretton Woods was a system of fixed but adjustable exchange rates among convertible currencies. During its short life, the goal became increasingly one of maintaining fixed rates. Adjustment of exchange rates and convertibility of the dollar into gold were lost. President Nixon's August 1971 decision, in this light, should be seen as a choice of adjustment over gold convertibility.

U.S. Policy

The professed principal aims of U.S. international economic policy included maintaining convertibility into gold and sustaining the Bretton Woods system. The policy failed in part because it was often short-sighted or wrong, in part because the United States placed much more weight on domestic concerns than on the maintenance of the world monetary system.

Throughout the 1960s, France urged, and the United States opposed, a revaluation of gold. The French argument was correct insofar as it recognized that a devaluation of the dollar against gold would increase the supply of world reserves and reduce dependence on the dollar as a reserve currency. The French were correct also in insisting that gold had a long history as an international money, but this argument confused rather than clarified the issues under discussion. Devaluation of the dollar against gold did not presuppose a change in the Bretton Woods system. That system was based on the dollar, a point that should have been completely clear after March 1968 when, de facto, countries could no longer convert dollars into gold. Had the United States agreed to revalue gold in 1965 or shortly after, it seems entirely possible that the many discussions leading to the issuance of SDRs would have been avoided and an adequate solution found for the liquidity problem much earlier. The U.S. policy delayed the solution until long past the time when it should have been apparent that a solution to the liquidity problem would not sustain the system.

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[71] See Meltzer (1988).

[72] The European exchange rate mechanism had much greater flexibility in its early years, and Germany and the Netherlands revalued several times. By the late 1980s, however, countries tried to avoid exchange rate changes.

Gold would have served as an effective means of payment between central banks, a role that the SDR did not acquire. More importantly for the Bretton Woods system, a revalued gold stock, if agreed to before 1968, could have imposed some discipline on the United States to pay in gold. Discipline was lacking once the de facto embargo on gold was in place after March 1968. Devaluation was not a panacea, however. Countries would have been unlikely to accept the cost of high U.S. inflation and frequent large devaluations against gold, so the system's survival would have required some restriction on U.S. policy. SDRs provided no discipline at all.

The arguments against gold revaluation were weak. The principal arguments were: (1) a devaluation of the dollar against gold would not solve the adjustment problem if other countries devalued against the dollar; (2) an increase in the gold price would benefit South Africa or the Soviet Union; (3) the gold standard was too rigid.

It is true that if all countries had devalued against the dollar, exchange rates would have remained fixed. But, the "liquidity" problem would have been solved and perhaps part of the "confidence" problem as well. Countries would have taken losses on their dollar reserves, but devaluation of the dollar would have reduced the risk that the system would collapse with a run on the dollar. Simultaneous devaluation would have focused attention on the adjustment problem by removing the liquidity problem that occupied so much time and attention.

Arguments about South Africa and the Soviet Union addressed domestic political concerns. These arguments had no practical relevance. In the end, the revaluation of gold was not avoided. South Africa and the Soviet Union continued to sell gold. The IMF established rules for purchasing South African gold that accepted South Africa's right to sell gold in the market and to member governments.

There is little reason to doubt that public opinion in many countries wanted to avoid a return to the gold standard. The gold standard was widely viewed as an excessively rigid, 19th century system. Some of the French, who favored a greater role for gold, emphasized the "discipline of gold" and the repayment of dollar and sterling liabilities.[73] They wrote as if they did not want a more flexible system of adjustment; they wanted greater discipline. They talked much more about the losses on holdings of dollars than the gain from a more stable, adjustable monetary system. Although a return to a full gold standard was not the consistent aim of French policy toward the international monetary system, their proposals and arguments made it easy for others to dismiss their arguments. Neither France nor other governments offered alternative proposals under which U.S. monetary policy would be subject to discipline.[74] Perhaps it was inevitable in the 1960s that any alternative to U.S. policy would be dismissed.

The U.S. argument that the dollar could not be devalued was, at most, a half truth. The restrictions placed on various types of transactions were partial devaluations that changed the relative prices of those transactions. The most obvious example was the interest equalization tax which raised the cost of borrowing dollars. Import-export bank subsidies lowered the cost of favored U.S. exports. Other restrictions worked in much the same way to selectively devalue the dollar.

Some of the restrictions were so short-sighted as to raise doubts about the purpose of the policy and the objectives of the policymakers. Restrictions on investment abroad by U.S. firms are an obvious example. Absent the restrictions, investment abroad would have been higher and the capital outflow larger. But, profitable investment abroad would have produced a return flow, increasing the current account surplus in the future. Whatever short-term gain the restrictions achieved, they had long-term, negative consequences. The problem was not a short-term problem of maintaining the Bretton Woods system for a few months or years. From a longer perspective the restrictions on investment were counter-productive.

One reason for the investment restrictions may have been that policymakers often focused on the basic balance or broader measures such as the official settlements balance. For these balances, U.S. long-term investment abroad is equivalent to an import of goods and services. Greater attention to the current account balance

[73]See Rueff (1969).

[74]There were many other private proposals including proposals for a world central bank. Haberler (1966), p. 9 refers to such proposals as endowing "the creation of their fantasy with perfect foresight, infinite wisdom..."

would have shown the steady decline in that balance, thereby concentrating attention on relative costs and prices. This focus would have posed more sharply the basic issue: deflation or devaluation. Reliance on investment controls partially obscured this basic issue as well as sacrificing the future for small, costly improvemments in the present.

The interest equalization tax was no less shortsighted than the restrictions on investment. The effect of the tax was to raise the cost of trading in U.S. markets, thereby encouraging part of the financial service industry to move abroad. A long-term result was loss of the export of some financial services.

By far the major flaw in U.S. policy, and the most damaging feature of the Bretton Woods system, was the failure to prevent U.S. inflation. As the system developed, the United States was able to choose domestic over international goals whenever a choice had to be made. At times, particularly in the early 1960s, U.S. nominal interest rates were kept higher for a few weeks or months to reduce the capital outflow. But such choices usually were reversed if unemployment rose. U.S. policymakers typically chose expansion to deflation and used controls of various kinds to get temporary reductions in the capital outflow. And, after 1966, policymakers adopted more inflationary policies than before. Given the priority placed on employment and other domestic goods, such as housing, price stability was ruled out.

All of the responsibility for failure does not fall on the United States, Germany, Japan and others pursued export growth as a holy grail and either made few efforts to adjust their exchange rates or none at all. Spokesmen for Germany could point correctly to the inflationary policies of the United States, and the failure of the United States to adjust domestic policies so as to honor international commitments, but they were less forthright about the adjustment of countries with sustained surpluses that had undervalued currencies.[75] After the Bretton Woods experience, Germany changed its policies toward adjustment. In the European Monetary System, Germany revalued frequently to keep that system from experiencing the adjustment problems of Bretton Woods.

It is surprising how little attention was paid to the adjustment problem. The Kennedy, Johnson and Nixon administrations did not propose a permanent solution.[76] Each so-called crisis left more controls on capital movements or other transactions, but these efforts were not followed by internal discussions of policies leading to a long-term solution in which controls would be removed. The *Economic Reports* of Presidents Kennedy, Johnson and Nixon have lengthy sections each year on the international monetary system, but the reports say little about adjustment. The typical comment was that surplus countries should revalue or expand demand. The explanation for neglect of adjustment is not that such discussions were sensitive. Solomon (1982) reports on the many meetings that were held during these years. There are pages on proposals and negotiations about liquidity, very little discussion of adjustment. The G-10 and the International Monetary Fund are no better.[77] They, too, avoided the issue or limited their comments to suggestions that surplus countries expand without inflating. Even the devaluations by Britain and France were not followed by discussions of the effect of the devaluation on the United States.

As the Bretton Woods system developed, it acquired some of the characteristics its designers had hoped to avoid. Major countries were reluctant to change parities. Surplus countries argued that adjustment was the responsibility of deficit countries. Deficit countries made opposite arguments, appealing to the need for symmetry.

The 1960s witnessed the beginning of efforts to solve international monetary or economic problems by coordinating policy actions. In practice, this usually meant that surplus and deficit countries were supposed to agree on different mixes of monetary and fiscal policy actions. Discussions produced few concrete steps. Foreign countries accepted the expansions implied by the flows of U.S. dollars, but they did not systematically reduce government spending or raise taxes to slow their expansions and lower domestic interest rates. And, as discussed earlier, the United States focused mainly on domestic

[75]See Emminger (1967) as an example. Otmar Emminger was a director and later president of the Deutsche Bundesbank.

[76]See Shultz and Dam (1971), p. 111. Milton Friedman sent a long memo to President-elect Nixon in December 1968 urging a prompt, decisive change in policy. Nothing was done. See Friedman (1988).

[77]See Solomon (1982), p. 173.

objectives. The dialogue about coordination, once started, was hard to stop. It continued into the 1970s and 1980s. Countries that faced a balance of payments deficit usually favored coordinated action. Countries in surplus usually were opposed.

The end of the Bretton Woods system was followed by diverse predictions. Some saw fluctuating exchange rates as a means of increasing stability or domestic policy. Some warned about the instability that would follow. It is now clear that neither was correct. The warnings about the consequences of the collapse of Bretton Woods proved to be wrong. The inconvertible dollar continued to function as an international medium of exchange and store of value. The accumulation of dollar assets by foreign central banks and governments continued to rise. By the end of the 1970s, nominal dollar reserves of the G-10 countries, excluding the United States, had doubled from the level at the end of 1972. In the next decade, these reserves doubled again to more than $300 billion. Central banks and governments continued to be more willing to acquire additional dollars than to allow the dollar to devalue.

The end of Bretton Woods improved the adjustment mechanism, but did not quickly eliminate inflation or inflationary policies. Countries gained the opportunity to pursue independent policies. Inflation differed between major currencies but both governments and some private individuals complained about the variability of nominal and real exchange rates. During most of the next 20 years, the principal currencies continued to fluctuate.

However, countries did not float freely. Dirty floating, managed exchange rates, intervention, exchange controls and trade restrictions were retained or introduced. Despite these policies and complaints about excessive variability of exchange rates, there was no interest in a return to Bretton Woods.

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