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In This Issue . . .

The first article in this *Review* is the text of the 1988 Homer Jones Memorial lecture presented by William G. Dewald of the U.S. Department of State. In "Monetarism Is Dead; Long Live the Quantity Theory," Dewald distinguishes between simplistic monetarism, which he believes "was widely interpreted as providing an alternative to short-run Keynesian model forecasts" and "the Quantity Theory, whose focus is on the long run."

After an analysis of long-run relationships and short-run forecasts, Dewald concludes that we simply don't know enough about the magnitude and timing of monetary effects to fine-tune the economy effectively in the short run with monetary policy actions; consequently, he believes that "monetarism as a short-run forecasting method should be buried." He recommends that Federal Reserve policy procedure should focus on the long-run relationship between money growth and nominal GNP growth, as emphasized by the Quantity Theory of Money, to constrain future inflation. Dewald suggests that having the Federal Reserve "target a non-inflationary nominal GNP growth path for the five-year federal budget cycle would be a step in the right direction."

* * *

Although economic policymakers from the major industrialized economies have called increasingly for greater coordination of policies, little is known about how such coordination might work in practice. To investigate the effects that economic policy coordination might have, Michael T. Belongia, in the second article in this issue, examines the performance of the European Monetary System. This group of countries has agreed, since 1979, to peg bilateral exchange rates within specified bounds, presumably to enhance overall economic performance. In "Prospects for International Policy Coordination: Some Lessons from the EMS," Belongia compares the performance of this group of countries against a group that did not (explicitly) peg exchange rates. He finds no systematic difference in performance, either between groups of countries or before and after the EMS was formed. Thus, policy coordination appears to have had no important influence on economic performance, one way or another.

* * *

During the past 10 years, considerable controversy has developed over how interest rates are related across countries. One approach focuses on the relationship of interest rates across the maturity spectrum, or term structure. In this view, movements in current short-term interest rates influence how interest rates will change in the future. In the third article in this *Review*, "International Linkages in the Term Structure of Interest Rates," Clemens J. M. Kool and John A. Tatom use this approach to study the relationship of short- and long-term interest rates for five countries: the United States, Canada, the United Kingdom, West Germany and Japan.

Kool and Tatom explain the theoretical basis for expecting interest rates to be connected across countries. They show that long-term rates have been closely related among the five countries, while short-term rates have not. This finding raises a serious challenge to the term-structure view.

The authors point out that the influence of changes in foreign short-term rates on both domestic short- and long-term rates could show up initially only in the latter rate. They find some evidence that changes in U.S. short-term rates have had a statistically significant influence on long-term rates in Canada, Japan and West Germany, but that changes in one-month interest rates elsewhere are not significant. The relationship from the United States to other countries is not robust either. Kool and Tatom conclude that the term structure is not a reliable mechanism connecting interest rates across countries. Instead, they suggest that changes in international long-term rates are related directly and quickly because of relatively common inflation rates and real interest rate developments.

* * *

In light of recent declines in the nation's unemployment rate to below 5.5 percent, Keith M. Carlson, in the fourth article in this *Review*, examines the question, How much lower can the employment rate go without accelerating inflation? This critical rate, usually referred to as the "natural rate of unemployment," was the subject of major research in the late 1970s. At that time, estimates of the natural rate ranged between 5 percent and 7 percent, but generally centered on 6 percent. Carlson reviews the developments that have affected the natural rate since World War II, focusing on the period since 1979.

The author notes that the most obvious structural change in recent years has been the shifting age composition of the labor force, which has reduced the natural rate about one-half percentage point below its 1979 level. The minimum wage, individual and employer tax rates and, possibly, unemployment benefits also have moved favorably. As a result, the current natural rate appears to be well below the 6 percent midpoint estimated in 1979.

* * *

Restrictions on the activities of banking organizations are being relaxed by federal and state authorities, and Congress is debating a more complete restructuring of the U.S. financial system. In the final article in this *Review*, "A Comparison of Proposals to Restructure the U.S. Financial System," R. Alton Gilbert describes six of the major proposals for restructuring the financial system and examines how they might affect the returns to shareholders of banking organizations as well as the potential losses to federal deposit insurance funds.

Examining various methods of combining a hypothetical bank and nonbanking firm in the same corporation leads the author to conclude that, under certain conditions, the expected loss to the insurance funds is smaller if banks offer nonbanking services directly, rather than through separate corporate entities. Gilbert also concludes that loans by bank subsidiaries to their nonbank affilitates generally are not in the interest of the bank holding company.

William G. Dewald

William G. Dewald is deputy director, Planning and Economic Analysis Staff, at the Department of State. This paper, the second annual Homer Jones Memorial Lecture, was presented at St. Louis University on May 6, 1988. Views expressed are the author's own and do not represent the U.S. Department of State or the federal government.

Monetarism Is Dead; Long Live the Quantity Theory

IN OCTOBER 1979, when the Federal Open Market committee adopted new operating procedures purported to be directed at control of monetary aggregates, newspapers reported that economists at the Federal Reserve Bank of St. Louis celebrated. Many had been hired and inspired by Homer Jones, its former research director, to whose memory this lecture is dedicated. The celebration was premature.

Those new procedures were a cover for genuinely restrictive policy actions that reversed the upward ratcheting of inflation begun in the 1960s. It threatened to get out of hand in 1979. Such a policy reversal was altogether appropriate, but, as in earlier episodes, it represented an abrupt shift in direction made necessary because earlier policy had taken the economy so far off course. Whether or not the Federal Reserve genuinely attempted to control growth in the monetary aggregates beginning in 1979, it no longer does. The reason is not that it could not, but that the relationship between growth in the aggregates and GNP, and in turn inflation, appeared so unpredictable. Consequently, in recent years the Federal Reserve has reverted to manipulating open market purchases and sales of securities to hold federal funds rates or free reserves within target ranges as was the practice from the 1920s until 1979.

In 1961, soon after leaving the Federal Reserve Bank of Minneapolis, I gave a talk there in which I criticized Federal Reserve operating procedures for focusing on free reserves or interest rates rather than growth in the monetary aggregates. The Federal Reserve was characterized as a baseball player who can't hit a curve. He swings at where the ball was, not where it is. The example I cited was the experience in 1960 when the Federal Reserve persisted in targeting lower and lower interest rates even as monetary growth turned negative and the economy slipped into recession.

The Chairman of the Board of Governors of the Federal Reserve in those days was William McChesney Martin. He likened the role of monetary policy to "leaning against the wind," the idea being that money market conditions as measured by interest rates or free reserves would tighten during business expansions and ease during contractions. In 1988, the Federal Reserve no longer tightens, it snugs. Whatever the name, there is a problem with this approach. Even if the Federal Reserve takes no action, interest rates can change because of changes in total spending in the economy and associated credit demands. The risk is that the Federal Reserve will attribute a decline in interest rates, as it did in 1960, to its policies when in fact, by not selecting a low enough interest rate

Chart 1

GNP Deflator

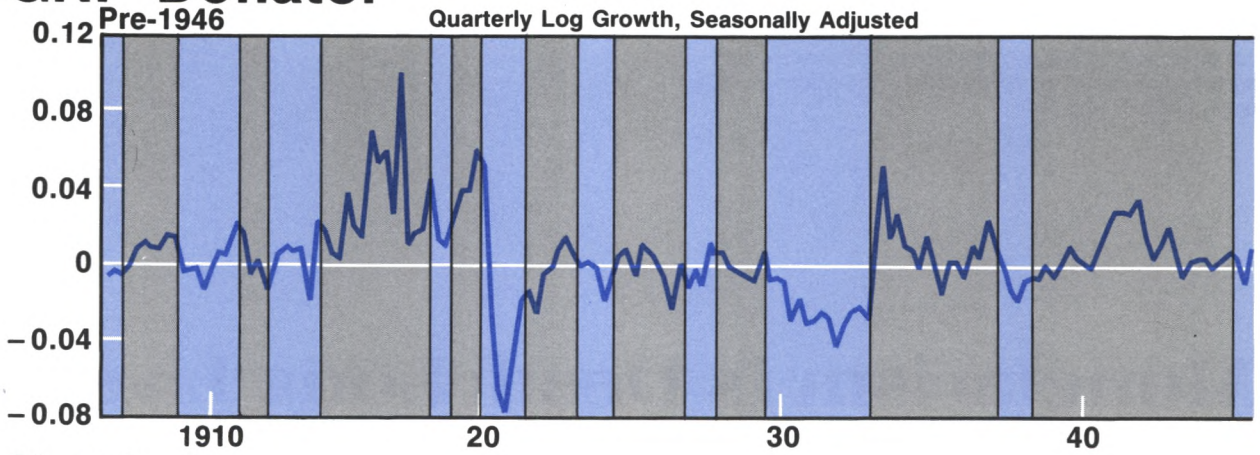


Chart 2

Real GNP

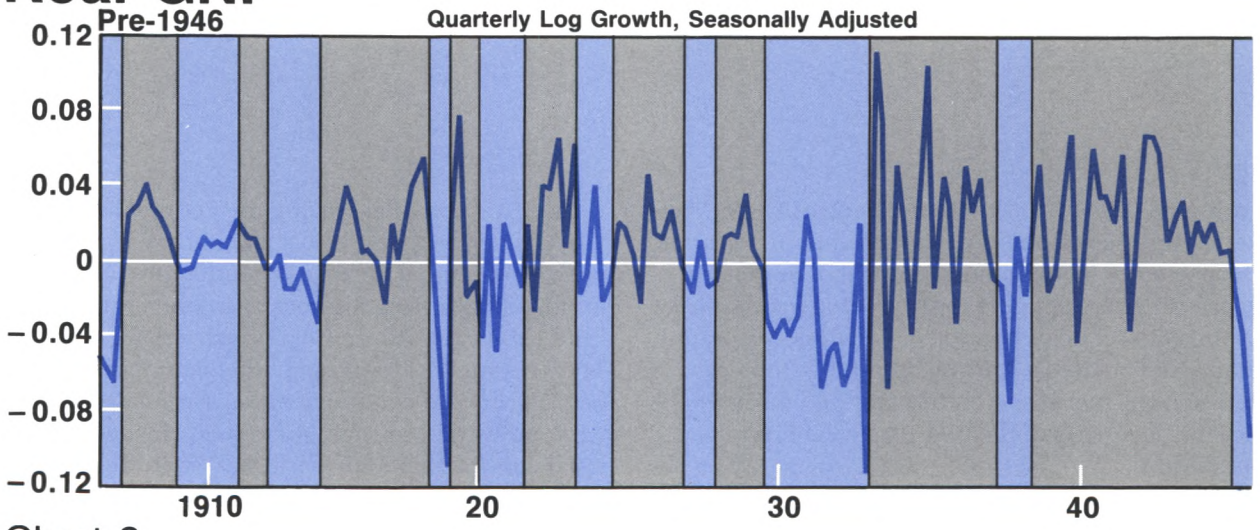
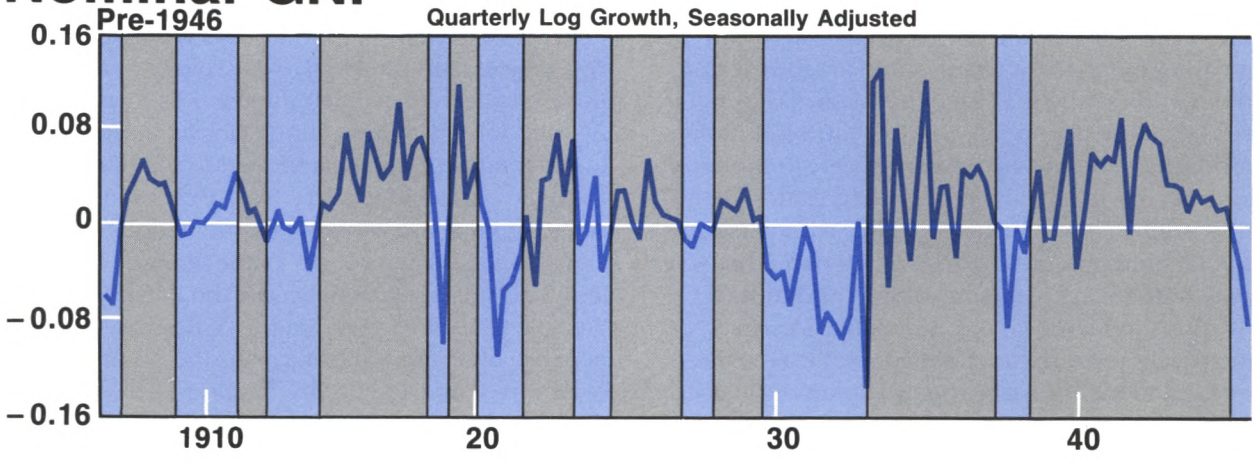
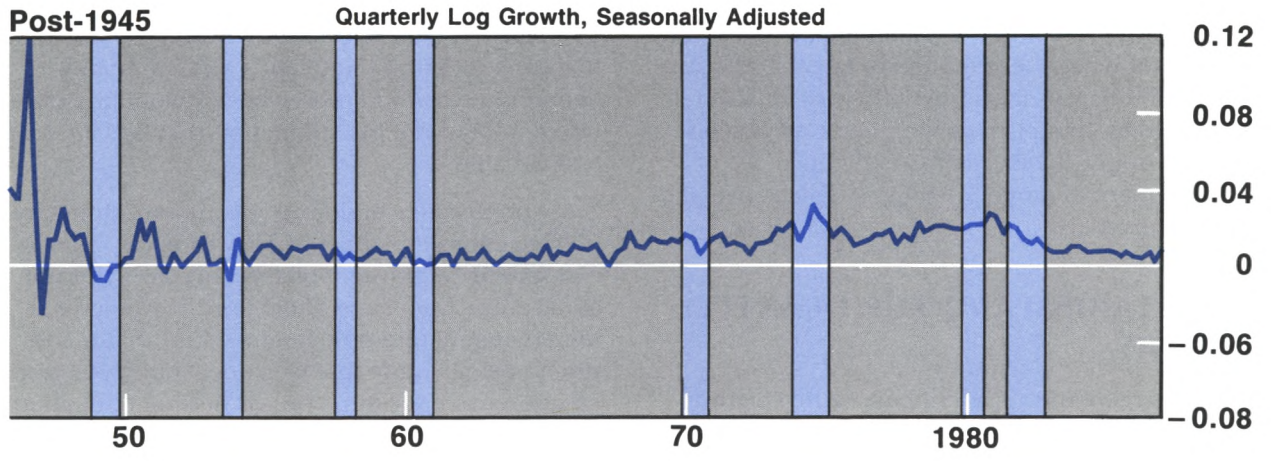
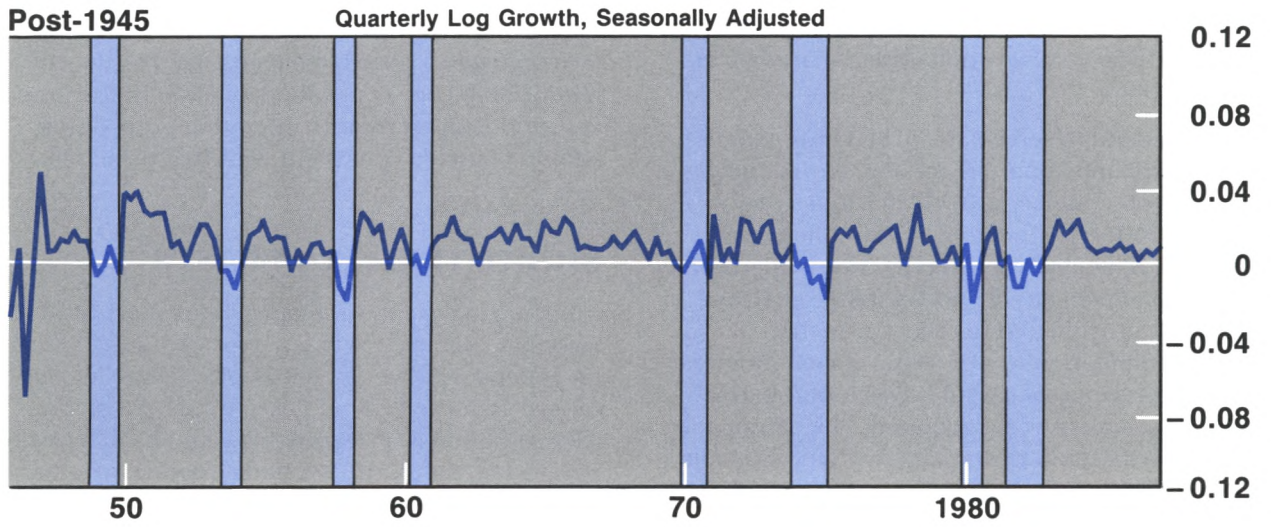


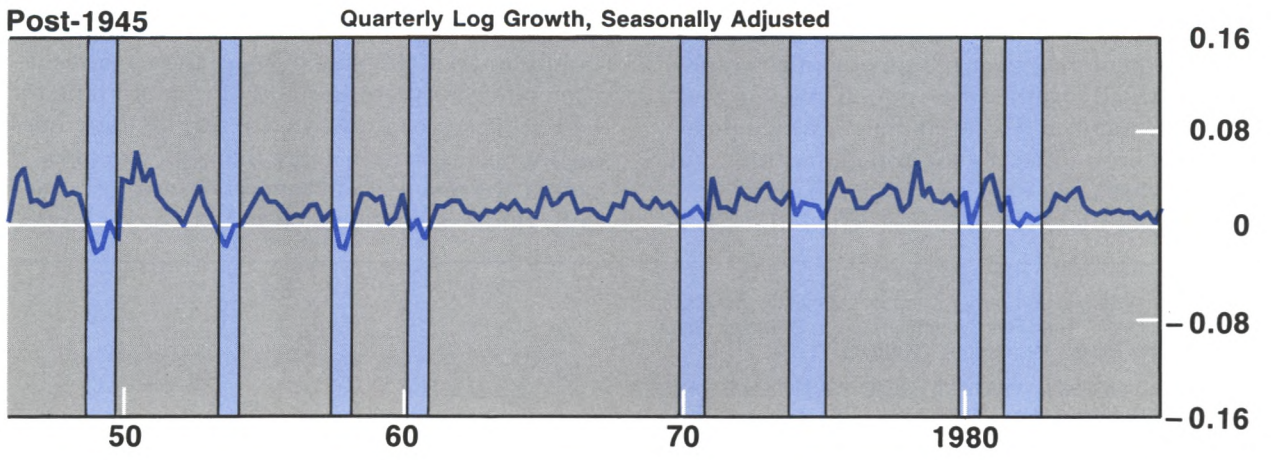
Chart 3

Nominal GNP









target, it sells open market securities and forces a contraction in monetary aggregates. As a result, interest rates are prevented from falling as much as if no action were taken.

There are problems associated with interest rate targets, but what about monetary targets? My presentation today addresses whether the relationship between monetary growth and GNP has become so unpredictable as to justify the abandonment of monetary targets which seems to have occurred.

MONETARISM AND THE QUANTITY THEORY

Monetarism, the apparent heir of the Quantity Theory of Money, was born in the 1960s. Not only was the name changed but also the concept. Unlike the Quantity Theory, whose focus is on the long run, monetarism was widely interpreted as providing an alternative to short run Keynesian model forecasts, a view not always shared by its progenitors.

The Federal Reserve Bank of St. Louis equation, which explained quarterly GNP growth largely as a function of monetary growth, became a major monetarist forecasting tool.[1] Its simplicity and apparent reliability captured the one-dimensional attention of Wall Street and Washington. GNP growth was estimated to reflect growth in narrowly defined money, M1, in the current quarter and the previous year; and it was found to rise about 3 percent a year independently of monetary growth. With hindsight, we know that this stable M1 velocity trend was peculiar to the period on which the estimates were based, initially the 1950s and 1960s but then the unfolding 1970s as well.

The Federal Reserve Bank of St. Louis model went beyond the estimated GNP or demand growth equation to incorporate potential supply growth which together determined inflation and unemployment, and a credit market which determined interest rates.[2] By the end of the 1970s and into the 1980s, the weekly publication of M1 changes became a major news event and market force because these data provided a basis for forecasts of total demand growth, inflation and interest rates.

The problem with the simplistic monetarism that afflicted Wall Street and Washington was that it accepted Milton Friedman's dictum that inflation is always and everywhere a monetary phenomenon but not his stipulation that lags are long and variable.

My point today builds on this theme. Monetary policy actions are appropriately directed at long-run stability of the general level of prices but not at offsetting undesired short-term movements in total demand, unemployment, or, for that matter, prices. I shall argue that we know enough to keep inflation trends within bounds but not enough to fully stabilize the price level let alone the business cycle. A corollary is that monetarism as a short-run forecasting method should be buried; but the Quantity Theory, defined as the predictability of GNP growth on the basis of growth in the monetary aggregates, should be recognized as the correct principle for controlling inflation in the long run; and Federal Reserve operating procedures should be made consistent with that principle.

SHORT-TERM FORECASTS

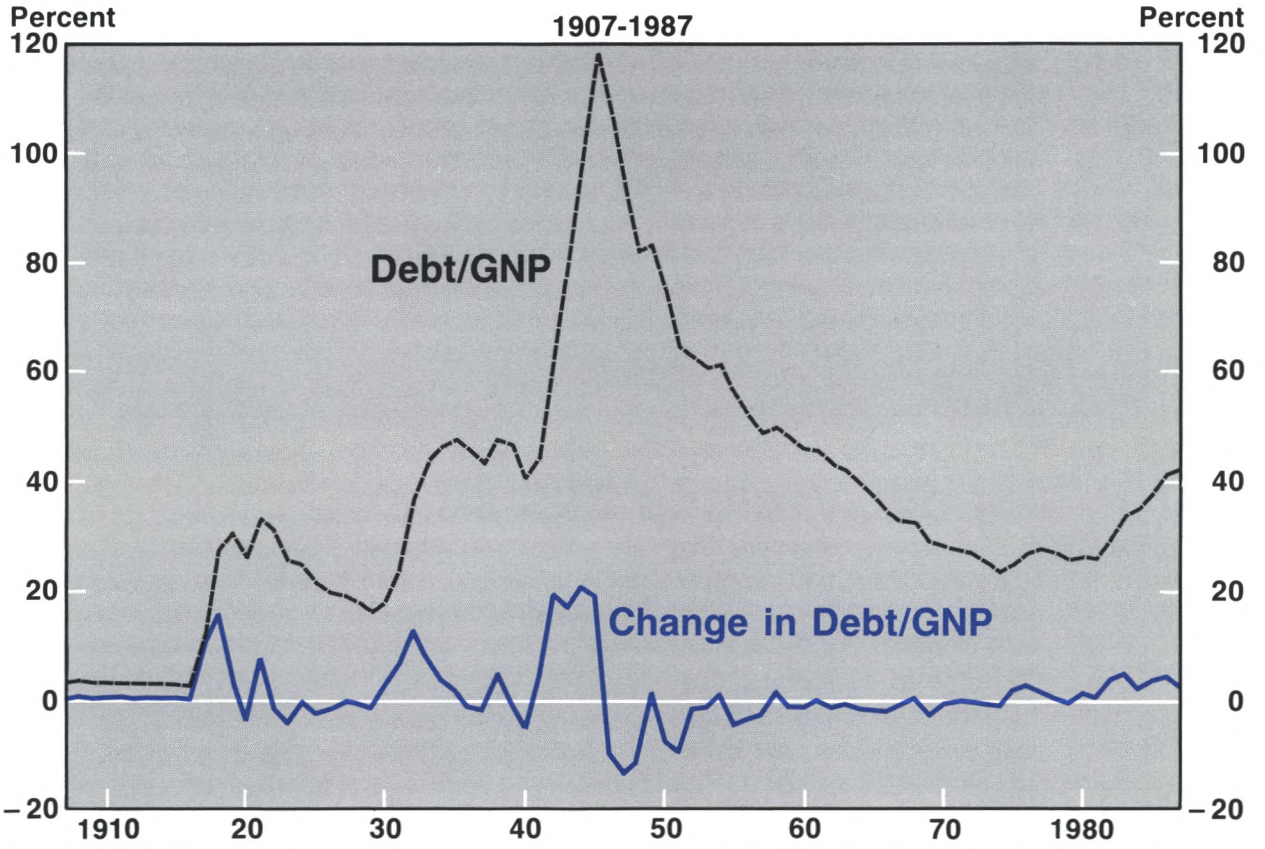
Let me make a few remarks about short-term forecasts. None are very good for very long. Based on Federal Reserve "green" books, Allan Meltzer reports that the Federal Reserve's record of forecasting nominal GNP growth a year ahead over the period 1967 through 1982 had a root mean square error equal to about 60 percent of average nominal GNP growth.[3] Since GNP growth averaged about 10 percent a year, the forecast error is 6 percentage points, indicating that one-third of the time forecasts would miss by more than 6 percentage points and half the time by more than 4 percentage points. Furthermore, and most important, the Federal Reserve forecasts were way off track, missing average growth by more than 5 percentage points, the result of the Federal Reserve persistently underestimating GNP growth during a pe-

[1]Leonall C. Andersen and Jerry L. Jordan, "Monetary and Fiscal Actions: A Test of Their Relative Importance in Economic Stabilization," this *Review* (November, 1968), pp. 11–24.

[2]Leonall C. Andersen and Keith M. Carlson, "A Monetarist Model for Economic Stabilization," this *Review* (April, 1970), pp. 7–25.

[3]Meltzer, Allan H. "On Monetary Stability and Monetary Reform" in Y. Suzuki and M. Okabe, eds., *Toward a World of Economic Stability* (Tokyo: University of Tokyo Press, 1988), pp. 51–74.

Chart 4
Federal Debt and Deficit Ratios to GNP



riod of a rising inflationary trend. These striking results are confirmed in an analysis of Federal Reserve forecasting that Karamouzis and Lombra presented at the Carnegie-Rochester Conference last month.[4] They found that the Federal Reserve forecasts systematically underpredicted GNP growth during expansions and overpredicted during contractions. According to Meltzer, private forecasters have had a somewhat better record than the Federal Reserve, but one still is talking about errors of 4 percentage points a third of the time and nearly 3 percentage points, half the time. Since inflation is such a lagging factor, changes in nominal GNP growth are initially translated into real growth changes. Hence, errors of 3 percentage points or more in real GNP growth half the time translate into being unable to distinguish reliably between a boom and a recession in either the current quarter or a year ahead.

Meltzer was mainly summarizing the performance of non-monetarist forecasts, but one can make at least as critical remarks about monetarist short-term forecasts in the 1980s. Like many another forecaster, Milton Friedman's record is blemished. For example, he forecast a recession that didn't materialize in 1984 and an equally illusory inflation in 1986. In 1988, not only Friedman but others of comparable persuasion are worried about the consequences of the contraction in monetary growth in 1987.

I too am concerned, though it is worth mentioning, as Jim Meigs, an early colleague of Homer Jones at the Federal Reserve Bank of St. Louis, has

[4]Karamouzis, Nicholas and Raymond Lombra "Federal Reserve Policy Making: An Overview and Analysis of the Policy Process," Carnegie-Rochester Conference Series on Public Policy, forthcoming.

Chart 5

Money: M1 and M1a

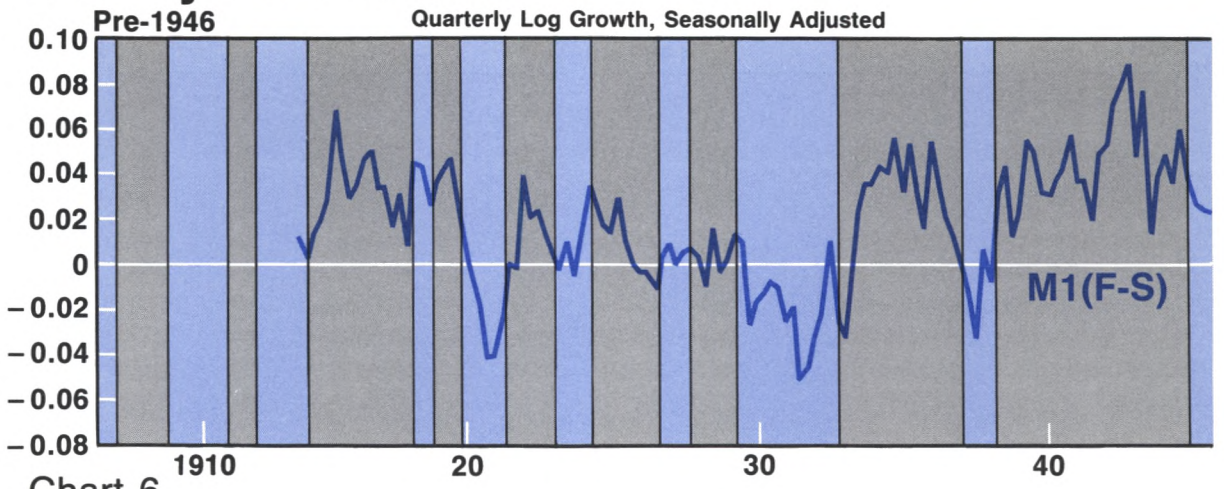
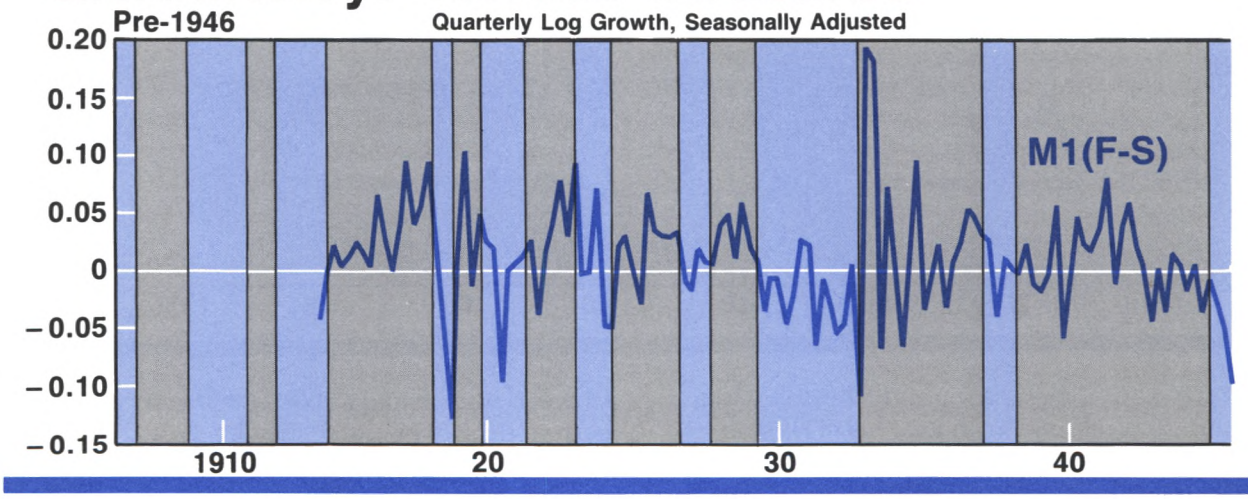


Chart 6

GNP/Money: Various Measures



reminded me, that Homer was suspicious about all short-term forecasts, including those based on monetary growth. It was his persistent questioning that created the flurry of econometric work about monetary relationships for which the Federal Reserve Bank of St. Louis became famous.

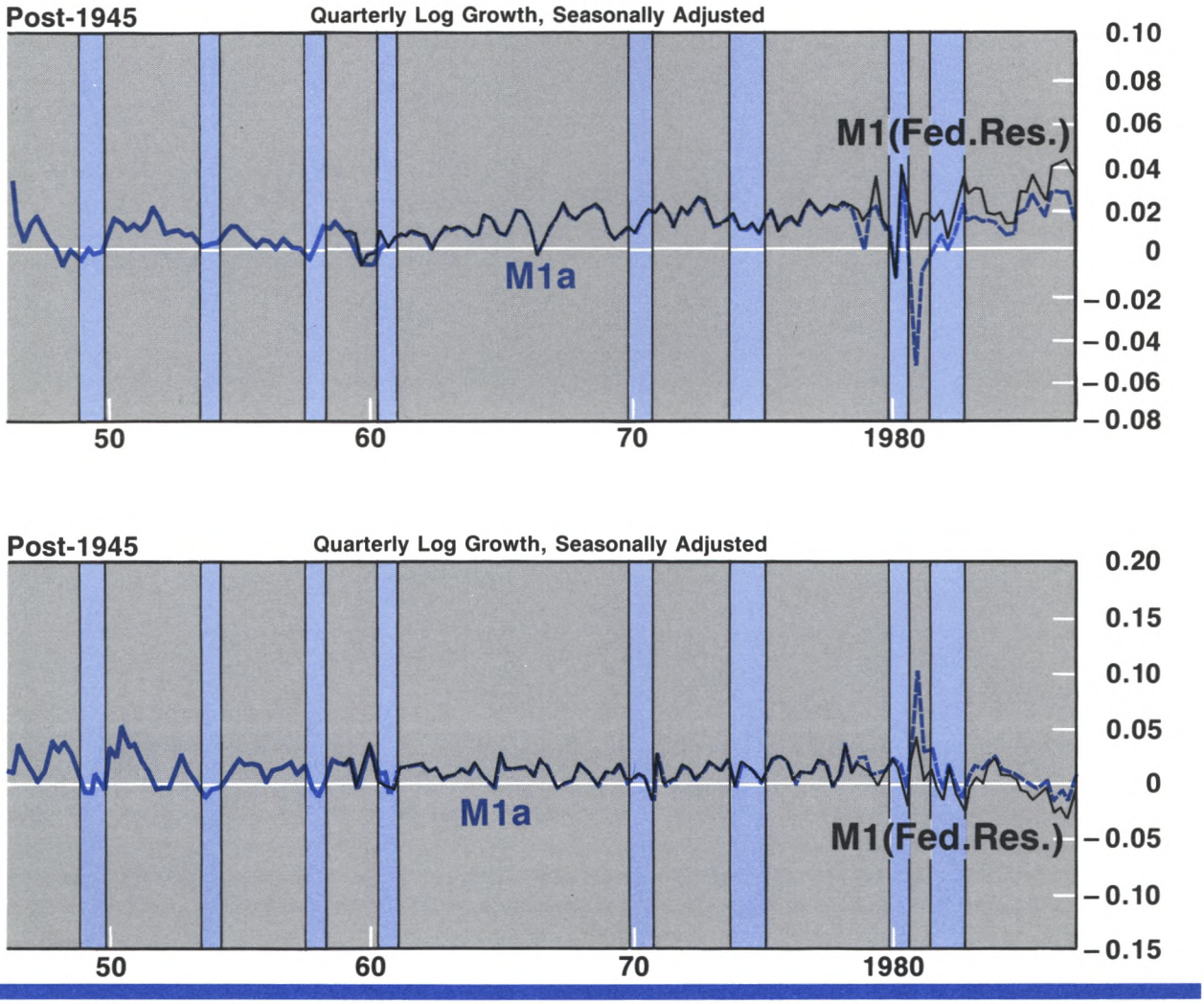
HISTORICAL RELATIONSHIPS: THE BROAD PICTURE

The historical relationship between monetary growth and spending confirms Jones' suspicion. Let me present some charts which put the experience of the 1980s in perspective.

Chart 1 records inflation in the United States since 1907, with 1907–45 and 1946–87 plotted separately. The blue-shaded areas identify recessions. Quite clearly inflation was a lot more variable in the initial period, though, because of deflations during recessions in the earlier period, there was no sustained inflation trend as there was in the second period.

Chart 2 plots the real GNP growth rate — a measure of growth in the real supply of goods and services. Though it averaged about 3 percent a year both before and after the end of 1945, the magnitude of the booms and busts was much greater in the earlier period. Since real growth averaged about as much in each period, it follows that the inflation uptrend in the second period was an aggregate demand not an aggregate supply phenomenon.

Chart 3 presents the nominal GNP growth rate



— a measure of growth in nominal demand for goods and services. Though most values are positive, there are some big negatives in recessions through 1960. Since then there has been slowed, not negative, GNP growth during recessions because we have had considerable inflation even in recessions. In terms of proximate causes, Chart 3 shows that slowed GNP growth has always been associated with slowed real growth in recessions, and accelerated GNP growth with accelerated real growth in expansions. Thus, decreased variability in real growth in the post-World War II period is linked to less variability in nominal GNP growth.

What about sources of nominal GNP growth? Conventional wisdom to the contrary, the timing of government spending and tax changes is not systematically correlated with GNP growth. The 1980s provide a good example. Fiscal policy by every measure was expansionary, yet nominal GNP growth contracted.

Chart 4 plots the ratio of nominal federal debt held by the public to nominal GNP. There is a nominal deficit if the debt rises, but a real deficit only if the debt rises faster than inflation. An increase in the debt to GNP ratio reflects the real deficit rising faster than real growth. The historical record shows that real deficits relative to real GNP did not amount to much before World War I. Big real deficits occurred in both World Wars, the early 1930s, and since 1980. Since nominal GNP growth accelerated in the wars but decelerated in the 1930s and 1980s, there is no consistent rela-

Chart 7

M2

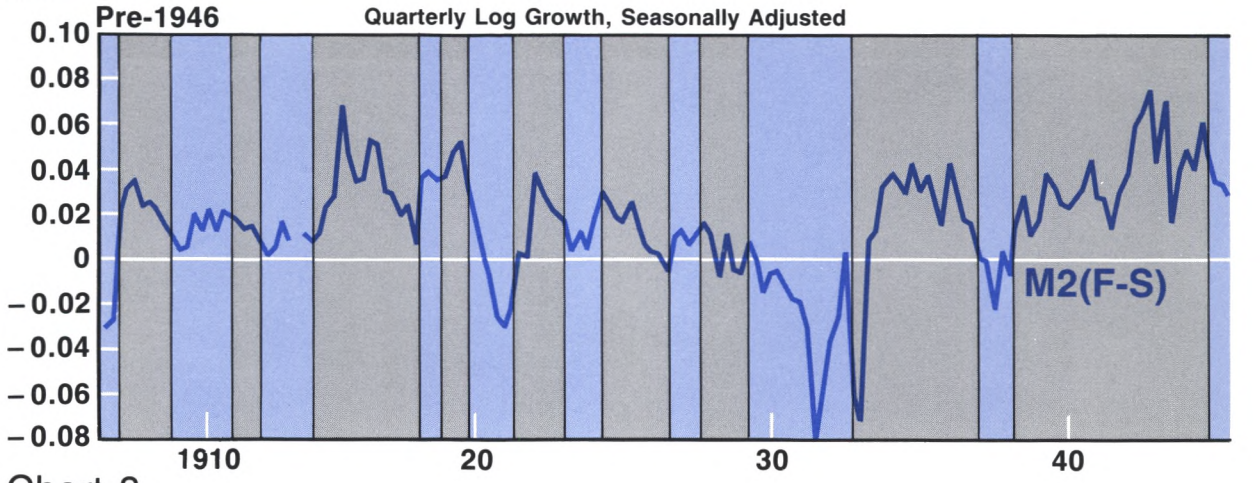
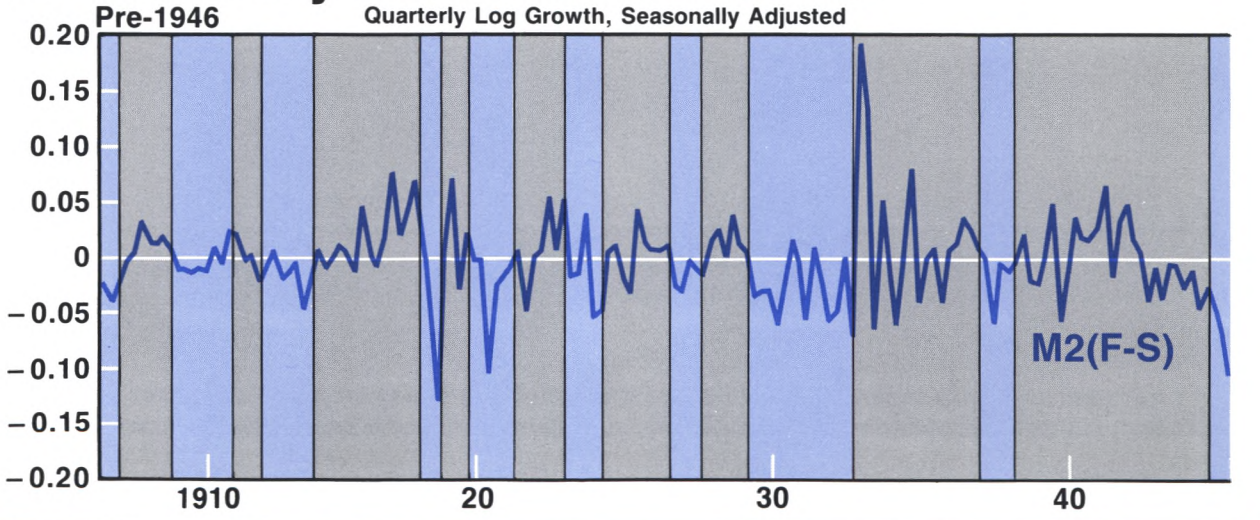


Chart 8

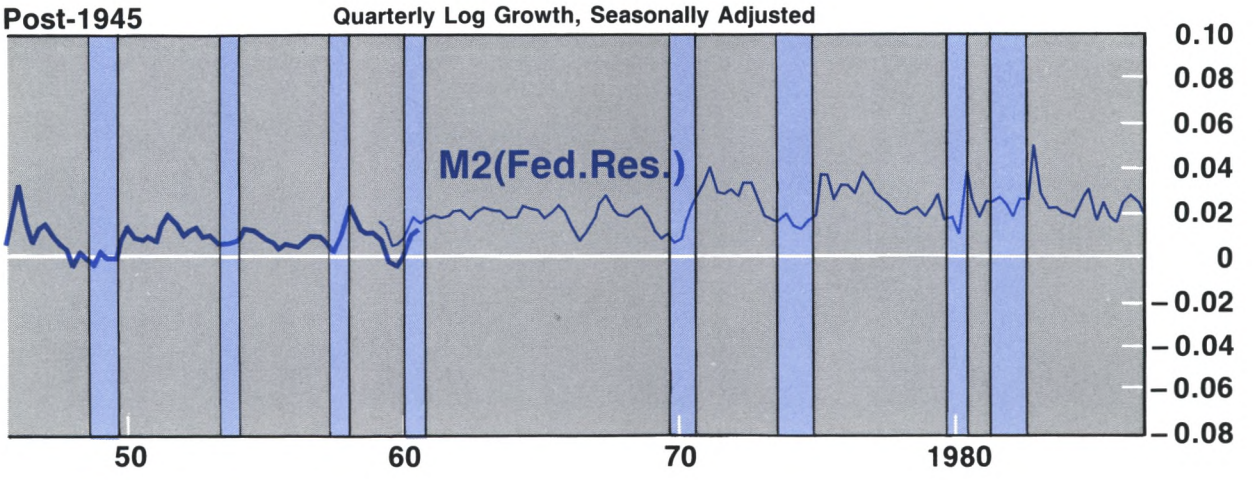
GNP/Money: Various Measures

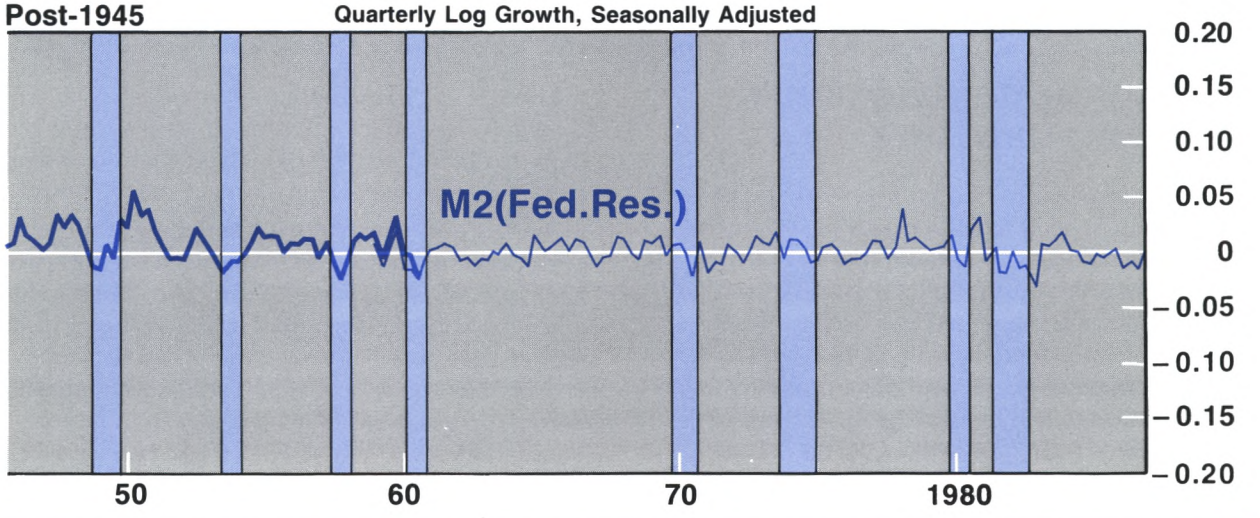


tionship. Furthermore, in the 40 years since the end of World War II, there have been nine business cycle expansions and in only one — the current one — did real deficits rise significantly relative to GNP. Perhaps these official debt figures are the wrong ones to look at because they do not incorporate discounted values of future entitlements and tax receipts. Others might find what they are looking for in these data, but I conclude that there is no consistent relationship between fiscal deficits and GNP growth.

Charts 5 and 6 present the growth rates of the monetary aggregates: M1, M1A and M2.[5] The record shows that major increases in GNP growth in World Wars I and II were accompanied by both accelerated monetary growth and rising fiscal deficits, and postwar contractions in GNP growth by the reverse movements. Nonetheless, there are

[5]M1 includes currency and demand deposits; M1A omits deposits that pay interest; M2 adds small time and savings deposits, overnight repurchase agreements and Eurodollar deposits, and, since 1959, shares in thrifts and money market mutual funds.





many instances when fiscal and monetary actions pushed in opposite directions. This divergence permits identification of which is the dominating factor affecting GNP growth. In the early 1930s, real federal deficits ballooned but monetary growth collapsed. So did GNP growth. In the 1960s and 1970s, real deficits grew less than real GNP if at all. Monetary growth increased and so did GNP growth and inflation. In particular episodes, such as 1966–67 when real deficits went one way and total spending growth the other, it was monetary growth that tipped the balance.

Charts 7 and 8 present the growth rates in M1 and M2 velocities. By definition, velocity growth is GNP growth in excess of monetary growth. The charts reveal how steadily M1 velocity increased in the 1950s through the 1970s, and how ragged its changes in every other period. The charts also show how M2 velocity remained largely trendless in comparison with M1 velocity which dipped in the 1930s but then rose persistently after 1945 until the 1980s. Note well that in every recession both M1 and M2 velocities fell so that to cushion GNP growth would require faster monetary growth. In the worst recessions, including 1981–82, monetary growth did not accelerate as velocity growth slowed; and in the worst inflations, including the late 1970s, monetary growth did not decelerate as velocity speeded up. Hence, monetary growth has often been an ineffective counterbalance to moderate excesses in GNP growth.

Table 1

Average Forecast Errors and Changes in Economic Trends (weighted least squares)

M1 (1924:4–1987:1)

R^2	0.30	0.29	0.26
Constant	−1.0 (−0.5)	−1.0 (−0.5)	−1.0 (−0.5)
Inflation	0.4 (1.3)	0.5 (1.9)	0.5 (2.0)
Real Growth	−0.1 (−0.3)	−0.2 (−0.7)	—
Interest Rate	0.1 (0.3)	—	—
Degrees of Freedom	9	10	11

M2 (1919:2–1987:1)

R^2	0.43	0.42	0.35
Constant	−0.1 (−0.1)	−0.1 (−0.1)	−0.1 (−0.1)
Inflation	0.4 (2.5)	0.4 (2.8)	0.4 (2.6)
Real Growth	0.1 (0.7)	0.2 (1.2)	—
Interest Rate	−0.1 (−0.4)	—	—
Degrees of Freedom	11	12	13

T-statistics in parentheses. Independent variables are changes from the last business cycle average in the estimation period to the average for the forecast period.

HISTORICAL RELATIONSHIPS: SPECIFIC FORECASTS

William Gavin and I have been studying the quality of quarterly GNP forecasts based on the monetary aggregates.[6] Though there are many studies that have examined the post-World War II period, we were interested in a broader historical experience. Our focus was on out-of-sample forecasts — the kind needed to direct monetary aggregate changes to achieve a desired GNP growth path. Quarterly GNP growth forecasts for each business cycle were based on estimates of the relationship between GNP growth and four quarterly lags of monetary growth for the three preceding cycles, that is, a modified St. Louis equation. On the average, both M1 and M2 changes were estimated to change GNP growth roughly proportionally while velocity trends were significant in relating M1 but not M2 to GNP. Overall there were 15 forecast intervals for M2 but only 13 for M1 because there was no quarterly information about the split between demand and time deposits before 1914. The first forecast for M1 was the business cycle 1924:4 – 1927:4.

There are many factors that influence GNP growth. Consequently, in our single equation models that relate GNP growth solely to monetary growth, we expected that shifts in the economy including monetary policy reactions to economic performance would lead to biases in the forecasts. For example, we expected that lower interest rates in a forecast period would decrease velocity and reduce GNP growth relative to monetary growth. To measure the effect of such shifts, we regressed average forecast errors on changes in inflation, interest rates and real growth from the last business cycle in the estimation interval to the average observed in the forecast cycle.

As noted, there was a large decrease in the variance of forecasts from the pre-1946 to the post-1945 period. To account for such heteroscedasticity, we weighted observations by the expected standard deviation of the mean forecast errors and then used ordinary least squares to estimate effects of shifts in inflation, interest rates and real growth trends on forecast errors. Table 1 presents the results. The only consistent link to forecast

[6]Gavin, William T., and William G. Dewald, "Velocity Uncertainty: An Historical Perspective," U.S. Department of State, Bureau of Economic and Business Affairs, Planning and Economic Analysis Staff Working Paper 87/4, November 1987. Gavin was an economist at the State Department in 1987 on leave from the Federal Reserve Bank of Cleveland.

errors was change in the inflation trend, not interest rates, and not real growth.

Gavin and I also examined cross-country evidence. The results appear in table 2. We estimated the relationship between annual GNP growth and current and lagged M1 growth for 39 countries for the late 1950s through 1979. GNP growth forecasts for each country were made for 1980–84. As in our U.S. time series analysis, these cross-country GNP forecast errors were strongly correlated with changes in inflation trends, even excluding outliers such as Bolivia, Brazil, Mexico and Peru that had huge inflation accelerations in the 1980s.

Why the consistent link to shifts in inflation trends? Look at chart 9. It is apparent that wide swings in interest rates over the business cycle were *not* closely related to M1 velocity movements. Furthermore, since real growth averaged about the same before as after the end of 1945, one cannot attribute the persistent rise in M1 velocity until 1982 to that source. Rather, the rise in M1 velocity after 1945 was associated with a persistent rise in the inflation trend.

Table 2

Average Forecast Errors and Changes in Inflation Trends (M1 models only for 39 countries)

	All countries	Excluding outliers
R^2	0.7	0.2
Constant	0.8	0.6
Inflation	0.3 (9.0)	0.3 (2.4)
Degrees of Freedom	37	33

Countries: Australia, Austria, Belgium, Bolivia, Brazil, Canada, Colombia, Denmark, Dominican Republic, Ecuador, El Salvador, Finland, France, Greece, Guatemala, Honduras, Iceland, Ireland, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Paraguay, Peru, Philippines, Portugal, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Turkey, United Kingdom, United States, Venezuela, West Germany.

Sample periods vary because of data availability but are approximately 1957–84.

Chart 9

Interest Rates and GNP/M1

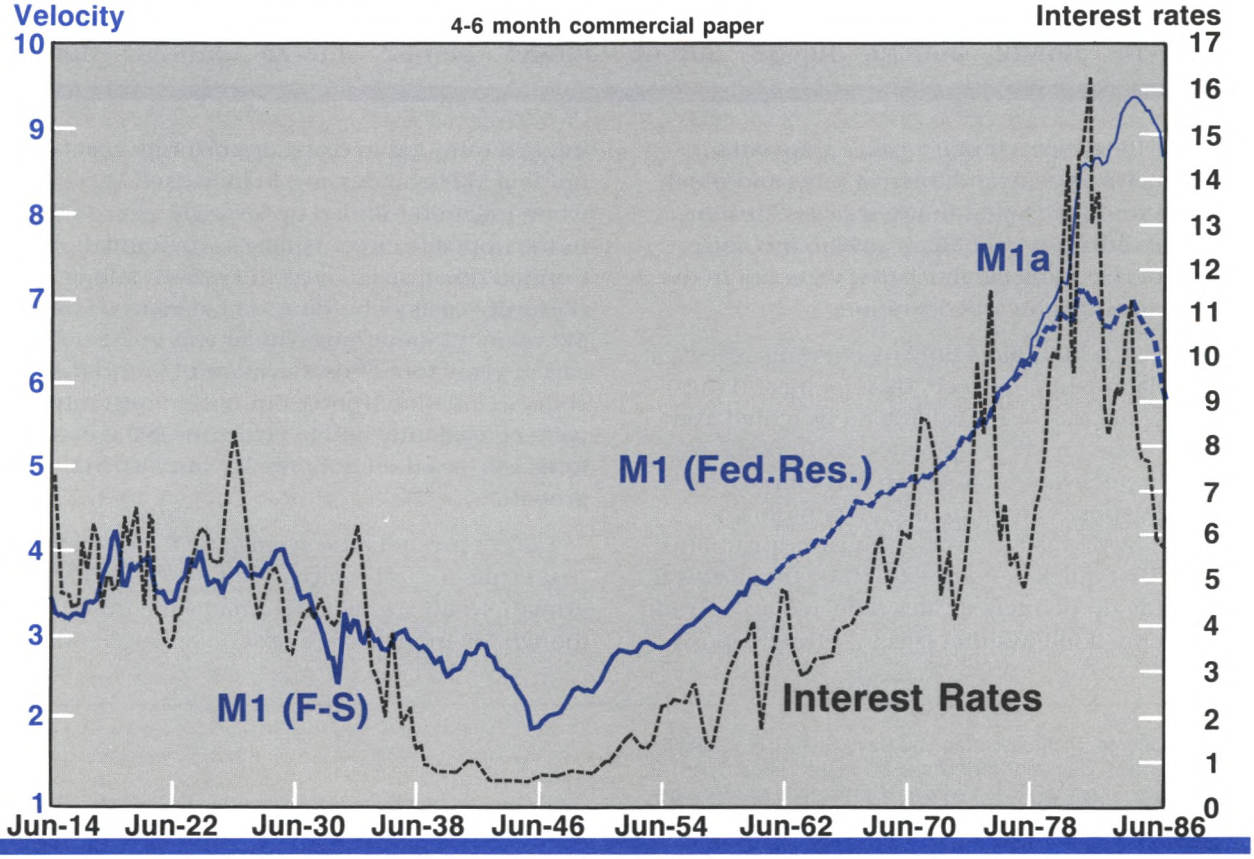


Chart 10
Interest Rates and GNP/M2

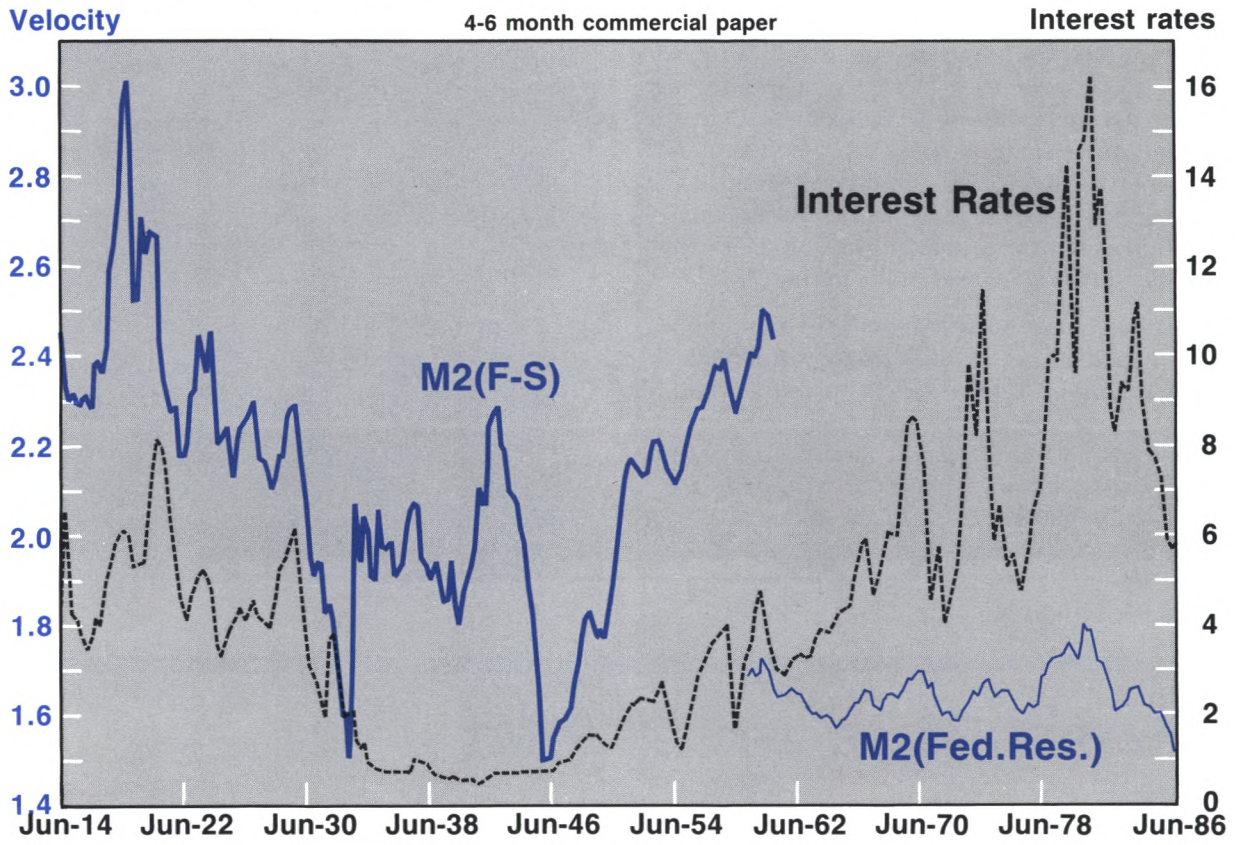


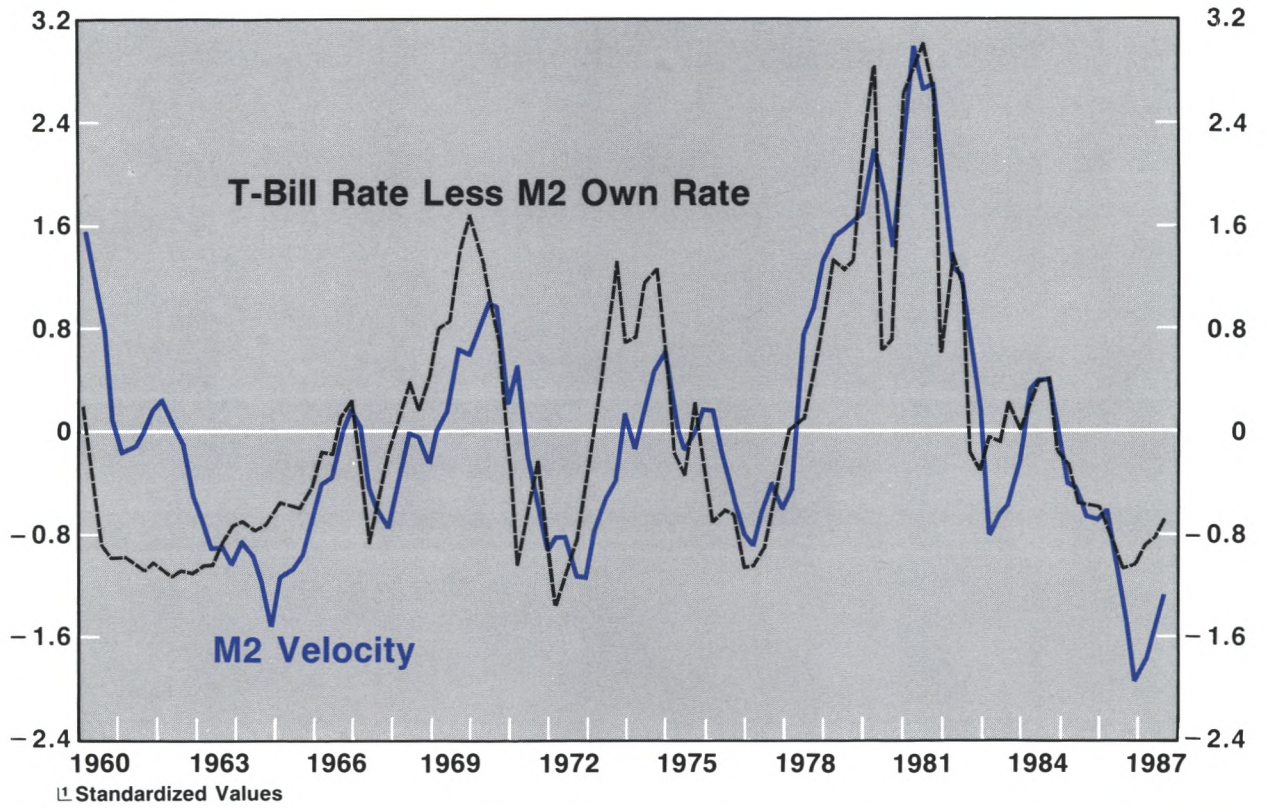
Chart 10 reveals a much weaker association between M2 velocity and interest rates and much less of a trend. The shift in the series is attributable to a redefinition of M2 in 1959 to include a variety of non-bank liabilities that were not in the Friedman and Schwartz definition.

Chart 11, which plots only recent data, reveals a close relationship between M2 velocity and the Treasury bill rate less a calculated weighted average own-rate on M2.[7] Depository institutions respond to persistent changes in market rates by altering deposit rates, but, even when unconstrained by deposit interest ceilings, adjustments are not that quick or complete. Since the post-war ratcheting up of interest rates reflected an uptrend in inflation, it follows that lags in setting deposit interest rates led to rising opportunity costs of holding M2 balances and to increased M2 velocity when inflation trended up strongly as in 1978–80. In the opposite circumstances when inflation trended down strongly as in 1982–87, falling opportunity costs of holding M2 balances decreased M2 velocity. Something similar was going on in earlier years too. Thus, Gavin and I found that shifts in inflation trends, but not interest rates, were consistently tied to errors in GNP growth forecasts based on not only M1 but also M2 growth.

Table 3 presents the average GNP growth forecast errors for full cycles based on M1 and M2 growth. Neither totally dominates the other though M2 models were best on average and in

[7]Moore, George, Richard Porter, and Dave Small. "Modeling the Disaggregated Demands for M2 and M1 in the 1980s: The U.S. Experience," Federal Reserve Board Conference on Monetary Aggregates and Financial Sector Behavior in Interdependent Economies (forthcoming).

Chart 11
M2 Velocity vs M2 Opportunity Cost[1]



the current cycle. Our finding that forecast errors are smaller for M2 than for M1 or M1A but not by a large margin suggests robustness to the choice of the monetary aggregate.[8] We also looked at the monetary base and found that M2 models provided the best forecasts on average for both 1907–45 and 1946–87.

Turning again to table 3, some forecast errors are huge. Root mean square errors average 17 to 18 percent in the pre-1946 period, though only about 6 percent in the post-World War II period. By the standards that Meltzer discussed, such errors are comparable to Federal Reserve forecast errors in the "green" book. An inference is that attempts to fine tune GNP growth by controlling either M1 or M2 growth would miss GNP growth targets by more than 6 percentage points one-third of the time and by 4 percentage points half the time. What was said about not being able to distinguish boom from recession holds for our forecasts just as for the Federal Reserve's. However, there is a difference. The average forecast error associated with our simple relationship of monetary growth to nominal GNP growth appears to be well under the reported average errors in Federal Reserve "green" books that Meltzer reported.

OPERATIONAL ISSUES

The operational question is what to do in the short run to achieve a long-term inflation objective. Suffice it to say that the Federal Reserve need not iron out every wrinkle in monetary growth to eliminate inflation trends, but it is necessary to tie

[8]For a different opinion, see Michael R. Darby, Angelo R. Mascaro, and Michael L. Marlow. "The Empirical Reliability of Monetary Aggregates as Indicators," Research Paper No. 87 (U.S. Department of the Treasury, 1987).

Table 3

GNP Growth Forecast Errors Annual Rates of Percent Change

Business cycles	Average forecast errors				Root mean square errors			
	M1	M1A	M2	BEST	M1	M1A	M2	BEST
1924:4–1927:4	1.8		0.1	M2	10.3		9.6	M2
1928:1–1933:1	−5.9		1.0	M2	15.1		13.6	M2
1933:2–1938:2	−1.8		5.3	M1	28.1		26.3	M2
1938:3–1945:4	−6.6		−0.1	M2	17.5		18.5	M1
Average Pre-1946	−3.1		1.5	M2	17.7		17.0	M2
1946:1–1949:4	8.8		4.7	M2	11.1		8.8	M2
1950:1–1954:2	0.2		−1.3	M1	7.0		7.8	M1
1954:3–1958:2	−0.6		−2.9	M1	4.4		6.1	M1
1958:3–1961:1	0.3		−3.0	M1	5.4		5.9	M1
1961:2–1970:4	−2.0		0.6	M2	4.4		3.0	M2
1971:1–1975:1	0.3		−0.1	M2	3.7		4.1	M1
1975:2–1980:3	1.2	1.9	1.6	M1	3.7	4.0	4.5	M1
1980:4–1982:4	−2.6	4.8	−1.7	M2	7.6	11.1	6.5	M2
1983:1–1987:1	−6.6	−3.2	−2.3	M2	8.6	4.9	4.3	M2
Average Post-1945	−0.1		−0.5	M1	6.2		5.7	M2
Overall Average	−1.0		−0.3	M2	9.8		9.1	M2

monetary growth to real growth over the medium term to avoid the kind of disturbances that shifts in inflation trends engender. The Federal Reserve needs to adopt systematic operational procedures to shift its policy targets on the basis of observed deviations of GNP growth from desired levels.

One way would have the Federal Reserve set a GNP growth target equal to long-term real growth plus an inflation target, perhaps zero in the long run but not unreasonably only a partial step in that direction in any one period. The point is not to set monetary targets on the basis of short-run forecasts of what real and nominal GNP growth is predicted — I hope I have made clear how error-prone such forecasts are — but rather on the basis of long-run real growth projections plus an inflation goal, not a current GNP forecast.[9]

Such a procedure in the 1970s would have led to very different results from what we got. The Federal Reserve persistently underforecast GNP growth even as it supplied funds to support accelerating monetary growth which was reflected in accelerating inflation, higher interest rates, an increasing velocity trend and unexpectedly large GNP growth. Could that sad cycle have been avoided?

Suppose in 1978, to pick a year, the Federal Reserve had aimed at 3 percent real growth — the long-term average — and an inflation target 2 percentage points below the 6.8 percent inflation in 1977. Target GNP growth for 1978 would have been 7.8 percent; for 1979, 5.8 percent; 1980, 3.8 percent; 1981 and thereafter, 3 percent — the long-term average real growth rate.

Fourth-quarter-over-fourth-quarter GNP growth in 1978 was 14.8 percent, not 7.8 percent. GNP growth stayed high: 9.5 percent in 1979 and again in 1980. Inflation accelerated: 7.7 percent in 1978, 8.5 percent in 1979 and 9.4 percent in 1980. Part of the problem was rising velocity, but the problem

[9]A somewhat similar proposal is found in Bennett McCallum. "Robustness Properties of a Rule for Monetary Policy," Carnegie-Rochester Conference Series on Public Policy, Vol. 29, forthcoming.

was compounded because the Federal Reserve validated the inflation process by an open market policy that permitted monetary aggregate growth of no less than 7 percent in any of those years and by as much as 11 percent. It was not distinguishing between the wind it was leaning against and the thrust of its own actions.

One cannot be certain about velocity movements in the short run but in the circumstances of the late 1970s with a rising inflation trend, one could have anticipated rising velocities. By whatever means the Federal Reserve might have chosen to control its open market operations — targeting free reserves, federal funds rates, or monetary base injections — over the course of those years it would have had to take actions to restrict monetary growth to prevent inflation from accelerating.

What was required in 1978, if not sooner, was a genuinely restrictive policy such as we finally got in 1980–81. That policy arrived too late to avoid enormous economic destruction. Inflationary expectations had become entrenched in market contracts denominated in dollars. The costs of disinflation: the worst recession since the 1930s, an overhanging burden of domestic and international debt accumulated on the basis of mistaken price expectations, and a legacy of uncertainty about whether it might not happen again.

WHY NOT TARGET NOMINAL GNP GROWTH?

It is my contention that putting a GNP target up front for the Federal Open Market Committee to aim at would allow it to mobilize its staff to design the best way to keep monetary growth and GNP growth down when such a course is obviously right as it was in the late 1970s. There is doubtlessly an element of discretionary fine-tuning in GNP targeting, but with a twist. Deviations from the target nominal GNP path should induce Federal Reserve actions to move monetary growth up or down in order to bring forecast GNP growth back to a long-run non-inflationary path. Perhaps, there should be some limit on how much change in targeted GNP to be permitted in a particular period. In any case, to avoid getting off track as in the 1970s, the Federal Reserve has to direct its considerable powers toward controlling inflation trends by actions that push monetary growth in the right direction when nominal GNP growth is off target.

CONCLUSION

To eliminate inflation trends, monetary growth must be kept low on average and close to real growth trends. Extraordinary increases as in 1977–79 or 1985–86 ought to be avoided so that offsetting decreases are not necessitated; but the past is history. What about the future? Certainly we want to avoid another cycle of inflation and disinflation. By luck or design the Federal Reserve in 1987 and early 1988 has pursued policies that are not so different from what I have suggested. Monetary aggregates are growing at about 4 percent annual rates, close to appropriate rates to bring inflation down gradually toward zero. I would hope that the lessons of history could be applied to stay on such a path.

A positive reform to make clear the responsibilities of the Federal Reserve regarding long-term inflation would be to bring it into the federal budget process. Have it announce nominal GNP targets each year on which to base Administration budget projections over the ensuing five fiscal years. Both GNP growth and inflation are critical to the budget with respect to tax receipts and expenditures, particularly interest outlays. Why have the Administration make arbitrary assumptions about GNP growth and inflation as it does now when the Federal Reserve, whose powers are so important in determining nominal magnitudes, could target such values and be held accountable for attaining them? It should take responsibility for what it can control in the medium term — nominal spending growth and inflation — and not play meteorologist by leaning against the uncertain winds of the business cycle.

Can we devise ways to create the right incentives for Federal Reserve officials to pursue policies to keep inflation low? The Germans and the Japanese have. In contrast to their success in keeping inflation low, we have gone through the motions of having the Federal Reserve announce monetary target ranges to Congressional Oversight Committees beginning in 1975, and since then the worst cycle of inflation and disinflation since World War II. Setting medium-term targets for GNP growth as I have recommended would establish a new responsibility. However, unless the monetary authorities shoulder that responsibility by taking actions to stabilize nominal GNP growth around a medium-term non-inflationary path, nothing would be gained. Establishing yet another target range would make sense only if deviations from it induced stabilizing policy reactions.

Perhaps, the Federal Reserve must be put on a shorter leash? We could specify a legal limit to the monetary base that the Federal Reserve was authorized to put into circulation in a fiscal year. Budget authority is required for the Treasury to spend, why not for the Federal Reserve? Then again, it might be somewhat unrealistic to count on Congress to check the inflationary tendencies of the Federal Reserve. An even shorter leash has been suggested by Milton Friedman (and not in jest). He would disband the Federal Open Market Committee and hire a federal employee to purchase Treasury securities each week as specified by law to keep some monetary aggregate on a long-term zero inflation course. Despite the budget savings in his proposal, wide variation in velocities historically suggests that we might do better than fixing a monetary growth rate in perpetuity.

The fact is that broadly stabilizing monetary policies have been observed on occasion in history. Even during the past decade, some countries have managed their affairs to avoid the worst excesses of inflation and disinflation that we and many others experienced. We can't repeat history, but we ought to learn from it. In the light of the contribution of Federal Reserve actions to instability in monetary growth, nominal GNP growth and inflation, having it target a non-inflationary nominal GNP growth path over a five-year federal budget cycle would be a step in the right direction. Responsibility for control of inflation would be assigned to the institution that has the most direct power to influence nominal GNP growth and, in turn, inflation. For nominal GNP targeting to succeed in eliminating inflation trends, however, Federal Reserve officials must have the understanding and courage to support the necessary policy actions to get back to a non-inflationary GNP growth path whenever the target is missed. If they did implement such a policy, they would not likely eliminate all the ups and downs in the economy, but they would avoid repeating the most egregious mistakes of monetary history.

DATA SOURCES

Data used in preparing the charts and statistical study summarized in this lecture came from a variety of sources.

M1 and M2 for May 1907 to December 1958 from Milton Friedman and Anna Jacobson Schwartz, *A Monetary History of the United States: 1867–1960,* (Princeton University Press, 1963); and January 1959 to March 1987 from the Board of Governors of the Federal Reserve System. Values of M1 were semi-annual until June 1914 and were used in constructing the charts.

Monetary base for May 1907 to December 1918 from Friedman and Schwartz; and January 1919 to March 1987 from the Federal Reserve Bank of St. Louis, adjusted for required reserve ratio changes but not seasonality. The Census X-11 program in SAS was used to seasonally adjust these monthly data from which quarterly averages were calculated.

Commercial paper rate for May 1907 to December 1970 from Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics,* 1976; and January 1971 to March 1987 from the *Federal Reserve Bulletin.* Quarterly averages were calculated from the monthly series.

GNP and GNP deflator for 1907:Q2 to 1947:Q4 from Robert J. Gordon, "Price Inertia and Policy Ineffectiveness in the United States, 1890–1980," *Journal of Political Economy* (December 1982), 1087–1117; and 1948:Q1 to 1987:Q1 from the Department of Commerce, Bureau of Economic Analysis.

All computation were performed on an IBM AT using RATS PC version 2.0 or LOTUS version 2.01.

Data from different sources were spliced by transforming the early series to growth rates and computing revised level series based on actual levels of the most recent series.

The original data used in the Gavin and Dewald study are available from the author on a LOTUS spreadsheet upon request with an accompanying 5¼ inch diskette and a stamped, self-addressed disk mailer.

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Prospects for International Policy Coordination: Some Lessons from the EMS

"Altogether, then, economic co-operation is no match for motherhood."
Clive Crook, *The Economist*

THE strong rise in the value of the dollar in the early 1980s and its sharp decline since February 1985 are alleged to have had wide-ranging effects on the economies of the United States and its major trading partners. In response to concerns about the costs of adjusting to large exchange rate movements specifically and the effects of divergent economic policies generally, policymakers have called for greater coordination of economic policies among the world's major industrial countries.[1] But, despite the stated official desire for greater policy coordination, little is certain about how it might work in practice. Some theoretical results suggest that there are potential gains from coordinated policy actions; these results, however, are not robust.[2]

One example of an explicit agreement for policy coordination is the European Monetary System (EMS). Established in 1979, the EMS was formed to stabilize bilateral nominal exchange rates among member countries. Because it is difficult to identify the direct benefits of more stable exchange rates per se, analysts typically have discussed the potential benefits of such coordination in terms of increased trade flows, faster real growth and policy convergence among member nations.

[1]At the September 1985 Plaza Accord, for example, the G-5 countries agreed to coordinated intervention policies that would reduce the value of the dollar. Since that meeting, there have been subsequent economic "summits" to discuss both target values for exchange rates (the Louvre Accord of February 1987) and indicators by which policies could be monitored (the June 1987 Venice Summit). Both the Bank for International Settlements (BIS) and the OECD have called for greater fiscal policy cooperation, with lower budget deficits in the United States and expansionary policies in Japan and Germany. See Bank for International Settlements (1987) and Organization for Economic Cooperation and Development (1987).

[2]Models using game theory have tended to conclude that policy cooperation will produce lower social welfare losses than non-cooperative policies. Some empirical work has provided evidence that supports the game theory results; see Currie and Levine, for example. It should be noted, however, that both lines of work are based on arbitrary social welfare functions and the existence of a benevolent policymaker. The public choice literature, in contrast, suggests that the wealth of the policymaker dominates social objectives as a criterion for choosing particular policy paths. If true, a quite different loss function would apply to policy choices. More generally, the game-theoretic results depend heavily on the loss function specified. Fischer (1987) and Frankel and Rockett (1987) also have shown that the results depend importantly upon the economic models used to evaluate policy effects.

As the one case in which some form of explicit cooperation has been adopted, the EMS offers an opportunity (and data) to examine its effect on a variety of economic indicators. This article reviews the economic experience of EMS countries relative to non-EMS countries during the 1980s to see whether exchange rate coordination has been associated with differential gains in other measures of economic well-being as well as to draw inferences about the likely effects of policy coordination on a greater scale by the industrial economies.

THE EMS: AN OVERVIEW

The EMS, which was established formally on March 13, 1979, was first composed of the nine European Community (EC) countries: Belgium, Denmark, France, West Germany, Ireland, Italy, Luxembourg, The Netherlands and the United Kingdom. Greece, which subsequently joined the EC, became an EMS partner in 1985 but Spain and Portugal, which joined the EC in 1984, have not yet become members of the EMS. Briefly, EMS membership requires each nation first to deposit 20 percent of its gold and gross dollar assets with the European Monetary Cooperation Fund (EMCF). In exchange, each nation receives an equivalent amount of European Currency Units (ECUs), which serve primarily as a unit of account for EMS functions (see Appendix). This asset exchange, however, is not so much a separate part of joining the EMS as it is a preliminary step to pursuing the System's objectives.[3] The second part of EMS membership involves the agreement to pursue stable nominal exchange rates, at agreed levels, for each bilateral set of rates. One rationale for this policy objective is that exchange rate variability is a source of uncertainty that reduces trade and the traded goods sector is a large portion of each EMS member economy.[4]

Although exchange rate objectives are "set," the EMS is not strictly a fixed-rate system; adjustments to the exchange rate levels have been made from time to time.[5] For example, in a major exchange rate realignment in March 1983, the French franc, Italian lira and Irish pound were devalued between 2.5 percent and 3.5 percent, while the remaining currencies were revalued between 2.5 percent (Danish krone) and 5.5 percent (German mark). As the IMF explains:

> Like previous realignments, this realignment had become necessary as a result of continued differences in the underlying strength of the participating countries' external positions, which reflected in turn divergences in economic policies and cost-price performance. These differences had generated expectations of exchange rate changes and led to large speculative capital flows.[6]

Similarly, in 1985, the lira was devalued 6 percent and other currencies revalued 2 percent when

> [t]he worsening of the current account reflected primarily the maintenance of a rate of growth in domestic demand higher than that of Italy's partners as well as the lagged effects of a significant loss of competitiveness vis-a'-vis other EMS countries over the previous two years.[7]

Thus, when fundamental differences in economic performance require changes in the established exchange rate targets, the EMS has revalued them. Table 1 shows the dates of these revaluations and their effect on individual currencies.

Between revaluations, bilateral rates are allowed to vary within margins of 2.25 percent of the desired values; because Italy historically has had higher rates of inflation than the other EMS countries, the lira has a band of 6 percent. Should bilateral rates violate these margins, however, the central banks in control of the two currencies are expected to intervene in foreign exchange markets in amounts necessary to bring the rates back into the agreed-upon ranges.[8]

The foregoing discussion represents a simple characterization of EMS policy coordination. The most important exception to this characterization for this study is that, although the U.K. exchanged

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[3]A detailed summary of the ECU, as well as the evolution of the EMS, is in Ungerer, et al. (1986). Karamouzis (1987) presents a shorter overview of the system and policy coordination.

[4]Both the theoretical and empirical evidence on a link between exchange rate variability and trade are ambiguous. DeGrauwe (1987, 1988), for example, provides evidence suggestive of a negative effect. Many others, surveyed in Farrell, et al. (1983), find no significant relationship between measures of exchange rate variability and trade. And, moving in the opposite direction, Franke (1987) provides theoretical reasoning for a positive relationship between exchange rate variability and trade. On balance, however, the predominant result seems to be that there is no important relationship between the two variables.

[5]Ungerer, et al., table 10.

[6]Ibid, p. 12.

[7]Ibid, p. 13.

[8]See Ungerer, et al., pp. 4–8, for a discussion of how interventions are conducted by the central banks of nations that participate in the exchange rate mechanism (ERM).

Table 1

EMS Realignments: Percentage Changes in Bilateral Central Rates

	German mark	Belgian franc	Danish krone	French franc	Irish pound	Italian lira	Dutch guilder
1979 9/24	+2		−2.86				
11/30			−4.76				
1981 3/23						−6	
10/5	+5.5			−3		−3	+5.5
1982 2/22		−8.5	−3				
6/14	+4.25			−5.75		−2.75	+4.25
1983 3/21	+5.5	+1.5	+2.5	−2.5	−3.5	−2.5	+3.5
1985 7/22	+2	+2	+2	+2	+2	−6	+2
1986 4/7	+3	+1	+1	−3			+3
8/4					−8		
1987 1/12	+3	+2					+2

SOURCE: Deutsche Bundesbank, *Intereconomics* (September/October 1987).

gold and dollar reserves for ECUs, it did not agree to participate in the cooperative effort to stabilize exchange rates.[9] Thus, while the U.K. is an EMS member, its exchange rate is not specifically tied to those of the other EMS nations. To make this distinction, the EMS countries that participate in the exchange rate mechanism (ERM) often are referred to as the ERM countries.

The ERM Has Reduced Exchange Rate Variability

Various studies have concluded that the ERM has significantly reduced the variability of exchange rate movements among the member countries. Table 2, reproduced from an IMF study by Ungerer, et al. (1986) provides one indication of how much the variability of monthly average nominal exchange rates, as measured by the coefficient of variation, declined after the EMS was formed; a similar pattern emerges if one examines data for real exchange rates (nominal exchange rates adjusted by CPIs) or other measures of variability, such as standard deviations; these reductions in bilateral exchange rate variability between ERM participants are statistically significant.[11] Finally, as depicted in the bottom portion of table 2, the IMF analysis indicates that exchange rates for non-ERM countries, such as the United Kingdom, the United States and Japan, generally experienced increased variability in the post-1979 period. Thus, relative to the exchange rate behavior of non-ERM industrial countries, the ERM has significantly reduced fluctuations in the real and nominal bilateral exchange rates among its members.[12]

ECONOMIC POLICY COORDINATION: A MORE GENERAL ANALYSIS

The ERM has achieved greater exchange rate stability. The usefulness of such policy coordination, however, must be judged ultimately on the basis of relative economic performance. This more general criterion for judging the efficacy of such coordination is important because economic theory does not suggest that stable exchange rates, per se, guarantee generally desirable economic outcomes.

[9]Greece, Portugal and Spain also do not participate in the exchange rate mechanism.

[10]Ibid, pp. 4–5 and pp. 18–21. Also see related evidence, provided by Rogoff (1985a), who found that bilateral exchange rates between EMS members have become more *predictable.*

[11]See Ungerer, et al., tables 16–21. The coefficient of variation is the standard deviation of a series divided by its mean.

[12]A contrary view is presented by Fels (1987). He argues that, because only n-1 bilateral rates in an n-exchange rate system are freely determined, the ERM really is nothing more than a dollar/Dmark system that pulls other exchange rates with it. More important, he argues that the ERM appears to have succeeded in the early 1980s only because the dollar's real value had risen sharply and stimulated export sales from ERM countries to the United States. As a consequence, member nations did not feel the need to pressure Germany to lead a currency devaluation through expansionary measures. Fels also conjectures — and is supported by recent developments — that realignments or other pressures on the ERM will occur as the dollar weakens.

Exchange Rate Stability, Economic Policies and Economic Performance Are Not Necessarily Related!

The ERM does not specify explicitly that member nations must coordinate policy actions. In other words, although the ERM members may agree to specific ranges on bilateral exchange rates, maintaining those ranges may be achieved, in principle, by a wide variety of policy actions.

To illustrate this point, consider a simple model of the nominal exchange rate:

$$(1)\quad e = \underset{\substack{\text{monetary}\\ \text{policy}\\ \text{measure}}}{(m^* - m)} \quad \underset{\substack{\text{financial}\\ \text{market}\\ \text{conditions}}}{- h(i^* - i)} \quad \underset{\substack{\text{real}\\ \text{output}\\ \text{conditions}}}{- k(y^* - y)}$$

where: e = the exchange rate $\left(\frac{\text{foreign \$}}{\text{domestic \$}}\right)$;

m = the nominal money supply;
i = the nominal interest rate;
y = real GNP;
k = the income elasticity of real money demand;
h = the interest response of real money balances; and
$*$ indicates values in a foreign country.

All variables in equation 1, except the interest rate, are expressed as natural logarithms.[13] The equation implies that a country's currency will depreciate (one unit of domestic currency will purchase fewer units of the foreign currency) if domestic money growth accelerates, domestic nominal interest rates decline or domestic real economic growth slows relative to changes in the equivalent measures in a foreign economy.

Once one recognizes, as in equation 1, that *differences* between domestic and foreign economic values determine the level of exchange rates, one can see clearly that a stable value for the nominal exchange rate is consistent with many different economic and policy environments and outcomes. For example, two countries could exhibit individually real growth of plus or minus 3 percent; as long as the difference between their real growth rates remained unchanged, however, the exchange rate, *ceteris paribus*, would be stable. Similarly, inflation in each country could be 20 percent or zero; other things the same, however, the exchange rate would be stable so long as the inflation differential were stable. Thus, stable exchange rates can be observed under a wide range of economic policies and conditions.

Equation 1 also points out that the exchange rate can be affected by policy actions in either the domestic or foreign country. If, for example, e were the French franc/DM exchange rate and the DM were rising (e, measured as French francs per DM, would be rising), e could be decreased (the DM made to decline) by increasing the German money stock relative to the French money stock. One way in which this might be accomplished would involve the Bundesbank and/or the Bank of France selling DM-denominated assets and buying franc-denominated assets, thus increasing the supply of marks and reducing the supply of francs. These changes in the markets for the franc and mark effectively would change the relative franc/DM price, that is, the exchange rate.

Table 2

Some Representative Comparisons of Monthly Average Variability in Nominal Exchange Rates[1]

Country	1974–78	1979–85
ERM		
Belgium	20.3	13.6
Denmark	25.0	14.8
France	31.6	15.9
Germany	29.2	16.3
Ireland	36.0	12.2
Italy	36.0	19.3
Netherlands	21.1	13.2
Non-ERM		
Austria	20.3	12.3
Canada	44.1	52.0
Japan	44.5	48.1
Norway	25.3	24.2
Sweden	30.2	31.6
Switzerland	44.0	25.9
United Kingdom	32.7	37.8
United States	34.7	55.7

[1]Adapted from table 16, Ungerer, et al. (1986). Figures are average values for the coefficient of variation, based on bilateral nominal exchange rates weighted by MERM weights.

[13]This model, taken from Dornbusch (1980), is based on the standard monetary approach to the balance of payments.

Notice, however, the effects of such an action. The money supply would expand in Germany and decline in France. First, if the Bundesbank were pursuing money growth within specified target ranges, the need for intervention of the sort described could well lead to money growth above the announced target path. Moreover, depending upon the magnitude and duration of intervention, the pursuit of a stable exchange rate (and its effects on the German money stock) could cause a rising price level in Germany; other short-run effects on output, unemployment and interest rates could be observed as well. Thus, in this one illustration, the two countries could achieve one objective at the expense of failing to attain others.[14]

ECONOMIC PERFORMANCE BEFORE AND AFTER THE ERM

Whether exchange rate stability has improved economic performance or brought about greater policy convergence among ERM countries is an empirical issue. In this section, this issue is assessed in two complementary ways.

ERM vs. Non-ERM Economic Performance: Another Look at the Evidence

To compare economic conditions before and after the ERM agreement, a set of monthly data for major indicators of policy actions and economic performance in the ERM countries and selected large non-ERM economies was assembled. The test consists of comparing the average growth rates and variances of the narrow (M1) money stock, CPI and index of industrial production and the average levels and variances of short-term interest rates between two periods: February 1975–February 1979 (before ERM), and April 1983–December 1987 (the "stable" ERM period). The interval between March 1979–March 1983, which IMF analysis has characterized as "frequent periods of exchange market strain and numerous consequent realignments of central rates," was not examined.[15] The transition period was omitted to focus on the comparison between the presumably less stable pre-ERM period and the relatively stable ERM period.

Specific hypotheses to be investigated with these comparisons include the following: If greater exchange rate stability brought about higher output growth and lower inflation, a comparison of period 1 versus period 3 should reveal significantly higher output growth (as measured by industrial production) and significantly lower inflation rates (as measured by CPIs) in the later period than in the earlier one. If these conditions are produced by the ERM, the same indicators for the non-ERM countries should exhibit significantly different, less beneficial output and price performance.

Equation 1 implies that stability in nominal exchange rate levels may be associated with greater volatility in money growth, interest rates or output, the equation's right-hand-side arguments.[16] If this is the case, measures of variability for these variables may have increased significantly in the ERM countries since 1979. Conversely, equation 1 would imply no change in the variability of these variables since 1979 in the non-ERM countries that did not attempt (at least explicitly) to reduce bilateral exchange rate variability.

Some caution in making these comparisons is necessary because they rest on a *ceteris paribus* assumption. The simple tests used here do not control for the effects of events that are unique to some countries (for example, a crop failure in Europe) or the differential effects across countries of a common phenomenon (for example, the energy price decline of the 1980s). Thus, rather than attributing a specific result — for example, a change in average money growth rates or the variance of interest rates — to the ERM, the comparisons are intended solely to reveal consistent patterns of change in the ERM and non-ERM countries. If there are consistent differences in the economic or policy performance between the ERM and non-ERM nations, it may be an initial indication of the possible effects of exchange rate coordination.

Differences in the Average Values of Selected Economic Indicators

The results in table 3 examine the economic measures that the simple theoretical model suggested as important in achieving greater exchange rate stability. The table 3 entries compare the

[14]For more general treatments of how policies and economies are linked, see Frenkel (1986) or Kahn (1987).

[15]Ungerer, et al., p. 11.

[16]Wood (1983), examining data for all EMS countries, found greater nominal exhange rate stability to be associated with greater variation in unanticipated interest rate changes in all cases except Ireland.

Table 3

Mean Values of Major Economic Indicators

Country	Period	Money growth (M1)	Inflation (CPI)	Short-term interest rates	Growth of industrial production
ERM					
Belgium	2/75-2/79	6.72[1]	6.77*	5.93*	6.18
	4/83-12/87	5.79[2]	3.36*	7.51*	2.82[2]
Denmark	2/75-2/79	13.70	8.72*	11.67*	4.19
	4/83-12/87	17.13[2]	4.70*	10.11*	5.19[2]
France	2/75-2/79	10.96	9.08*	8.25*	3.79
	4/83-12/87	8.65[2]	4.75*	9.84*	1.42
Germany	2/75-2/79	10.75	3.72*	3.85*	3.11
	4/83-12/87	6.54	1.24*	4.84*	2.99
Italy	2/75-2/79	18.00*	13.95*	12.84*	14.22
	4/83-12/87	11.64*[3]	7.35*	14.95*	3.13[2]
Netherlands	2/75-2/79	10.35	6.21*	5.45	2.57
	4/83-12/87	6.00	1.43*	5.72	2.85
Ireland	2/75-2/79	19.98*	N.A.	N.A.	7.18
	4/83-12/87	7.50*	N.A.	N.A.	8.55
Non-ERM					
United Kingdom	2/75-2/79	15.71	13.69*	9.46	2.75
	4/83-12/87	17.22[2]	4.59*	9.98	3.20
United States	2/75-2/79	6.79	6.96*	6.23*	6.61
	4/83-12/87	8.85	3.46*	8.15*	5.23
Canada	2/75-2/79	7.76*	8.16*	8.53[4]	4.09
	4/83-12/87	17.35*[2]	4.11*[2]	9.44	7.16[2]
Japan	2/75-2/79	10.01	6.35*	6.70*	6.23
	4/83-12/87	5.39	1.27*	5.39*	5.88
Austria	2/75-2/79	7.87	5.30*	N.A.	3.53
	4/83-12/87	5.81	2.71*	3.72	3.32[2]
Norway	2/75-2/79	10.01	7.92	8.40*	6.20
	4/83-12/87	14.39[5]	6.50	12.89*[5]	12.24
Sweden	2/75-2/79	12.24	9.50*	8.10*	−2.69
	4/83-12/87	4.09[2]	5.88*	11.23*	4.73
Switzerland	2/75-2/79	10.39*	1.84	1.62*[6]	N.A.
	4/83-12/87	1.61*[2]	2.02[2]	3.00*	N.A.

All data are monthly. Asterisks denote that values are statistically different at the 0.05 level.
[1]Data begin in 1976.02.
[2]Data end in 1987.09.
[3]Data end in 1987.06.
[4]Data begin in 1978.05.
[5]Data end in 1986.12.
[6]Data begin in 1975.09.
SOURCE: International Financial Statistics, *International Monetary Fund.*

mean values for major economic indicators prior to 1979 and since 1983; entries designated with an asterisk are values that differ significantly between the two periods shown.

The data show that the inflation rate of each ERM country has been reduced significantly since 1983. Some observers expected this result from an exchange rate agreement, arguing that the policies of low inflation countries, such as Germany, could dominate those of the high inflation countries, such as Italy. The bottom portion of table 3, however, indicates that inflation rates in the United Kingdom and other non-ERM countries — despite the absence of any explicit exchange rate agreement — also were significantly reduced.[17] This

[17]DeGrauwe and Verfaille, pp. 29–30, also show that the uncoordinated policy actions of non-ERM industrialized economies achieved lower average rates of inflation, and did so more quickly, than the coordinated ERM actions. This result is consistent with the theoretical reasoning in Rogoff (1985b).

Table 4
Variances of Major Economic Indicators

Country	Period	Money growth (M1)	Inflation (CPI)	Short-term interest rates	Growth of industrial production
ERM					
Belgium	2/75-2/79	188.80[1]	15.35	5.06*	12,371.77*
	4/83-12/87	181.01[2]	15.03	2.87*	2,826.57*[2]
Denmark	2/75-2/79	591.03*	130.37*	27.22*	2,904.63
	4/83-12/87	2,406.07*[2]	37.27*	2.56*	2,982.49[2]
France	2/75-2/79	176.02*	7.85	1.57*	645.52
	4/83-12/87	707.15*[2]	10.85	3.83*	439.13
Germany	2/75-2/79	146.27	11.50	0.45	302.35*
	4/83-12/87	177.64	7.37	0.53	1,116.63*
Italy	2/75-2/79	172.73*	54.18*	8.56	29,548.77*
	4/83-12/87	91.25*[3]	15.66*	7.03	749.01*[2]
Netherlands	2/75-2/79	507.71*	42.69*	11.65*	508.84*
	4/83-12/87	153.99*	19.64*	0.29*	1,808.63*
Ireland	2/75-2/79	358.50	N.A.	N.A.	2,018.50
	4/83-12/87	409.71	N.A.	N.A.	2,266.87[2]
Non-ERM					
United Kingdom	2/75-2/79	298.06	100.73*	5.50*	715.70*
	4/83-12/87	417.33[2]	26.00*	1.40*	158.17*
United States	2/75-2/79	17.89*	9.17	2.36	75.98
	4/83-12/87	48.71*	6.86	2.32	63.41
Canada	2/75-2/79	96.47*	18.88*	2.68[4]	214.42*
	4/83-12/87	518.58*[2]	7.99*[2]	2.05	443.98*[2]
Japan	2/75-2/79	289.58*	97.78*	6.06*	162.64*
	4/83-12/87	712.13*	42.50*	1.57*	287.42*
Austria	2/75-2/79	311.31	25.82	N.A.	529.33*
	4/83-12/87	205.05	29.51	0.18	1,135.33*[2]
Norway	2/75-2/79	1,334.30*	45.21*	6.50*	1,610.54*
	4/83-12/87	580.04*[5]	25.83*	1.32*[5]	17,020.64*
Sweden	2/75-2/79	815.42*	34.73	2.90	408.92*
	4/83-12/87	1,489.48*[2]	31.72	4.27	1,455.67*
Switzerland	2/75-2/79	618.98*	10.36	1.03[6]	N.A.
	4/83-12/87	146.38*[2]	14.40[2]	1.28	N.A.

All data are monthly. Asterisks denote that variances are statistically different at the 0.05 level.
[1]Data begin in 1976.02.
[2]Data end in 1987.09.
[3]Data end in 1987.06.
[4]Data begin in 1978.05.
[5]Data end in 1986.12.
[6]Data begin in 1975.09.
SOURCE: International Financial Statistics, *International Monetary Fund.*

result suggests that some common, worldwide phenomenon is a more likely source of lower inflation rates observed among the industrialized countries than the policy coordination associated with the ERM nations.

The remainder of the data in table 3 fail to identify any unique economic circumstances associated with the ERM group alone. Money growth declined significantly for two ERM countries, interest rates rose in four (and fell in one) and industrial production was statistically unchanged in all seven. The non-ERM group also displayed generally higher interest rates and unchanged industrial production growth. Thus, there is no change in the average value of a particular economic indicator that can be identified uniquely with the ERM countries.

Variation in Economic and Policy Indicators

The results in table 4 show a mixed pattern of performance with respect to the variances of the

Table 5

Growth in Real Trade Flows (Exports plus Imports)

	Period	With ERM countries	With non-ERM countries
ERM country			
Belgium	1973–78	7.7%	12.5%
	1979–86	2.2	4.5
Denmark	1973–78	12.8	5.2
	1979–86	3.8	3.2
France	1973–78	6.8	8.5
	1979–86	2.9	5.7
Germany	1973–78	7.0	7.6
	1979–86	2.9	6.8
Ireland	1973–78	20.0	8.2
	1979–86	9.4	4.8
Italy	1973–78	4.6	5.4
	1979–86	8.1	10.1
Netherlands	1973–78	6.2	10.5
	1979–86	2.4	5.3
Non-ERM country			
Austria	1973–78	11.3	4.2
	1979–86	4.8	4.0
Canada	1973–78	4.4	4.2
	1979–86	6.5	7.2
Japan	1973–78	11.6	7.2
	1979–86	9.5	10.0
Norway	1973–78	8.2	9.7
	1979–86	9.3	6.6
Sweden	1973–78	6.0	3.8
	1979–86	4.6	4.9
Switzerland	1973–78	8.0	6.8
	1979–86	4.5	3.8
United Kingdom	1973–78	11.4	5.1
	1979–86	5.4	4.2
United States	1973–78	4.4	4.2
	1979–86	7.3	8.5

Data are nominal trade values, reported in dollars by the IMF, adjusted by the U.S. GNP deflator and the Federal Reserve Board's trade-weighted exchange rate index (TWEX).

assorted economic and policy indicators. Short-term interest rates were significantly less variable in the third period for three of the ERM countries but significantly more variable in France. Similarly, industrial production became significantly less variable in Italy, but more volatile in two other countries, especially in Germany, where the variance of industrial production increased by a factor of four.

In contrast, for the United Kingdom, which does not participate in the ERM, the variances of the inflation rate, interest rates and industrial production all *declined* significantly. While the variances of money growth increased significantly in four non-ERM countries, two of these countries and four non-ERM nations overall achieved less variable inflation rates. Three non-ERM countries experienced significantly less interest rate volatility, while none experienced greater variability. Five of the eight non-ERM countries saw greater output variability in the more recent period. Overall, as in table 3, this mixed picture does not yield any uniquely beneficial results associated with ERM membership.

Exchange Rate Variability and Trade Flows

A somewhat different result emerges when data on trade flows are examined as in table 5. One possible result of reducing exchange rate variability is that the greater exchange rate certainty might increase trade flows. Since exchange rate

variability did decline among ERM countries but increased both among the non-ERM nations and between the ERM and non-ERM countries, it is interesting to see how trade flows changed after 1979 both within the ERM group and between the ERM and non-ERM nations.

Table 5 shows that the growth of intra-ERM trade *declined* in ERM economies (except Italy) during the period of greater exchange rate stability. In contrast, trade by non-ERM members both with each other and the ERM group often rose, even though these exchange rates became more variable. Canada, Japan and the United States are the notable cases of this result. On the basis of these results, again holding other things constant, greater ERM exchange rate stability was not associated with relatively larger intra-ERM trade.

SUMMARY

Proposals for policy coordination among the major industrial economies have been discussed more frequently in recent years. Initially such proposals were intended to correct what were perceived as problems created by a "high" value of the U.S. dollar; subsequently, they were intended to mitigate the adverse consequences of variable exchange rates and the falling value of the dollar.

One attempt to coordinate domestic policies in recent years in pursuit of stable bilateral nominal exchange rates is found in the EMS. Evidence based on data before and after the establishment of the EMS suggests that, while bilateral exchange rates have become more stable, other measures of economic performance and policy actions fail to show the effects of such coordination. Lower inflation rates in ERM countries have been matched by lower inflation rates in major non-ERM economies. Other variables, such as money growth, interest rates and real output measures also show no consistent differential response in ERM and non-ERM countries in recent years. The data do not even show that intra-ERM trade has increased any more than trade with non-ERM countries, despite the reductions in exchange rate variability among ERM nations. Overall, the only experience we have with concerted policy coordination does not indicate that general economic or policy measures have been much affected — one way or another — by such coordination.

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Appendix
The European Currency Unit

The European Currency Unit (ECU) serves primarily as a unit of account for a variety of functions within the European Community (EC). For example, the value of the ECU is a reference point from which to judge the divergence of individual currency values from desired values. More generally, the ECU is a unit of account for the EC's budget, its Common Agricultural Policy and its other finance and credit activities.

The ECU itself is simply a weighted-basket of EMS member currencies. As shown in the table, as of September 17, 1984, one ECU was equal to the market value of 3.71 Belgian francs, 0.219 Danish krones and so on across the 10 EMS currencies. Over time, both the weights attached to member currencies and their market values relative to non-EMS currencies have changed so that the value of the ECU has varied (see chart on opposite page).

The ECU originally had been intended to serve also as a means of settlement and a reserve asset. In both cases, however, its use has been small. It is rarely used as a means of settlement and, as a reserve asset, is largely a substitute for the gold and dollar deposits a member country gave up to join the EMS.

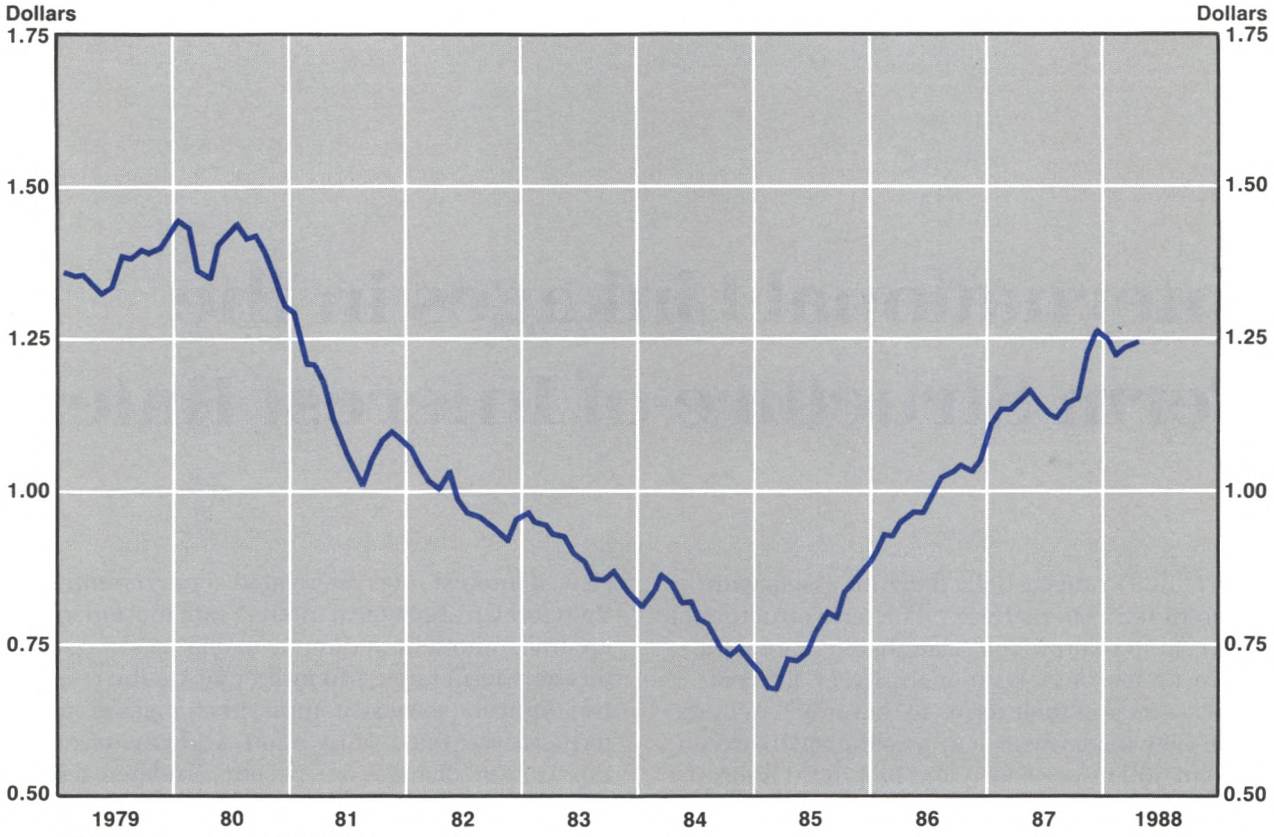
The private use of ECUs, however, is a different matter. Because it represents a basket of EC currencies and because a formal agreement exists to keep constituent currencies within specified bounds, investors have viewed financial instruments denominated in ECUs to be less risky than similar instruments denominated in a specific currency. For this reason, sight and time deposits, loans and bonds all have been offered denominated in ECUs. Thus, the ECU may be viewed best as a currency index unit of account that varies less than its constituent currencies.

Representative Composition of the ECU

Currency	National currency units September 17, 1984	Percentage weights September 17, 1984
Belgian franc	3.71	8.2
Danish krone	0.219	2.7
French franc	1.31	19.0
Deutsche mark	0.719	32.0
Irish pound	0.00871	1.2
Italian lira	140.00	10.2
Luxembourg franc	0.14	0.3
Netherlands guilder	0.256	10.1
Pound sterling	0.0878	15.0
Greek drachma	1.15	1.3
		100.0

SOURCE: Ungerer, et. al. (1986), table 4.

Chart 1
Value of the ECU in U.S. Dollars



NOTE: Data are period averages.

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International Linkages in the Term Structure of Interest Rates

INTEREST rates usually differ for assets with different terms to maturity.[1] The term structure of interest rates shows the relationship among the interest rates, or yields to maturity, of different-lived assets and their terms to maturity.[2] Analysts often view the term structure as the link between current and future short- and long-term interest rates. This link is important because of the widely held belief that monetary authorities are able to influence only short-term money market rates, while long-term rates are more relevant in making investment and consumption decisions. An understanding of the transmission mechanism from current short-term rates to future interest rates is crucial, according to this view, in implementing and evaluating monetary policy.

This article extends the analysis of the term structure by examining whether movements in the domestic term structure are influenced by foreign interest rate developments. In the term structure view, if interest rates are related across countries, then foreign short-term interest rate movements are transmitted both directly to changes in domestic short-term rates, and indirectly, via the respective domestic term structures, to changes in long-term interest rates. Thus, short- and long-term interest rate changes are closely correlated across countries and long-term interest rates changes in one country are related to foreign short-term rates as well. This hypothesis is commonly thought to hold for the United States, whose policies are blamed for adverse interest rate developments abroad. This article examines the relationships among the term structures of interest rates in the United States, Canada, the United Kingdom, West Germany and Japan. Our chief focus is on the extent to which movements in short- and long-term interest rates are related internationally and whether changes in foreign interest rates influence domestic interest rates.

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[1]A given yield curve implicitly assumes that other characteristics of the short- and long-term assets are identical. Yields on financial assets differ for many reasons, including differences in default risk, marketability and tax treatment. In term structure research, it is typical to examine short- and long-term government securities and to assume that differences in their maturity are the main determinant of the differences in their yields. See Wood (1983).

[2]In this article, the terms interest rate and yield to maturity are used interchangeably. Both measures reflect the average expected rate of return over the remaining life of the underlying financial asset. These measures usually will differ from the holding-period return, which equals the return on an asset over a fixed period. For example, the one-year holding-period return on a 10-year bond is the annual coupon payment plus the capital gain over the year, while the yield to maturity on the same bond is the average of all current and expected future one-year holding-period returns until the end of the bond's life. Only when the holding period and the remaining maturity of the bond are equal will these two measures of return coincide. An approximately linear negative relation holds between the change in the long-term interest rate and the holding period return. For details, see Shiller *et al.* (1983).

TERM STRUCTURE THEORY

The expectations theory is the principal theoretical approach to the term structure of interest rates. This theory assumes that investors view short- and long-term government bonds as perfect substitutes, that is, investors are indifferent to the maturity of holdings of government securities.[3] This assumption implies that every investment strategy in government securities has the same expected return over any given future holding period. For example, suppose that the current one-year rate is 6 percent, while the interest rate on a 10-year bond is 8 percent. If investors expect future one-year rates to remain constant at 6 percent, it is more attractive now to buy the 10-year bond. Over a 10-year holding period, the 10-year bond yields an 8 percent annual rate of return; rolling over a sequence of one-year assets for the same 10-year period yields an expected rate of only 6 percent. Increased purchases of 10-year bonds bid up their price, thereby depressing their yield; similarly, sales of existing one-year securities (to switch into higher-yielding 10-year bonds) lower their price and raise their expected yield. This process continues until the long rate equals an average of current and expected future short rates.

Thus, the interest rates on a three-month bill, a one-year bill and a 30-year bond will differ according to the market's assessment of expected interest rates on short-term assets beyond the life of each instrument. The one-year bill will have a yield that reflects not only the expectation for the next three months embodied in the three-month bill rate, but also the expectations for the subsequent nine months. Similarly, a 30-year bond will have a current yield to maturity that is influenced by the same expectations as the one-year bill for the first year, but also by expectations for the remaining 29 years of its life. If future short-term rates are expected to be higher (lower) than today, a positive (negative) spread, or difference, between today's long- and short-term interest rates will reflect it.

DOMESTIC TERM STRUCTURE EQUATIONS

According to theories of the domestic term structure of interest rates, the current spread between the level of long- and short-term interest rates is directly related to the expectation that future short-term interest rates and, therefore, long-term rates will be higher. Formally, this relationship for the long-term interest rate, R_t, can be written as:

$$(1)\quad \Delta R_t = \beta_0 + \beta_1 S_{t-1} + \varepsilon_t,$$

where S_{t-1} is the lagged spread, $(R_{t-1} - i_{t-1})$, and i_{t-1} is the lagged short-term interest rate. In theory, the parameter β_0 is expected to be negative and β_1 is expected to be positive.[4] The intercept β_0 is the negative of a term or risk premium. Long-term interest rates, on average, will not change ($\Delta R_{t+1} = 0$) when the spread, S_t, equals the ratio of $(-\beta_0/\beta_1)$; this ratio is positive when there is a positive term premium and zero when β_0 is zero. Long-term rates are expected to rise (fall) when the current spread exceeds (is less than) $(-\beta_0/\beta_1)$.

A similar equation can express the same relation for short-term rates (Δi_t). Term structure theory does not provide a theoretical value for the spread coefficient in such an equation, since expected changes in future short rates are not necessarily distributed uniformly over each future period's short rate. Thus, a rise in the spread need not indicate that the short rate will be higher next month, although it does indicate that some unspecified future short rates (and long rates for assets that span the period) will be higher than they are now. When expected future short-term interest rate changes are distributed uniformly or weighted more heavily to the near future, which

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[3]There are several competing theories of the term structure of interest rates. For a detailed description of these theories, see the discussion in a textbook such as Wood and Wood (1985), chapter 19. They *all*, however, have a common foundation in what sometimes is called the traditional expectations theory. The purpose of this article is not to test competing theories of the domestic term structure; instead, it uses a general specification as a point of departure to study international linkages among interest rates.

[4]Theoretical expressions for the values of β_0 and β_1 are found by equating holding-period returns, adjusted for any term premium. Consider a monthly analysis of one-month Treasury bills and 10-year bonds, like that below. The one-month holding-period return on a one-month T-bill is its interest rate, i_t; the one-month holding-period return on a 10-year bond is the interest rate R_t plus the annualized expected capital gain; this capital gain is inversely proportional to the expected one-month change in the 10-year bond rate, ΔR_{t+1}. The equality results in a β_1 measure that is positive, but very small in a monthly analysis, and proportional to the average in-sample long rate; the expression for β_0 equals $(-TP)\beta_1$ where TP is the average term premium. See Mankiw (1986) for an example of this derivation.

generally is the case in theoretical or empirical investigations, the spread coefficient in a short-term rate equation should also be positive.[5]

A variant of the standard term structure equation used in many macroeconomic models is:

$$(2)\quad S_t = \alpha_0 + \alpha_1 S_{t-1} + \alpha_2 \Delta i_t + \alpha_3 \Delta i_{t-1} + \varepsilon_t.$$

In equation 2, the long-term interest rate is a long distributed lag of past short-term rates.[6] Equation 2 can be rewritten as:

$$(3)\quad \Delta R_t = \beta_0 + \beta_1 S_{t-1} + \beta_2 \Delta i_t + \beta_3 \Delta i_{t-1} + \varepsilon_t.$$

Equation 3 adds information on the current change in the short rate and a lagged value of this change to equation 1.[7] One rationale for adding "news" about the short rate is that short-rate changes reflect new information about expected future short rates beyond the information contained in the recent spread.[8] If markets are efficient and adjust within one period, β_3 should equal zero and β_2 should be positive. Equations like this are widely used to study the term structure of interest rates empirically. Accordingly, we use it as a point of departure in investigating international term structure linkages.

Domestic Macroeconomic Determinants of the Level of Interest Rates

Term structure and asset price theory explain differences in yields over time or among assets, but do not explain the general level of interest rates. Closer scrutiny of the factors influencing both short and long rates might indicate additional domestic determinants of the term structure that would modify equation 3.

The central factors influencing the general level of nominal interest rates, according to Fisher (1930), are the expected real rate of return on capital and the expected inflation rate.[9] Economic theory indicates that the expected real rate of interest is determined by the marginal productivity of capital and the marginal utility of consumption. Numerous economic factors, however, can impinge, at least temporarily, on these rather abstract determinants and, hence, on the real rate of interest.[10]

One approach to analyzing the term structure of interest rates models the effect of domestic macro-

[5]Estimates of long- and short-rate equations like equation 1 often lack predictive content and are systematically at odds with the theory. See, for example, Shiller (1979), Shiller *et al.* (1983), Mankiw and Summers (1984) and Mankiw (1986). Most studies of the term structure find support for the inclusion of a term, or risk, premium in a term-structure equation: it is common to include a constant and nonzero term premium in characterizations of the expectations theory. See Wood and Wood (1985) or Clarida and Campbell (1987), for examples. Moreover, financial theory indicates that risk premia also are related to returns in other financial markets, like stocks, and to expectations about general economic conditions. For example, Cox Ingersoll and Ross (1981) modify the expectations theory to account for a negative effect on the term premium that is proportionate in magnitude to economic uncertainty. The possibility of a nonzero average, or constant, term premium is included in the estimates below. Specifications like equation 1 implicitly presume that all other influences on interest rates in the next period, beyond the current spread information and the term premium, have zero mean and are uncorrelated with the current spread. Such restrictions are relaxed in empirical models like those below.

[6]See Mankiw (1986). Modigliani and Sutch (1966) used a more famous variation of such an equation; it had a 16-quarter distributed lag on past short rates, instead of the lagged spread term, and so was explicitly backward-looking, rather than forward-looking as the expectations theory emphasizes.

[7]This transformation is found by subtracting S_{t-1} from both sides of equation 2 to obtain ΔS_t, then adding Δi_t to both sides to obtain equation 3. Equation 3 also can be derived from equation 1 and its short-rate variant. This form, however, suggests that one source of a negative coefficient on the lagged spread is that short rates are more sensitive to recent spread changes, which is likely if movements in the current spread are more informative about near-term prospective short rates than about all future short rates. Testing this alternative is beyond the scope or purpose of this paper.

[8]This view implies that an observationally equivalent view of equation 2 is that the lagged spread incorporates unbiased forecasts of future rates as in equation 1, but news reflected in current short-rate movements is informative about revisions of expected future rates. The Modigliani and Sutch variant of equation 2 has been criticized by numerous analysts, including Phillips and Pippenger (1976). The latter show that a forward-looking, efficient markets model rejects the Modigliani-Sutch model without including the lagged spread. The results below suggest that their specifications can be improved, however.

[9]These considerations also suggest that the term structure of nominal interest rates is a combination of a term structure of expected inflation and a term structure of expected real rates. When inflation temporarily accelerates (slows) due to a supply shock, the spread shrinks (widens) because the short-term rate rises (falls) more than the long-term rate. Garner (1987) presents evidence for the United States on the close relationship between the term structure of interest rates and the term structure of inflationary expectations.

[10]The standard laundry list of other macroeconomic factors includes the money stock, the price level, tax rates, government expenditures and other fiscal variables, and other domestic real variables such as private sector aggregate demand for goods and services, the business cycle, the mix between consumption and investment, and risk. Both current values and expectations of future values of these variables and their growth rates affect current and expected future real rates.

economic changes on the two components of both long- and short-term interest rates.[11] If financial markets are efficient, however, investors will have used the available relevant domestic information to price assets, including government bonds of all maturities. Thus, no additional domestic information exists that can improve on the implicit forecast of future interest rates reflected in the current term structure.

International Term Structure Linkages

Whether additional information on foreign interest rates influences the domestic term structure depends on the exchange rate regime. Under a fixed-exchange-rate system, domestic interest rates and monetary policy are not independent of foreign developments. Inflation rates tend to be equal across the countries that have a fixed-rate commitment; they equal the rate of depreciation of the purchasing power of the commodity or the money against which the exchange value of the currencies are fixed. In addition, if capital markets are integrated internationally, a change in the real rate of return in any one country is transmitted to all nominal rates both domestically and abroad as investors attempt to maximize real rates of return.[12] Since in this case the expected inflation rate and real rate are closely linked across countries, the nominal interest rate, at all maturities, is also closely linked. Economic developments at home or abroad could influence the interest rates common to all countries, but foreign factors would not have an independent influence on a domestic term structure like that shown in equation 3; news of such developments would be fully captured in the Δi_t term for the domestic economy.

The relation of interest rates across countries for a given maturity, called the covered interest parity condition, is

$$(4)\quad i = i^* + \frac{(f-e)}{e}n,$$

where

- i and i^* = the domestic and foreign interest rates, respectively, for comparable assets with respect to maturity and risk,
- e = the current or spot exchange rate expressed as the number of domestic currency units per unit of foreign currency,
- f = the corresponding forward rate one period in the future, and
- n = the annualizing factor for the term of assets being compared, which equals 12 divided by the number of months to maturity.

Under a credible fixed rate regime, the expected forward rate would equal the spot rate at all maturities, so that countries would have the same term structure of interest rates. Domestic news in one country that affects domestic rates and the term structure would be immediately transmitted abroad, so that $(i = i^*)$ would hold for all maturities.

Even in the absence of a credible fixed-rate commitment, monetary authorities may still have a long-run exchange-rate objective and may periodically intervene in the exchange market or conduct policy to further that goal.[13] If they do, international rates could still be related, although the relationship would be looser, and changes in short rates especially would not be systematically coincident.

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[11] Wood and Wood (1985) have noted an interpretation problem with such a procedure; do such variables enter as determinants of a term premium, via a "segmented markets" argument, for example, or do they provide additional information on the time path of expected future real interest rates? This problem mediates against the arbitrary introduction of current information for such variables. Moreover, the long list of potentially relevant macroeconomic factors and the dynamics of their effects operating through lags indicate that this approach is difficult and invariably controversial to implement. Even if undertaken successfully, however, the effort could be quite misleading.

[12] For a more detailed description of interest rate relations across countries, see Bisignano (1983) and Kirchgassner and Wolters (1987). Glick (1987) provides evidence on the real-interest-rate linkage between the United States and the Pacific Basin countries.

[13] In the absence of risk premia in foreign exchange markets, the forward rate would equal the expected future spot rate, so the second term on the right-hand side would equal the expected rate of appreciation of the foreign currency. Even if risk premia exist in foreign exchange markets, the forward rate will be a close approximation of the future spot rate in most situations, so the second term will approximate the expected rate of appreciation of foreign currency. Meese and Rogoff (1983) argue that this approximation is often unsatisfactory. Covered interest parity has been tested widely and successfully for short-term rates; such tests are typically restricted to short-term assets to ensure that there is an active market in forward contracts for foreign exchange for a comparable period. See Frenkel and Levich (1975, 1977) or, more recently, papers that reject the stronger variant called the "Fisher open" hypothesis or uncovered interest parity, such as Cumby and Obstfeld (1984). The strength of international linkages also depends on the extent to which assets of the same maturity across countries are substitutes; different tax regimes, transactions costs or other factors can impair the international interest rate linkage.

In a "pure float," or regime with no exchange-rate commitments, interest rates across countries can be independent if countries pursue independent inflation rate objectives and if the real interest rate is constant. Movements in foreign interest rates can be reflected in the prospective change in the exchange value of the domestic currency, rather than in domestic interest rates. Even in this case, however, the implicit exchange rate change can have undesirable effects on other policy objectives, such as the price level, so that interest rates will still not be independent across countries.

In particular, a rise (fall) in a foreign interest rate need not spill over to the domestic rate if the domestic currency is free to appreciate (depreciate) relative to the foreign currency. But the appreciation (depreciation) of the domestic currency can depress (raise) the domestic price level as well as, temporarily, the inflation rate. While there may not be an explicit exchange rate objective, an inflation or other objective can be at odds with such exchange rate effects and, therefore, require policy actions to raise (lower) interest rates. Hence, foreign interest rate changes can result in equal domestic rate changes despite the absence of an exchange-rate commitment.[14] Finally, when domestic short-term interest rate movements are only temporarily insulated from foreign movements by central bank intervention, long rates will still reflect these foreign changes immediately. In this case, foreign short-term rates would exert an independent effect on domestic long-term interest rates, given domestic short-term rates.

THE EMPIRICAL RELATIONSHIPS

To analyze domestic and international interest rate relationships, end-of-month observations of representative short- and long-term interest rates for the United States, Canada, the United Kingdom, West Germany and Japan were selected for the period from April 1977 to June 1987. This period was chosen on the basis of data availability.[15]

The Data: Some Simple Statistics

The top panel in table 1 shows the means and standard deviations of the levels and monthly changes of these interest rates and spreads in each country. The levels of rates show considerable variability, but the mean long rate exceeds the mean short rate in each country. The mean level of short rates in Canada and the United Kingdom are not significantly different from each other.[16] The same is true for West Germany and Japan, but their mean interest rate levels are lower than those in the other three countries. The mean U.S. short rate is significantly higher than in Japan and West Germany but lower than in Canada and the United Kingdom.

The rank ordering of the mean long rates is the same as for short rates, but the mean levels of the long rate are significantly different for each pairwise comparison of countries. The mean spread is not significantly different for four of the country pairs: the United Kingdom and Canada, the United Kingdom and Japan, the United Kingdom and Germany, and Japan and West Germany; in the other six pairwise comparisons (four of which are for the United States), the mean spreads are significantly different. The mean of changes in interest rates is approximately zero for each country and maturity class. In each country, the standard deviation of changes in the short rate far exceeds the standard deviation of changes in the long rate, indicating the greater volatility of short rates in all five countries.[17]

The bottom panel of table 1 shows correlation coefficients for both levels and changes of short rates, long rates and the spread for each country. A correlation of 0.18 or larger in absolute value is statistically different from zero at the 5 percent significance level. The evidence suggests that the short and long rates are highly correlated within each country. Similarly, monthly changes in short and long rates are highly correlated in each country except Japan.

The spread is dominated by the short rate; this is indicated by the significant negative correlation between the spread and the short rate in all five countries and the absence of a significant positive correlation for the spread and the long rate in any country. The level of the long rate and the spread are insignificantly correlated for the United States

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[14]The theoretical and empirical basis of this absence of independence under floating exchange rates has been developed extensively by Mussa (1979) and Swoboda (1983).

[15]A description of the data is contained in the appendix to this article.

[16]The tests of differences in the means in table 1 use a "pooled t-test" with a 5 percent significance level.

[17]This smaller long-rate variability reflects the notion that, if the long rate is a weighted average of current and expected future short rates, some short-rate variability over time is expected to average out.

Table 1

The Term Structure Data For Five Countries (April 1977 to June 1987)

	United States		United Kingdom		Japan		Germany		Canada	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Levels										
Short-Rate (i)	8.75%	2.77%	11.67%	2.95%	6.30%	1.66%	6.44%	2.71%	10.98%	3.20%
Long-Rate (R)	10.51	2.32	12.39	1.88	7.23	1.27	7.65	1.34	11.49	2.20
Spread (R − i)	1.76	1.59	0.72	1.92	0.93	1.16	1.21	1.62	0.52	1.76
Changes (Δ)[1]										
Short-Rate (Δi)	0.01	1.18	0.01	0.92	−0.02	0.56	−0.01	0.63	0.01	0.84
Long-Rate (ΔR)	0.01	0.54	−0.00	0.59	−0.03	0.28	−0.00	0.31	0.01	0.55
Spread (ΔR − Δi)	−0.00	1.01	−0.01	0.83	−0.01	0.59	0.01	0.57	0.00	0.75
Correlation of Interest Rates Within Each Country[2]										
(i, R)	0.82		0.77		0.71		0.90		0.85	
(i, Spread)	−0.55		−0.78		−0.65		−0.93		−0.76	
(R, Spread)	0.03		−0.21		0.07		−0.68		−0.31	
(Δi, ΔR)	0.52		0.47		0.13		0.43		0.49	
(Δi, Δ Spread)	−0.89		−0.78		−0.89		−0.87		−0.76	
(ΔR, Δ Spread)	−0.07		0.19		0.35		0.07		0.19	

Data sources listed in the appendix to this article.
[1]Data for changes are from May 1977 to June 1987.
[2]Critical value for 95 percent confidence level is 0.18; for 99 percent confidence level, it is 0.23.

and Japan. For the other three countries, this correlation is even negative. In first differences, the correlations between the long rate and the spread are always positive, though significantly so only in the United Kingdom, Japan and Canada, while the changes in the short rates remain significantly negatively correlated with the changes in the spread.

Table 2 presents correlations of rates across countries that allow a preliminary assessment of whether and how rates are linked internationally; the critical level for 5 percent significance is the same as in table 1, 0.18. All long rates appear to be highly correlated in levels. This correlation is strongest among the United States, Canada and West Germany. The same is true for the level of short rates. While changes in long rates are significantly positively correlated across all five countries, only the United States and Canada exhibit a strong significant positive correlation between changes in short-term interest rates. Changes in short-term rates in West Germany and Canada, as well as in West Germany and Japan, are marginally significantly related but the other seven country pair correlations are not.

The strong and significant correlations for both long-term interest rate levels and changes across all five countries suggest that these countries experienced strongly similar inflationary developments between 1977 and 1987.[18] The fact that there is generally an absence of a significant correlation between contemporaneous short-rate changes is important for at least two reasons. First, it suggests that the period was characterized by a free float. Second, it suggests that the strong positive correlation of changes in long rates does not arise through a term structure transmission mechanism that runs from foreign short rates (and associated

[18]Monthly rates of increase in consumer prices also support this suggestion. The smallest pairwise correlation over this period is 0.17 for Germany and Japan, and for Canada and the United Kingdom; these are significant at a 6.5 percent significance level. The other eight pairwise correlations exceed 0.33 and are significant at a 1 percent level. On the same basis (and like the long-rate results above), the mean inflation rate is not significantly different for Germany and Japan, for the United States and Canada, or for Canada and the United Kingdom. The other seven pairwise comparisons are significantly different from zero and the rank ordering is the same as for long rates.

Table 2

Correlations of Levels and Changes of Interest Rates in Five Countries (April 1977 to June 1987)

	United States	United Kingdom	Japan	Germany	Canada
Short-term rate[1]					
United States	1.00				
United Kingdom	0.58	1.00			
Japan	0.43	0.57	1.00		
Germany	0.80	0.68	0.63	1.00	
Canada	0.88	0.63	0.43	0.90	1.00
Long-term rate					
United States	1.00				
United Kingdom	0.71	1.00			
Japan	0.68	0.71	1.00		
Germany	0.91	0.80	0.80	1.00	
Canada	0.97	0.73	0.64	0.91	1.00
Changes in the short-term rate[2]					
United States	1.0				
United Kingdom	−0.01	1.0			
Japan	0.01	−0.03	1.0		
Germany	0.13	0.05	0.19	1.0	
Canada	0.34	0.17	0.09	0.18	1.0
Changes in the long-term rate[2]					
United States	1.0				
United Kingdom	0.33	1.0			
Japan	0.35	0.35	1.0		
Germany	0.52	0.32	0.53	1.0	
Canada	0.80	0.32	0.30	0.48	1.0

[1]Critical value for 95 percent confidence level is 0.18; for 99 percent confidence level, it is 0.23.
[2]Data for changes are from May 1977 to June 1987.

foreign long-rate movements) to domestic short rates and, again via a term structure, to domestic long rates. These implications can be tested more directly using domestic term structure equations.

Domestic Term Structure Estimates

The domestic term structure equation 3 is used to examine international linkages.[19] The coefficient β_1 involves the constraint that the effect of R_{t-1} is equal and opposite to that of i_{t-1}, given Δi_t and Δi_{t-1}. Viewed another way, the term i_{t-1} enters equation 3 through three right-hand-side terms (S_{t-1}, Δi_t, Δi_{t-1}). Therefore, unconstrained estimates of the equation are used to avoid any bias imposed by the constraint and to examine each term in the equation. The unconstrained version of equation 3 used here is:

$$(5)\quad \Delta R_t = \beta_0 + \beta_1 R_{t-1} + \beta_2 \Delta i_t + \beta_4 i_{t-1} - \beta_3 i_{t-2} + \varepsilon_t.$$

If the constraint in equation 3 holds, β_4 equals $(\beta_3 - \beta_1)$. Insignificant terms generally are omitted in the estimates of equation 5 that are reported in table 3. In particular, the i_{t-2} term is generally insignificant and omitted. In this case, β_4 would equal $-\beta_1$ if the spread constraint holds; β_4 can be compared directly with the coefficient on R_{t-1}. Additional lags of long-term and of short-term rates up to four months earlier were checked for significance, but their addition to the table 3 equations was uniformly rejected.

[19]Estimates (not reported) of equation 1 for ΔR_t and a short-rate equation for Δi_t have little or no explanatory power; only four of the 20 intercept and slope terms are significantly different from zero. These are the positive lagged spread coefficients in the short-rate equations for the United States, United Kingdom and Japan, and a significant negative constant in the Japanese equation. Often (three of five cases), the insignificant lagged-spread coefficient (β_1) in the long-rate equation is negative, contrary to the theory.

Table 3

Domestic Long Interest Rate Regressions (September 1977 to June 1987)

	$\bar{R}_2$	DW	h	SE	$\hat{\rho}$
United States					
$\Delta R_t = 0.30 + 0.26\Delta i_t + 0.09i_{t-1} - 0.10R_{t-1}$	0.33	2.04	−0.23	0.45	–
(1.49) (7.28) (3.42) (−3.34)					
Canada					
$\Delta R_t = 0.50 + 0.33\Delta i_t + 0.07i_{t-1} - 0.11R_{t-1}$	0.27	2.00	0.00	0.48	–
(1.93) (6.20) (2.66) (−2.85)					
United Kingdom					
$\Delta R_t = -0.01 + 0.30\Delta i_t - 0.12\Delta i_{t-1}$	0.24	1.87	–	0.52	–
(−0.12) (5.81) (−2.33)					
West Germany					
$\Delta R_t = 0.91 + 0.23\Delta i_t + 0.08i_{t-1} - 0.18R_{t-1}$	0.25	1.86	1.40	0.27	0.28
(2.32) (6.14) (2.17) (−2.36)					(2.17)
Japan					
$\Delta R_t = -0.02 + 0.06\Delta i_t$	0.01	1.92	–	0.27	–
(−0.90) (1.39)					

For the United States, Canada and West Germany, the coefficient on the lagged spread, indicated by that on R_{t-1} in table 3, is negative.[20] The observation of a negative and significant coefficient for β_1 is a rejection of the expectations hypothesis, but, as noted above, there may be sound reasons for this common empirical result. For our purposes, all that is important is that R_{t-1} has a statistically significant effect on ΔR_t in three of the countries and, therefore, should be controlled for in testing international linkages.

In Japan, neither the lagged long rate nor short rate have any significant effect; in fact, the change in the long rate is essentially uncorrelated with any domestic interest rate information. No lagged short rate changes enter significantly in equation 5, except in the United Kingdom, where β_3 and β_4 are equal in magnitude but β_1 is zero. The current change in the short rate is the most powerful explanatory variable for the change in the long rate; for all countries except Japan, a 1 percent change in the short-term interest rate raises the long rate by about a quarter of a percent in the same month.

Table 4 contains similar domestic regression results for the change in the short rate in each country. Past values of both short-term and long-term interest rates for up to four periods were examined sequentially, both individually and jointly, to see if they provided statistically significant explanatory power for the change in the short-term interest rates. For all countries, there is a significant positive relation between the current change in the short rate and the first or second month's lagged change in the long rate.[21] This is broadly consistent with the expectations theory that indicates the change in the current long rate reflects changes in expected future short rates. If these expectations are realized, the change in the long rate presages these future short-rate changes.

In the Canadian case, the short rate is a three-month rate instead of the one-month rate that is available for the other countries; the use of a three-month rate imparts a natural second-order moving average process in the residuals of this

[20]These three equations in table 3, and in table 6 below, include lagged dependent variables so the Durbin-Watson d-statistic (labeled DW in the tables) is not the appropriate test for autocorrelation. This problem arises in tables 4 and 5 below, as well. The Durbin h-statistic is computed whenever the number of observations is not too large to prevent this calculation. In tables 3 and 6, h-statistics can be computed and they reject the presence of significant autocorrelation. The critical value is 1.65. For the equations for West Germany, a correction for first-order serial correlation is necessary and its estimated coefficient, p, is indicated in the tables. There is no indication of further significant autocorrelation in the equations, however.

[21]The computed h-statistics indicate the absence of significant autocorrelation. The statistic cannot be computed for the short-term interest rate equations in table 4 for Canada or the United Kingdom. In these countries, Durbin's alternative test that regresses errors on the lagged error and all right-hand-side variables is used. The coefficient on the lagged error term provides the test statistic for autocorrelation. This coefficient is not statistically significant in either country, so no correction for autocorrelation was computed.

Table 4

Domestic Short-Rate Regressions (September 1977 to June 1987)

	$\bar{R}_2$	DW	h	SE
United States				
$\Delta i_t = 1.15 - 0.13 i_{t-1} + 0.73 \Delta R_{t-1}$	0.14	1.96	0.21	1.11
(3.22) (−3.36) (3.83)				
Canada				
$\Delta i_t = 0.61 + 0.24 \Delta i_{t-1} - 0.05 i_{t-2} + 0.35 \Delta R_{t-1}$	0.20	2.01	N.C.	0.76
(2.38) (2.49) (−2.45) (2.41)				
United Kingdom				
$\Delta i_t = -0.31 - 0.25 \Delta i_{t-1} - 0.13 i_{t-2} + 0.57 \Delta R_{t-1}$	0.13	2.11	N.C.	0.87
(−0.55) (−2.39) (−2.80) (3.69)				
$+ 0.15 R_{t-2}$				
(2.09)				
West Germany				
$\Delta i_t = -0.00 - 0.16 \Delta i_{t-1} + 0.46 \Delta R_{t-2}$	0.06	2.03	−0.55	0.62
(−0.02) (−1.82) (2.48)				
Japan				
$\Delta i_t = -0.06 - 0.14 i_{t-1} + 0.50 \Delta i_{t-3}$	0.35	1.73	1.60	0.46
(−0.24) (−3.65) (6.71)				
$+ 0.45 \Delta R_{t-1} + 0.13 R_{t-2}$				
(2.80) (2.46)				

N.C. means the h-statistic cannot be computed.

equation.[22] Correction for this simply affects the standard error of the reported coefficients; except for the constant and lagged dependent variables, no standard error is reduced (or t-statistic raised) by more than 5 percent, so that the variable selection process is unaffected.[23]

Although in most countries the dynamics appear to be more complicated for the short rates than the long rates, the explanatory power of the estimated equation is rather low, except in Japan. In Japan, most of the explanation comes from the three-period lagged change in the short rate. Outliers are not the source of this curious dynamic relation whose explanation is unknown to us. In general, only a small fraction of future short-rate changes is explained with such domestic information; current changes in the short rates are largely unexplained.[24]

Foreign Influences on Domestic Rates

The estimates in table 3 generally show that typical determinants of the domestic term-structure, like lagged spread information and current short-rate changes, provide significant and similar information across countries. These estimates can be used to examine whether foreign short-term interest-rate changes exert an independent influence on the domestic term structure. The correlation evidence above indicates that long rates are systematically linked across countries.

[22]Hansen and Hodrick (1980) point out this problem for equations such as this. Note that this problem could also arise for the United States for data after April 1984 because of data problems described in the appendix, but we could find no evidence of bias due to this in the U.S. equations in tables 4 or 5.

[23]The differences in the information content apparently shows up in the positive coefficient on Δi_{t-1}, unlike the negative coefficients for this variable in other countries. For one-month rates in other countries, a rise in the rate is systematically related to a subsequent decline; a rise in the three-month rate in Canada is related systematically to a rise in the next month's three-month rate.

[24]Bisignano (1983) specifies a long-rate term structure equation that includes either the realized change in the short rate or the news in the short rate; the difference is marginal. He also concludes that current short-rate changes are unpredictable. Krol (1986) examines the impact of current and lagged domestic short-term interest rate changes on Eurodollar bond rates and doesn't find a significant effect for lagged changes; only current, U.S. short-term interest rate changes appear to be relevant in explaining Eurodollar bond rate changes.

Table 5

Short-Rate Regressions with Changes in Foreign Short Rates as Explanatory Variables (September 1977 to June 1987)

	$\bar{R}_2$	DW	h	SE	$\hat{\rho}$
United States					
$\Delta i_t^{US} = 1.22 - 0.14 i_{t-1}^{US} + 0.44 \Delta R_{t-1}^{US} + 0.41 \Delta i_t^{CA}$	0.21	2.10	−0.50	1.07	–
(3.53) (−3.69) (2.16) (3.17)					
Canada					
$\Delta i_t^{CA} = 0.42 + 0.27 \Delta i_{t-1}^{CA} - 0.04 i_{t-2}^{CA} + 0.26 \Delta R_{t-1}^{CA}$	0.29	2.23	−0.20	0.72	–
(1.70) (2.97) (−1.77) (1.89)					
$+ 0.21 \Delta i_t^{US} + 0.15 \Delta i_t^{UK}$					
(3.57) (2.06)					
United Kingdom					
$\Delta i_t^{UK} = -0.31 - 0.25 \Delta i_{t-1}^{UK} - 0.13 i_{t-2}^{UK} + 0.57 \Delta R_{t-1}^{UK}$	0.13	2.11	N.C.	0.87	–
(−0.55) (−2.39) (−2.80) (3.69)					
$+ 0.15 R_{t-2}^{UK}$					
(2.09)					
West Germany					
$\Delta i_t^{WG} = 0.00 - 0.43 \Delta i_{t-1}^{WG} + 0.35 \Delta R_{t-2}^{WG} + 0.32 \Delta i_t^{JP}$	0.11	1.95	N.C.	0.60	0.32
(0.05) (−3.52) (1.82) (3.41)					(2.35)
Japan					
$\Delta i_t^{JP} = -0.03 - 0.16 i_{t-1}^{JP} + 0.53 i \Delta i_{t-3}^{JP} + 0.41 \Delta R_{t-1}^{JP}$	0.40	1.79	1.36	0.44	0.24
(−0.08) (−3.09) (7.39) (2.64)					(2.09)
$+ 0.15 R_{t-2}^{JP} + 0.17 \Delta i_t^{WG}$					
(2.16) (2.75)					

N.C. means the h-statistic cannot be computed.

The absence of systematic significant positive correlations of changes in short rates, however, raises the question of whether and how short or long rates are linked internationally through a term structure relation. The question examined is whether current interest-rate changes abroad exert an independent influence on domestic interest rates beyond the influence of domestic information.[25]

Table 5 shows the international linkages between short rates. For each country, current changes in all foreign short rates are added to the domestic equation from table 4; insignificant additions (individually or as a group) are omitted.[26] The data show a strong two-way relationship between changes in short rates in the United States and Canada. A similar relationship exists between Japan and West Germany. No foreign influence is significant for the United Kingdom, suggesting that the British authorities followed relatively independent policies, especially with regard to the exchange rate.[27] The interaction between the U.S. and Canadian financial markets reflects the large degree of integration of these economies and their geographical relation.

The lack of a relationship between changes in short rates in the United States and those in West Germany and Japan could be surprising to many analysts. Monetary authorities in West Germany and Japan generally are assumed to have at least

[25]Lagged information from foreign markets should not be important for current domestic changes. Even if such lagged variables were significant, those patterns should be unstable over time, reflecting specific occurrences without having anything to do with stable transmission mechanisms. The significance of lagged information was examined; it is significant in some cases, but not stably so. Thus, the results are omitted.

[26]As in table 4, correction for a second-order moving-average process in the Canadian equation has no effect on the coefficients, summary statistics or variable selection. The h-statistic reported for Canada is that found from the moving-average-corrected standard error of the coefficient for the lagged dependent variable. The h-statistic indicates that first-order autocorrelation is rejected for the United States, Canada and, after correction, Japan. In the United Kingdom and West Germany, the alternative test discussed in footnote 21 above rejects autocorrelation.

[27]Over the sample period, the United Kingdom was not part of any exchange-rate system nor was it the focus of international cooperation arrangements. Most of the discussion of international policy coordination focused on the United States vs. West Germany and Japan.

Table 6

Long-Rate Regressions with Changes in Foreign Short Rates As Explanatory Variables (September 1977 to June 1987)

	$\bar{R}_2$	DW	h	SE	$\hat{\rho}$
United States					
$\Delta R_t^{US} = 0.28 + 0.23\Delta i_t^{US} + 0.07 i_{t-1}^{US} - 0.08 R_{t-1}^{US}$	0.34	2.04	−0.20	0.45	–
$(1.39) \quad (5.82) \quad (2.39) \quad (-2.55)$					
$+ 0.11\Delta i_t^{CA}$					
(1.89)					
Canada					
$\Delta R_t^{CA} = 0.34 + 0.23\Delta i_t^{CA} + 0.07 i_{t-1}^{CA} - 0.10 R_{t-1}^{CA}$	0.40	1.93	0.35	0.44	–
$(1.45) \quad (4.49) \quad (3.06) \quad (-2.84)$					
$+ 0.17\Delta i_t^{US} + 0.10\Delta i_t^{UK}$					
$(4.72) \quad (2.30)$					
United Kingdom					
$\Delta R_t^{UK} = -0.01 + 0.27\Delta i_t^{UK} - 0.13\Delta i_{t-1}^{UK} + 017\Delta i_t^{CA}$	0.29	1.96	–	0.50	–
$(-0.15) \quad (5.43) \quad (-2.53) \quad (3.07)$					
West Germany					
$\Delta R_t^{WG} = 0.57 + 0.18\Delta i_t^{WG} + 0.06 i_{t-1}^{WG} - 0.12 R_{t-1}^{WG}$	0.48	1.88	0.78	0.23	0.23
$(2.10) \quad (5.53) \quad (2.26) \quad (-2.28)$					(2.05)
$+ 0.07\Delta i_t^{US} + 0.13\Delta i_t^{CA} + 0.04\Delta i_t^{UK}$					
$(3.72) \quad (4.52) \quad (1.88)$					
Japan					
$\Delta R_t^{JP} = -0.02 + 0.05\Delta i_t^{JP} + 0.05\Delta i_t^{US} + 0.08\Delta i_t^{CA}$	0.14	1.98	–	0.26	–
$(-1.02) \quad (1.18) \quad (2.19) \quad (2.82)$					

implicit exchange-rate objectives with respect to the U.S. dollar, even if they otherwise try to remain as independent as possible from the United States. Nevertheless, no significant linkages between news in the United States, as reflected in its change in the short-term interest rate, and short-rate changes in West Germany and Japan were found.

The significant relationship between changes in short-term interest rates in West Germany and Japan may also surprise analysts. Yet this positive relationship, and the absence of one for the United States and either West Germany or Japan, are stable results; both characteristics are found in estimates for only the first or the last half of the sample period.

Central bank exchange-rate policies may not be so sufficiently rigid and automatic that foreign developments are incorporated instantaneously in domestic short rates. If there is a longer-run exchange-rate objective, however, foreign changes in short rates will contain information about future changes in domestic short rates; therefore, they should produce immediate revisions of domestic long rates. Table 6 displays evidence examining this hypothesis. All foreign short-rate changes were added to the preferred equations from table 3; only the significant terms are reported in table 6.

An interesting result is that the Canadian short-rate change affects most countries. This phenomenon probably arises because of the use of a three-month rate for Canada. Changes in this yield are more forward-looking, reflecting the expected yield for the month *and* the subsequent two months.[28] Thus, the Canadian yield used here contains more information than the other short-term rates, so its significance may arise because of this difference rather than unusual properties of the Canadian financial market.

[28]At a point in time, the same information is used to determine both the one-month and the three-month interest rate. The latter, however, reflects expectations for the two months beyond the current one and is influenced not only by current information influencing this month's one-month rate, but also by current information that is specific to the subsequent two months. In the simplest expectations model, the three-month rate is approximately equal to the arithmetic average of the current and two prospective expected one-month rates, or the one-month rate plus two-thirds of the expected change in the one-month rate, one month from now and one-third of the change in the one-month rate, two months from now.

The change in the long rate in the United States, given the influence of the current change of the U.S. short rate, is independent of all foreign short-rate movements. The change in the Canadian rate is included in the U.S. equation, despite the fact that it is marginally insignificant, because it is strongly significant in the other three countries. On the other hand, the change in the U.S. short rate enters significantly in the long-term rate equations for Canada, Japan and West Germany, suggesting that these three countries follow implicit exchange-rate policies that involve infrequent and variable interventions in money and currency markets, with lags beyond one month. The long-rate equations for Canada and West Germany improve considerably with the inclusion of foreign short rates. The U.K. long rate is not significantly affected by the U.S. short rate. The results, with the exception of the U.K. equation, are consistent with a view of the world in which foreign financial markets react to movements in U.S. short-term interest rates.

Except for the problematical Canadian influence, the international linkages shown in table 6 are sensitive to the period chosen. One of the simplest ways to test for temporal stability of regression estimates is to break the sample period in half to investigate whether the estimates are significantly different across the periods. Based on such a consideration, the equations in table 6 were re-estimated for each half of the sample period. The significance of foreign influences virtually vanishes when only the last half of the sample period (1982:7–1987:6) is used. Only the Canadian rate change remains significant in the U.S. and U.K. equations, and even this variable disappears in the equations for West Germany and Japan. All the other significant foreign influences shown in table 6 drop out; the remaining estimates in the table are virtually unaffected. Thus, although foreign changes in short-term rates sometimes influence domestic long rates, this influence is not robust.[29]

The results in table 2 show that correlations between changes in long rates internationally are pairwise significant in all cases; this result persists even when the sample is split into approximately equal subperiods. While long rates are not linked strongly through currency and money markets, there are significant and stable relationships between them. Apparently, the integration of international capital markets assures that nominal long-term rates move together, despite the fact that this integration usually is quite direct and does not arise from the short-term considerations in currency and money market emphasized by term structure explanations.

SUMMARY AND CONCLUSION

This article explores international linkages among interest rates. The framework used for this purpose is a conventional model of the domestic term structure. In a term-structure framework, a change in a foreign short-term rate would be expected to alter the foreign long-term rate and, if interest rates are linked internationally, to alter domestic short-term rates as well. The latter change, again via a domestic term-structure relation, would change domestic long-term rates. This article tests these relationships. It also tests whether foreign short-term rate changes exert an independent term structure influence, given the current change in the domestic short-term rate.

When foreign interest rates are added to the domestic, short-term interest rate equations, there is some marginal, though segmented, connection between rates across countries. Changes in short-term rates in either Canada or the United States affect short-term rates in the other. In addition, changes in the U.K. short-term rate directly influence interest rates in Canada. There is a similar bidirectional connection between short-term rates in Japan and West Germany. There is no significant linkage, however, between changes in U.S. short-term interest rates and changes in short-term rates in the United Kingdom, Japan or West Germany, over the full period examined here.

The evidence suggests that long-term nominal interest rates are related closely and directly across countries. The addition of changes in foreign short-term rates to the domestic long-term

[29]The foreign influences in table 5 are somewhat more robust in a similar test. For the latter half of the sample period, the significant influences of Canadian short rates on U.S. short rates, U.K. short rates on Canadian short rates and short rates in Japan on those in Germany remain significant. The bidirectional elements from the United States to Canada and from Germany to Japan disappear. Thus, no short-run influence is left running from U.S. short rates to those in any of the countries.

rate equations, however, generally provides no significant information. Also, short-term interest rate changes are not contemporaneously correlated across countries. Thus, the relationship between long-term nominal interest rates does not arise indirectly through an international term-structure transmission or through common short-term-rate movements that are transmitted through the domestic-term structures. Neither of these channels is found to be significant.

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Appendix
The Interest Rate Data

All data are end-of-month values.

Canada

Short rate: interest rate on three-month Treasury bill rates from the database of the Federal Reserve Board.
Long rate: interest rate on government bonds with a remaining maturity of 10 years from the database of the Federal Reserve Board.

Japan

Short rate: one-month Gensaki rate provided by the Bank of Japan.
Long rate: average yield to maturity on a number of government bonds with a constant remaining maturity of nine years, provided by the Bank of Japan.

United Kingdom

Short rate: one-month interbank deposit rate from the *Financial Times.*
Long rate: average yield to maturity on a number of government bonds with remaining maturity between eight and 12 years from the *Financial Times.*

United States

Short rate: Until April 1984, the yield on one-month T-bill rates was available. From May 1984 to June 1987, the series was updated using the interest rate on three-month T-bill rates. A test of the adequacy of this approximation was performed by regressing the one-month T-bill rate on a constant and the three-month T-bill rate over the period when both were available, January 1978 to April 1984. The constant is not significantly different from zero, while the coefficient on the three-month rate is not significantly different from one. The other statistics also justified the approximation. The one-month data were provided by Professor Alex Kane. The three-month data came from the database of the Federal Reserve Board.
Long rate: the series is the yield to maturity of government securities bonds with remaining maturity of 10 years from the database of the Federal Reserve Board.

West Germany

Short rate: one-month interbank deposit rate from the *Frankfurter Allgemeine.*
Long rate: average yield to maturity on a number of government bonds with remaining maturity over eight years from the *Frankfurter Allgemeine.*

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How Much Lower Can the Unemployment Rate Go?

IN JUNE 1988, the civilian unemployment rate dipped to 5.3 percent, its lowest rate since May 1974. The Council of Economic Advisers (CEA), in its 1988 *Annual Report*, forecast a continuing drop in the unemployment rate, accompanied by a decline in the inflation rate from 4.6 percent in 1987 to 3 percent in 1991.[1]

These developments raise an interesting question: how low can the unemployment rate be driven without accelerating inflation? In the late 1970s, considerable research was devoted to the discussion of such a critical rate, usually referred to as the "natural rate of unemployment." This research produced estimates of the natural rate in the late 1970s ranging between 5 percent and 7 percent, but generally were centered on 6 percent.[2] With the unemployment rate well above 6 percent for most of the 1980–87 period, the debate about the level of the natural rate had subsided; with the unemployment rate moving well below 6 percent in early 1988, however, the debate has now resurfaced.

This article reviews the factors that determine the natural rate of unemployment, focusing specifically on developments since 1979. First, it discusses the concept of unemployment and summarizes how the government measures unemployment. Second, it reviews the choice of benchmark years as an aid in the analysis. Finally, it examines the underlying determinants of the natural rate of unemployment in detail. Though no attempt has been made to derive precise estimates of the natural rate, the direction of its movement in recent years has been *detailed*.[3]

BACKGROUND: CONCEPTS AND MEASUREMENT

To analyze recent unemployment trends, it is useful to summarize the reasons for unemployment. Since the focus is on unemployment as measured by the U.S. government, some detail about how unemployment statistics are gathered is also useful (see opposite page).

[1]The CEA report was prepared in February. See Council of Economic Advisers (1988), p. 50. For further detail on the Administration's forecast, see Office of Management and Budget (1988), pp. 3b–7–8. The annual inflation rate is that for consumer prices measured from fourth quarter to fourth quarter.

[2]A representative estimate is that of Cagan (1979), p. 215. For a more exhaustive survey of alternative estimates, see Weiner (1986).

[3]Most of the studies were done in the late 1970s and have not been updated since then. See Weiner (1986). The major exceptions are Rissman (1986) and Gordon (1987), in which he "assumes" continuation of the natural rate at 6 percent through 1985. He offers statistical evidence in support of this contention in Gordon (1988).

A Primer on U.S. Unemployment Statistics

Each month, during the week containing the 12th day of the month, the U.S. Bureau of the Census surveys 65,000 households for the Bureau of Labor Statistics.[1] One-fourth of the households is replaced each month so that no household is interviewed more than four months in a row. This procedure allows for continuity of the data and reduces the reporting burden on families.

In response to a series of questions, the interviewer determines whether each household member 16 years and older is employed, unemployed or not in the labor force. Unemployed persons are those who had no employment during the survey week but were available for work. The interviewer also establishes whether each unemployed person (1) made specific efforts to find work in the preceding four weeks, (2) was waiting to be recalled to a job from which he or she had been laid off or (3) was waiting to report to a new job within 30 days.

Further information is obtained about the reason for unemployment. The unemployed are classified as (1) job losers (involuntary quits), (2) job leavers (voluntary quits), (3) reentrants (those who previously worked, but were out of the labor force before looking for work), and (4) new entrants (those who never worked before but were now looking for work).

Employed persons are (1) persons who, during the survey week, either worked as paid employees in their own business or as unpaid workers in a family-operated enterprise, and (2) those who did not work but had jobs from which they were temporarily absent because of illness, weather, vacation, strikes or personal reasons.[2]

The labor force is the sum of persons aged 16 and over who are classified as employed or unemployed. The unemployment rate is calculated as the total number unemployed as a percent of the labor force. Unemployment rates according to sex, age, race and reason for unemployment are also calculated.

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[1]For a useful summary of how the government collects information for its unemployment report, see Bureau of Labor Statistics (1987).

[2]The government also provides information on the distinction between part-time and full-time employment.

Types of Unemployment

Unemployment can be categorized as frictional, cyclical and structural. Although the government does not present its statistics in this way, such a categorization is still helpful in understanding why unemployment occurs.

Cyclical unemployment can be most readily understood as representing movements of the unemployment rate that result from fluctuations of aggregate demand for goods and services. These fluctuations, in turn, can be traced to monetary and fiscal policy or anything else that affects aggregate demand.

Frictional unemployment results from relative shifts in the supply or demand for goods and services between industries or occupations. Because information about jobs is costly to obtain, people can be "caught between jobs," resulting in temporary unemployment while information about other jobs is sought. Sometimes, to emphasize its short-run transitional nature, this type of unemployment is called turnover unemployment and is considered a vital aspect of the operation of a free-enterprise economy.

Structural unemployment occurs when there is a mismatch of workers and job vacancies either by reason of skill or location. It is only artificially distinguishable from frictional unemployment in that it is considered longer in duration and involves, in addition to the costs of job-information search, training or relocation costs.

Categorizing unemployment into three types is a useful way to analyze it. The three types of unemployment involve costs in obtaining information about the availability of other jobs. Because labor markets are characterized by heterogeneity of skills and job requirements, it takes time and

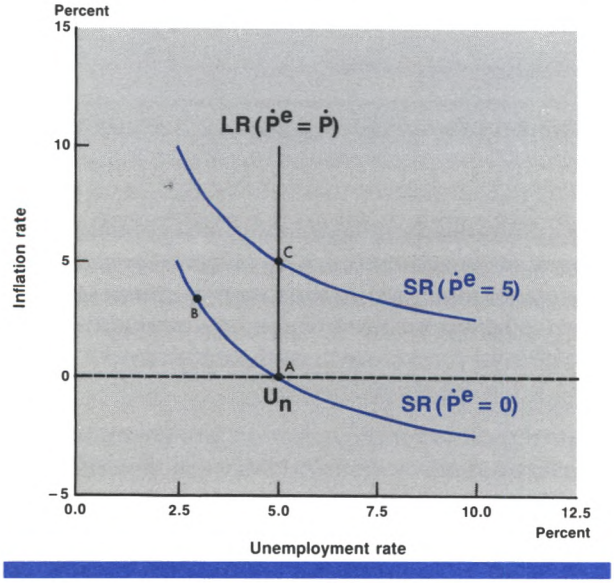
resources to get such information. In general, this process continues until the expected benefit of the search (present value of expected future income) equals the cost of the continued search (again, in present value terms).

Defining the Natural Rate of Unemployment

To analyze unemployment further, one must clarify the meaning of the term "natural rate of unemployment." This can be done by explaining the concept using a Phillips curve diagram.

Phillips-curve analysis was popularized in the 1960s and is still useful today as an expository device.[4] In essence, the Phillips curve summarizes the relationship between inflation and the unemployment rate. When first introduced, it was thought to be a relationship that policymakers could exploit. Over the years, however, this interpretation has changed. Analysts now generally accept that there is a whole family of short-run Phillips curves, corresponding to different expected rates of inflation ($\dot{P}^e$ in figure 1).

Figure 1
Phillips Curve Diagram



In the short run, before expectations of inflation change, there is a trade-off between inflation and unemployment (shown as SR curves in figure 1). Suppose the economy initially is at point A, with expected inflation equal to zero. If monetary and fiscal policy become expansionary, employers will note an increase in sales and will interpret the increase as a shift in demand for their product and attempt to expand employment. Attractive wage offers will induce many workers to cut short their job search and accept employment. Higher prices and lower unemployment will result, moving the economy to point B.

This movement is temporary, however, as both employers and workers come to expect inflation. When the shift in demand is perceived as general, workers will return to their normal job search patterns and employers' demand for labor will be reduced to previous levels. The economy will move to point C, where unemployment is equal to its natural rate, U_n, once again, but inflation is higher than it was at point A. The vertical line is called a long-run Phillips curve because it reflects a period long enough for inflationary expectations to adjust fully.

The revised interpretation of the Phillips curve yields a definition of the natural rate of unemployment: when the actual rate of inflation equals the expected rate, the unemployment rate that corresponds is the natural rate (shown as U_n in figure 1). This does not mean that there is anything "natural" about such a rate. For example, it is not constant over time, but rather is influenced by demographic changes as well as government policies.

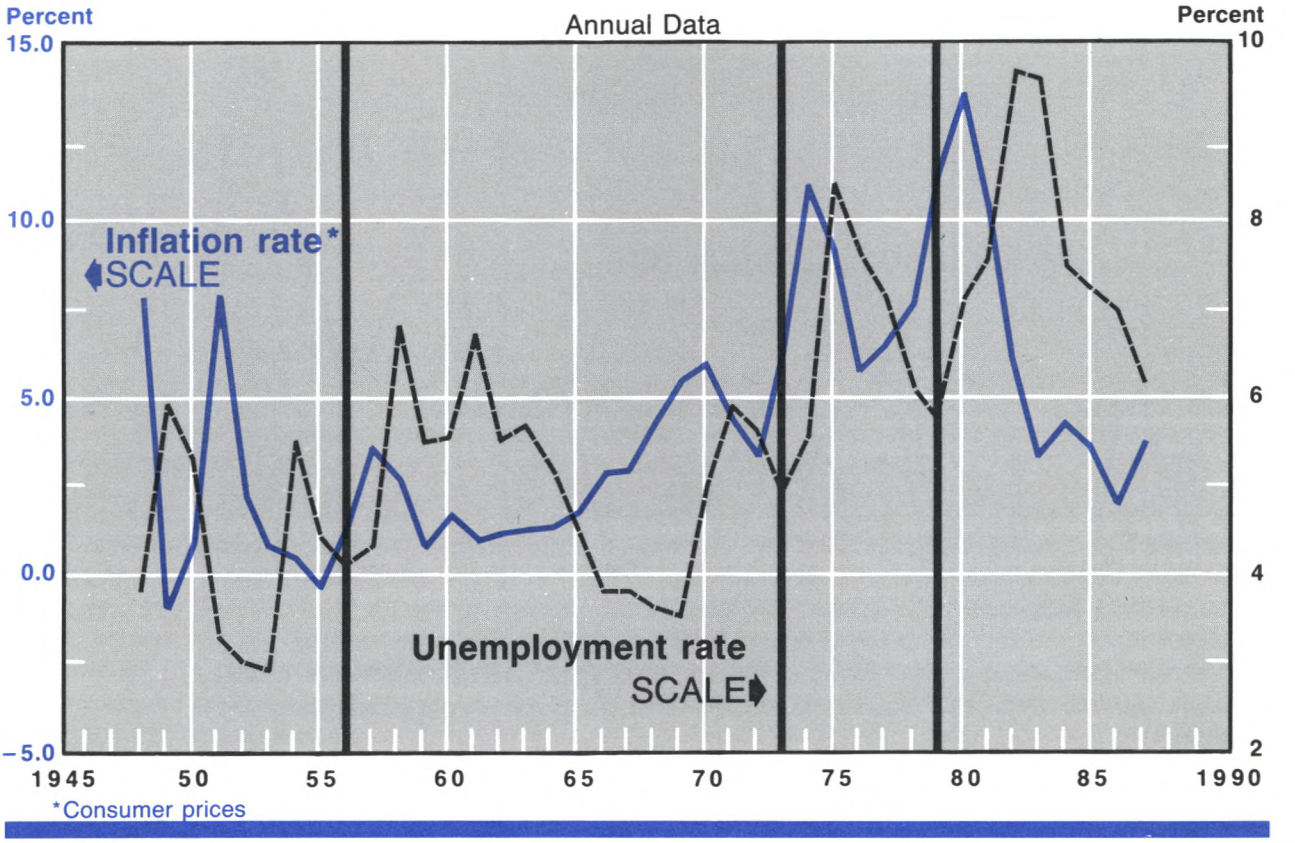
The Phillips curve diagram also allows a more precise definition of cyclical unemployment. When unemployment departs from its natural rate, we have cyclical unemployment. Or, in other words, cyclical unemployment results when actual inflation and expected inflation are unequal.

The government's unemployment statistics provide little help in estimating the natural rate. Conceptually, however, the sum of frictional and structural unemployment is equal to natural unemployment. Consequently, any factor that influences either frictional or structural unemployment (or both) is relevant to the determination of the natural rate.

Past research suggests that the most important influences on the natural rate are demographic or institutional. Demographic factors involve such characteristics of the work force as age, sex and racial distribution. One of the most prominent demographic factors in the post-World War II period occurred when the baby-boom generation came of age and entered the labor market. In recent years, this generation has swelled the size of

[4]For a survey, see Santomero and Seater (1978).

Chart 1
Inflation and Unemployment Rates



the prime-age working group (age 25 to 54). Age groups like this require time to develop the skills necessary to match the requirements of job vacancies. Such adjustments eventually take place, but the process is usually longer than, say, the temporary nature of turnover or even cyclical unemployment.

Institutional factors can have an effect on the natural rate, for example, the pattern of shifting demand across industries, the minimum wage, and government policies that influence job-information search (personal and employer taxes, unemployment benefits).

CHOOSING BENCHMARK YEARS

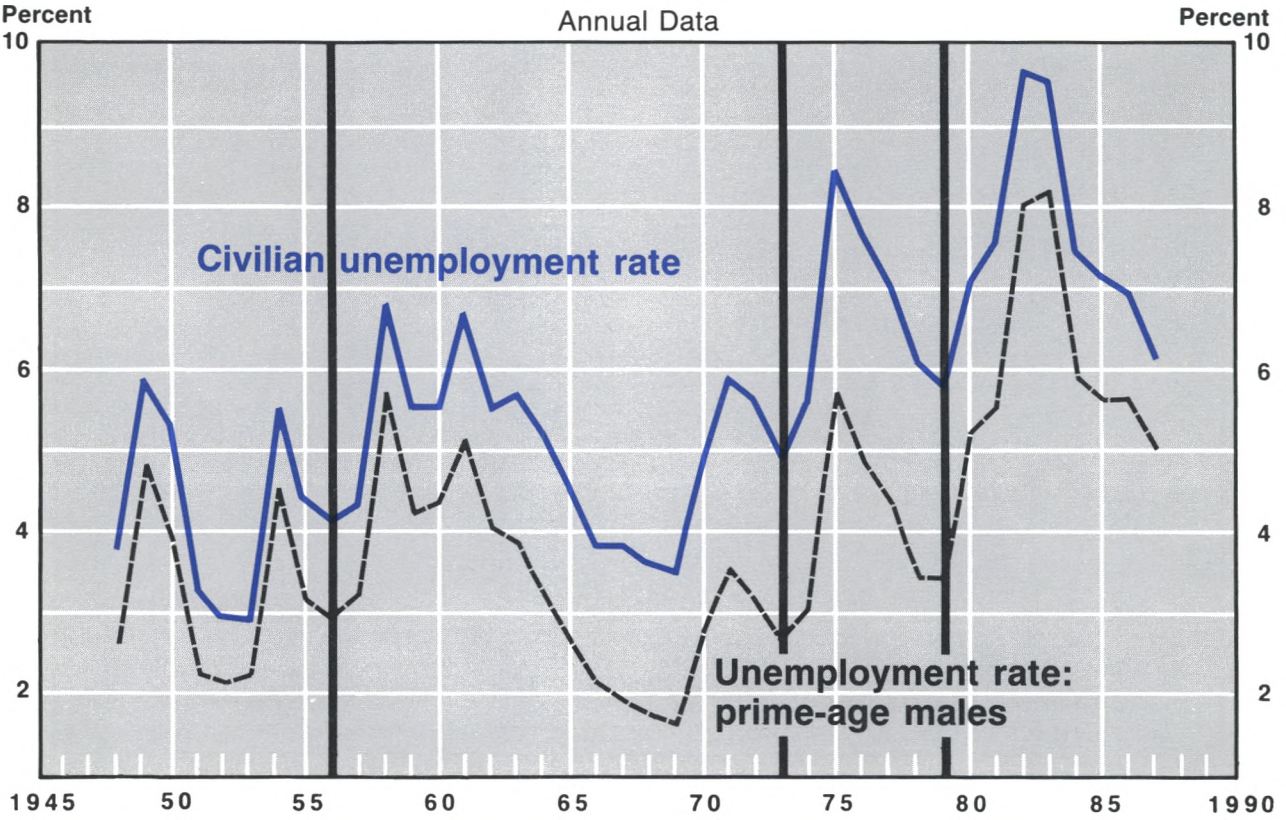
To analyze unemployment trends, one must begin with the choice of certain benchmark years that are representative of full employment.[5] The benchmark years in this study are ones that occur late in business expansions and are free of the influences of war. It is difficult to identify any years in the 1948–55 period as benchmark years; they are obviously influenced by the economic conditions associated with World War II, the Korean War and their aftermath. For this reason, 1956 is chosen as the first benchmark year. This year is recognized generally as one of "full employment" without serious inflation and the other benchmark years chosen — 1973 and 1979 — are also ones that occur late in business expansions and are generally free of wartime influence.[6]

Chart 1 summarizes inflation and unemployment, with the benchmark years highlighted. As one can see, the relationship between the two is highly variable, reflecting a host of complex factors. A direct examination of the inflation-

[5]"Full employment" is defined here as the employment counterpart of the natural rate of unemployment.

[6]This was probably recognized first by the Council of Economic Advisers in the early 1960s. Actually both 1955 and 1956 are used; de Leeuw and Holloway (1983) use 1955, while Cagan (1979) uses 1956.

Chart 2
Unemployment Rates



unemployment relationship yields little information about how low the unemployment rate can go.

Chart 2 summarizes the civilian unemployment rate along with that for prime-age males for the 1948–87 period. Civilian unemployment in the three benchmark years ranges from 4.1 percent of the labor force in 1956 to 5.8 percent in 1979. Compared with 1979, it appears that the economy reached full employment in late 1987 when the unemployment rate fell below 6 percent; compared with the earlier benchmarks, however, there seems to be room for further employment expansion.

The structure of unemployment, especially as it reflects a changing composition of the labor force, is an additional consideration in assessing the nearness of actual employment to full employment. Chart 2 also shows unemployment for prime-age males, the group that has the lowest turnover rate in the labor force. The unemployment rate for this group was 2.9 percent in 1956, 2.6 percent in 1973, and a somewhat higher 3.4 percent in 1979. The 1987 unemployment rate for this group averaged 5 percent, again suggesting there is room for further expansion in employment.

A direct examination of those unemployment measures that are considered most important does not provide a clear-cut conclusion about whether the 1987 levels of unemployment indicate an economy approaching full employment. Therefore, we examine the composition of the labor force in further detail.

CHANGES IN DEMOGRAPHIC FACTORS

The overall unemployment rate reflects a weighted average of many unemployment rates, as table 1 indicates. As this table shows clearly, certain groups typically have higher or lower unem-

Table 1

Unemployment Rate by Age and Sex (selected years)

	1956	1973	1979	1987
Total	4.1%	4.9%	5.9%	6.2%
Male				
16–19	11.0	13.9	15.9	17.8
20–24	6.9	7.3	8.7	9.9
25–54	2.9	2.6	3.4	5.0
55–64	3.5	2.4	2.7	3.7
65 +	3.5	3.0	3.4	2.6
Female				
16–19	11.0	15.3	16.4	15.9
20–24	6.3	8.4	9.6	9.4
25–54	4.1	4.4	5.2	5.1
55–64	3.7	2.8	3.2	3.1
65 +	2.3	2.9	3.3	2.4

Table 2

Composition of Labor Force by Age and Sex (selected years)

	1956	1973	1979	1987
Total[1]	100.0%	100.0%	100.0%	100.0%
Male	67.7	61.0	57.9	55.2
16–19	3.7	5.2	4.9	3.4
20–24	5.2	8.0	8.1	6.5
25–54	45.6	37.8	36.1	37.9
55–64	9.3	7.9	6.9	5.8
65 +	3.9	2.1	1.9	1.6
Female	32.2	38.9	42.1	44.7
16–19	2.8	4.3	4.3	3.2
20–24	3.7	6.3	6.9	6.0
25–54	20.6	22.4	25.3	30.4
55–64	3.9	4.7	4.5	4.1
65 +	1.2	1.2	1.1	1.0

[1]May not equal 100 due to rounding.

ployment rates than the overall average. The teenage group is always the highest, followed by the 20–24 year-old group. Consequently, to understand more fully the significance of a given unemployment rate, one must examine both the relative importance of each age group in any given year and the growth rate of each age group over time.

Table 2 summarizes the relative importance of the different age-sex groups for the benchmark years. One striking observation is the change in the ratio of males to females that has taken place since 1956. This changing proportion, however, may not be critical in interpreting what has happened to the overall unemployment rate: as table 1 shows, female unemployment is not always above that for males.[7]

What is important in interpreting movements in the unemployment rate over time is the shifting importance of age groups. Obviously, the rise in importance of the 16–19 and 20–24 year-old groups from 1956 to 1979 was an important factor in interpreting unemployment trends for that period. As table 1 shows, the unemployment rate was always highest for these groups. Significantly, however, these youngest age groups have declined as a proportion of the labor force from 1979 to 1987.

Table 3 summarizes the growth of the labor force by age group between the benchmark years.

Table 3

Growth of Labor Force by Age and Sex (selected years, annual rates)

	1956–73	1973–79	1979–87
Total	1.8%	2.7%	1.7%
Male			
16–19	3.9	1.5	−2.7
20–24	4.3	2.9	−1.1
25–54	0.6	1.9	2.3
55–64	0.7	0.4	−0.5
65 +	−1.8	0.3	−0.3
Female			
16–19	4.3	2.9	−1.9
20–24	5.0	4.2	−0.2
25–54	2.3	4.8	4.0
55–64	2.9	1.8	0.6
65 +	1.5	1.5	0.6

For the 1979–87 period, the 25–54 year-old group grew fastest, reflecting the maturation of the 16–19 and 20–24 year-old groups of the 1970s.

To aid in analyzing the effects of changes in the underlying demographics, a weighted unemployment rate, where the weights are based on the composition of the labor force, is commonly used.[8]

[7]For an analysis of women in the labor market, see Shank (1988).

[8]See Clark (1977), Flaim (1979), Cain (1979), Antos, Mellow and Triplett (1979) and Cagan (1979).

Table 4

Alternative Unemployment Rates

	Overall Rate	Fixed Weight[1]	Prime-Age Male	Overall Less Fixed-Weight	Overall Less Prime-Age Male
1956	4.1%	4.3%	2.9%	−0.2%	1.2
1973	4.9	4.4	2.6	0.5	2.3
1979	5.9	5.3	3.4	0.6	2.5
1980	7.2	6.6	5.2	0.6	2.0
1981	7.6	7.1	5.5	0.5	2.1
1982	9.7	9.2	8.0	0.5	1.7
1983	9.6	9.2	8.2	0.4	1.4
1984	7.5	7.2	5.9	0.3	1.6
1985	7.2	7.0	5.6	0.2	1.6
1986	7.0	6.8	5.6	0.2	1.4
1987	6.2	6.1	5.0	0.1	1.2

[1]Calculated using average of labor force composition in 1956 and 1987 (see table 2).

Table 4 summarizes various unemployment rates and provides information about how the changing composition of the labor force influences the overall unemployment rate. A comparison of the alternative rates with the overall rate shows that demographic shifts were most pronounced in the 1956–79 period.[9] Changes in the composition of the labor force shifted the unemployment rate upward by 0.8 percentage points (overall less fixed-weight column) compared with an actual rise of 1.8 percentage points (5.9 minus 4.1). In other words, the labor market pressure of 4.1 percent in 1956 would have changed to 4.9 percent in 1979 because of a shift in the composition of the labor force toward the youngest groups.

There was also a widening of the difference between the overall unemployment rate and that for prime-age males, reaching 2.5 percentage points in 1979, up from 1.2 percentage points in 1956. This differential yields the same general conclusion: considering demographic changes, the natural rate of unemployment rose quite sharply between 1956 and 1979.

Since 1979, the composition of the labor force has shifted back toward the older groups, which suggests that the natural rate of unemployment has declined. The difference between the fixed-weight measure and the overall rate has narrowed to almost zero. The smaller differential means that demographic considerations no longer loom as large in determining if the economy is at full employment. For demographic reasons alone, the 1987 natural rate of unemployment is only about 0.3 percentage points higher than that of 1956, and 0.5 percentage points lower than that of 1979. This interpretation is supported by the change in the differential between the overall rate and that for prime-age males. Thus, although methods vary in calculating the effects of changing demographics on the unemployment rate, there seems to be little doubt that changes in the composition of the labor force since 1979 have produced a lower natural rate of unemployment.[10]

CHANGES IN INSTITUTIONAL FACTORS

As noted earlier, in addition to the age-sex composition of the labor force, many other factors influence the unemployment rate. These factors are discussed in this section along with a summary of their recent trends.

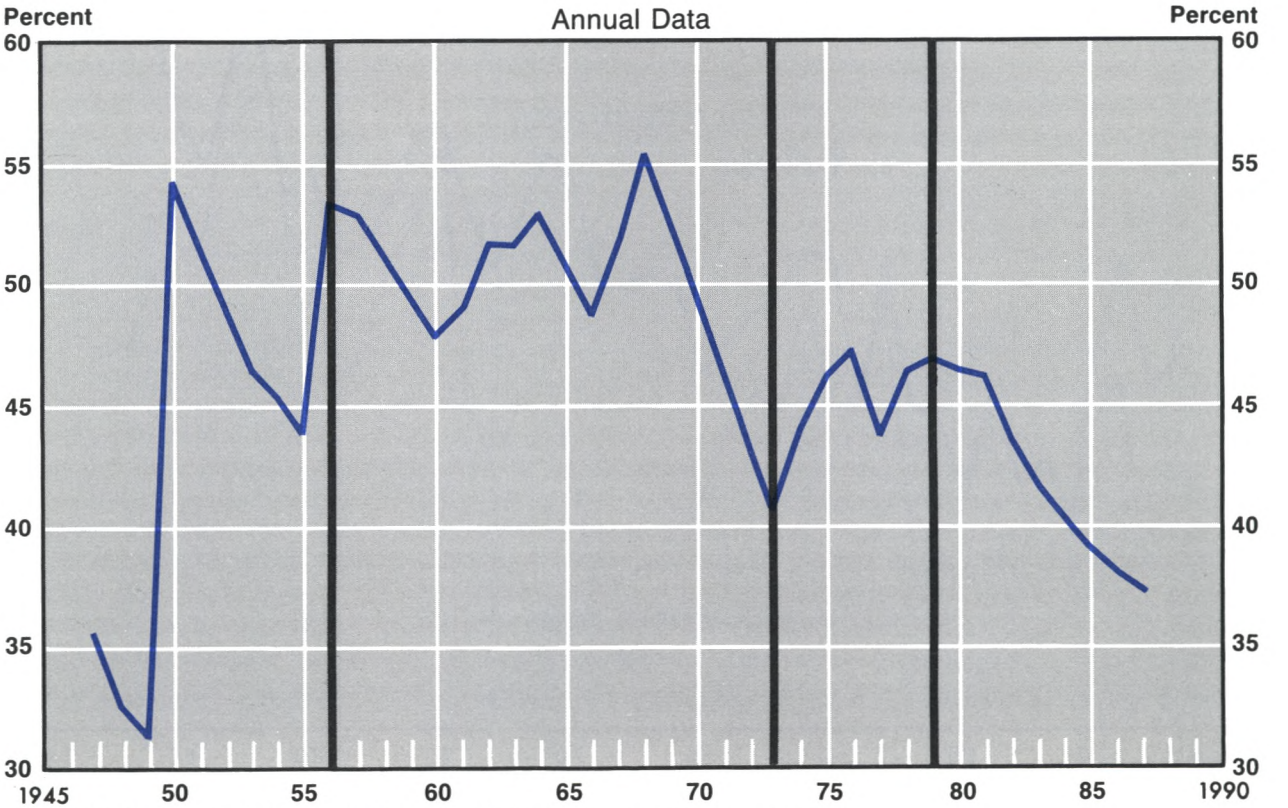
Minimum Wage

Federal minimum wage legislation was introduced in the United States in 1938; by 1985, 80 percent of the U.S. labor force was employed in sectors subject to its coverage. By paying the lowest-income workers a higher wage than the competitive market would pay in the absence of a

[9]For a similar table and analysis, see Council of Economic Advisers (1978), p. 170.

[10]See Cain (1979).

Chart 3
Minimum Wage as a Percent of Average Hourly Earnings



NOTE: Average hourly earnings are for the private nonagricultural sector.

minimum wage, this legislation raised the average level of real wages above their competitive level.[11] In response, the quantity of labor services supplied will exceed the quantity demanded, with the difference being classified as unemployed.

When the minimum wage was first legislated in 1938, it was $.25 per hour and covered about 40 percent of the nation's nonsupervisory employees. Over the 1938–81 period, it was raised 15 times, reaching $3.35 per hour in 1981 and has not been changed since. By 1985, 87 percent of nonsupervisory employees were subject to the minimum wage.

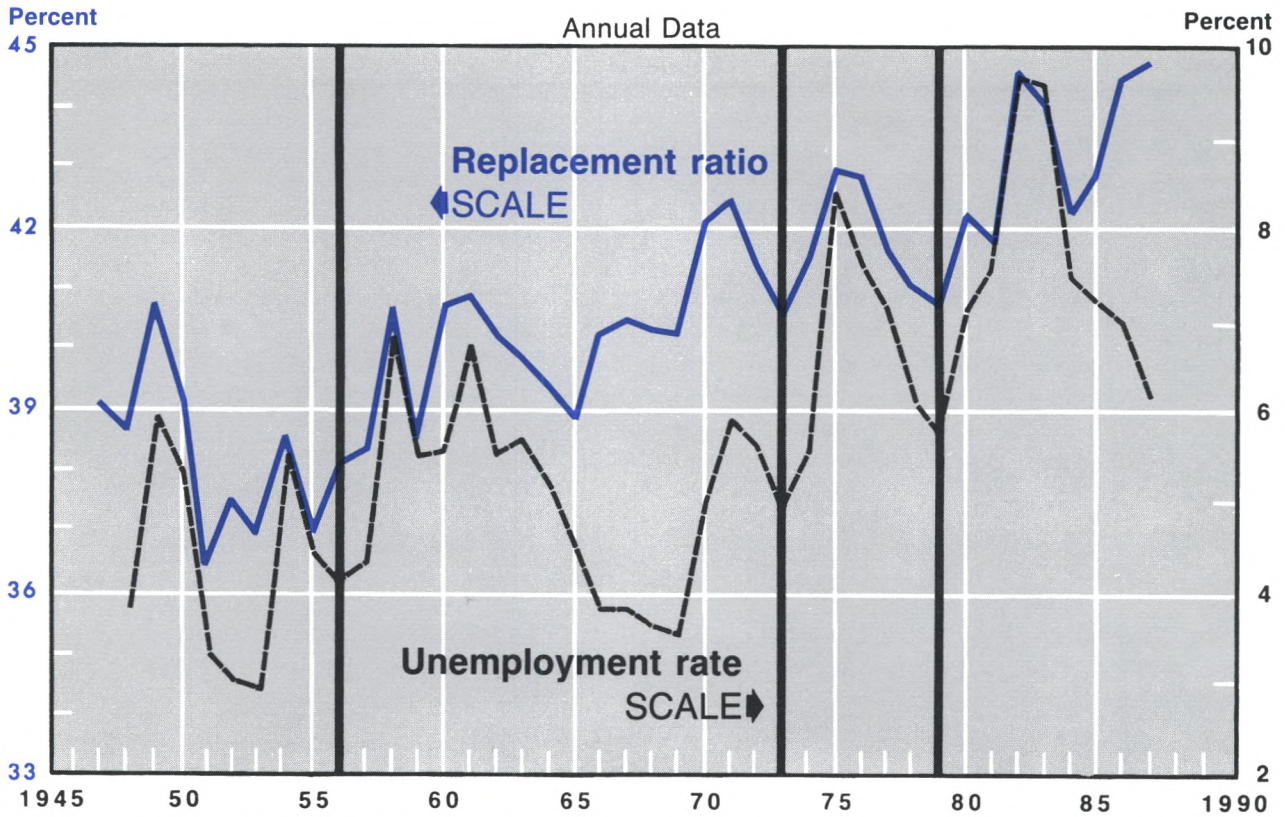
The minimum wage law has had its greatest effect on teenage employment with little effect on other age groups. Because they have fewer skills and less education, teenagers' marginal products are typically below those of older, more experienced workers. Consequently, the minimum wage is much more likely to be above the competitive wage for this group.

To assess the impact of minimum wage legislation, the minimum wage must be viewed relative to average hourly earnings. The comparison measure used here is average hourly earnings for workers in the private nonagricultural sector. The movement of the minimum wage relative to this measure from 1947 to 1987 is shown in chart 3.

After a large jump in 1950, the minimum wage relative to average hourly earnings fluctuated between 45 percent and 55 percent, before dropping below 45 percent in 1972. It then rose from about 40 percent in 1973 to 46 percent in 1981. With the minimum wage constant at $3.35 per hour since 1981, however, a steady decline in the relative

[11]For a survey, see Brown, Gilroy and Kohen (1982).

Chart 4
Replacement Ratio and Unemployment Rate



NOTE: Replacement ratio is the average of unemployment benefits paid weekly as a percent of average weekly earnings in the private nonagricultural sector.

minimum wage has occurred since then, reaching 37 percent in 1987.

Although the relative minimum wage declined from 1957 to 1973, the coverage increased from 45 percent to 75 percent, primarily because of the rapid growth of teenagers in the labor force. The minimum wage may have pushed the unemployment rate upward from 1973 to 1979, but this trend was sharply reversed from 1979 to 1987. Since the last benchmark year of 1979, the minimum wage movements have had a positive effect on the labor market; its decline has reduced the natural rate of unemployment.

Unemployment Benefits

An increase in unemployment benefits relative to wages lowers the cost of job search.[12] As a result, other things equal, individuals will search longer for a job, lowering the amount of work that they are willing to supply at a given real wage. Also, individuals who are not in the labor force will be inclined to enter it to obtain a job and be eligible for unemployment benefits in the future.

One important measure in assessing the effect of unemployment benefits is the ratio of average unemployment benefits paid weekly relative to average weekly earnings. This ratio is called the replacement ratio. Chart 4 shows the ratio from 1947 to 1987 as a solid line. Because this ratio shows cyclical movement throughout the period, the unemployment rate is also charted (dashed line).

Generally, the replacement ratio and the unemployment rate move in tandem. From 1965 to 1973,

[12]For discussion and references, see Parkin (1984) and Cagan (1979).

however, the replacement ratio rose quite sharply relative to unemployment. From 1973 to 1979, it then declined slightly relative to the unemployment rate. But since 1984, the divergence between these measures has been sharp.

A closer examination reveals that the source of this recent divergence is chiefly a slowing of average weekly earnings while unemployment benefits have continued to rise at relatively rapid rates. Despite this development, the replacement ratio seems to have had a recent upward effect on the natural rate of unemployment. This effect is dampened somewhat by two considerations: (1) recent changes in tax law whereby unemployment benefits became partially subject to taxation in 1979, and completely so in 1987, and (2) a general tightening of eligibility requirements in recent years.[13] Thus, the actual value of the replacement ratio in 1987 relative to 1979 is less than shown in the chart. It is impossible, however, to say how much the change is without further research.

Taxes

Another factor of considerable importance in determining unemployment trends is the role of taxes in influencing the labor markets.[14] Again, the analysis is complex and the conclusions are not clear-cut. As an aid in understanding the macroeconomic effects, it is useful to think in terms of the effects on labor supply and demand separately.

Focusing first on labor supply, the tax wedge is the difference between the real wage that the employer is willing to pay and the after-tax value of that wage to the workers; the size of this wedge is important in the work-vs.-leisure decision that people make. An increase in the tax wedge will reduce labor services offered at a given real wage and may encourage a longer job-search by reducing the cost of being unemployed.

On the demand side of the labor market, the relevant tax is the employer's contribution for social insurance. Introducing (or raising) this tax reduces the quantity of labor demanded for a given real wage and, because of the higher cost of labor, may also lengthen the amount of time employers take in searching for workers.

Thus, increased tax rates, whether applicable to employers or employees, reduce employment and may increase unemployment. To show what has happened to the tax wedge, employee and employer taxes are combined into a summary measure and plotted against the unemployment rate in chart 5. This tax wedge measure incorporates personal income taxes (federal, state and local), employer and employee contributions for social insurance, and sales and excise taxes.[15] Using 1956 as a reference point, the tax wedge has increased from about 21 percent to more than 32 percent by 1987. The rise was relatively rapid from 1956 to 1973, slightly slower from 1973 to 1979 and even slower from 1979 to 1987. These trends suggest that taxes contributed to an increase in unemployment before 1979; since then, the tax wedge has had little effect, except perhaps to reduce unemployment somewhat since 1981.

Demand Shift

Recent research has suggested that shifts in industry demand also have an effect on the natural rate.[16] This effect is commonly called frictional unemployment. If changing tastes, technology or relative factor prices induce rapid shifts in industry demands for labor, there will be greater uncertainty in labor markets and increased search time for both the employee and the employer.

Unemployment that occurs for these reasons is a healthy reflection of a dynamic economy. For our discussion, however, only the long-run movements in the composition of industrial output are relevant. Chart 6 is one attempt to capture this phenomenon; it shows the three-year moving average of the sum of the absolute percentage

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[13]See Abraham (1988) and, for a state-by-state summary of unemployment legislation in 1987, see Runner (1988).

[14]Meyer (1981).

[15]The tax wedge for households (or suppliers of labor services) is

$$\frac{W}{P} - \frac{W}{P}\,\frac{(1-t_p)}{(1+t_c)},$$

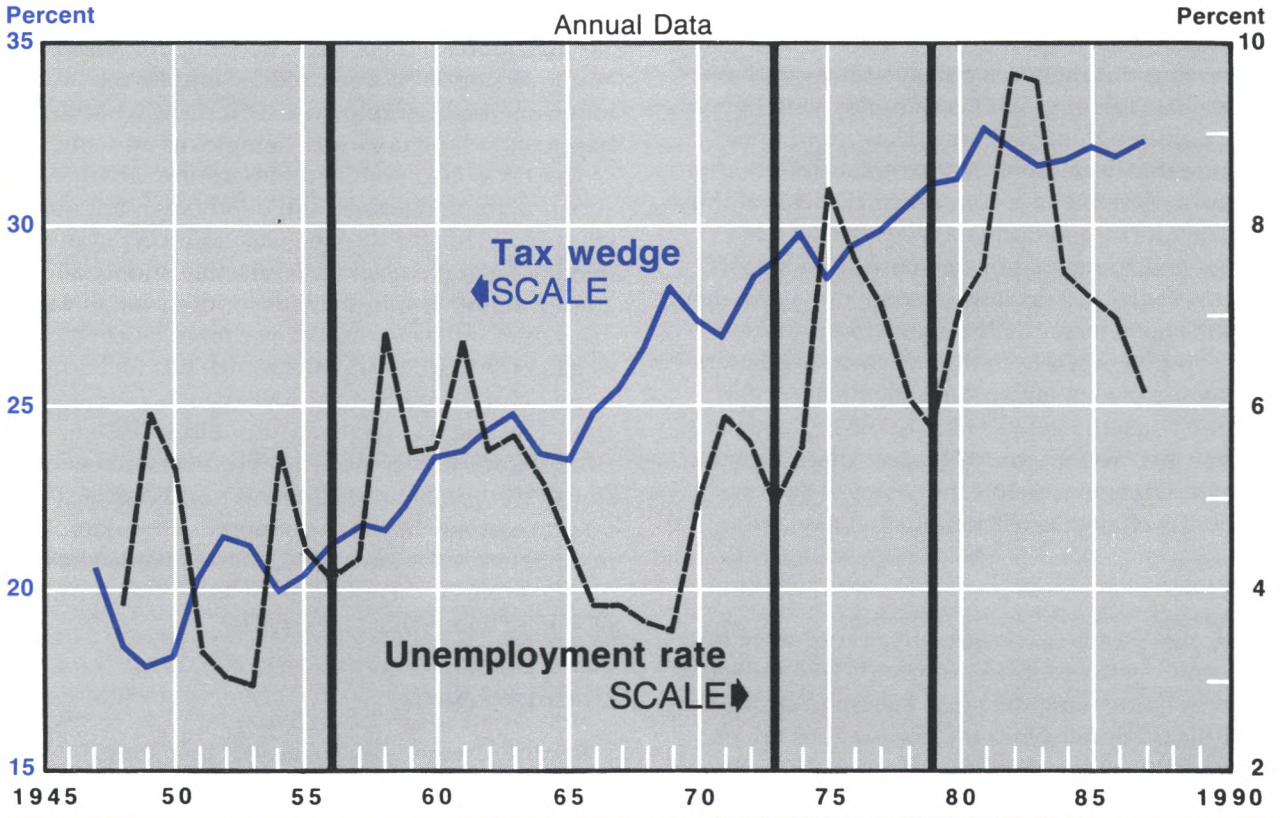
where W is the nominal wage, P is the price level, t_p is the personal tax rate and t_c is the consumption tax rate. This expression can be manipulated to give

$$\frac{W}{P}\,\frac{(t_c+t_p)}{(1+t_c)}.$$

Chart 4 shows the value of the expression following W/P *plus* the employer's contribution rate for social insurance. For further discussion, see Parkin (1984), pp. 184–85.

[16]For a discussion and critique of this literature, see Johnson and Layard (1986). See also Lilien (1982), Lilien and Hall (1986), and Rissman (1986).

Chart 5
Estimate of Tax Wedge and Unemployment Rate



change in sectoral employment shares.[17] By this measure, there was a downward trend in the degree of shifting employment until the mid-1960s; since then the measure of shifting employment has moved upward, although it has varied substantially around the trend.

Focusing on the benchmark years, there is a slight downward movement from 1956 to 1973 to 1979, followed by an upward movement from 1979 to 1987. From 1982 to 1987, however, the measure dropped sharply.[18] Viewed in this perspective, it is unlikely that shifts in the structure of the economy have influenced the natural rate of unemployment substantially. The relationship between "demand" shifts and the unemployment rate appears, rather, to be a shorter-run phenomenon.

Other Factors

The above list of factors, while not exhaustive, summarizes most of the factors that influence unemployment trends. Government regulations, however, also affect labor markets. For example,

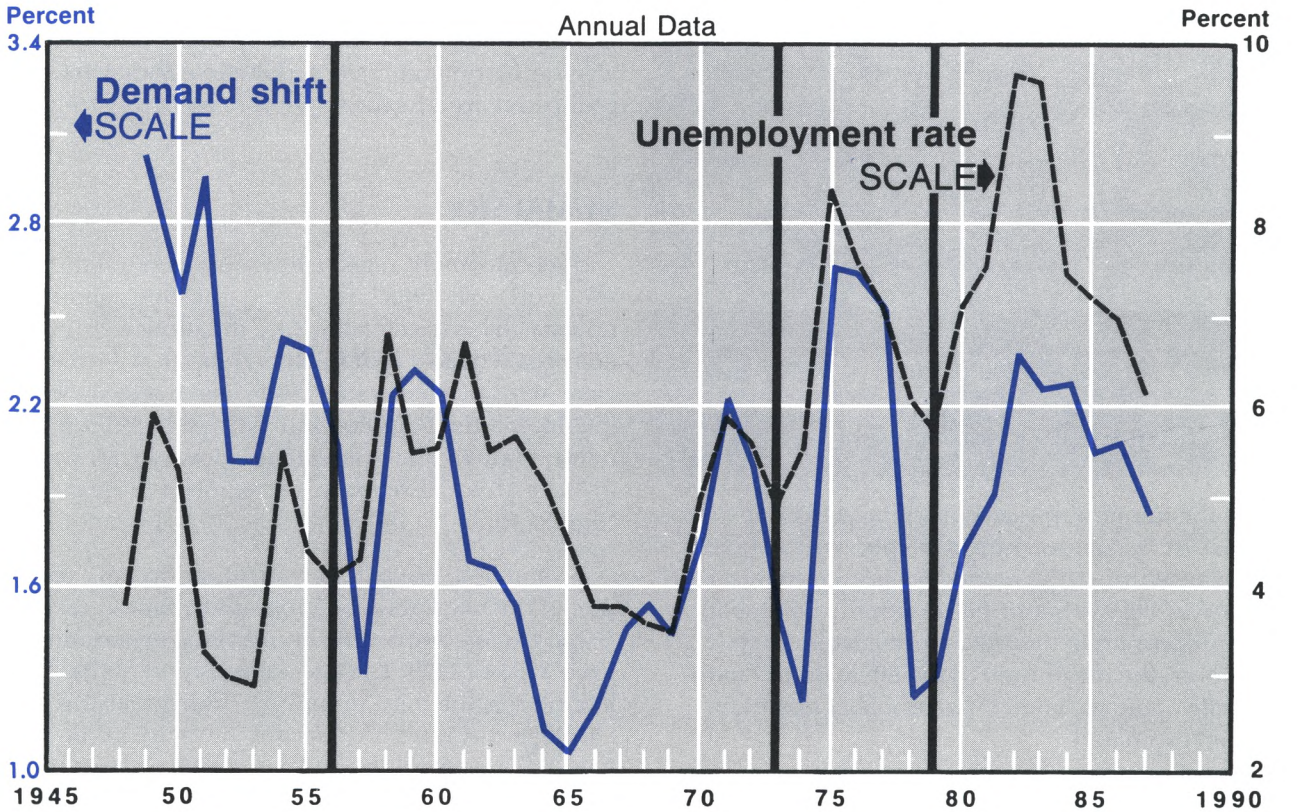
[17]The measure of demand shift (in year t) is

$$100 \times \left[\sum_{i=1}^{10} \left| \frac{E_{i,t}}{E_t} - \frac{E_{i,t-1}}{E_{t-1}} \right| \right],$$

where $E_{i,t}$ is employment in the ith industry in year t and E_t is total employment in year t. Data used were employees on nonagricultural payrolls by major industry. See Council of Economic Advisers (1988), pp. 296–97.

[18]One factor operating during this period was the sharp swing in the value of the dollar, rising sharply from 1980 to 1985, and then falling sharply to 1987. If these developments affected mainly manufacturing exports, the effect could have been to raise frictional unemployment (and the natural rate) when the dollar was rising, and lower such unemployment when it was falling. But since the focus here is on 1987 vs. 1979, a period over which the trade-weighted exchange rate rose only 10 percent, there would seem to be little net effect on the natural rate. Furthermore, manufacturing employment as a percent of total non-agricultural employment has shown little sensitivity to exchange rate movements, even of the magnitude experienced in the 1980s.

Chart 6
Measure of Demand Shift and Unemployment Rate



regulations imposed by the Occupational Safety and Health Administration (OSHA) in the interest of safety and health can divert funds that would normally be used for investment spending.[19] These regulations can act like an employer tax, driving a wedge between the wage the employer is willing to pay and the actual cost.

Another example of regulations that had an important effect on unemployment are work registration requirements for various government programs like welfare and food stamps. For example, in 1972, legislation was passed that required welfare mothers who were able to work to register for work.[20] Although some found jobs, others were added to the count of the unemployed.

SUMMARY OF FACTORS AFFECTING NATURAL RATE

The role of these factors is brought together in table 5. Shown are general conclusions about the direction in which the structural factors have been operating between the benchmark years since 1956. No attempt is made to estimate precisely the magnitude of the effects on the natural rate of unemployment.

The most obvious change in recent years is the shifting age distribution of the labor force, which has reduced the unemployment rate. In other words, the baby-boomers, who made their presence felt throughout the 1970s by pushing up the natural rate of unemployment, are now in the prime-age group. Having accumulated skills, education and experience, this group is now marketing its productive skills, thus reducing the natural rate of unemployment by about one-half of a percentage point from 1979.

The minimum wage has had a favorable effect in reducing the trend of unemployment since 1981, but no attempt was made here to estimate the magnitude of effect. Cagan, however, estimated

[19]For a broad survey, see Licht (1988).

[20]Clarkson and Meiners (1977).

Table 5

Summary of Effects on the Natural Rate of Unemployment

Factor	1956–73	1973–79	1979–87
Demographic change	↑	↑?	↓
Minimum wage	↑?	↑	↓
Unemployment benefits	↑	↓?	↑?
Tax wedge	↑	↑	0
Demand shifts	↓?	↓?	↑?

NOTE: Arrow indicates direction of effect on the natural rate of unemployment. Question mark with arrow indicates the effect is probably small. A zero indicates no effect on the natural rate.

that the minimum wage contributed to an increase in the natural rate of .45 percentage points from 1956 to 1977.[21] The relative minimum wage in 1987 was below that in 1956. With the decline in the proportion of teenagers in the labor force, however, the magnitude of the effect on the natural rate of unemployment is probably less than Cagan estimated.

Unemployment benefits generally appear to have affected recent unemployment trends negatively. The replacement ratio has risen quite dramatically since 1984. This is misleading, however, because starting in 1987, unemployment benefits became fully taxable by the federal government, while eligibility requirements have been tightened in recent years. These developments have raised the cost of being unemployed and have reduced the trend of unemployment.

Taxes were a factor in the 1956–73 period (and to some extent from 1973 to 1979), increasing unemployment, both by reducing the cost of the job search (reducing foregone earnings) and increasing the tax wedge between what employers pay to labor and workers receive. Since 1979, however, the upward trend of taxes has slowed, suggesting that the tax wedge has not worsened. These developments are assessed as having no effect on the natural rate in the 1979–87 period.

Despite considerable fluctuation in the shares of sector employment, demand-shift factors do not appear to have been a factor during the post-World War II period. In general, the key factors that influence the natural rate of unemployment have served to reduce it in the 1980s. As a result, the current natural rate appears below the 6 percent rate estimated in 1979.[22] Shifts in the age structure of the labor force alone have reduced it about one-half of a percentage point. Other favorable developments, as noted in table 5, may have reduced it even further.

SUMMARY

Unemployment rates below 6 percent in late 1987 and early 1988 have raised questions about how far the rate can fall before inflation again emerges. The fact that inflation has shown no clear signs of acceleration suggests that structural changes in the U.S. economy have reduced the natural rate of unemployment below what it was in 1979. This article examined some of these structural factors.

Several of these factors were found to have reduced the natural rate of unemployment in recent years, when compared with previous experience from 1956 to 1979. The age composition of the labor force, the minimum wage, individual and employer tax rates are a few of the factors that have moved favorably. Any conclusions about unemployment benefit ratios, however, require further study. For the unemployment rate to continue to decline depends critically on the course of future government actions, namely, legislation relating to the minimum wage, tax rates and unemployment benefits.

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[21]Cagan (1979).

[22]Weiner (1986) and Cagan (1979).

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A Comparison of Proposals to Restructure the U.S. Financial System

SINCE the 1930s, commercial banks have been permitted to offer only a limited range of financial services. At the same time, firms engaged in nonfinancial activities, as well as some in financial industries, have not been permitted to own banks. Such restrictions were intended to limit the risk of bank failure, to avoid conflicts of interest and to prevent undue concentration of financial power.[1] In recent years, however, the separation between banking and other activities has been relaxed somewhat; what's more, Congress is considering further relaxation, including expanding the powers for banking organizations to underwrite securities.

One major reason for permitting the common ownership of banks and firms in other industries is based on concern about the role of banks in financial intermediation in the future. Some bank customers have found cheaper sources of credit and other financial services outside the banking industry. Consequently, some analysts say, restrictions must be relaxed if banks are to survive.[2] The purpose of this paper is to describe several major proposals for changing banking restrictions and to

[1]These restrictions have not been applied to the ownership of banks by individuals. Individuals who own bank stock may own and operate firms in any other industry. Under the Change in Bank Control Act of 1978, individuals and groups of individuals acting in concert must apply to the appropriate federal supervisory agency for permission to acquire the stock of a bank over certain percentages of ownership. See Spong (1985), pp. 94–95. The bank supervisory agencies may deny permission to purchase bank stock under the following conditions:

(1) The purchase would create a monopoly in any part of the banking industry,
(2) The financial condition of the acquiring party could adversely affect the bank, or
(3) The competence, experience or integrity of the proposed ownership would not be in the interest of the bank's depositors.

[2]Corrigan (1987), Federal Deposit Insurance Corporation (1987) and Huertas (1986, 1987).

examine the concepts that underlie these proposals.

CURRENT RESTRICTIONS ON BANKING ACTIVITY

At present, the activities of federally insured commercial banks are limited essentially to accepting deposits, holding relatively low-risk securities and making loans. Banking organizations may acquire firms engaged in financial activities through bank holding companies (BHCs) — corporations that own one or more banks. In the Bank Holding Company Act (BHCA), Congress authorized the Federal Reserve Board to determine what activities are permissible for BHCs; these activities, according to the act, should be "so closely related to banking as to be a proper incident thereto." Banks generally can engage in most activities that BHCs are allowed to pursue.[3] A major distinction between banks and the nonbank subsidiaries of BHCs involves opportunities for geographic expansion. The nonbank subsidiaries of BHCs may have offices throughout the nation, whereas nationwide branch banking is not permitted.

BHCs are subject to the supervision of the Federal Reserve, which periodically inspects them to determine whether they are operating in a sound manner and in compliance with regulations, including the capital requirements set by the Federal Reserve.[4] On several occasions, the Federal Reserve Board has ruled that BHCs could not undertake certain activities because they were not closely related to banking, might result in conflicts of interest or might have subjected the BHCs to greater risk.[5]

Table 1

Restrictions on Credit Relationships Between Commercial Banks and Their Nonbank Affiliates

Restrictions in section 23A of the Federal Reserve Act:

1. Loans by banks to nonbank affiliates must be fully and adequately collateralized.
2. Total credit to any one nonbank affiliate is limited to 10 percent of the bank's capital.
3. Combined credit to all nonbank affiliates is limited to 20 percent of the bank's capital.
4. Purchases by banks of unsound assets from nonbank affiliates are forbidden.
5. Bank transactions with affiliates (including transactions covered by the statute and transactions specifically exempt) are to be on terms and conditions that are consistent with safe and sound banking practices.

Restrictions in section 23B of the Federal Reserve Act:

1. A bank's transactions with affiliates must be on terms and under circumstances, including credit standards, similar to those offered to nonaffiliate companies.
2. A bank, acting as a fiduciary, shall not purchase securities issued by an affiliate, unless such purchases are specified in the fiduciary agreement.
3. A bank shall not purchase securities being underwritten by a securities affiliate.
4. A bank shall not state or suggest that it is responsible for the obligations of its affiliates.

NOTE: Legislation in 1982 removed most of the restrictions on transactions between commercial banks that are subsidiaries of the same corporation. If a corporation owns 80 percent or more of the shares of its subsidiary banks, the only restriction on transactions between the subsidiary banks is that one bank may not sell low quality assets from another bank in the same organization. See Rose and Talley (1982).

[3]Spong (1985), pp. 95–98. The major exception to this involves the nonbank banks. The BHCA, which gave the Federal Reserve jurisdiction over the acquisitions of banks by corporations, defined a bank as one that accepts demand deposits and makes commercial loans. Acquisitions of institutions that did not accept demand deposits or make commercial loans were not subject to the jurisdiction of the Federal Reserve in its capacity as regulator of BHCs. These limited-service banks are commonly called nonbank banks. The Competitive Equality Banking Act of 1987 (CEBA) closes that loophole in the law. It places restrictions on the growth and activities of nonbank banks acquired on or before March 5, 1987, and requires firms that acquired nonbank banks after that date to sell them or restrict their activities to those permissible for BHCs. The following restrictions apply to nonbank banks acquired on or before March 5, 1987:

(1) They may not engage in new activities,
(2) They may not market the goods or services of affiliates or have their banking services marketed through nonbank affiliates, except through those marketing arrangements in effect before March 5, 1987, and
(3) Beginning in August 1988, their assets may not rise by more than 7 percent in any 12-month period.

CEBA also imposes restrictions on the daylight overdrafts of nonbank banks.

[4]Gilbert, Stone and Trebing (1985).

[5]Volcker (1986), pp. 436–38. The following are some of the activities not permissible for BHCs and the dates of denials for those activities by the Federal Reserve Board: underwriting general life insurance (1971), real estate brokerage (1972), land investment and development (1972), operating a savings and loan association (1974), operating a travel agency (1976) and acting as a specialist in foreign exchange options on a security exchange (1986).

Table 2

Proposals to Restructure the Financial System

Features	Association of Bank Holding Companies (LaWare (1987))	Association of Reserve City Bankers (1987)	Robert Heller (1987)	Federal Deposit Insurance Corporation (1987)
Corporate structure required of firms that own banks	FSHCs would own BHCs and holding companies that own firms engaged in financial activities in addition to banking.	FSHCs would directly own banks and firms in other industries.	BHCs could acquire banks and firms engaged in financial activities. Nonfinancial firms could acquire BHCs.	Firms in any industry could buy banks, and banks could engage in nonbanking activities through their own subsidiaries.
Ownership of banks by nonfinancial firms permitted	No	Yes	Yes	Yes
Restrictions on transactions between banks and their affiliates	Keep current restrictions	Eliminate section 23B of the Federal Reserve Act (see table 1).	Keep current restrictions	Impose uniform restrictions on dividends and lending limits of banks. Make these restrictions and those in sections 23A and 23B of the Federal Reserve Act apply to transactions between banks and their subsidiaries.
Supervisory authority of regulatory agencies	Supervision of banks and BHCs unchanged. No one agency supervises FSHCs, which may own BHCs and holding companies that own firms in financial industries other than banking. Subsidiaries of FSHCs in nonbanking industries subject to supervision by their regulatory authorities.	Same as for the Association of Bank Holding Companies.	No comment on the supervisory powers of the Federal Reserve over BHCs. Nonbank subsidiaries of BHCs subject to supervision by their own government authorities.	Firms that buy banks not subject to supervision by bank supervisors. Banks required to report all transactions with affiliates or subsidiaries to bank supervisors, which could audit the terms of the transactions.
Obligation to support bank subsidiaries	None	None	BHCs must absorb losses of bank subsidiaries. Nonbanking firms must absorb losses of their BHCs.	None
Restrictions on assets of banks	Current restrictions	Current restrictions	Current restrictions	Current restrictions

Gerald Corrigan (1987)	Robert Litan (1987)
Firms that engage in financial activities exclusively could purchase banks.	Firms engaged in any activities could buy banks, subject to restrictions on the assets held by those banks.
No	Yes
Keep current restrictions	Prohibit banks owned by nonbanking organizations from lending to affiliates.
Firms that own banks subject to supervision by the federal bank supervisors, including exercise of powers to limit risks (such as capital requirements) and aggregate concentration in the financial system.	Nonbank firms that own banks not subject to bank supervisors except to verify that those banks held only the designated safe assets.
No formal obligation, but general commitment to be a source of strength for bank subsidiaries.	None
Current restrictions	Bank subsidiaries of nonbanking firms may hold only designated low-risk, liquid assets.

Some banks offer financial services through their own subsidiaries. The Comptroller of the Currency determines which activities are permissible for subsidiaries of national banks; these are generally restricted to activities that are permissible for national banks themselves. In recent years, state governments have allowed subsidiaries of state-chartered banks to engage in a variety of new activities; among these are insurance, real estate investment and securities underwriting.[6]

All federally insured commercial banks are subject to restrictions on transactions with their affiliates; these restrictions are shown in table 1. Thus, for example, total loans to affiliates are limited to 20 percent of the bank's capital. Additional restrictions apply to sales of assets to banks and purchases by banks of securities issued by nonbank affiliates or underwritten by securities affiliates, as well as restrictions on loans by banks to their officers, directors and major stockholders.[7]

PROPOSALS FOR RESTRUCTURING THE U.S. BANKING SYSTEM

This section describes six proposals for restructuring the U.S. banking system. Although others could be included, particularly those dealing with the entry of banks into specific industries, the following proposals encompass the range of options being considered in current policy debates.

The key features of these six proposals are summarized in table 2. Each proposal would permit banking organizations to engage in a broader range of activities than currently allowed. Essentially, the proposals allow nonbanking services to be offered through corporate entities (affiliates or subsidiaries) distinct from the banks themselves.

There are two primary differences among the proposals. First, they differ on whether to permit nonfinancial firms to acquire banks or BHCs. These differences reflect conflicting views on the

[6]Federal Deposit Insurance Corporation (1987), p. 106. This paper focuses on the issues involved in the common ownership of commercial banks and firms in other industries. Nonbanking firms may offer a wide range of banking services by acquiring savings and loan associations (S&Ls). Corporations in any industry other than securities underwriting may acquire one S&L each. Regulations prohibit lending by S&Ls to their nonfinancial parent organizations and restrict other types of transactions that could benefit the parent organization at the expense of the S&L subsidiary. See Federal Home Loan Bank Board (1986).

[7]Spong (1985), pp. 55–58.

policies necessary to avoid conflicts of interest, decreased or unfair competition among firms offering financial services and undue concentration of economic resources. These issues have been discussed extensively elsewhere; they are not analyzed in this article.[8]

Second, the proposals differ on the policies necessary to limit the risk assumed by banks. Note that the proposals have some common features designed to limit banking risk. Each proposal in table 2 requires banking organizations to offer nonbanking services through subsidiaries or affiliates; moreover, each includes restrictions on banks lending to their nonbank subsidiaries or affiliates. These proposals rely in part on the legal concept of "corporate separateness," under which the creditors of a corporation have no legal claim on the assets of a stockholder, even if that stockholder is another corporation. Thus, creditors of the nonbanking units of a firm that also owns banks would have no claim on its banks' assets.[9]

Several proposals include special features to limit the risk of bank failure that might result from affiliation of banks and nonbanking firms. The Heller proposal (Heller (1987)) requires BHCs to absorb all losses incurred by their bank subsidiaries; nonfinancial firms that acquire BHCs would absorb all losses incurred by their BHCs. The FDIC proposal (Federal Deposit Insurance Corporation (1987)) requires bank supervisors to audit transactions between banks and their nonbank affiliates or subsidiaries to determine whether they are detrimental to the banks. The Corrigan proposal (Corrigan (1987)) relies on direct supervision of the firms that buy banks to limit the risk they assume. Finally, the Litan proposal (Litan (1987)) requires banks purchased by nonbanking firms to hold only low-risk liquid assets.[10]

A FRAMEWORK FOR ANALYZING THE RISK OF BANK FAILURE

The proposals for changing bank regulations are concerned with their likely effect on bank failures. This section illustrates how the probability of bank failure is affected when banks and nonbanking firms combine.

Key Factors Affecting the Profits and Risks of Combining Banks and Nonbanking Firms[11]

If a bank offers nonbanking services, the effect on both the expected rate of return and the variability of returns to the bank's shareholders, as well as the risk of failure for the bank, depend on five factors. Suppose a bank merges with a nonbanking firm. One important factor is the average level of expected profits or rate of return for the nonbanking service. A second factor is the "risk" associated with the prospective nonbanking service; risk is often measured by the standard deviation of the profits or rates of return. A third factor is the correlation between the profit rates of the bank and

[8]Rose (1985).

[9]Black, Miller and Posner (1978).

[10]Similar proposals have been made by Kareken (1986), Gilbert (1987), Tobin (1987) and Forrestal (1987). Tobin proposes limiting the assets of all banks to short-term, low-risk assets.

[11]The factors that determine the expected value and variance of profits of a firm that buys a bank and a nonbanking firm can be expressed in the following equations:

$$E(B + N) = E(B) + E(N),$$

$$V(B + N) = V(B) + V(N) + 2COV(B,N),$$

where E refers to expected value, V to variance, B to the profits of the bank, N to the profits of the nonbanking firm and COV to the covariance of the profits of the bank and the nonbanking firm. Holding constant the covariance of the two profit streams, a higher variance in the profits of the nonbanking firm means a higher variance in the profits of the combined firms. The variance of the combined profit streams depends on the covariance of the two profit streams. Finally, as the size of the nonbanking firm rises relative to the size of the bank, the variance of the combined profit streams converges to the variance of the profits of the nonbanking firm.

An analysis of the proposals to restructure the financial system involves an analysis of the mean and variance of the returns to shareholders of a firm that buys a bank and a nonbanking firm and operates them under the conditions of the various proposals. One approach to this analysis might involve expressing the mean and variance of the profits of the firm that buys the bank and the nonbanking firm in terms of the mean and variance of the profits of the bank and the nonbanking firm separately, as indicated in the equations above. The problem with this approach is that the distribution of returns to shareholders is not the same as the distribution of profits. In some outcomes, losses exceed the investment of the shareholders; losses to shareholders, however, are no larger than their investment in the firm. The distinction between the distribution of profits and the distribution of returns to shareholders is especially important for this study, since the various proposals involve different rules for truncating the losses to shareholders. Analysis of the mean and variance of returns to shareholders must be based on specific distributions of the profits of the bank and the nonbanking firm, as presented in the text, not on the expected value and variance of the profits.

Table 3

Means and Standard Deviations of Profit Rates for Firms in Financial Service Industries, 1975–84

Industry	Average after-tax return on equity (ROE)	Standard deviation of ROE
Commercial banks	12.3%	1.3%
Thrift institutions	3.4	10.7
Securities brokers	13.0	4.0
Securities underwriters	16.4	5.7
Large investment banks only	21.5	7.7
Life insurance underwriters	13.7	2.3
Property-casualty insurance underwriters	11.9	6.4
Insurance brokers and agents	12.2	4.1
All manufacturing	13.1	2.0

SOURCE: Litan (1987), p. 64.

nonbanking firm. A fourth factor is the size of the bank relative to the nonbanking firm. The third and fourth factors are important because the bank may actually reduce its risk by acquiring a nonbanking firm that has a higher coefficient of variation of profits than the bank. This possibility will be demonstrated later.

The fifth factor that must be considered is the "synergies" (increase in profits) involved in combining banking and nonbanking services in the same organization. Offering banking and nonbanking services through the same firm may reduce the cost of providing the services and may attract customers who value the wider array of services offered by the combined bank-nonbank firm. These synergies could produce profit rates that exceed the sum of the profit rates of banks and firms in the nonbanking industry operating as separate corporations.

Some Empirical Estimates of Rates of Return and Risk

A number of studies have investigated the profit rates in banking and selected nonbank activities.[12] One finding, demonstrated in table 3, is that both the average profit rate and its standard deviation are lower in banking than in several industries that banks would be permitted to enter under the recent proposals.[13] Indeed, the standard deviation of return on equity, one measure of risk, is lowest in table 3 for the banking industry. Another key finding of these studies is that the profit rates of banks are not positively correlated with the profits of firms in many industries that they would be permitted to enter. Thus, banks could diversify their risk by entering many nonbanking industries, even if the profits of firms in those industries are more variable than those of banks.

[12]Eisenbeis and Wall (1984) survey the studies. For more recent studies, see Boyd and Graham (1988) and Macey, Marr and Young (1987). There is evidence that BHCs reduce their risk by offering nonbanking services. See Boyd and Graham (1986), Wall (1987) and Brewer (1988). The results of these studies do not indicate the effects on risk of banking institutions entering nonbanking industries as permissible under the proposals in table 2. The nonbanking activities permissible for BHCs now are primarily those permissible for banks. The diversification of risk achieved by offering the nonbanking services currently permissible for BHCs may reflect merely geographic diversification.

[13]Some studies measure returns to shareholders using data on stock prices and dividends. These studies report similar patterns: mean rates of return and variability of returns to shareholders are higher in several of the industries that banking organizations would be permitted to enter than in the commercial banking industry. See Boyd and Graham (1988), Eisemann (1976) and Macey, Marr and Young (1987).

Table 4

Variability of Profits of Hypothetical Firms formed through the Merger of Banks and Firms in Various Financial Industries, 1962–82

Item	Coefficient of variation
Banks alone	0.22
Banks plus savings and loan associations	0.18
Banks plus personal credit agencies	0.24
Banks plus business credit agencies	0.22
Banks plus securities and commodities brokers	0.22
Banks plus life insurance	0.15
Banks plus mutual insurers	0.29
Banks plus insurance agents	0.15
Banks plus real estate operators and lessors	0.20
Banks plus subdividers and developers	0.20

NOTE: A time series of the profits of each hypothetical firm is formed by assuming that 75 percent of the assets of the hypothetical firm are devoted to banking and 25 percent are devoted to the nonbanking activity. The coefficient of variation is derived for the constructed time series.

SOURCE: Litan (1987), p. 88.

Table 4 illustrates the potential reduction in variability of bank profits possible through mergers with firms that offer other financial services. The table illustrates this with the coefficient of variation, a measure of relative risk that is calculated by dividing the standard deviation of the profit rates by the mean. The results demonstrate, using a hypothetical situation involving the relative size of banking and nonbanking components of the firm, that the combined firm can have the same or even lower risk than the bank itself, even though risk is higher in the nonbanking industries.

Because banks have not yet entered the various nonbanking industries, there is little evidence on the magnitude of the synergies involved in combining banks with other firms.[14] There is evidence, however, of synergies for banks and selected financial activities. For example, before the separation of commercial banking and investment banking in the 1930s, securities affiliates of commercial banks held a large share of the investment banking business.[15] In nations where commercial banking organizations may offer investment banking services, commercial banking organizations have large shares of the investment banking business.[16]

An Illustration

The effects of permitting banking organizations to offer nonbanking services on the risk and returns in banking are analyzed using two probability distributions of profits, one for a hypothetical bank and another for a nonbanking firm. These probability distributions, presented in table 5, are designed to reflect the results of studies of risk and returns in banking and various nonbanking industries summarized above. Profit distributions are combined in table 6 under various assumptions that reflect the proposals for restructuring

[14]Several studies estimate the effects of the combination of services offered by banks on their costs. See Gilligan and Smirlock (1984) and Benston, et. al. (1983). The results of these studies are not relevant in estimating the effects of nonbanking services on the costs of banks, since the data are for banks subject to current limitations on the services they may offer.

[15]White (1986).

[16]Daskin and Marquardt (1983).

Table 5

Probability Distributions of the Profits of a Bank and a Nonbanking Firm Prior to Merger or Affiliation

Bank			
Outcome	Probability	Profits	Return to shareholders
A	0.01	−$110	−$100
B	0.98	10	10
C	0.01	130	130
Nonbanking firm			
Outcome	Probability	Profits	Return to shareholders
A	0.05	−$115	−$100
B	0.90	15	15
C	0.05	145	145

	Bank	Nonbanking firm
Expected return to shareholders as a percentage of capital	10.1%	15.75%
Coefficient of variation of returns to shareholders	1.6117	2.4637
Expected loss to the FDIC	$0.10	

the financial system described in table 2. Table 7 shows the returns to shareholders and the expected loss to the FDIC for the four cases analyzed in table 6.

The illustration is designed to be simple. Differences among the four cases might change under assumptions that would make the analysis more complex. For instance, the management of the firm that buys the bank and the nonbanking firm is assumed to make no changes that affect the capital ratios or the probability distributions of profits. Analysis of the cases under alternative assumptions is beyond the scope of this paper.

The bank begins the current year with book value of equity equal to $100. The market value of the bank is assumed to equal its book value prior to financial restructuring, which permits the affiliation of the bank with the nonbanking firm. As presented in table 5, the (discrete) probability distribution of the bank's profits in the current year has three possible outcomes: a 1 percent chance of a loss of $110, which would cause the bank to fail, a 98 percent chance of a profit of $10 (a 10 percent return on equity) and a 1 percent chance of a profit of $130.[17]

Table 5 also presents the probability distribution of profits of a nonbanking firm that begins the year with book value capital of $100. The market value of the nonbanking firm is also assumed initially to equal $100. The nonbanking firm is riskier than the bank: the coefficient of variation of its profits is higher than that of the bank. This specification was chosen to reflect the greater variability of profits shown in table 3 in some of the industries that banking institutions wish to enter.

The effects of combining the bank and the nonbanking firm in the same corporation are examined using three indicators: the expected return to shareholders as a percent of capital, the coefficient of variation of returns to shareholders of the consolidated firm, and the expected loss to the FDIC from the bank's failure. These measures are calculated in table 5 for both the bank and the nonbanking firm as separate organizations to provide benchmarks for comparison. The distribution of returns to shareholders differs from the distribution of profits because losses to shareholders are limited to the amount of their initial investment in the firm. Thus, losses to shareholders are limited to $100 for the bank and $100 for the nonbanking firm. The expected loss to the FDIC is calculated as follows. The bank fails in only one of the three possible outcomes: a loss of $110, with a chance of 1 percent. The loss to the FDIC in that outcome would be $10, since the initial capital of the bank is $100. Thus, the expected loss to the FDIC is $10 (loss to FDIC) × 0.01 (probability) = $0.10.

In deriving the distribution of returns to shareholders in table 6, one must specify their investment, which determines their maximum loss and the denominator used in calculating their expected rate of return. The shareholders' initial investment is measured as the book value of the combined firms. The use of book value, net of any accounting goodwill resulting from the acquisition of the bank and the nonbanking firm, provides a

[17]The large profit of the bank associated with the small probability might reflect the recovery on loans previously charged off as losses or a large favorable change in market interest rates on portfolios of assets and liabilities that do not have matched duration.

Table 6

Distributions of Returns to Shareholders for Various Combinations of a Bank and a Nonbanking Firm

Outcome	Outcomes from underlying profit distributions (bank, nonbanking firm)	Probability (bank × nonbanking firm)	(1) Merger		(2) Affiliation, corporate separateness		(3) Affiliation, Heller proposal		(4) Affiliation, corporate separateness; bank lends $10 at a zero interest rate to its nonbank affiliate	
			Return to shareholders	Loss to FDIC	Return to shareholders	Loss to FDIC	Return to shareholders	Loss to FDIC	Return to shareholders	Loss to FDIC
1	A, A	0.01 × 0.05 = 0.0005	−$100 − $100 = −$200	$25	−$100 − $100 = −$200	$10	−$100 − $100 = −$200	$10	−$100 − $100 = −$200	$20.50
2	A, B	0.01 × 0.90 = 0.009	− 110 + 15 = − 95		− 100 + 15 = − 85	10	− 110 + 15 = − 95		−100 + (15 + 1.053) = − 83.947	10.50
3	A, C	0.01 × 0.05 = 0.0005	− 110 + 145 = 35		− 100 + 145 = 45	10	− 110 + 145 = 35		−100 + (145 + 1.053) = 46.053	10.50
4	B, A	0.98 × 0.05 = 0.049	10 − 115 = − 105		10 − 100 = − 90		10 − 100 = − 90		(10 − 0.50) − 10) − 100 = − 100.500	
5	B, B	0.98 × 0.90 = 0.882	10 + 15 = 25		10 + 15 = 25		10 + 15 = 25		(10 − 0.50) + (15 + 1.053) = 25.553	
6	B, C	0.98 × 0.05 = 0.049	10 + 145 = 155		10 + 145 = 155		10 + 145 = 155		(10 − 0.50) + (145 + 1.053) = 155.553	
7	C, A	0.01 × 0.05 = 0.0005	130 − 115 = 15		130 − 100 = 30		130 − 100 = 30		(130 − 0.50 − 10) − 100 = 19.500	
8	C, B	0.01 × 0.90 = 0.009	130 + 15 = 145		130 + 15 = 145		130 + 15 = 145		(130 − 0.50) + (15 + 1.053) = 145.553	
9	C, C	0.01 × 0.05 = 0.0005	130 + 145 = 275		130 + 145 = 275		130 + 145 = 275		(130 − 0.50) + (145 + 1.053) = 275.553	

Table 7

Returns to Shareholders and Losses to the FDIC Under Various Combinations of a Bank and a Nonbanking Firm

Case number	Means of combining the firms	Expected return to shareholders as a percentage of capital	Coefficient of variation of returns to shareholders	Expected loss to the FDIC
1	Merger	12.51%	1.7754	$0.0125
2	Affiliation, corporate separateness	12.93	1.6278	0.1000
3	Affiliation, Heller proposal	12.88	1.6434	0.0050
4	Affiliation, corporate separateness; bank lends $10 at zero interest rate to nonbank affiliate	12.93	1.6860	0.1100

basis for specifying bankruptcy. Book value also provides a common denominator for comparisons of expected rates of return in the various cases. The market value of the firm that buys the bank and the nonbanking firm will exceed their combined book value. If this were not the case, the combination of these firms in the same corporation would not benefit the shareholders.

The profits of the bank and the nonbanking firm are assumed to be statistically independent and, thus, uncorrelated. This assumption simplifies the analysis; it is also consistent with some of the evidence cited previously for several industries that banks could enter. For each outcome for the profits of the bank, there are three possible outcomes for the profits of the nonbanking firm. If combined into one firm, there would be nine possible outcomes for the returns to shareholders of the consolidated firm, as table 6 illustrates.

Tables 6 and 7 ignore the existence of synergies from combining a bank with a nonbanking firm; they assume that there is no increase in the joint profits resulting from lower costs or a wider array of services to offer customers. As previously mentioned, it is difficult to determine the magnitude of such synergies, given that such combinations have been unlawful for many years. Such synergies, of course, must exist to make such combinations attractive to shareholders; investors can easily obtain the benefits of diversification by owning shares of firms with uncorrelated profits. In this paper, however, assumptions about the size of the synergies are unnecessary; the relevant comparisons are made between the various cases. An increase in the levels of profits for each outcome would not alter the differences among the four cases examined in tables 6 and 7, unless the synergies eliminate bankruptcy in all outcomes.

Merger of the Bank and the Nonbanking Firm: The Simplest Case

Each proposal described in table 2 calls for the new activities of banking organizations to be conducted through corporate entities that are separate from banks. This feature of the proposals reflects the view that the chances of bank failure and the potential loss to the FDIC would be higher if the organizations that own banks offered nonbanking services through their bank subsidiaries, rather than through subsidiaries that are separate from the banks.

This view is not valid under all circumstances, as case 1 in tables 6 and 7 illustrates. In this case, the bank begins offering nonbanking services by merging with the nonbanking firm that has the profit distribution presented in table 5. The capital of the bank after the merger is $200. Given the underlying profit distributions in table 5, there is only one outcome in which the bank fails: in outcome # 1, the returns from the banking and nonbanking activities yield the largest possible losses. In that outcome, the shareholders lose their total investment. The bank remains in operation in all of the other outcomes. In outcomes # 2 and # 3, in which the losses from banking operations are large enough to make the bank fail if operating as a separate corporation, the profits from the nonbanking operations and the increased capital of the bank resulting from the merger keep the bank from failing.

The expected loss to the FDIC in case 1 depends on what happens to the liabilities of the nonbanking firm after the merger. Suppose the nonbanking segment of the merged firm continues to borrow from the same sources it used before the merger. If the claims of these lenders are subordinated to the claims of depositors, the merger might reduce the expected loss to the FDIC, perhaps to zero.

In this illustration, however, the merged organization converts all of its liabilities to federally insured deposits. If the bank involved in the merger goes bankrupt, the FDIC absorbs losses above the capital of $200. In outcome # 1, because the bank's maximum loss after its merger with the nonbanking firm is $225, the loss to the FDIC is $25. Although the maximum loss to the FDIC is larger after the merger, the expected loss ($25 × 0.0005) is actually smaller after the merger (compare tables 5 and 7).

The effects that a merger have on the possibility of bank failure and the expected loss to the FDIC depend on the size of the nonbanking firm relative to the bank. To illustrate, suppose the bank merges with a nonbanking firm whose distribution of profits is 10 times as large for each outcome as that presented in table 5 and whose capital is $1,000. In this case, which is not shown in the table, the expected loss to the FDIC would be $2.04, much larger than the expected loss shown in table 7. Thus, in considering a restructuring of the financial system, the size of the bank relative to the nonbanking firm is an important determinant of the expected loss to the FDIC.

Affiliation of a Bank with a Nonbanking Firm

If banks combine with nonbanking firms, one way to limit the FDIC's expected loss is to require that banks remain separate corporations within their parent organizations and limit FDIC insurance only to the deposit liabilities of the banks. Within such structures, the principle of corporate separateness would prevent the nonbanking firm's creditors from claiming the assets of the bank.

The risk and return characteristics of a holding company that buys the bank and the nonbanking firm are presented in case 2. Under this case, labelled "affiliation, corporate separateness," losses to shareholders of the holding company resulting from losses by the nonbank subsidiary are limited to the capital of the nonbank subsidiary. The bank does not rescue the nonbank subsidiary by absorbing the additional losses. In turn, if the bank has losses that exceed its capital, the nonbank subsidiary does not rescue the bank by absorbing the additional losses. There is assumed to be no lending among units of the holding company. The holding company lends to neither the bank nor the nonbank subsidiary, and the bank lends nothing to the nonbank affiliate. The nonbank affiliate borrows, instead, from nonaffiliated lenders; the liabilities of the bank are covered by FDIC insurance.

The expected return to the shareholders is higher and the variability of returns is lower in case 2 than under a similar combination of firms arranged through a merger. Thus, the shareholders benefit more from a combination of the bank and the nonbanking firm as affiliates of a holding company than through the merger of these firms.

The benefit to the shareholders, however, comes partly at the expense of the FDIC. The FDIC's expected loss is the same in case 2 as in the benchmark case in table 5 but higher than under the merger. Under affiliation and corporate separateness, the outcomes in which the FDIC is exposed to losses are determined by the probability distribution of the bank's profits. Under the merger illustrated in case 1, in contrast, losses in outcomes # 2 and # 3 that would make the bank fail are absorbed by the profits of the nonbank segment of the merged firm and the capital contributed by the nonbanking unit. Under affiliation and corporate separateness, however, the expected loss to the FDIC does not depend on the size of the bank relative to its nonbank affiliate.

IMPLICATIONS FOR THE PROPOSALS

Merger or Affiliation

The cases in tables 6 and 7 indicate that, under some conditions, the risk of FDIC loss would be lower if a bank engages in a nonbanking activity directly, rather than through affiliation with a nonbanking firm. In considering proposals for financial restructuring, therefore, it is unnecessary to prohibit the direct offering of nonbanking services through banks under all circumstances.

The Financial Services Holding Company (FSHC) Proposal

The proposals by the Association of Bank Holding Companies (LaWare (1987)) and the Association of Reserve City Bankers (1987) would permit FSHCs to acquire banks as subsidiaries under the condition of affiliation and corporate separateness. The bank could not use its assets to rescue a failing nonbank affiliate, and the FSHC would not be required to rescue a failing bank.

A comparison of case 2 in table 7 with table 5 shows how the formation of FSHCs can affect risk in banking. Affiliation of a bank with a nonbanking firm reduces the probability that the bank will fail only if affiliation yields synergies that raise the profits of the bank for each possible outcome. Thus, affiliations between banks and nonbanking firms that facilitate diversification of risk for shareholders of banking firms reduce the probability of bank failure and the expected loss to the FDIC *only* if there are synergies from combining banking and nonbanking firms in the same organization.

The Heller "Double Umbrella" Proposal

The distribution of returns to shareholders under the Heller (1987) proposal is presented under case 3 in table 6. The implications of this proposal can be illustrated by comparing the distribution of returns to shareholders under various outcomes in cases 2 and 3. Under the Heller proposal, the losses of the bank and nonbank subsidiary in outcome # 1 absorb all of the capital of the holding company. The FDIC has a loss of $10 in that outcome, the amount by which the loss of the bank exceeds its capital. In outcome # 2, the bank has a loss that exceeds its capital, but the holding company is required to cover that loss, drawing on its profit of $15 from the nonbanking subsidiary and its capital. The holding company also covers the large loss of the bank in outcome # 3. In outcomes # 4 and # 7, in contrast, the holding company does not absorb all of the losses of the nonbanking subsidiary. Instead, the nonbanking subsidiary goes bankrupt. The holding company writes off its investment of $100, and nonaffiliated lenders absorb the additional loss of $15 in each of these outcomes.

The minimum level of synergies necessary to make combinations of banks and nonbanking firms attractive to investors is higher under the Heller proposal than under the FSHC proposal. The diversification of risk illustrated in case 2 could be achieved through a mutual fund that buys shares in firms in banking and nonbanking industries. Any synergies would make the shareholders' expected rate of return higher with the bank and nonbanking firm combined in the firm under affiliation and corporate separateness than through a mutual fund. To make combinations of banks and nonbanking firms under the Heller proposal attractive to shareholders, synergies would have to exceed a level necessary to compensate the holding company for the expected cost of bailing out the failing bank subsidiary.

The synergies necessary to make the affiliation of banks with nonbanking firms profitable under the Heller proposal would be different for each potential combination of firms. For case 3, the synergies would have to raise the returns to shareholders by $0.095 to make them equal to the expected returns to shareholders in case 2, and even more to compensate shareholders for the higher variability of returns in case 3.

The Corrigan Proposal

Corrigan (1987) assumes that the methods of insulating banks built into the proposals for FSHCs will be ineffective. This view is based on evidence that BHCs are integrated organizations that have used all of their resources, including those of their bank subsidiaries, to support any nonbank subsidiary in danger of failing. Corrigan also expresses concern that, in approving the acquisition of banks by nonbanking firms, the federal supervisory authorities will extend the federal safety net to the parent organizations themselves.

The Effects of Loans to Nonbank Affiliates on Stockholder Wealth — The Corrigan proposal reflects these views on the relationship between banks and their parent organizations. Case 4 in tables 6 and 7 examines whether such concerns reflect rational, profit-maximizing behavior. The

Corrigan proposal assumes that firms are willing to risk the assets of their bank subsidiaries to aid their nonbank subsidiaries. One way for a holding company to do this is to allow the bank to lend directly to the nonbank subsidiary. To illustrate this, the bank in case 4 lends $10 to the nonbank affiliate at a zero interest rate, thus subsidizing the nonbank subsidiary at the expense of the bank.

Several assumptions have been made to derive the probability distribution of returns for shareholders of the holding company. First, the bank loan is assumed to be subordinated to other debt of the nonbank affiliate. If the nonbank affiliate goes bankrupt, therefore, the bank absorbs the first $10 of losses to creditors. Second, the interest rate on riskless assets is assumed to be 5 percent. The distribution of profits for the bank is derived by subtracting $0.50 from the profits for each possible outcome presented in table 5; this reduction reflects the opportunity cost of foregoing an alternative investment of $10 at the riskless rate.

The nonbank subsidiary saves $1.053 in interest expense on the $10 it borrows from the bank; this is the amount that a risk-neutral lender charges to compensate for the risk-free rate of 5 percent and the 5 percent chance of losing the $10 principal and foregoing the interest income if the nonbanking firm goes bankrupt.[18]

The effects of this loan on the distribution of shareholders' returns are illustrated in table 6 under case 4. In outcomes # 1, # 4 and # 7, the bankruptcy of the nonbanking firm imposes an additional loss of $10 on the bank. In outcome # 1, in which the bank has its largest losses, the FDIC absorbs a loss of $20.50 ($10 loss from the underlying distribution in table 5, $0.50 loss of interest income on the loan to the nonbank affiliate and $10 loss on the loan to the nonbank affiliate).

The cost saving by the nonbank affiliate due to the zero interest loan from the bank raises the returns to shareholders by $1.053 in all outcomes except those in which the nonbank affiliate goes bankrupt. The return to shareholders is $0.01 higher in case 4 than in case 2; this difference is not large enough, however, to raise the expected rate of return in table 7 by 1 basis point. The important difference between the distributions of returns in case 4 and case 2 is that the coefficient of variation of the returns is higher in case 4. Thus, it is not in the shareholders' interest to have their bank lend to its nonbank subsidiary, even at a subsidized rate. Such loans make their returns more variable.

Typically, bank supervisors would make such a loan even less attractive to the shareholders. Because the loan to the nonbank affiliate raises the expected loss to the FDIC, bank supervisors would require the bank to maintain a higher capital ratio. Though the bank could raise its capital ratio by reducing its total assets while keeping its capital unchanged, the asset reduction would reduce the level of profits for each possible outcome the bank faces.

This analysis is consistent with evidence that few banks make loans to their nonbank affiliates up to the limits allowed by regulation. Rose and Talley (1983) examine transactions among affiliates of 224 of the 229 BHCs that filed reports with the Federal Reserve from the fourth quarter of 1975 through the fourth quarter of 1980. In 1980, 27 percent of the BHCs had no transactions among affiliates. Among the 16 BHCs in which the bank subsidiaries made larger loans to the nonbank affiliates than the nonbank affiliates made to the banks, loans to the nonbank affiliates in 1980 were only 1.3 percent of the capital of the bank subsidiaries.

Banking Risk under Assumptions Other Than Profit Maximization — The distribution of returns in cases 2 and 4 reflect the assumption that, if the bank does not lend to the nonbank affiliate, the affiliate's bankruptcy does not affect the bank's profits. In a few cases, however, the bankruptcy of a nonbank subsidiary of a holding company has induced depositors to withdraw their deposits from the bank subsidiary.[19] The management of a holding company, therefore, might justify loans from a bank subsidiary to a nonbank affiliate as a way to prevent the nonbank subsidiary from going

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[18]The interest rate that the nonbank affiliate would pay to borrow from a nonaffiliated lender is determined by calculating the rate that would make the expected return on such a loan equal to the risk-free interest rate. Let rl be the interest rate on the loan and rs the risk-free rate. In lending $10 to the nonbank affiliate, there is a 95 percent chance of collecting the principal plus interest at the rate rl and a 5 percent chance of losing the principal and collecting no interest. The expected returns on the alternative investments are calculated as follows:

$$rl \times \$10 \times 0.95 - \$10 \times 0.05 = rs \times \$10.$$

If rs is 5 percent,

$$rl = [0.05 + 0.05] \div 0.95 = 0.1053.$$

[19]Cornyn, et. al. (1986).

bankrupt and thus make depositors less concerned about the safety of their deposits. In this case, the costs of bailing out the nonbanking subsidiary might be less than the cost of adverse reaction by depositors.

There have been several cases in which the management of a BHC used the resources of a bank subsidiary to aid a nonbank affiliate in distress. In the mid-1970s, for example, the holding company that owned the Hamilton National Bank of Chattanooga, Tennessee, arranged for the bank to buy low-quality mortgages from a mortgage banking affiliate. The mortgage purchase was an important factor that led to the failure of the bank.[20] In October 1987, to cite another case, the Continental Illinois National Bank made a loan that exceeded its limit for loans to one customer to a subsidiary that deals in options. The subsidiary suffered a large loss after the sharp fall in stock prices that month.

The rationalization behind bank loans to bail out the nonbank affiliate overlooks an alternative that might be more favorable to the shareholders of the holding company: let the nonbank subsidiary go bankrupt and sell the bank to another party. Losses to the holding company would be limited to its investment in the nonbank subsidiary, with nonaffiliated lenders forced to absorb any additional losses. If potential bidders are concerned that the bank made loans to the failing nonbank affiliate or in some way assumed responsibility for the debts of that affiliate, the FDIC could facilitate the sale by offering to reimburse the winning bidder for any losses resulting from the failure of the nonbank affiliate.

Management of the holding company may prefer to have the bank absorb the losses necessary to bail out the failing nonbank affiliate, rather than sell the bank, which will result in the loss of their jobs. It may be in management's interest to arrange for the bank to lend to the nonbank subsidiary and pray that some favorable outcome helps the holding company remain solvent. The possibility of such action is why government supervisors must remain aware of any financial problems in firms that own banks and must subject the bank subsidiaries of those firms to particularly close supervision.

The analysis in tables 6 and 7 of a bank lending to its nonbank affiliate is based on the assumption that the loan is used for legitimate business purposes. Loans from a bank to a nonbank affiliate, of course, could be made for fraudulent purposes. Suppose a bank is permitted to make a loan of any amount to an affiliate. One method of stealing from a bank would be to buy the bank through a holding company, arrange for a loan that exceeded the investment of the holding company in the bank and disappear with the proceeds of the loan.

The potential for fraud indicates that it may be prudent to prohibit loans to affiliates that exceed the capital of a bank. This prohibition would not prevent all forms of fraud in banking, but its violation would indicate to the bank supervisors when a bank is vulnerable to this type of fraud. It is also prudent to screen the background of those who buy banks through holding companies, as the federal bank regulatory agencies do when individuals buy banks.

The FDIC (1987) proposal calls for greater authority to audit the terms of any loans banks make to affiliates or subsidiaries. This proposal does not indicate what bank examiners would look for in such audits. Audits to detect fraud would be appropriate.

The Safe Bank Proposal

The so-called safe bank proposal (Litan (1987)) is intended to reduce the expected level and standard deviation of profit rates of banks subject to the "safe bank" asset restrictions. As the appendix indicates, for each $100 of assets shifted from business loans to Treasury bills, the revenue of the safe bank would decline by $1.26. The asset limitations for safe banks may be so restrictive that they would prevent many affiliations of banks with nonbanking firms that would promote diversification or benefit society through synergies.

One way to evaluate the safe banking proposal is to compare the size of the synergies necessary to make bank acquisitions profitable for nonbanking firms to the synergies necessary under alternative proposals. Suppose the bank had loans of $600.[21] If the bank becomes a safe bank by reinvesting the $600 in Treasury bills, its revenue falls by $7.56. It

[20]Ibid., p. 186.

[21]Suppose the bank has a capital-to-asset ratio of 10 percent. For all federally insured commercial banks, the average ratio of loans to assets is about 60 percent. Thus, $600 is a reasonable level for loans of the hypothetical bank with capital of $100 and a 10 percent capital ratio.

must, however, continue to pay competitive interest rates on deposits after becoming a subsidiary to avoid a decline in its deposits. Thus, synergies from the operation of the bank as a subsidiary must be worth at least $7.56 to the holding company. This amount can be compared to the synergies necessary to make the acquisition of a bank subsidiary profitable under the Heller proposal, which is $0.095 for the case examined above.

This large difference reflects the fact that the safe bank proposal imposes a significant opportunity cost on a nonbanking firm that buys a bank under each possible outcome. The Heller proposal, on the other hand, imposes a loss on the nonbanking firm under an unlikely outcome — the failure of the bank subsidiary. These comparisons suggest that fewer combinations of banking and nonbanking firms that would promote diversification of risk and, possibly, more efficient use of resources would be viable under the safe bank proposal than under the Heller proposal.

CONCLUSIONS

Several barriers separating banking from other industries have been removed in recent years, while Congress debates a more complete restructuring of the financial system. Much evidence indicates that banking organizations could diversify risk by affiliating with firms in a wide variety of other industries, even those with more variable profits than the banking industry. This paper illustrates the potential for risk diversification through the common ownership of a hypothetical bank and nonbanking firm.

The illustration has several implications for current proposals for restructuring the financial system. Banks are not necessarily made safer by requiring that all nonbanking activities be conducted through separate subsidiaries. On the contrary, banks may be less vulnerable to failure if some nonbanking activities are offered through the banks directly. Moreover, the expected loss of federal deposit insurance funds may be lower even if the nonbanking activities are financed through insured deposits.

The major proposals for restructuring the financial system would permit firms in various industries to buy banks and operate them as separate subsidiaries. Some of the proposals build in safeguards to prevent nonbanking firms from using the resources of their bank subsidiaries in ways that would increase both the chance for bank failure and the expected loss of the federal deposit insurance funds. These restrictions are based on the presumption that, without such safeguards, nonbanking firms would use the resources of their bank subsidiaries to benefit their nonbank subsidiaries.

The analysis in this paper indicates that the shareholders of a holding company generally do not benefit by having their bank subsidiary lend at a subsidized interest rate to the nonbank subsidiary. In fact, shareholders are made worse off by such transactions because the holding company profits become more variable. Transactions that benefit nonbank subsidiaries at the expense of bank subsidiaries do not increase the shareholders' wealth. The greatest danger in banks lending to affiliates involves management of holding companies attempting to save their jobs by bailing out nonbank subsidiaries and fraudulent schemes to steal from banks through loans to affiliates.

Two of the proposals place special constraints on the nonbanking firms that buy banks to limit the risks of bank failure. One proposal requires that the holding companies absorb all losses incurred by banks, up to the holding company's total capital. The other proposal requires the bank subsidiaries of nonbanking firms to hold only low-risk liquid assets. Both proposals raise the level of synergies necessary to make the acquisition of banks by nonbanking firms profitable. Of these proposals, the safe banking proposal is the more restrictive. Some consolidations of banking and nonbanking firms that would yield social benefits in the form of higher profits and reduced variation in stockholder returns would not be attractive to shareholders under the safe banking proposal but would be attractive under other proposals.

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Appendix
The Opportunity Cost Of Holding Safe Assets

The safe bank proposal (Litan (1987)) would put the bank subsidiaries of nonbanking firms at a disadvantage in competing for deposits by restricting the return on their investments. This disadvantage could be offset slightly by waiving deposit insurance premiums for the subsidiaries of nonbanking firms. Under the requirements for holding only safe assets, the subsidiaries of nonbanking firms would not expose the federal deposit insurance funds to potential losses; therefore, an argument could be made for exempting "safe" banks from deposit insurance premiums.

The opportunity cost of investing in Treasury securities instead of loans is estimated using data from the functional cost analysis program of the Federal Reserve. A change in the composition of a bank's assets affects its interest revenue and expenses. The functional cost data includes information on interest income and expenses allocated to various categories of loans, as well as expenses involved in purchasing and holding securities. Table A1 indicates that the gross yields on loans almost always exceed those on three-month Treasury bills. Net yields on loans, which reflect expenses and losses, are lower than the net yields on Treasury bills in some years for mortgage and installment loans.

Table A1

Gross and Net Yields on Bank Assets

Year	Number of banks	Treasury bills		Real estate mortgage		Installment loans		Commercial and other loans	
		Gross	Net	Gross	Net	Gross	Net	Gross	Net
1972	86	4.07%	3.92%	7.58%	6.82%	10.19%	6.54%	6.71%	5.35%
1973	96	7.04	6.88	8.11	7.35	10.29	6.65	8.44	7.21
1974	99	7.89	7.72	8.57	7.77	10.77	6.90	10.53	9.09
1975	98	5.84	5.67	8.17	7.36	11.01	6.81	8.88	7.17
1976	109	4.99	4.83	8.39	7.46	11.11	6.91	8.22	6.39
1977	102	5.27	5.11	8.84	7.89	11.05	7.31	8.21	6.46
1978	85	7.22	7.08	8.88	7.93	11.43	8.02	9.67	8.16
1979	80	10.04	9.86	9.32	8.39	12.00	8.57	12.23	10.68
1980	59	11.51	11.28	10.01	9.29	12.90	9.18	14.31	12.62
1981	63	14.03	13.81	10.80	9.88	14.90	10.94	16.85	14.86
1982	76	10.69	10.54	10.84	9.95	15.87	11.96	14.96	12.36
1983	90	8.63	8.47	11.02	9.95	14.98	11.07	11.93	9.26
1984	82	9.58	9.43	11.41	10.31	14.39	11.10	12.82	10.34
1985	81	7.48	7.31	11.60	10.33	13.41	10.16	11.30	8.91
1986	75	5.98	5.75	10.21	8.50	12.50	9.11	10.21	7.73

NOTE: Data on the gross and net yields for the three categories of loans are derived from the functional cost accounting data. These data are for the banks with total assets greater than $200 million. The second column indicates the number of banks in that size category that reported data for the investment function each year. The choice of this largest size category in the functional cost accounting reports is based on the assumption that the safe banks owned by relatively large nonbanking firms would tend to have assets above this dollar level. Net yields on loans reflect adjustments of the gross yields for expenses in making and servicing loans and loss rates on the various types of loans. The gross yields on Treasury bills are the annual averages of yields on three-month Treasury bills, new issues. Net yields on Treasury bills are the gross yields minus the costs of buying and holding investments per dollar of investments in the functional cost accounting data. Under the safe bank proposal, safe banks could hold longer-term Treasury securities, but the longer-term securities have greater potential for capital gains and losses. This exercise uses the yields on short-term Treasury securities and ignores capital gains and losses.

Table A2 isolates the comparisons between net yields on Treasury bills and those on three categories of loans. Net yields on mortgages and installment loans tend to fall below the net yields on Treasury bills in periods of sharp increases in interest rates. The most stable spread is that between the net yield on commercial and other loans and the net yield on Treasury securities. On average, banks lose $1.26 in net income before income taxes per dollar transferred from commercial loans to Treasury bills.

Table A2

Sacrifice of Income Before Income Taxes per $100 Dollars of Loans Shifted to Treasury Bills

	Loan Categories		
Year	Real estate mortgages	Installment loans	Commercial and other loans
1972	$2.90	$2.62	$1.43
1973	0.47	−0.23	0.33
1974	0.05	−0.82	1.37
1975	1.69	1.14	1.50
1976	2.63	2.08	1.56
1977	2.78	2.20	1.35
1978	0.85	0.94	1.08
1979	−1.47	−1.29	0.82
1980	−1.99	−2.10	1.34
1981	−3.93	−2.87	1.05
1982	−0.59	1.42	1.82
1983	1.48	2.60	0.79
1984	0.88	1.67	0.91
1985	3.02	2.85	1.60
1986	2.75	3.36	1.98
Mean	.768	.905	1.262

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