

FEDERAL RESERVE BANK OF KANSAS CITY

Economic Review



Third Quarter 1993

Sluggish Job Growth: Is Rising Productivity or an Anemic Recovery to Blame?

Are Derivatives Too Risky for Banks?

Exchange Rate Regimes and Volatility

Manufacturing: A Silent Force in the Tenth District Economy

Rural Banks and Their Communities: A Matter of Survival

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Sluggish Job Growth: Is Rising Productivity or an Anemic Recovery to Blame?

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By George A. Kahn

Of the many economic issues confronting U.S. policymakers, perhaps only the federal budget deficit has gained more attention in the press and on Capitol Hill than sluggish job creation in the current economic recovery. Many analysts argue that employment growth has been slow because businesses have restructured to cut labor costs and boost productivity. But other analysts blame the anemic recovery for much, if not all, of the sluggish job growth.

Understanding how relationships among employment, productivity, and output may have changed in the current recovery is an important issue for policymakers. In the short run, employment may continue to grow slowly if businesses continue to restructure. As a result, monetary and fiscal stimulus may have less of an impact on employment than in the past. And, achieving any particular reduction in the unemployment rate would require either greater monetary stimulus than in the past or a longer lead time. In the long run, employment and output may actually grow faster than in the past as businesses begin to realize the productivity-enhancing benefits of restructuring. Thus, in the future, policymakers may need to recognize that a faster rate of nominal GDP growth than in the past may be consistent with price stability.

Kahn examines the relationship between employment growth and economic activity and concludes that both enhanced productivity growth and slow output growth have contributed to sluggish job growth during the current recovery.

Are Derivatives Too Risky for Banks?

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By Sean Beckett

Bank participation in the market for derivatives has been growing rapidly in recent years. Derivatives such as swaps, futures, and options now form a significant share of total assets at some of the nation's largest banks. Moreover, participation in these markets accounts for a growing share of bank revenues.

Some observers worry that derivatives may be too risky for banks, because derivatives are relatively new and complex assets. In light of these concerns, it is relevant to ask whether banks should be prohibited from participating in derivatives markets. Laws and regulations already restrict many bank activities to protect depositors and ensure the integrity and stability of the payments system.

Beckett examines whether derivatives are too risky for banks at the current stage of market development. He concludes that banks can safely manage and regulators can effectively supervise bank participation in derivatives markets.

Exchange Rate Regimes and Volatility

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By Charles Engel and Craig S. Hakkio

High volatility in exchange rates can have important adverse consequences. If investors equate volatility with risk, they may alter their investment decisions. As a result, long-term capital flows may be reduced, thereby retarding the efficient flow of capital in the world economy. Moreover, if the exchange value of foreign sales becomes more volatile, firms may be reluctant to engage in international trade. And, if exchange rate volatility spills over into the real economy or inhibits the smooth functioning of the financial system, monetary policymakers will be less able to achieve policy goals.

To reduce exchange rate volatility, some observers recommend that the United States, Japan, and Germany abandon their system of flexible exchange rates and adopt a target zone system. Under a target zone system, exchange rates are fixed within a narrow band that can be periodically adjusted, or realigned.

Engel and Hakkio examine the European experience with a target zone system to learn whether a target zone for the U.S. dollar, yen, and mark would reduce exchange rate volatility. They conclude that exchange rate volatility would probably not decline if the United States, Japan, and Germany were to adopt a target zone system.

Manufacturing: A Silent Force in the Tenth District Economy

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By Tim R. Smith

The economy of the Tenth Federal Reserve District is frequently identified by its rich supply of natural resources. While it is true that agriculture and mining are relatively more important to the district than to the nation, these sectors directly account for only a small share of the total value of goods and services produced in the district. The largest share of district output is owned by manufacturing. Yet the importance of manufacturing in district states is often understated, and the characteristics of the region's manufacturing sector are not widely known.

Smith describes the dimensions of the district's manufacturing sector and considers the outlook for its key industries. First, he establishes the importance of manufacturing to the region's economy, reviews the industrial composition of manufacturing output and employment in the district, and identifies the district's three key industries: transportation equipment, industrial machinery, and food processing. Next, he provides a more detailed description of the district's key industries and shows how important these industries are to individual district states. Finally, he explores how the outlook for the key industries will be shaped by such factors as domestic and foreign economic growth, regional trade developments, and defense spending cuts.

Rural Banks and Their Communities: A Matter of Survival

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By Deborah M. Markley and Ron Shaffer

As rural community banks chart their futures, they are challenged by economic and financial change. Today's rural communities are no longer isolated from global and national economic trends. Competition from abroad has hurt profit margins for rural businesses. Technical innovation, while boosting productivity, has softened the demand for rural labor. Many of the most educated rural workers have migrated to more urbanized areas in search of higher returns on their educational investment. And, many rural businesses are being drawn to urban centers where they can be closer to suppliers and customers.

Just as the economic landscape is changing, so is the financial environment in which rural community bankers must operate. Deregulation and new technology have brought larger financial institutions into the rural marketplace. And, as the regulatory burden on banks continues to change, rural bankers are finding it harder to compete on their home turf.

Markley and Shaffer explore the challenges that face rural communities and their community banks and discuss strategies bankers might use to help themselves in the changing environment. They conclude that to survive and prosper, rural community bankers need to play a more active role in fostering economic growth in their communities. Fundamentally, the success of rural community bankers is closely tied to the economic health of their rural communities.

Sluggish Job Growth: Is Rising Productivity or an Anemic Recovery To Blame?

By George A. Kahn

Of the many economic issues confronting U.S. policymakers, perhaps only the federal budget deficit has gained more attention in the press and on Capitol Hill than sluggish job creation in the current economic recovery. While a “typical” recovery would have produced 4.3 million jobs in its first eight quarters, the current recovery has produced fewer than 900,000. Many analysts argue that employment growth has been slow because businesses have restructured to cut labor costs and boost productivity. But other analysts blame the anemic recovery for much, if not all, of the sluggish job growth.

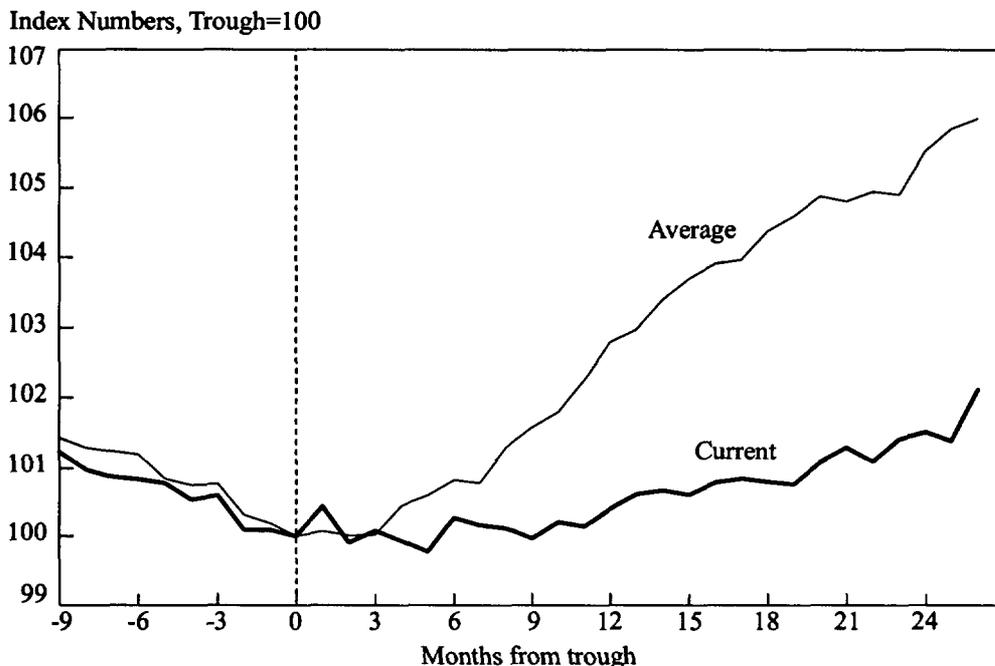
Understanding how relationships among employment, productivity, and output may have changed in the current recovery is an important issue for policymakers. In the short run, employment may continue to grow slowly if businesses continue to restructure. As a result, monetary and fiscal stimulus may have less of

an impact on employment than in the past. And, achieving any particular reduction in the unemployment rate would require either greater monetary stimulus than in the past or a longer lead time. In the long run, employment and output may actually grow faster than in the past as businesses begin to realize the productivity-enhancing benefits of restructuring. Thus, at some point in the future, policymakers may need to recognize that a faster rate of nominal GDP growth than in the past may be consistent with price stability.

This article examines the relationship between employment growth and economic activity. The first section compares the behavior of employment and output during the current recovery with past recoveries and reviews alternative explanations for recent sluggish employment growth. The second section uses a statistical analysis to show that sluggish employment growth in the current recovery is consistent with sluggish output growth and an increase in long-run productivity growth. The article concludes that both enhanced productivity growth and slow output growth have contributed to sluggish job growth during the current recovery.

George A. Kahn is an assistant vice president and economist at the Federal Reserve Bank of Kansas City. Eric Thomas, an assistant economist at the bank, helped prepare the article.

Chart 1

Total Employment

Note: "Average" is for business cycles with troughs in May 1954, April 1958, February 1961, November 1970, March 1975, and November 1982. "Current" represents the current recovery, with a trough in March 1991.

Source: Bureau of Labor Statistics.

EMPLOYMENT, OUTPUT, AND PRODUCTIVITY IN HISTORICAL PERSPECTIVE

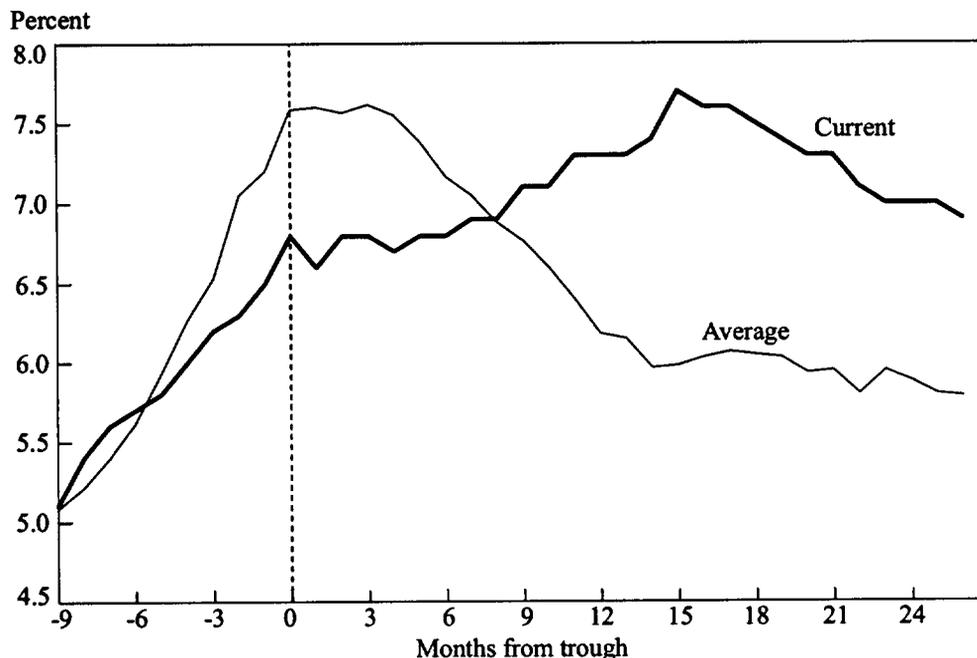
Compared with all previous postwar recoveries, employment growth in the current recovery has been unusually slow. What accounts for the recovery's failure to create more jobs? Two competing explanations are increased productivity growth, stemming from business restructuring, and sluggish output growth. Evidence on these two explanations is mixed. For example, while productivity growth has been no stronger than in past recoveries, it has accounted for

virtually all of the increase in output over the last two years.

Employment in the current recovery

The sluggishness of employment growth in the current recovery is apparent in data from both the Bureau of Labor Statistics' (BLS) household survey and its establishment survey. As shown in Chart 1, total employment as measured by the household survey grew much more slowly in the current economic recovery than in past recoveries. In the chart, data on

Chart 2

Civilian Unemployment Rate

Note: "Average" is for business cycles with troughs in May 1954, April 1958, February 1961, November 1970, March 1975, and November 1982. "Current" represents the current recovery, with a trough in March 1991.

Source: Bureau of Labor Statistics.

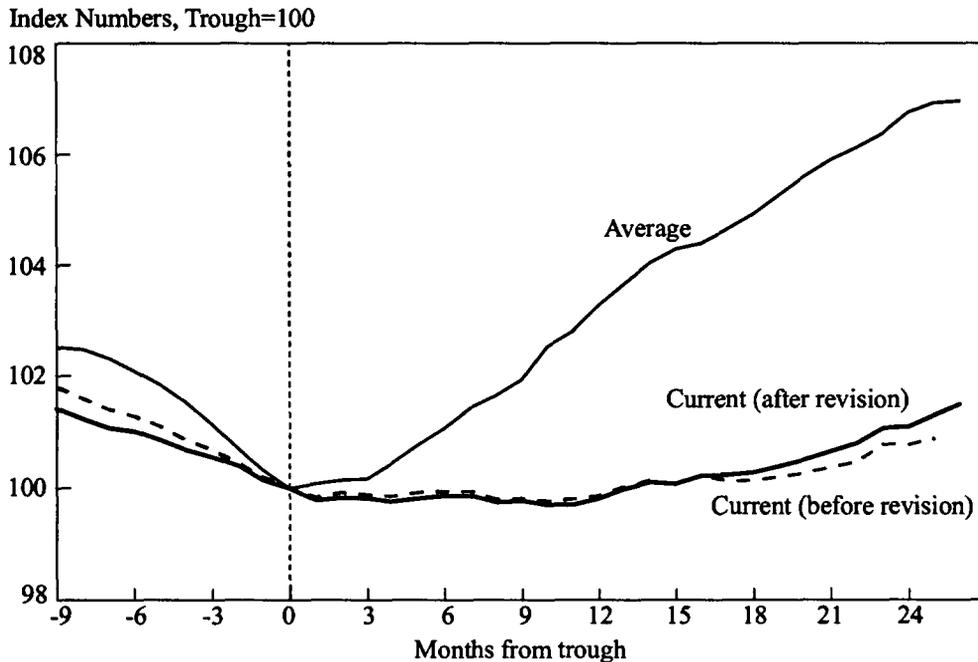
employment are expressed as indexes with values of 100 at business cycle troughs. The line labeled "current" represents the current business cycle, which reached its trough in March 1991. The line labeled "average" shows employment relative to its trough in an average of six previous business cycles. The divergence of the two lines shows how much slower employment growth has been in the current recovery than in past recoveries.

The unusual behavior of employment is also apparent in the unemployment statistics from the household survey. With employment growing slower than the labor force, the unemploy-

ment rate trended upward through the first 15 months of the current recovery. As shown in Chart 2, this pattern is in marked contrast to the typical pattern of the unemployment rate in a recovery. In particular, in a "typical" postwar recovery, the unemployment rate would have leveled off immediately and started falling after the third month.

Data from the BLS's establishment survey, which tracks employment in the private nonfarm sector, give a similar picture of job growth. Despite recent benchmark revisions to the establishment data that show a milder recession and stronger recovery than previously reported, the

Chart 3
Payroll Employment



Note: "Average" is for business cycles with troughs in May 1954, April 1958, February 1961, November 1970, March 1975, and November 1982. "Current" represents the current recovery, with a trough in March 1991.

Source: Bureau of Labor Statistics.

data still show employment growth in the current recovery much weaker than in past recoveries. Chart 3 plots employment growth from the establishment survey before and after the June 1993 benchmark revisions and compares this growth to employment growth in an average of postwar recoveries. Like the previous chart, employment is reported as an index, based on a value of 100 at business cycle troughs. And like the previous chart, the establishment data show decidedly weaker job growth in the current recovery than in previous recoveries.

Explanations for sluggish employment growth

Numerous explanations have been offered for the sluggish pace of job growth. Many of the explanations, especially those appearing in the press, focus on the restructuring of business activity to produce more goods and services with less labor. Less emphasized by the press is the unusually slow growth of output in the current recovery. Because aggregate demand for goods and services has grown slowly in the recovery, firms have only gradually increased

production. Therefore, firms have only gradually increased their demand for labor.

Business Restructuring. Two recent developments that support restructuring as an explanation for sluggish employment growth are technological change and the rising cost of labor. In attributing sluggish employment growth to technological change, many analysts emphasize the absorption of computer technology into the workplace.¹ According to this view, computers that were introduced in the 1980s may only recently have been used to their full potential. Factors that pushed firms to use existing computer technology more efficiently were the recession and increased competition from abroad. To maintain profits in the recession and compete with low-cost foreign producers, businesses may have substituted computer technology for labor. The resulting absorption of computer technology into the workplace may have resulted in flatter corporate hierarchies and fewer mid-level, white-collar workers (Krugman as quoted in Trehan).

Another force possibly contributing to a restructuring of business activity is the increasing cost of labor. While wage costs have moderated considerably over the past several years, employee benefit costs have grown rapidly. A large part of the increasing cost of benefits is the soaring cost of employer-provided health-care benefits. As these costs have risen, employers may have become more reluctant to expand payrolls.² In addition, uncertainty over the future employer costs of federally mandated government health-care programs has likely discouraged some firms from hiring full-time workers. Because of these recent and anticipated labor cost increases, employers may have met rising demand from the current recovery by working their employees harder than in past recoveries.

Sluggish output growth. An alternative explanation is that sluggish employment growth simply reflects sluggish output growth in the current recovery. Chart 4, which compares the current recovery with an average of postwar

recoveries, shows output growth has been unusually slow. Starting from a value of 100 at the trough, the plotted index of real GDP increased to about 104 in the first eight quarters of the current recovery. In the average recovery, real GDP increased to 110—more than twice as much. With unusually slow output growth but relatively normal productivity growth, employment growth would be expected to be unusually slow.

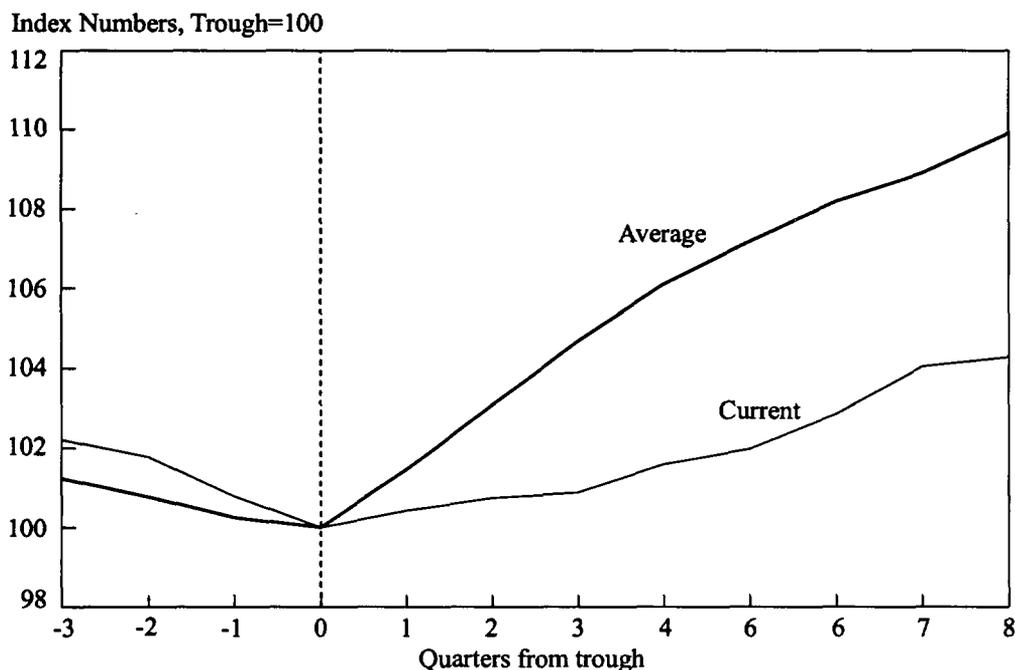
Because *both* employment and output growth have been sluggish in the current recovery, their behavior may have a common explanation. That is, the same factors that explain why output growth has been so slow may also explain why employment growth has been so slow.

A number of factors can potentially explain the behavior of both output and employment. First, cutbacks in defense spending have clearly reduced GDP because government purchases of defense goods are a component of GDP. These defense cuts have in turn led to job cuts as defense contractors have scaled back their production of goods and services. Second, as consumers and firms have restructured their balance sheets to reduce debt burdens, spending has grown sluggishly. As a result, businesses have hired less labor and increased production of goods and services less than in a typical recovery. Third, as our trading partners' economies have slowed, so has the demand for U.S. exports. Slow growth of exports has in turn caused exporting firms in the United States to cut back production and employment growth.³

Preliminary evidence

A preliminary look at the data does little to resolve the issue of whether sluggish employment growth has been caused by increased productivity growth or has simply been associated with sluggish output growth. An implication of the productivity view is that slower employment growth has been offset by increased labor pro-

Chart 4

Real GDP

Note: "Average" is for business cycles with troughs in 1954:Q2, 1958:Q2, 1961:Q1, 1970:Q4, 1975:Q1, and 1982:Q4. "Current" represents the current recovery, with a trough in 1991:Q1.

Source: Bureau of Economic Analysis.

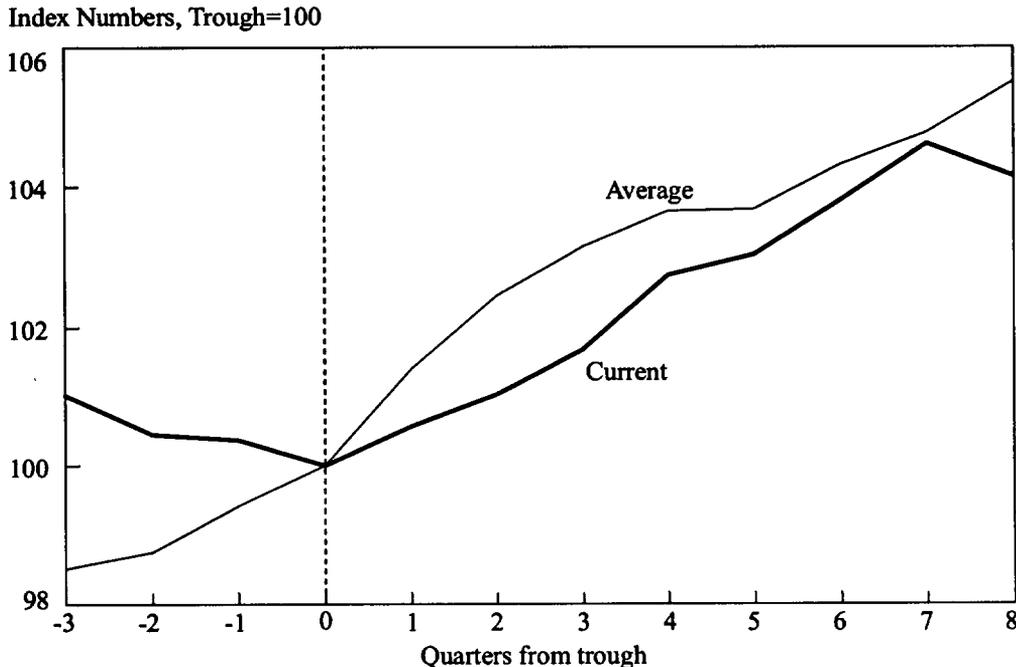
ductivity in the current economic recovery. If businesses are making better use of existing computer equipment and working their labor harder than in previous recoveries, productivity growth should be faster than usual. In fact, productivity growth has not been unusually strong, but it has accounted for an unusually large share of output growth.

As shown in Chart 5, productivity in the non-farm business sector has grown at a rate similar to the average growth of productivity in postwar recoveries. In the current recovery, productivity increased from an index of 100 at the trough

(1991:Q1) to just under 105 in the seventh quarter (1992:Q4). In the average recovery, productivity increased slightly more. Moreover, productivity declined in the eighth quarter of the current recovery (1993:Q1) but continued to increase in previous recoveries. The chart therefore implies that productivity has not been unusually strong in the current recovery. This evidence appears to contradict explanations of sluggish employment growth that rely on unusually strong productivity growth.

A different interpretation of the evidence, however, supports the productivity view. By

Chart 5
Productivity



Note: Productivity is measured as output/hour in the nonfarm business sector. "Average" is for business cycles with troughs in 1954:Q2, 1958:Q2, 1961:Q1, 1970:Q4, 1975:Q1, and 1982:Q4. "Current" represents the current recovery, with a trough in 1991:Q1.

Source: Bureau of Labor Statistics.

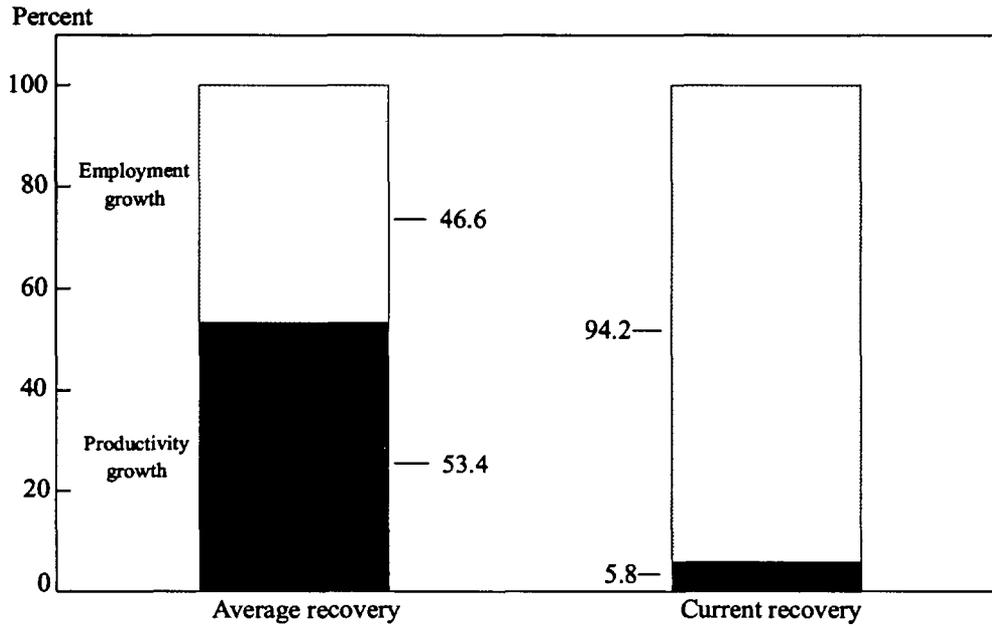
definition, output growth is the sum of employment growth (measured as total hours worked) and productivity growth (measured as output per hour). If the anemic recovery were the only explanation for the behavior of employment, growth of both employment and productivity would likely be slower than usual. Moreover, the relative contribution of employment and productivity growth to output growth would likely be similar to that in the past. In fact, productivity growth has contributed significantly more to output growth in the current recovery than in past recoveries.

Chart 6 compares how productivity and employment growth have contributed to output

growth in the current recovery with how they contributed in an average of past recoveries. In the average recovery, employment accounted for 53 percent of output growth and productivity accounted for 47 percent. In the current recovery, employment has accounted for only 6 percent while productivity has accounted for 94 percent. Thus, despite the fact that productivity growth has not been unusually strong, productivity gains have played an essential role in supporting output growth in the current recovery.

In summary, three features of this recovery have been unusual. Employment growth has been unusually sluggish. Output growth has been un-

Chart 6

Contribution of Employment and Productivity to Output Growth

Note: "Average recovery" represents the first eight quarters of recoveries beginning in 1954, 1958, 1961, 1970, 1975, and 1982. "Current recovery" represents the first eight quarters of the recovery beginning in 1991.

Source: Bureau of Labor Statistics.

usually sluggish. And productivity growth has accounted for an unusually large share of output growth. One feature of this recovery has not been unusual: overall productivity growth in the recovery has been similar to that in previous recoveries. How can these facts be reconciled, and what do they say about possible explanations for sluggish employment growth?

WHY HAS EMPLOYMENT GROWTH BEEN SO SLUGGISH?

To examine the relationship among employ-

ment, output, and productivity, this section uses a relatively simple economic identity. The identity forms the basis for a statistical analysis of employment growth in the current and previous recoveries.⁴ The analysis points to two conclusions. First, long-run trend productivity growth has increased in the 1990s. This pickup in productivity growth explains both the overall increase in productivity growth and productivity's unusually large contribution to economic growth in the current recovery. Second, the short-run relationship between employment and output has not changed in the current recovery. As a result, sluggish output growth largely explains the slug-

gish employment growth of this recovery.

The output-employment identity

The following identity relates output to employment, productivity, and several other important labor-market indicators:

$$Q = \frac{E}{L} \times \frac{Q^B}{E^B H^B} \times \frac{L}{N} \times H^B \times N \times \frac{Q}{Q^B} \times \frac{E^B}{E}.$$

On the left side of the identity, Q represents output as measured by real GDP.⁵ The various terms on the right side of the identity when multiplied together also equal Q .

The first term on the right-hand side, E/L , represents the employment rate. It is calculated as total employment (from the BLS's household survey), E , divided by the number of persons in the civilian labor force, L , and is equal to 1 minus the unemployment rate. An employment rate of 94 percent, for example, corresponds to an unemployment rate of 6 percent. The second term on the right-hand side represents productivity in the nonfarm business sector. It is calculated as nonfarm business output, Q^B , divided by the product of nonfarm business (private payroll) employment, E^B , and average hours worked, H^B . The third term, L/N , represents the labor force participation rate, which equals the labor force divided by the adult (over-16-year-old) noninstitutional population, N . The fourth term, H^B , represents average hours worked by nonfarm business employees. The fifth term, N , represents the adult noninstitutional population.

These five variables on the right-hand side form the core of the output identity. The product of four of these variables—the employment rate, the labor force participation rate, average hours, and population—equals total hours worked. The other variable—productivity—equals output divided by total hours. By definition, total hours times productivity equals output.

The last two variables on the right side of the

identity adjust for differences between the nonfarm business sector and the total economy. They are included because data on average hours and productivity are available only for the nonfarm business sector and not for the economy as a whole. The first of these terms, Q/Q^B , represents the “output mix.” It is the ratio of total output to nonfarm business output. The main sectors accounting for the difference between these two measures of output are farming and government. Similarly, the second term, E^B/E , represents the “employment mix.” It is the ratio of private nonfarm business employment to total employment.

The left and right sides of the identity are equivalent ways of expressing the same thing—real output. Therefore, any change in real output must somehow be divided among the seven right-hand-side components of the identity. Because the level of output is the product of its seven components, the growth rate of output must be the sum of the growth rates of its components. For example, a 3 percent increase in real GDP might be associated with a 1 percent increase in the employment rate, a 1 percent increase in productivity, and a 1 percent increase in average hours. In this case, any change in the other components on the right-hand side of the identity—labor force participation, population, and the two mix variables—would have to cancel each other out. Alternatively, a 3 percent increase in GDP might be associated with a 2 percent increase in the employment rate and a 1 percent increase in productivity, with no change in the other components of the identity.

The output identity in economic recoveries

The output identity can be used to examine the behavior of employment in the current recovery relative to past recoveries. A simple breakdown of output growth into its components clearly shows the anomalous behavior of output

Table 1

Growth Rates of Real GDP and Its Components*First eight quarters of postwar recoveries*

Period	Annualized percent change							
	Real GDP	Employment rate	Output per hour	Participation rate	Average hours	Population	Output mix	Employment mix
1949:Q4-1951:Q4	10.18	1.89	5.42	.00	-1.05	.15	.48	3.29
1954:Q2-1956:Q2	4.05	.84	2.00	1.04	.00	1.19	-1.35	.33
1958:Q2-1960:Q2	4.43	1.14	1.69	-.08	.04	1.52	-.73	.86
1961:Q1-1963:Q1	4.67	.53	3.59	-.88	-.64	1.41	-.41	1.06
1970:Q4-1972:Q4	5.00	.26	3.69	-.01	-.38	2.45	-1.34	.33
1975:Q1-1977:Q1	4.72	.39	3.04	.54	-.34	1.91	-.88	.05
1982:Q4-1984:Q4	5.47	1.86	2.04	.30	.44	1.17	-1.43	1.09
1991:Q1-1993:Q1	2.07	-.27	2.03	-.06	-.12	.96	-.08	-.39

Source: Bureau of Labor Statistics and Bureau of Economic Analysis.

and employment in the current economic recovery. Table 1 breaks output growth during various economic recoveries into its seven components. Specifically, the table gives average growth rates for real GDP and its components over the first eight quarters of the current and seven previous recoveries.⁶ It confirms the evidence from the previous section suggesting three unusual features of the current recovery and one typical feature. In addition, the table points to a couple of other unusual aspects of the data.

Table 1 clearly shows the unusually sluggish pace of both output and employment growth and the peculiar role of productivity. Specifically, output growth in the current recovery has been significantly slower than in the seven previous recoveries. Moreover, the decline in the employment rate over the first eight quarters of the current recovery has been unprecedented. In all other recoveries, the employment rate rose. Finally,

productivity growth in the current recovery has not been unusual by historical standards. Nevertheless, productivity has accounted for virtually all of the growth in output since 1991. In no other recovery has productivity accounted for as large a share of output growth.

Other labor market indicators behaving unusually in the current recovery are the employment and output mixes. While growth of both private nonfarm employment from the establishment survey and total employment from the household survey has been unusually sluggish, growth of private nonfarm employment has been particularly weak. As a result, the employment mix has declined at a 0.39 percent annual rate in the current recovery.⁷ In all previous recoveries, the employment mix rose. Private business sector jobs have not been created, relative to total jobs, at nearly the same rate in the current recovery as in past recoveries.⁸ Similarly, the output

mix has declined less in the current recovery than in any previous recovery except 1949-51. The implication is that private business output has grown slower relative to total output in the current recovery than in past recoveries.

With the employment rate and both mix variables declining in the current recovery, the remaining components of real GDP together have had to grow faster than GDP to add up to the realized rate of GDP growth. Growth in the labor force participation rate, average hours, and population has not been much different than in previous recoveries. Therefore, with unusually sluggish growth in several of the components on the right-hand side of the identity and no component unusually strong, GDP has grown at its slowest rate of the postwar period.

The relationship among output, employment, and productivity

While the output identity points to unusual features of the current recovery, the identity does not establish cause-and-effect relationships. Judging the extent to which sluggish output growth has caused sluggish employment growth in the current recovery therefore requires going beyond the simple identity. One approach is to look at rules of thumb that have held in the past. Another approach is to estimate econometric relationships that show how variables on the right-hand side of the identity respond to long-run and short-run movements in output.

Okun's Law. The economics literature provides a rule of thumb for judging how employment rates usually change with changes in real GDP. In the 1960s, the late Arthur Okun, former Chairman of the Council of Economic Advisors, examined the historical association between output and employment. He argued that a 3 percent increase in real GDP relative to trend was generally associated with a 1 percent increase in the employment rate. Subsequent

estimates of "Okun's Law" suggested the relationship was closer to 2 to 1 than 3 to 1 (Gordon 1984, 1990). These estimates have proven to be quite reliable in the past in projecting the effect of an increase in real GDP on employment.

Assuming trend output growth of 2.5 percent, Okun's Law predicts a decline in the employment rate close to what actually occurred in the current recovery. Given trend GDP growth of 2.5 percent, GDP has declined slightly relative to trend. (Actual GDP growth of about 2.1 percent minus trend growth of 2.5 percent equals -0.4 percent growth of GDP relative to trend.) As a result, the revised Okun's Law would predict a 0.2 percent decline in the employment rate (half of -0.4 percent). With an actual decline in the employment rate of 0.27 percent, the estimated decline of 0.2 percent is fairly accurate. In other words, Okun's Law appears to have held in the current recovery—as long as the assumption of trend output growth of 2.5 percent is accurate. If so, the decline in the employment rate in the current recovery can be attributed to sluggish output growth.⁹

But Okun's Law oversimplifies the relationship between employment and output. It requires an estimate of the trend growth rate of output, which is assumed constant. Trend growth of 2.5 percent is a common estimate that seems reasonable based on historical experience. But this experience may no longer apply. For example, if business restructuring has boosted productivity growth, trend GDP growth may be above 2.5 percent. On the other hand, slower growth of the labor force—as indicated in Table 1 by the decline in the participation rate and the slowdown in population growth—may have reduced trend output growth.

In addition, Okun's Law ignores possible lags in the short-run relationship between output and employment. Employment, however, may adjust slowly to changes in output, and the adjustment may differ depending on the pattern of output growth in any particular recovery (Gor-

Table 2

Trend Growth Rates of Real GDP and Its Components

1948:Q4 - 1993:Q1

Period	Annualized percent change							
	Real GDP	Employment rate	Output per hour	Participation rate	Average hours	Population	Output mix	Employment mix
1948:Q4-1953:Q4	4.77	.02	2.81	-.12	-.82	.78	.89	1.21
1953:Q4-1957:Q3	2.73	-.14	2.21	.52	-.14	1.19	-.58	-.33
1957:Q3-1960:Q1	2.63	-.40	2.37	-.47	-.36	1.49	-.07	.06
1960:Q1-1970:Q3	3.63	.00	2.35	.22	-.97	1.56	.02	.46
1970:Q3-1974:Q2	3.23	.00	1.36	.37	-.46	2.28	-.30	-.03
1974:Q2-1979:Q2	2.94	-.11	1.20	.73	-.72	1.87	-.30	.26
1979:Q2-1990:Q3	2.27	.01	.70	.39	-.28	1.20	-.04	.28
1990:Q4-1993:Q1*	2.06	.00	1.34	.00	-.54	.88	.14	.24

* Because no final benchmark for the current cycle yet exists, these trends are estimated using the regression analysis described in the appendix.

Source: Bureau of Labor Statistics and Bureau of Economic Analysis.

don 1984, p. 543). Finally, because Okun's Law holds long-run productivity growth constant, it cannot help identify changes in long-run productivity growth possibly stemming from business restructuring.

Long-run trends. Identifying long-run trends in output, employment, and productivity is a necessary first step in estimating the short-run effect of output on employment in the current recovery. In addition, identifying trends reveals long-term shifts in the behavior productivity and other key variables. Table 2 provides estimates of long-run trends in the data and identifies trend shifts. The dates in the table correspond to benchmark quarters in which the economy was operating near full employment

during various economic recoveries.¹⁰ Except for the last line, the data in the table are average annualized growth rates of each component of the output-employment identity from one benchmark to the next. These data therefore give estimates of trends between benchmarks.

Because the economy has not yet achieved full employment in the current economic recovery, no benchmark yet exists for the current cycle. As a result, trends must be estimated using a different methodology. The methodology, which is described in detail in the appendix, is based on the assumption that the employment rate is constant when the economy is growing at its trend growth rate. The last line of the table shows estimated trend growth rates based on this

Table 3

Cumulative Responses to a 1 Percent Increase in Real GDP
1949:Q2 - 1993:Q1

Percent							
Employment rate	Output per hour	Participation rate	Average hours	Population	Output mix	Employment mix	Sum
.48	.11	.09	.05	-.05	-.15	.47	1.01

Notes: Estimates are based on the regression analysis described in the appendix.

alternative methodology. Trends for each variable are estimated from 1990:Q3—the quarter in the previous economic recovery when the economy operated near full employment—to 1993:Q1—the latest quarter for which data are available.

The most striking feature of the current recovery shown in Table 2 is the apparent slowdown in trend output growth, coupled with an apparent pickup in trend productivity growth. Specifically, trend output growth slipped from 2.27 percent in 1979-90 to 2.06 percent in 1990-93. The trend growth rate estimated for the early 1990s is therefore the slowest of the postwar period. Because trend growth has apparently fallen in the last several years, assuming a constant 2.5 percent trend growth rate in applying Okun's Law is inappropriate.

Despite the slowdown in trend output growth, trend productivity growth rose from 0.70 percent in 1979-90 to 1.34 percent in 1990-93. In all previous benchmark periods since 1957-60, trend productivity growth slipped. The pickup in trend productivity growth in the current recovery may be consistent with the view that firms have benefited from investments in productivity-enhancing equipment and technology.¹¹ Faster productivity growth has not yet

contributed to an increase in trend output growth, however, because the pickup in productivity growth has been accompanied by slower trend growth of both population and labor force participation.

Short-run relationships. After accounting for trend shifts in the data, short-run relationships can be estimated that show the response of each component of the output-employment identity to temporary output fluctuations.¹² As described in the appendix, estimates are based on regressions that include current and lagged real GDP among the set of explanatory variables. These regressions allow sluggish adjustment of each component of the output-employment identity to short-run fluctuations in real GDP.

Table 3 summarizes the short-run relationships for the postwar period as a whole, based on quarterly data. It shows the cumulative response of each variable to a change in real GDP. For example, the cumulative response of the employment rate to real GDP gives a summary measure, analogous to Okun's Law, of the short-run relationship between employment and output. The estimated cumulative response of employment to real GDP was 48 percent. In other words, a 1 percent increase in real GDP relative to trend was associated with a cumula-

tive 0.48 percent increase in the employment rate.¹³ Thus, the estimated cumulative response was consistent with the 2 to 1 rule of thumb from revised estimates of Okun's Law (that is, a 50 percent employment response).¹⁴

With the employment rate accounting for about half of the cumulative increase in output, the other components of the output-employment identity together had to account for the other half. Table 3 shows that labor force participation, average hours, and population contributed trivially to short-run movements in output.¹⁵

The more important components were productivity and the output and employment mix variables. Productivity, measured as output per hour, contributed 11 percent to output, implying that a 1 percent increase in output growth was associated with a cumulative 0.11 percent increase in productivity growth. More than offsetting productivity growth, however, was the output mix, which subtracted 15 percent from output. Thus, a 1 percent increase in output growth was associated with a 0.15 percent decline in the growth of total output relative to private business output. Finally and most importantly, the employment mix contributed 47 percent, roughly the same contribution as employment.¹⁶ Thus, in the typical recovery, private payroll employment rises faster than total household employment and contributes importantly to explaining real GDP in the output-employment identity.

While the estimated short-run relationship between employment and output was consistent with Okun's Law over the postwar period as a whole, did the relationship hold up in the current economic recovery? Of all of the components of the output-employment identity other than population, which was well explained by its trend growth, the relationship between the employment rate and output was tightest. Thus, it is not surprising that the behavior of the employment rate was well predicted in the current economic recovery.

Chart 7 demonstrates the predictive power of the estimated relationship between the employment rate and output in the current recovery. For ease of interpretation, the employment rate is converted to the unemployment rate (the unemployment rate is 1 minus the employment rate). As the chart shows, the historical relationship fairly closely predicts the actual path of unemployment over the first eight quarters of the current recovery.¹⁷ While the unemployment rate was somewhat overpredicted—meaning predicted unemployment was greater than actual—in the first three quarters of the recovery, it was somewhat underpredicted in the last three quarters shown. However, the prediction errors in all cases were less than half a percentage point.¹⁸ Thus, evidence suggests the short-run relationship between the unemployment rate and output has not changed in the current recovery.¹⁹

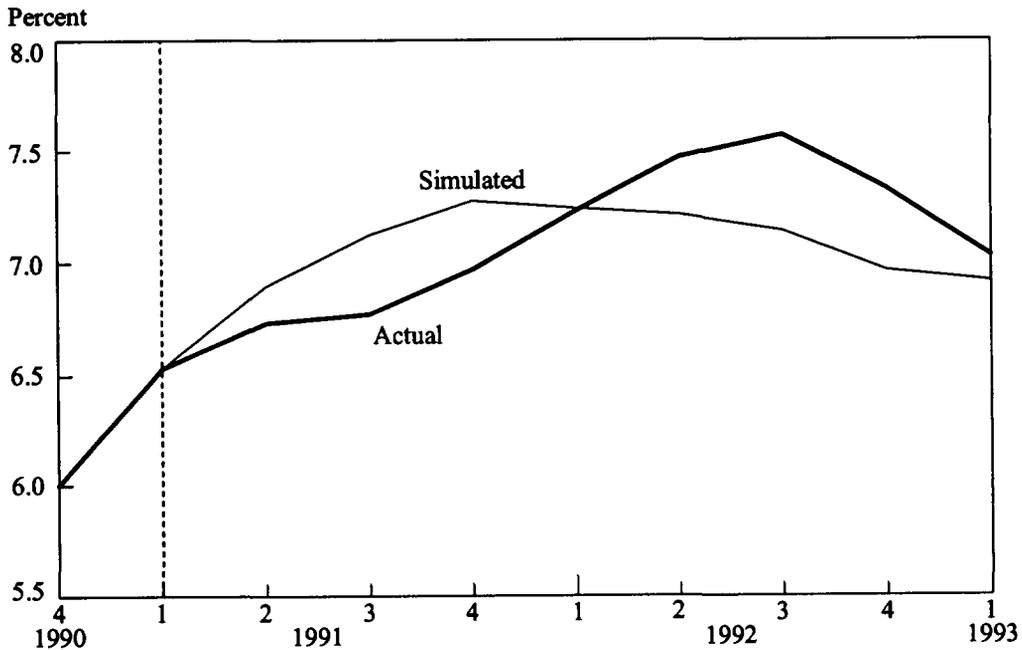
Together, the long-run and short-run results indicate that both restructuring and sluggish output growth have played roles in explaining sluggish employment growth. After accounting for trends in the data, the short-run effect of output on employment in the current recovery was similar to that in previous recoveries. In addition, evidence suggests trend productivity growth has increased in the current recovery. A possible cause of this productivity increase is business restructuring.

CONCLUSIONS

Employment growth in the current economic recovery has been unusually sluggish. One explanation is that businesses have restructured to increase productivity and rely less heavily on labor. Another explanation is that sluggish employment growth simply reflects sluggish growth of real output.

Evidence presented in this article shows that sluggish employment growth in the current recovery is consistent with sluggish output growth

Chart 7
Actual and Simulated Unemployment Rates



Note: Simulated unemployment is based on the regression analysis described in the appendix.

and an increase in long-run productivity growth. If business restructuring is responsible for the increase in productivity, then both explanations for slow job growth have merit.

These findings have important policy implications. In the short run, monetary and fiscal policies that increase output will likely have the

same proportional effect on employment as in the past. In the long run, the estimated increase in productivity growth potentially implies faster long-run growth for both employment and output in the future. If so, a faster rate of nominal GDP growth than in the past may be consistent with price stability.

APPENDIX

This appendix describes the procedure used in estimating long-run trends in the data and short-run cyclical relationships between each component of the output-employment identity and real GDP. The procedure is a variation of the approach used by Gordon (1984). Each component on the right side of the identity was regressed on eight 0-1 dummy variables, four lagged values of the dependent variable, and current and four lagged values of real GDP. The specific equations were as follows:

$$y_{it} = \sum_{p=1}^8 a_{ip} D_{ip} + \sum_{s=1}^4 b_{is} y_{t-s} + \sum_{s=0}^4 c_{is} q_{t-s} + u_{it},$$

where y_{it} represents each of the seven right-hand-side components of the output-employment identity, D_{ip} is a vector of dummy variables, q_{t-s} represents real GDP, and u_{it} represents a zero mean, finite variance error term. All variables, except the dummies, were measured as annualized quarterly growth rates (400 times first differences in logs).

A different 0-1 dummy variable, D_{ip} , was included for each of the seven benchmark periods, p , defined in the text. An additional dummy variable was included for the period from 1990:Q4 to 1993:Q1 (where no final benchmark could be determined). The dummy variables allow for trend shifts in the data. Following Okun and Clark (1984), trend GDP growth was estimated using the employment rate equation ($i=1$), under the assumption that the employment rate is constant when real GDP is growing at trend. Thus, for each period, trend GDP growth is as follows:

$$q_p^T = \frac{-a_{1p}}{\sum_{s=0}^4 c_{1s}},$$

where q_p^T represents trend GDP growth in bench-

mark period p , and the 1 subscript references the employment rate equation.

Given estimates for trend GDP and the assumption that the full employment rate remains constant between benchmark dates, trends in the right-hand-side components of the output-employment identity can be estimated as follows:

$$y_{ip}^T = \frac{a_{ip} + (\sum_{s=0}^4 c_{is}) q_p^T}{1 - \sum_{s=1}^4 b_{is}},$$

where i equals 2 to 7, and y_{ip}^T is the trend growth rate for benchmark period p of the i th component of the output-employment identity. The trend employment rate, y_1^T , is assumed to remain constant within benchmark periods.

Table A1 gives the coefficient estimates and summary statistics for the equations explaining each of the seven components of the output-employment identity. The table also gives the long-run elasticity of each component with respect to output. The elasticity, which is also reported in Table 3 of the text, is calculated as:

$$\frac{\sum_{s=0}^4 c_{is}}{1 - \sum_{s=1}^4 b_{is}}.$$

These elasticities do not add up exactly to one because of the lagged dependent variables that were included in the regressions to correct for serial correlation.

Table A2 gives the calculated trends for each component of the identity for each period. These estimates are close to the actual growth rates between benchmarks reported in Table 2 in the text. Because of the lagged dependent variables

Table A1
Regression Equations for Components of GDP Identity
 1949:Q2 - 1993:Q1

Independent variable	Lag length	Dependent variable (growth rates)						
		Employment rate	Output per hour	Participation rate	Average hours	Population	Output mix	Employment mix
Intercept terms:								
1949:Q2-1953:Q4		-2.81**	2.88**	-.73	-1.30**	.61**	1.91**	-1.09*
1954:Q1-1957:Q3		-1.60**	2.00**	.34	-.44	.74**	-.23	-1.56**
1957:Q4-1960:Q1		-1.82**	2.30**	-.82	-.60	.96**	.40	-1.19*
1960:Q2-1970:Q3		-2.09**	2.36**	-.17	-1.38**	.98**	.66	-1.39**
1970:Q4-1974Q:2		-2.04**	1.52*	.08	-.75	1.39**	.18	-1.80**
1974:Q3-1979:Q2		-1.81**	.95	.65	-1.08**	1.14**	.25	-1.19**
1979:Q3-1990:Q3		-1.29**	.54	.24	-.48	.74**	.35	-.86**
1990:Q4-1993:Q1		-1.19**	1.32	-.24	-.78	.55**	.55	-.80
Lagged dependent variable	1	.18*	.02	-.11	-.05	.38**	-.02	-.05
	2	-.14	-.07	-.10	-.14	.10	-.01	-.06
	3	-.18*	-.11	-.13	.04	-.04	-.17*	.00
	4	-.06	-.03	.04	-.07	-.02	-.03	.01
Real GDP growth	0	.23**	.56**	-.01	.15**	.01	-.15**	.20**
	1	.12**	-.20**	.07*	.00	-.01	-.10*	.10**
	2	.09**	-.09	-.05	-.04	-.02*	.02	.15**
	3	.09**	.00	.04	-.05	-.01	-.02	.04
	4	.04	-.14*	.06*	-.01	.01	.06	.02
Addendum:								
Standard error of estimate		.98	2.33	1.33	1.37	.41	1.90	1.69
Sum of real GDP growth coefficients		.57**	.13	.12*	.06	-.03	-.18*	.51**
Long-run effect of a change in real GDP growth		.48	.11	.09	.05	-.05	-.15	.47

* Significant at the 5 percent level.

** Significant at the 1 percent level.

Table A2

Estimated Trends from Regression Equations
1949:Q2 - 1993:Q1

Period	Annualized percent change							
	Real GDP	Employment rate	Output per hour	Participation rate	Average hours	Population	Output mix	Employment mix
1949:Q2-1953:Q4	4.89	.00	2.97	-.13	-.83	.84	.83	1.30
1954:Q1-1957:Q3	2.78	.00	2.00	.51	-.22	1.16	-.60	-.13
1957:Q4-1960:Q1	3.18	.00	2.29	-.34	-.33	1.54	-.14	.40
1960:Q2-1970:Q3	3.64	.00	2.39	.19	-.95	1.55	.00	.44
1970:Q4-1974:Q2	3.55	.00	1.67	.38	-.44	2.28	-.38	.02
1974:Q3-1979:Q2	3.15	.00	1.15	.78	-.73	1.85	-.26	.39
1979:Q3-1990:Q3	2.25	.00	.70	.38	-.28	1.19	-.04	.27
1990:Q4-1993:Q1	2.06	.00	1.34	.00	-.54	.88	.14	.24

in the regressions, the trends for each right-hand-side component of the output-employment identity do not add up exactly to trend GDP growth.

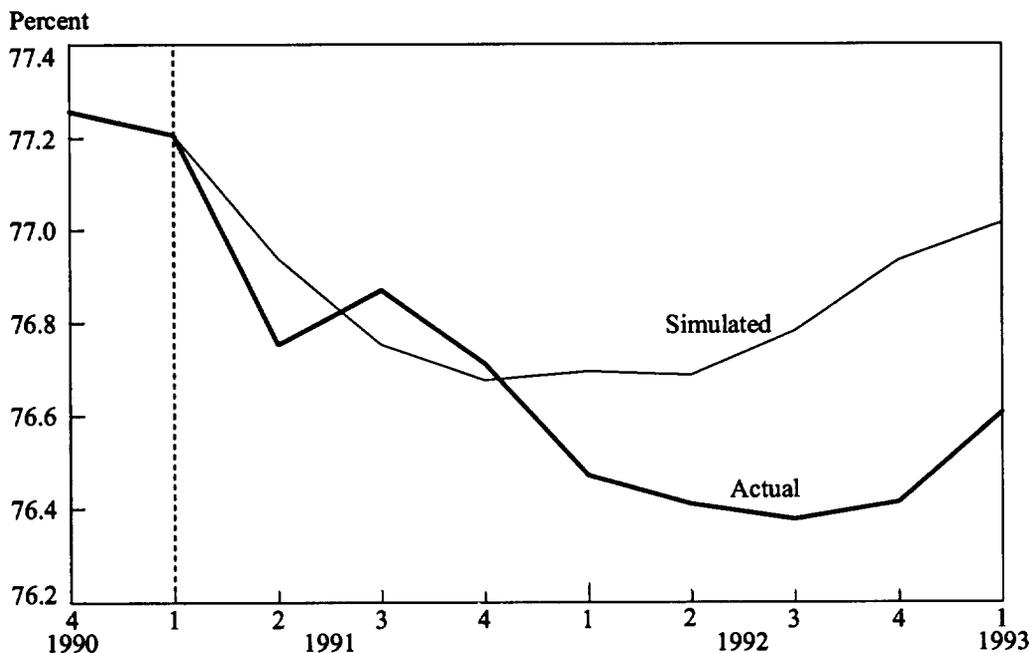
The approach differs in at least one important respect from the approach taken by Gordon (1984). Gordon estimated trends as actual growth rates between benchmark dates. Because a benchmark could not be determined for the last period, Gordon used a cumbersome grid-search method to identify trend growth for the last period. Regressions were then run on the levels of variables defined as deviations from trend. A constant term was used in place of the vector of dummy variables. Gordon's results did not "add up," however, in the sense that the sum of the long-run responses of y_i to q ($i=1$ to 7) was only 0.6—a "moderately serious problem" (p. 549).

As noted earlier, the approach used in this article was to estimate equations in logged first differences and estimate trends by including a set of dummy variables in each equation. The results

come closer to adding up. The sum of the long-run responses to real GDP was 1.01 as reported in Table 3 in the text.

Chart 7 in the text shows that unemployment is well predicted by output in the current recovery. In addition, the employment mix is well predicted. Chart A1 compares the actual behavior of the employment mix in the current recovery with its predicted value based on its historical relationship to real GDP²⁰. In the first three quarters of the recovery, the predicted employment mix is close to the actual mix. In the last five quarters of the recovery, however, the predicted mix exceeds actual by as much as 0.5 percentage point. While this prediction error seems large compared with errors from earlier in the recovery, it is not unusual by historical standards.²¹ Thus, as with the employment rate, the response of the employment mix to output in the current recovery has not been unusual.

Chart A1

Actual and Simulated Employment Mix

Note: Simulated employment mix is based on the regression analysis described in the appendix.

ENDNOTES

¹ See, for example, Trehan.

² Moreover, rising health-care costs may have led some employers to substitute part-time workers—who typically receive little or no health-care benefits—for full-time workers and to employ more overtime hours. The substitution of part-time workers for full-time workers would not, however, be reflected in the employment series used in this article.

³ Other “third factors” explaining both sluggish output and employment growth are discussed in Meckstroth. They include increases in state and local income taxes, which have reduced consumer spending; overbuilding of commercial offices, shopping centers, and hotels, which has slowed investment spending on new structures; and the adoption of new inventory management techniques, which has reduced the buildup of inventories.

⁴ This section draws heavily on Gordon (1984).

⁵ Clark (1983) and Gordon (1984) used this identity to study the output-employment relationship.

⁶ The 1981 recovery was excluded because it did not last eight quarters.

⁷ The decline in the employment mix was even greater according to the unrevised data on payroll employment. According to data available before June 1993, the employment mix declined at a 0.55 percent annual rate.

⁸ Two factors may underlie the decline in private non-farm payrolls relative to total employment. First, the decline in the employment mix may simply reflect statistical discrepancies between the two labor market surveys. For example,

the BLS has to adjust data from the establishment survey to account for jobs created by new firms. If more jobs were created by new firms in the current recovery than in past recoveries, the adjustment procedure might tend to understate recent job growth in the nonfarm business sector. Second and more fundamentally, the decline in the employment mix may reflect a greater adjustment of employment in the private sector than in the public sector to structural changes. For example, the private sector may have been more aggressive in controlling costs through reductions in its work force than the public sector.

⁹ Okun's Law can also be applied looking across recoveries under the assumption of no change in trend output growth. For example, real GDP growth was 3.4 percentage points slower in the 1991-93 recovery than in the 1982-84 recovery. Therefore, according to the 2 to 1 ratio from the revised Okun's Law and assuming no change in trend growth, employment growth should have slowed in the current recovery by one-half of 3.4 percentage points, or 1.7 percentage points. The actual slowdown of 2.1 percentage points was only a little greater than expected. Thus, the decline in the employment rate from the previous recovery to the current recovery was close to what might be expected based on Okun's Law.

¹⁰ Trends are estimated between "benchmark" quarters in which the economy was operating at or near full employment. The benchmarks from 1949 to 1974 are the same as in Gordon 1984. However, the 1979 benchmark was moved back from the third quarter to the second quarter because of data revisions since Gordon's study. Benchmarks after 1979 were estimated using Gordon's (1984) methodology and his 1990 series for the "no shock" natural unemployment rate. This series represents the unemployment rate at which there is no tendency for inflation to increase or decrease. It can be thought of as a measure of "full" employment. Gordon's series for the natural rate ends in 1989:Q2. As a result, from 1989:Q2 to 1993:Q1, the natural rate was assumed to remain unchanged at 6.0 percent.

The actual unemployment rate fluctuates around the natural unemployment rate, falling below the natural rate as the economy moves toward a business cycle peak and rising above the natural rate as the economy slips into recession. Thus in each business cycle, the actual unemployment rate corresponds to the natural rate at two different points in time. To generate one benchmark for each business cycle, the second crossing point is used as the benchmark quarter. Following Gordon, benchmarks were chosen as the quarter before the quarter when the actual unemployment rate was closest to the natural rate. Choosing the benchmarks in this way allows for lags in the adjustment of unemployment to the rapid decreases in GDP that are typical at the beginning of

recessions. The specific benchmark quarters are 1953:Q4, 1957:Q3, 1960:Q1, 1970:Q3, 1974:Q2, 1979:Q2, and 1990:Q3. The current business cycle has no benchmark associated with it because the economy has not yet returned to its natural unemployment rate.

¹¹ But it is not necessarily consistent with the view that firms are substituting away from labor over the long run. For example, the pickup in productivity growth is accompanied by an assumed constant trend employment rate. With only eight quarters of data in the current recovery with which to identify new trends, however, these estimates must be viewed with a healthy dose of skepticism. Moreover, because the trend shifts between the last benchmark period and the current recovery are statistically small, they should be viewed as merely suggestive.

¹² Strictly speaking, trend shifts and short-term relationships are estimated simultaneously.

¹³ Strictly speaking, a 1 percent increase in the *growth* rate of real GDP was associated with a 0.48 percent increase in the *growth* of the employment rate. For expository ease, the text describes relationships between the levels of variables rather than the growth rates of variables. But estimated responses come from regressions estimated in first differences of logs, as described in the appendix.

¹⁴ Unlike simple rules of thumb, however, the estimated response comes from a statistical relationship that allows employment to adjust sluggishly to output. The relationship also allows the employment response to differ across recoveries, at least to the extent that output behaves differently in each recovery.

¹⁵ It is not surprising that the adult population does not vary cyclically. Other components perhaps have a smaller-than-expected cyclical component.

¹⁶ As explained in the appendix, the long-run responses do not add up exactly to 100 percent because of the presence of lagged dependent variables in the regressions.

¹⁷ The employment rate-output equation described in the appendix was simulated dynamically, in sample, from 1991:Q2 to 1993:Q1. Actual growth in real GDP was plugged into the right-hand side of the equation. Forecast growth rates of the employment rate were converted to levels, based on the actual employment rate in 1991:Q1. The forecast employment rates were then converted to unemployment rates. A similar procedure was followed to generate forecasts in each of the earlier recoveries (not shown). Forecast errors from the current recovery were then compared with errors from the earlier recoveries.

¹⁸ Moreover, the prediction errors were not unlike those in previous recoveries. The root mean square error (RMSE), a measure of predictive power, was 0.28 in the current recovery. In previous recoveries the RMSE ranged from 0.12 to 0.57.

¹⁹ As shown in the appendix, the other major contributor to output in the output-employment identity—the employment mix—was also unchanged. While the relationship between the employment mix and output is not nearly as tight as the relationship between the employment rate and output, the employment mix-output relationship appears to have held

up fairly well in the current recovery. This is perhaps somewhat surprising in light of the unusual recent behavior of the employment mix.

²⁰ The procedure for simulating the employment mix-output relationship was similar to the one used for the employment rate-output relationship. The employment mix equation is described in Table A1 of the appendix.

²¹ The root mean square prediction error in the current recovery was 0.31, compared with a range of 0.21 to 0.71 in seven previous recoveries.

REFERENCES

- Clark, Peter. 1983. "Okun's Law and Potential GNP," Board of Governors of the Federal Reserve System, Working Paper, June.
- _____. 1984. "Comments and Discussion," *Brookings Papers on Economic Activity*, No. 2, pp. 565-67.
- Gordon, Robert. 1984. "Unemployment and Potential Output in the 1980s," *Brookings Papers on Economic Activity*, No. 2, pp. 537-64.
- _____. 1990. *Macroeconomics*. Glenview, Ill.: Scott, Foresman.
- Krugman, Paul. 1993. "Plugging in to Productivity," *U.S. News and World Report*, February 15.
- Meckstroth, Daniel. 1993. "The Missing Ingredient in the Economic Expansion—New Jobs," *Business Economics*, National Association of Business Economists, July, pp. 29-34.
- Okun, Arthur. 1962. "Potential GNP: Its Measurement and Significance," American Statistical Association, *Proceedings of the Business and Economic Statistics Section*, pp. 98-104, reprinted in Okun, *The Political Economy of Prosperity*, Washington: Brookings, 1970, pp. 132-45.
- Trehan, Bharat. 1993. "Why Has Employment Grown So Slowly?" Federal Reserve Bank of San Francisco *Weekly Letter*, April 9.

Are Derivatives Too Risky for Banks?

By Sean Beckett

Bank participation in the market for derivatives has been growing rapidly in recent years. Derivatives such as swaps, futures, and options now form a significant share of total assets at some of the nation's largest banks. Moreover, participation in these markets accounts for a growing share of bank revenues.

Some observers worry that derivatives may be too risky for banks, because derivatives are relatively new and complex assets. In a 1992 speech to the New York Bankers Association, E. Gerald Corrigan, then-president of the Federal Reserve Bank of New York, warned that the growth and complexity of derivatives activities "should give us all cause for concern." And in April of this year, prominent investor Warren Buffet worried that derivatives might one day trigger a catastrophic "chain reaction" in world financial markets.

In light of these concerns, it is relevant to ask whether banks should be prohibited from participating in derivatives markets. Laws and regulations already restrict many bank activities to protect depositors and ensure the integrity and stability of the payments system. For example, most investment banking activities are barred by the Glass-Steagall Act, and banks are prohibited from buying corporate stocks for their own

accounts because stocks are considered too risky. Some observers believe that derivatives, like corporate stocks, may be too risky for banks to deal in or to hold.

This article examines whether derivatives are too risky for banks at the current stage of market development. The first section defines derivatives and explains their uses. The next section examines the role of banks in the derivatives market, traces the growth of bank participation in the market, and considers the reasons for this increased participation. The third section describes the risks derivatives pose to banks and discusses how banks are managing these risks. The fourth section explains how regulators monitor banks' derivatives activities. The article concludes with the view that banks can safely manage and regulators can effectively supervise bank participation in derivatives markets.

DERIVATIVES DEFINED

Derivatives are financial contracts whose values are derived from the values of other underlying assets, such as foreign exchange, bonds, equities, or commodities. Because their values are related to these underlying assets and because they have certain other characteristics, derivatives are useful for hedging, speculating, arbitraging price differences, and adjusting portfolios at low cost.

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What are derivatives?

A derivative is a financial contract whose value depends on the value of an underlying asset or index of asset values.¹

For example, an interest rate futures contract is a derivative that commits the parties to exchange a debt security, say a Treasury bond, at a future date for a predetermined price. The value of the futures contract depends on the value of the Treasury bond that underlies it. If the Treasury bond price rises, the value of the futures contract also rises because the buyer of the futures contract is now entitled to receive a more valuable asset.

The enormous and rapidly growing variety of derivatives can be bewildering even to experienced financial market participants. But all derivatives can be classified according to three features: the type of contract, the type of asset underlying the security, and whether the derivative is traded on an exchange or in the over-the-counter (OTC) market.

Banks trade mainly in the following three types of derivatives contracts. *Forward and futures contracts* are agreements between two parties to exchange a quantity of assets at a future date at a predetermined price.² The Treasury bond futures contract mentioned above is an example of this type of contract.

Options contracts confer the right, but not the obligation, to buy or sell an asset at a predetermined price on or before a fixed expiration date. For instance, a call option on IBM stock confers the right to purchase some number of IBM shares at a predetermined price on or before the expiration date. Conversely, a put option confers the right to sell the shares at a predetermined price on or before the expiration date.

Swaps are agreements between two parties to exchange cash flows in the future according to a prearranged formula. In an interest rate swap, for example, one party agrees to pay the other party a sequence of fixed cash flows in exchange for a sequence of variable cash flows.

The fixed cash flows are equal to the interest payments that would be associated with a hypothetical fixed-rate loan. The principal in this hypothetical loan is called the notional principal and is used as a measure of the size of the swap. The variable payments are equal to the interest payments that would be associated with a floating-rate loan with the same notional principal.³

Most derivatives are based on one of four types of underlying assets: foreign exchange, interest rates (that is, debt securities), commodities, and equities. Examples of derivatives based on each of these different types of underlying assets are forward contracts for foreign exchange, interest rate swaps, wheat futures, and options on equities.

Some derivatives are traded on organized exchanges, while others are traded only in the OTC market. Exchange-traded derivatives are standardized contracts—that is, these contracts have standardized features and are not tailored to the needs of individual buyers and sellers. For example, S&P 500 stock index futures are traded on the Chicago Mercantile Exchange. The value of these futures contracts is tied to the Standard & Poor's Composite Stock Price Index. The futures expire four times a year, and the exchange prescribes rules for settling any outstanding contracts in cash on the expiration dates. In contrast, OTC derivatives are customized to meet the specific needs of the counterparties. Swaps are the leading example of OTC derivatives. The terms of, say, an interest rate swap—the fixed and floating interest rates, the notional principal, the term of the sequence of payments—are determined to suit the two counterparties.

Another important difference between exchange-traded and OTC derivatives is their credit risk. In the OTC market, a derivatives investor is exposed to the risk that his counterparty may default on the contract. In the market for exchange-traded derivatives, though, credit risk is controlled by the exchanges which act as a clearinghouse for all trades and set margin requirements. When a futures contract is traded

on an exchange, for instance, the exchange simultaneously sells the contract to the buyer and buys the same contract from the seller. The buyer and seller trade with the exchange rather than with each other. As a consequence, the buyer and seller need not worry about each other's creditworthiness. The exchange protects itself by requiring traders to maintain margins large enough to cover most one-day movements in prices. In exceptionally volatile markets, exchanges may even require traders to post additional margin during the trading day. Because of these mechanisms, losses on exchanges due to defaults have been almost nonexistent (Hull).

The characteristics of derivatives

Derivatives have grown in popularity because they offer a combination of characteristics not found in other assets. The most important characteristic of derivatives is the close relationship between their values and the values of their underlying assets. There are three other characteristics that distinguish derivatives from underlying assets and make them useful for a variety of purposes. It is easier to take a short position in derivatives than in other assets; exchange-traded derivatives are liquid and have low transactions costs; and, it is possible to construct or combine derivatives to closely match specific portfolio requirements.

Relationship between the values of derivatives and their underlying assets. When the values of underlying assets change, so do the values of the derivatives based on them. For some derivatives, such as most swaps and futures, the relationship between the values of the underlying asset and the derivative is straightforward. In a Treasury bond futures contract, the price to be paid when the bond is delivered is fixed by the futures contract, but the value of the bond to be delivered fluctuates. Thus, the value of the futures contract fluctuates with the value of the

Treasury bond. The relationship between the values of an underlying asset and an option on that asset is more complicated, but the values of the option and the underlying asset are still associated.⁴

Short positions. An investor is said to have a short position in an asset if he is obligated to deliver the asset in the future. For example, an investor can short a stock by temporarily borrowing and then selling the stock. This investor will profit if the stock price falls before he must return it to the lender. An investor is said to have a long position in an asset if he either currently owns or is entitled to future delivery of the asset.

It is easier to take a short position in derivatives than in other assets. To short stocks or bonds, for example, an investor must find someone who owns the needed quantity of the asset and is willing to lend it to the short seller. Shorting a futures contract or an option is more straightforward. Every futures or options trade results in one party who is long (who buys the derivative) and one party who is short (who sells the derivative). Since the underlying asset is not exchanged when a derivative security is bought and sold, there is no need to find asset holders willing to lend their securities.⁵

Liquidity and transactions costs. Exchange-traded derivatives are more liquid and have lower transactions costs than other assets. They are more liquid because they have standardized terms, low credit risk, and interest in the underlying assets is broad (Remolona). Furthermore, their transactions costs are low. For example, Kling presents evidence that

... the transaction cost for buying a diversified portfolio of common stock is dramatically lower using the futures market than using the cash market. For Treasury securities, costs are lower in the futures market as well, although the difference between cash and futures transaction costs is not as striking as in the stock market.

In addition, margin requirements for exchange-traded derivatives are relatively low, reflecting the relatively low level of credit risk associated with these derivatives (Hull; Morris

1989a, 1989b). In a stronger statement, Miller claims that futures contracts “are designed and introduced by exchanges with basically one consideration in mind: low-cost trading.”

In contrast, customized terms and the lack of a clearinghouse make OTC derivatives relatively illiquid. As a consequence, counterparties to OTC derivatives may be unable to withdraw from their contracts if their portfolio needs change. In this circumstance, the counterparty wishing to withdraw must undertake an offsetting trade while keeping the original contract in place.

Financial engineering. Derivatives can be constructed or combined to closely match specific portfolio requirements. For example, suppose a firm with a floating-rate loan needs to limit its exposure to sharp increases in the interest rate. The firm can purchase a derivative called an interest rate cap. This derivative pays the firm the difference between the floating rate of interest and a predetermined maximum called the cap rate whenever the floating rate exceeds the cap. Similarly, the lender can protect against a sharp decline in interest rates by purchasing an interest rate floor. This derivative pays the lender the difference between a predetermined floor rate and the floating rate whenever the floating rate falls below the floor. Another floating-rate borrower might want protection against any large change in the interest rate, either up or down. This borrower can construct an interest rate collar by purchasing a cap and selling a floor. In this case, the borrower’s effective interest rate will lie between the floor and cap rates.⁶ These three examples present fairly simple ways of using derivatives to meet specific portfolio requirements. Investors often construct far more complex derivatives positions to meet their special needs.

How do investors use derivatives?

The novel characteristics of derivatives make them useful in a variety of ways. Investors

use derivative securities to hedge risk, to speculate on anticipated market movements, to adjust portfolios quickly and cheaply, and to arbitrage price discrepancies in financial markets. While investors could achieve most of these objectives using the underlying assets themselves, the special characteristics of derivatives make them more useful for these purposes.

Hedging and speculating. Derivatives are useful for hedging and speculating for three reasons. First, the values of derivatives are correlated with the values of their underlying assets. Second, it is easy to take a short position in derivatives. Finally, some derivatives have low transactions costs.⁷ For example, an investor with a portfolio of bonds can hedge the value of that portfolio by shorting (selling) Treasury bond futures. An increase, say, in the general level of interest rates will reduce the value of the investor’s bond portfolio. At the same time, though, the value of the investor’s short position in Treasury bond futures will increase in response to the interest rate rise. The increase in the value of the futures position will hedge to some extent the decrease in the value of the investor’s portfolio.⁸

Adjusting portfolios. The liquidity and low transactions costs of exchange-traded derivatives can make it cheaper to rapidly adjust a portfolio using derivatives rather than the underlying assets. In addition, the ability to create customized combinations of derivatives makes it possible to “fine-tune” portfolio adjustments in ways that might not be possible using only the underlying assets. For instance, a large institutional investor wishing to quickly increase its holdings of equities may find it impossible to buy large amounts of stock without driving up stock prices. This investor may be able to achieve the same result by buying stock index futures instead. The high liquidity of these futures makes their price less sensitive to large buy or sell orders. Later, stocks can be acquired slowly to avoid pushing up their prices, and the

position in stock index futures can simultaneously be closed out.

Arbitraging price discrepancies. Derivatives can be used to arbitrage price discrepancies in financial markets. Two types of arbitrage are important. First, investors can use derivatives to take advantage of differences in the cost of capital. For example, suppose a multinational firm needs to borrow dollars but could receive a preferential loan rate from a lender in Germany.⁹ This firm might borrow German marks (DM) at the more favorable interest rate and convert the DM to dollars in the currency market. Then, to hedge the exchange rate risk of the future loan payments, the firm might enter into a dollar/DM currency swap (pay dollars/receive DM). In effect, the multinational firm borrows dollars at the lower German interest rate.

In the second type of arbitrage, market makers can use derivatives to take advantage of temporary discrepancies in asset prices. Because the value of a derivative security depends on the value of one or more underlying assets, investors can sometimes make riskless profits if the price of the derivative gets out of line with the prices of the underlying assets. Market makers are usually the only ones in a position to make arbitrage profits because market makers face lower transactions costs than other market participants. The readiness of market makers to pursue arbitrage opportunities guarantees that such price discrepancies are few and small.

WHY DO BANKS PARTICIPATE IN DERIVATIVES MARKETS?

Banks play two roles in the derivatives market. First, some money center banks are intermediaries in the OTC market, matching buyers and sellers of swaps and forward contracts. Second, many banks are end-users of derivatives, using them for the same purposes as other inves-

tors. The growth of bank participation is largely the result of the rapid growth in the use of OTC derivatives, which has generated demand for the intermediation services offered by money center banks.¹⁰

Banks' role as intermediaries

The OTC market in derivatives is supported by intermediaries who make a market in these derivatives. Important derivatives intermediaries include major banks and securities firms in the United States, United Kingdom, Japan, France, and Switzerland. End-users of derivatives turn to intermediaries in the OTC market when their needs cannot be completely met by the standardized contracts traded on exchanges (Board of Governors and others).

OTC intermediaries make a market in two ways. First, intermediaries act as brokers, matching parties with offsetting needs. More typically, though, intermediaries act as counterparties, taking the other side of the contracts with their customers. Without intermediaries, it would be difficult for firms, particularly nonfinancial firms, to find willing counterparties in a timely fashion. Thus, intermediaries increase the liquidity of the OTC derivatives market and, thereby, make OTC derivatives more useful to end-users.

Intermediation activities are a source of revenue for banks. This revenue takes three forms: transactions fees, bid-offer spreads, and trading profits. Banks sometimes charge end-users transactions fees for executing trades. More commonly, banks charge implicit fees by inserting a spread between their bid and offer quotes. For example, if a bank is acting as a broker and matching two end-users, the bank may arrange the trade so the seller of the contract receives slightly less than the amount paid by the buyer. This difference is the bid-offer spread. Similarly, when a bank acts as counterparty, it

may offer to pay somewhat less and ask to receive somewhat more than end-users pay and receive. Over a series of trades, these differences provide income to the bank.

Banks can also profit from their trading positions when there are discrepancies in asset prices. In their activities as market makers, banks acquire detailed information about asset prices and build up sometimes sizable asset positions. When a discrepancy arises, banks often recognize it quickly and can act to profit from it. Occasionally a bank can make riskless arbitrage profits when essentially the same asset is trading at different prices.¹¹ More commonly, banks can attempt to profit from spread trading, that is, from taking positions in assets whose relative spread has deviated from its traditional level. Unlike pure arbitrage, spread trading involves risk, but market makers can sometimes earn profits without exposing themselves to excessive risk.

Another advantage to banks of making a market in OTC derivatives is the opportunity it provides to strengthen relationships with their corporate customers. If banks did not participate as market makers, these customers might turn to other intermediaries for these services. These other intermediaries compete with banks in arranging financing for corporations. Thus, by acting as OTC intermediaries, banks can handle a wider range of corporations' financing needs and may also reduce the interaction between banks' corporate customers and banks' competitors.

Banks' role as end-users

Banks are also end-users in the derivatives markets. Banks' market-making activities expose them to financial market risks that they may wish to hedge with derivatives. Banks' traditional activities expose them to financial market risks as well.

As was noted above, banks build up posi-

tions in derivatives as a consequence of their market-making activities. These positions leave the banks exposed to financial market risks. To hedge against these risks, banks engage in offsetting trades, in the same way that other end-users trade in derivatives to hedge the risks associated with their portfolios and business activities. Sometimes banks will try to find an exact offset for their open position. For example, a bank that agrees as a market maker to enter into an interest rate swap may attempt as an end-user to enter into an offsetting swap. Alternatively, banks may buy or sell other assets, including other derivatives, that can hedge their open positions to some degree. Banks may use exchange-traded derivatives as well as OTC derivatives for hedging purposes, depending on which provide the best and cheapest hedges.

Banks' traditional activities can also leave them exposed to financial market risks, and these exposures lead banks to enter derivatives markets as end-users. For example, mortgage lending, particularly lending for fixed-rate mortgages, typically increases a bank's exposure to interest rate risk (Morris and Merfeld). A bank that increases its mortgage lending may choose to enter into an interest rate swap or to purchase interest rate futures to hedge some of its interest rate risk. Mortgage lending also exposes the bank to prepayment risk since mortgage borrowers have the option to prepay at any time (Beckett). As a result, a bank may choose to purchase interest-rate-based options to hedge some of the prepayment risk associated with mortgage lending.¹²

The growth in bank participation

Bank participation in the derivatives market has grown rapidly in recent years. Interest rate contracts account for most of the growth, both in the exchange-traded and OTC markets. Participation has been concentrated in a handful of the largest banks in the country.

One measure of bank participation is the notional value of bank holdings of derivatives. This measure grew almost sixfold from 1986 to 1992, from \$1.4 trillion to \$8.6 trillion.¹³ In contrast, over the same six-year period total bank assets increased only 22 percent and commercial and industrial loans actually declined 16 percent.

Another measure of bank participation in derivatives markets is the replacement cost of banks' derivatives holdings. Unlike the notional value of banks' holdings—which is used only for accounting purposes—the replacement cost is an estimate of the real economic value of derivatives holdings. In particular, the replacement cost is an estimate of the loss the bank would suffer if the counterparties to the banks' derivatives positions failed to honor their contractual obligations. By the end of 1992, the replacement cost of banks' holdings of interest rate and foreign exchange derivatives reached \$150 billion, an amount equal to 5 percent of banks' assets and two-thirds of banks' equity.

Reflecting general trends in derivatives markets, the fastest-growing component of bank's derivatives holdings has been OTC interest rate contracts (Remolona). From 1990 through 1992, the replacement cost of banks' interest rate contracts grew 84 percent, compared with 28 percent growth in the replacement cost of banks' foreign exchange contracts.¹⁴ Banks' derivatives holdings have always been concentrated in such OTC derivatives as interest rate swaps and forward contracts for foreign exchange.

It is not surprising that banks have played such a large role in the growth of the OTC market, because credit risk is perhaps the most important risk of OTC derivatives. Banks' creditworthiness is well known to other investors, so money center banks are readily accepted as counterparties in OTC trades. In addition, gauging creditworthiness is banks' stock in trade. Banks already lend to many of the investors in OTC derivatives, thus they already know more than other market participants about the

creditworthiness of these investors. And in cases where a bank is not already familiar with a particular investor, the bank possesses the expertise to make an informed judgment of creditworthiness.

While bank participation in derivatives markets has grown rapidly in recent years, it remains concentrated in a handful of large, money center banks (Board of Governors and others; Calla and Pomper). As of June 1992, bank holding companies with more than \$10 billion in assets accounted for over 97 percent of the notional value of banks' derivatives holdings. And the ten bank holding companies with the largest holdings, as measured by replacement cost, accounted for 95 percent of the total holdings.

CAN BANKS MANAGE THE RISKS OF DERIVATIVES?

Banks participating in derivatives markets are exposed to credit risk, market risk, and operating risk (Table 1).¹⁵ Some of these risks are the same as risks faced by banks in their traditional activities. As a result, banks have the means to manage these familiar risks. Other risks pose new challenges for bank management, and many banks may not be capable of managing these new risks. However, bank participation in derivatives markets is concentrated at a handful of large, money center banks that possess the sophistication and resources to manage both the familiar and the novel risks of derivatives. Thus at the current stage of market development, banks are able to safely manage the risks of derivatives.¹⁶

Credit risk

Credit risk in derivatives dealings includes the risk of default by a counterparty and the risk of changes in credit exposure.

Table 1

The Risks Derivatives Pose to Banks

<u>Type of risk</u>	<u>Familiar or new</u>
<i>Credit risk</i>	
Counterparty credit risk	Familiar
Potential exposure	New
<i>Market risk</i>	
Price risk	Familiar
Liquidity risk	Familiar
Settlement risk	
Ordinary settlement risk	Familiar
Anomalous settlement values	New
Cross-market disturbances	New
<i>Operating risk</i>	
Inadequate internal controls	
Risk of error or fraud	Familiar
Valuation risk	New
Legal risk	New
Regulatory risk	Familiar

Note: This table classifies the various risks derivatives pose to banks. Risks classified as familiar are similar in kind and scale to the risks banks face in their traditional lending and investing activities. Risks classified as new are either different in kind or greater in scale than the familiar risks. Of the risks classified as new, potential credit exposure, anomalous settlement values, and valuation risk are different in kind from the risks banks face in their traditional activities. Cross-market disturbances and legal risks are familiar to banks but these risks are more pronounced in banks' derivatives activities.

Counterparty credit risk. The risk of counterparty default is an important risk for OTC derivatives, the market segment in which banks are most heavily involved. OTC derivatives are bilateral contracts. If one counterparty defaults, the other counterparty is exposed to financial loss.¹⁷ Thus, participants in the OTC derivatives market must carefully evaluate and monitor the creditworthiness of their counterparties.

This type of credit evaluation and monitoring is identical to the credit evaluation and monitoring

banks undertake when making commercial loans. Moreover, many of a bank's derivatives counterparties are firms to whom it might reasonably make loans. As a consequence, counterparty credit risk does not present banks with a new type of risk to manage. Instead, it presents banks with the same type of risk they already manage, only in the context of investment activities rather than commercial lending. Indeed, banks sometimes require counterparties to post collateral against a derivatives position, just as

they sometimes require collateral of borrowers.

Potential exposure. While assessing the creditworthiness of counterparties is not new to banks, evaluating the potential exposure of derivatives positions is a new challenge. With a loan, the bank's maximum exposure to a default is the outstanding balance of the loan plus any legal costs of handling the default. In contrast, most derivatives contracts have no net value when they are initiated, but their value—and hence the bank's potential loss—may fluctuate significantly over the life of the contract. No money changes hands when a futures contract is exchanged or a swap is entered into, because the contract simply binds the parties to exchange in the future assets whose present values are equal.¹⁸ As time passes, though, the value of a derivative changes in response to changes in financial market conditions.

Banks have experimented with ways to reduce potential increases in credit exposure. In addition to requiring collateral, banks sometimes require interim settlement of the current market value of a position. Or banks may require early settlement of an entire derivatives position if its market value exceeds a predetermined threshold. One approach that has attracted the interest both of banks and regulators is the use of netting agreements. Such agreements stipulate that all of a bank's derivatives contracts with a counterparty are closed out in the event the counterparty defaults on any of them (Bank for International Settlements, 1989, 1990; Group of Thirty). Netting agreements essentially use the contracts whose value has moved in favor of the defaulter as collateral against the contracts whose value has moved against the defaulter. The practice of netting has increased in the United States since the passage of the FDIC Improvement Act (FDICIA), which provided legal validation of a broad range of netting contracts and gave the Federal Reserve Board the authority to further extend this coverage, where appropriate. The legal status of cross-country

netting agreements is still unresolved, and this uncertainty has slowed the spread of netting.

Market risk

Market risk describes banks' exposure to price fluctuations, reductions in market liquidity, uncertainty over settlement, and vulnerability to cross-market disturbances.

Price risk. The simplest type to understand is price risk: the value of a derivatives position will almost certainly change over time. Price risk is familiar to banks, which are exposed to price risk in all of their investment activities.¹⁹ Moreover, it is misleading to consider the price risk of derivatives alone, since derivatives are typically used to hedge a bank's other assets and liabilities. Even when hedges are imperfect, derivatives typically reduce a bank's overall price risk.

Liquidity risk. Banks also face liquidity risk since, from time to time, circumstances may temporarily reduce the liquidity of particular derivatives. This ordinary liquidity risk is familiar to banks, since many traditional bank investments are also prone to temporary bouts of relative illiquidity. Indeed, commercial loans are extremely illiquid.

Another type of liquidity risk is associated with extraordinary events, such as the disruption of the European Exchange Rate Mechanism (ERM) in September 1992. Such incidents can temporarily reduce liquidity in many markets at the same time. As a consequence, investors may be unable to execute derivatives strategies designed to protect their portfolios precisely at the moment that protection is most needed.²⁰

Liquidity risk is a problem for all derivatives investors, but it is probably more of a concern to intermediaries because they must continually adjust their derivatives positions to remain hedged. The financial market disruptions of the last six or seven years give some idea of the

likely effects of liquidity risk. While many market participants suffered losses during these disruptions, very few participants were severely impaired and systemic collapses were avoided.²¹

Settlement risk. Derivatives investors also face settlement risk. One kind of settlement risk is common to all financial markets and thus is familiar to banks. This risk arises when one party pays out funds or delivers assets before receiving assets or payment from its counterparty. Technical problems with the payment system or the sudden, unanticipated failure of the counterparty expose the paying party to the risk of loss. This kind of settlement risk is more pronounced in cross-country transactions because markets in the countries involved may not be open at the same time.

Another kind of settlement risk is unique to derivatives markets and thus presents a new challenge to bank managements. Many derivatives contracts are settled on terms that depend on the prices of particular assets at settlement time. For example, the settlement value of some contracts is determined by the average value of LIBOR, the London Interbank Offer Rate, on the settlement date. Similarly, the settlement value of a Treasury bond futures contract depends on the price of the bond that is cheapest to deliver on the expiration date, as specified in the futures contract. These asset prices may move anomalously on settlement day, and thus may affect the settlement values of derivatives contracts.

Cross-market disturbances. Derivatives investors are also vulnerable to cross-market disturbances. Because the values of derivatives are based on the value of one or more underlying assets, disturbances in the markets for the underlying assets can disrupt the derivatives market. An extreme example is the stock market break of October 1987, where the breakdown in the stock market's trading mechanisms led to intermittent closures of the stock index futures mar-

ket (U.S. Presidential Task Force on Market Mechanisms). A related problem arises when portfolio strategies require taking positions simultaneously in several derivatives (and perhaps some underlying assets as well). These "multi-legged" positions are particularly vulnerable to cross-market disturbances, since a disruption in any one of the markets involved may make it impossible to manage the position safely.²²

Banks are exposed to cross-market disturbances in their other investment activities. The links between financial markets have grown tighter over time. Thus, a disruption in, say, the Japanese stock market is likely to have an impact on the market for U.S. Treasury bonds. Nonetheless, by their nature, banks' derivatives activities probably involve more exposure to the risk of cross-market disturbances than do banks' other investment activities.

Operating risk

Operating risk refers to risks associated with monitoring and controlling risk-taking by employees, ensuring accurate valuation of derivatives holdings, guaranteeing legal enforceability of contracts, and anticipating changes in regulation.

Inadequate internal controls. Banks are exposed to operating risk in all their activities. Many bank failures can be traced, at least in part, to inadequate internal controls. In these instances, either management failed to adequately supervise employees who exposed the banks to losses, or misguided management policies inadvertently guided the banks toward failure.

Participating in derivatives markets requires highly sophisticated and reliable internal controls. Losses can occur in many ways. And because derivatives can be complex, the potential for human error is high. Also, the complexity of derivatives makes it difficult for management

to monitor the employees responsible for derivatives trading and thus to guard against error or fraud. And since some derivatives positions can be highly volatile, the cost of mistakes can mount rapidly. As a result, management may need to monitor derivatives positions more frequently than it monitors other aspects of the portfolio.

While not all banks are capable of maintaining the high level of internal controls required of derivatives traders, only a small number of large, money center banks have significant derivatives activities. These banks are among the most sophisticated financial institutions in the world, and they clearly possess the expertise and resources to manage the risks associated with derivatives trading. Nonetheless, even these banks must constantly review and upgrade their internal controls to take account of the special characteristics of derivatives and the rapid evolution of derivatives markets.²³

Valuation risk. One aspect of a bank's internal controls is the maintenance of accurate valuations of derivatives holdings. Because of their complexity, the values of some of these assets can be calculated only with the aid of mathematical models. While the development and refinement of these models have been one of the most active areas of academic research in recent decades, all such models are based on assumptions about underlying market conditions. In periods of unusual turmoil or volatility, these assumptions may not hold, and the models may give misleading valuations. The problem of accurate valuation is widely recognized as an important risk in derivatives markets, and investors and regulators devote significant resources to improving valuations.

Legal risk. Legal risk is an important type of operating risk in derivatives markets, largely because derivatives are relatively new and involve some features whose legal standing is yet to be tested. During the 1980s, for example, the London Borough of Hammersmith and Fulham

entered into interest rate swaps on which it subsequently suffered large losses. In January 1991, however, the U.K. House of Lords ruled that the borough lacked the legal authority to enter into interest rate swaps and invalidated the contracts. The Hammersmith and Fulham default has been estimated to account for half of all losses due to default since the inception of swap activity (Group of Thirty). Uncertainty about the legal enforceability of netting agreements also exposes banks to similar risk.

Regulatory risk. Regulatory risk—the possibility that regulatory treatment of bank activities might change—is an important risk for all of a bank's operations. But again, this risk may be higher for derivatives because derivatives markets are relatively new and some aspects of their regulatory treatment are still evolving. For example, banks must consider whether the treatment of derivatives positions and of netting schemes in the calculation of a bank's capital adequacy might change as derivatives markets and institutional arrangements continue to develop. Industry standards for hedge accounting also may be refined in the future, and these changes may be reflected in new regulations. Nonetheless, in recent years important changes in capital standards, deposit insurance, and other fundamental aspects of banking demonstrate that regulatory risk is familiar to banks.

Summary. Many of the most important risks of derivatives are essentially the same as those banks already manage. Perhaps the most important risk of the OTC derivatives in which banks specialize is the credit risk that a counterparty will default. Banks' core skill is evaluating the creditworthiness of borrowers. The leading market risk of derivatives is price risk. Banks already face similar price risks in their other investments. Moreover, the price risk of derivatives alone overstates total risk, since derivatives are used to hedge other bank assets and activities. Derivatives trading requires strict internal controls to protect against human error or

fraud, but traditional lending and investment activities require similar controls.

Some risks associated with derivatives present new challenges to bank managements. Accurately valuing derivatives positions and estimating potential credit exposures require sophisticated mathematical models and highly skilled staff. The potential for periods of reduced liquidity, anomalies in settlement values, and cross-market disturbances complicate the prudent management of derivatives positions. And uncertainties about the legal and regulatory treatment of derivatives activities test the abilities of bank managements as well.

The novel risks of derivatives suggest that, for many banks, it may not be prudent to have substantial derivatives dealings. And, in fact, only a handful of the largest and most sophisticated money center banks have significant derivatives activities. These banks have the capital, human resources, and financial market experience to understand and safely manage these risks.

The potential for illiquidity, cross-market disturbances, and related problems raises concerns about the vulnerability of the banking system as a whole to the new risks of derivatives. The limited experience so far suggests that derivatives markets and participants have the ability to weather market crises without suffering undue losses and without endangering financial markets generally. Derivatives participants emerged from the market crises of October 1987 and 1989 and the exchange rate disturbances of September 1992 in relatively good financial shape. And large commercial and investment banks with significant derivatives holdings have failed without disrupting derivatives markets or setting off a chain reaction of other failures. These admittedly few tests of derivatives markets should not make banks or regulators complacent, but they do show that the worst fears of the critics of derivatives may be avoidable.

CAN REGULATORS EFFECTIVELY SUPERVISE BANKS' DERIVATIVES ACTIVITIES?

Banking authorities—such as the Federal Reserve, the FDIC, and the Comptroller of the Currency—have responsibilities for regulating bank activities to maintain the safety and soundness of individual banks and of the banking system. The growth of bank participation in derivatives markets adds a new set of activities which the authorities must monitor. The novel aspects of derivatives, particularly the complicated mathematical models used for valuing derivatives and calculating potential credit exposure, raise concerns about the ability of regulators to effectively supervise the derivatives activities of banks.

Despite these novel aspects, regulators can effectively supervise banks' use of derivatives. Banking authorities have addressed the new features of derivatives by participating in studies of developments in derivatives markets and by augmenting the training of examination staff. Moreover, the traditional tools of bank supervision—on-site bank examinations, financial reports prepared by banks, and discussions with market participants—are just as useful in monitoring derivatives activities as they are in monitoring traditional bank lending and investment activities.

The challenge posed by the apparent complexity of derivatives valuation may well be overstated. Even the most complicated derivatives are composed of individual building blocks—individual options and forwards—which are well understood, and the values of these complex derivatives literally are equal to the sums of the values of the individual pieces. In fact, the ability to express the value of a derivative in a mathematical formula can be regarded as evidence that valuing derivatives is less complicated than evaluating the quality of some traditional bank assets. For example, a

loan for a large, commercial real estate project may involve many subtle risks that cannot be reduced to a simple mathematical formula. Instead, a great deal of judgment is required. Assessing the quality of such a loan may be a greater challenge for bank examiners than calculating the value of derivatives.

There is another way in which the challenge faced by regulators may be overstated. Because derivatives are complex, only a few, highly sophisticated banks have substantial derivatives activities. The majority of banks have negligible derivatives holdings. As a consequence, relatively few bank examiners need to fully understand derivatives. Providing adequate training for this modest number of examiners is a manageable burden for regulators.

The traditional tools of bank supervision keep regulators well informed of developments in derivatives market and of banks' competence in managing the risks of derivatives. On-site bank examinations are the cornerstone of supervisory efforts to evaluate the risks of all banking activities, including participation in derivatives markets. During examinations, regulators review capital adequacy, asset quality, management systems for internal control, earnings, and liquidity. For newer activities, such as participation in derivatives, examinations may be the best source of information for banking authorities. During a full-scope, on-site examination, examiners have the opportunity to meet with bank management to discuss a bank's experience with and plans for participation in derivatives markets. In addition, examiners can assess the adequacy of internal controls and the competence of the bank's staff to carry out management's policies concerning derivatives. Banks that are troubled or that show evidence of exposure to high risk receive extra scrutiny and may be required to submit additional information on their activities and to take steps to reduce their risk exposure.

Commercial banks also file quarterly Call

Reports that disclose certain information about their derivatives activities. Bank holding companies provide similar information for the consolidated holding company. These reports enable banking authorities to identify the major participants in the derivatives markets and to gauge the growth of this participation. These reports also help authorities identify shifts in the types of derivatives purchased by banks.

In addition to the formal activities of examining banks and perusing financial reports, banking authorities have regular informal meetings with banks, other market participants, and trade organizations. For example, the Federal Reserve open market and foreign exchange staffs in Washington and New York meet often with market participants to monitor market conditions. These meetings also serve to alert the Federal Reserve to new developments in financial markets.

To ensure that the various implications of financial market changes are fully understood, banking authorities sponsor and participate in research on these developments. In recent years, several studies of derivatives markets have been conducted under the auspices of the Bank for International Settlements (BIS). These studies have drawn on the experiences of banking authorities from most of the countries with active derivatives markets. Each of these banking authorities, including the Federal Reserve, also has conducted its own studies of derivatives activities. And many members of the staffs of these authorities are engaged in research on topics related to bank participation in derivatives markets.

CONCLUSION

The rapid growth of bank participation in derivatives markets has raised concerns about the riskiness of this activity. In particular, the role of banks as OTC intermediaries has placed banks in the fastest growing and most rapidly

evolving part of the derivatives market.

Derivatives are more complicated than such investments as Treasury securities. In addition, derivatives are relatively new assets, and many features of derivatives and of their market organization are still evolving. As a consequence, some observers have expressed concerns that banks may not be able to safely manage, and regulators may not be able to effectively supervise, bank participation in derivatives markets.

These concerns appear to be overstated. The novel characteristics of derivatives make them particularly useful for hedging risks already faced by banks and other market participants. Banks have a natural advantage as intermediaries in the market for OTC derivatives, because evaluating the creditworthiness of derivatives counterparts is the most important factor in managing the risk of OTC trading. And the traditional tools of bank supervision keep regu-

lators well informed of banks' competence in managing the risks of their derivatives activities.

As with any new asset or activity, banks and regulators need to exercise greater-than-usual vigilance as they gain experience with derivatives and as derivatives markets continue to evolve. Additional controls and safeguards may turn out to be needed. And derivatives activities are likely to remain concentrated in the handful of large, money center banks which have the resources and experience to safely manage this new activity. But, as former Fed chairman Paul Volcker said in his foreword to the recent Group of Thirty study of global derivatives practices,

... derivatives by their nature do not introduce risks of a fundamentally different kind or of a greater scale than those already present in the financial markets. Hence, systemic risks are not appreciably aggravated, and supervisory concerns can be addressed within present regulatory structures and approaches.

ENDNOTES

¹ This broad definition includes not only such contracts as futures, options, and swaps, but such instruments as mortgage-backed securities as well. There is an important difference, however, between these types of contracts: futures, options, and swaps are designed to transfer price risks associated with fluctuations in asset values. In contrast, mortgage-backed securities and other, similar derivatives are designed to facilitate borrowing and lending for specific purposes. In keeping with other recent accounts of the derivatives market, this article restricts its attention to contracts which transfer price risks, that is, to futures, options, swaps, and related contracts.

² Futures contracts have standard delivery dates and trading units and are almost always exchange-traded contracts. Forward contracts are customized contracts that allow the parties to select any delivery dates and trading units they wish. Forward contracts are over-the-counter instruments.

³ Technically, all derivatives can be classified as either forward contracts, options, or combinations of forward contracts and options. Swaps, for instance, can be regarded as a sequence of forward contracts. These simple building blocks are used to create more complex structures such as caps, collars, floors, swaptions, etc.

⁴ The valuation of derivatives is one of the most heavily researched areas in finance. In addition to the value of the underlying asset, the value of a futures contract is affected by the interest rate and the time remaining to the delivery date. Option values are influenced by all these factors as well as by the volatility of the value of the underlying asset. Hull presents a formal analysis of derivatives valuation.

⁵ Many derivatives promise to deliver the underlying asset in the future. However, most derivatives are settled by taking offsetting positions in the derivative security rather than by taking or making delivery of the underlying asset. As a consequence, there is no effective limit on the quantity of claims to the underlying asset that can be traded. Indeed, outstanding futures contracts often promise to deliver many multiples of the existing quantity of the underlying asset.

⁶ By selling a floor, the borrower is forgoing the savings that would be realized if the interest rate fell below the floor rate. However, the borrower receives an initial payment from the buyer of the floor contract which can be used to offset the cost of the cap contract that protects the borrower against increases in the interest rate.

⁷ Because speculators deliberately assume additional market risk, some observers have expressed concerns that the actions of speculators might increase volatility in financial markets or might raise the level of credit risk in the market. In some circumstances, though, speculators may reduce volatility by providing an increased supply of counterparties and thus increasing the liquidity of certain contracts. And to help control credit risk, derivatives exchanges frequently require speculators to post higher margins than other investors.

⁸ The futures contract will not provide a perfect hedge unless the investor's portfolio is composed of precisely the same Treasury bonds the futures contract promises to deliver (Morris 1989a, 1989b).

⁹ There are several ways this situation might arise. For example, the German lender might be a supplier to the multinational and might offer a better-than-market loan rate as a way to strengthen the ties between the two companies.

¹⁰ The current state of bank participation in derivatives markets, both as intermediaries and as end-users, is examined in Board of Governors of the Federal Reserve System and others. Remolona analyzes the recent growth in financial derivatives markets and discusses bank activities in these markets as well. Parkinson and Spindt provide a useful overview of bank activities as of the end of 1985, just prior to most of the growth in derivatives activity.

¹¹ It may seem unlikely that a financial asset could have two different prices at one time. However, some combinations of assets guarantee the same cash flows as an underlying asset. These combinations are called synthetic securities since combining (synthesizing) the component assets produces the same payoff as buying the underlying asset. Since the prices of each of the component assets are set in separate markets, the price of the synthetic security may sometimes fail to equal the price of the underlying asset. When this happens, intermediaries can earn arbitrage profits by simultaneously buying the cheaper version (synthetic or underlying) of the asset and selling the more expensive version. This arbitrage eventually eliminates the price discrepancy.

¹² Since a bank's traditional activities create an exposure to financial market risks, the portfolio changes that result from market-making activities may actually reduce the bank's need to hedge. Consider again the example of a bank that makes fixed-rate mortgage loans funded by floating-rate deposits. When acting as an intermediary in the OTC derivatives market, this bank might become the floating-rate counterparty in a number of interest rate swaps. That is, the bank might agree to make floating-rate payments in exchange for receiving fixed interest payments. These swaps would tend to offset the bank's exposure to interest rate risk.

¹³ Data on banks' positions in derivatives come from the Consolidated Financial Statements for Bank Holding Companies (FR Y-9C) that bank holding companies file with the Federal Reserve. Data for interest rate swaps and foreign exchange futures and forwards are available from the second quarter of 1986, along with limited data on other off-balance-sheet items. More detailed information on derivatives positions is available starting in the third quarter of 1990. The Y-9C records notional values which greatly exceed the market values or replacement costs of the contracts. Nonetheless, the rate of growth in the notional values is an estimate of the rate of growth in the market values. The notional values reported in the text include foreign exchange contracts with an original maturity of 14 days or less. These short-term contracts totaled between \$300 billion and \$600 billion at the end of 1992. The replacement cost figures reported below exclude these short-term contracts. Excluding short-term foreign exchange contracts from the notional value figures would not change the impression that banks' derivatives holdings grew very rapidly from 1986 through 1992.

¹⁴ The replacement cost of banks' foreign exchange contracts is almost twice the size of the replacement cost of its interest rate contracts—\$98 billion in foreign exchange contracts at the end of 1992 compared with \$52 billion in interest rate contracts—but, as the text notes, interest rate contracts are growing more rapidly. Commodity and equity contracts, on the other hand, comprise a much smaller fraction of banks' derivatives holdings (Board of Governors and others).

¹⁵ There are many ways to classify financial market risks. The report prepared by the banking agencies (Board of Governors and others) distinguishes credit risk, market risk, operating risk, settlement risk, market liquidity risk, legal risk, and aggregate or interconnection risk. The report of the Group of Thirty's Global Derivatives Study Group combines settlement risk with credit risk and liquidity risk with market risk. This article follows the report of the Bank of England's internal working group on derivatives by allocating these various risks to just three categories: credit risk, market risk, and operating risk.

¹⁶ This section and the next one draw heavily on Bank of England and Board of Governors and others.

¹⁷ Only counterparties with positively valued contracts are exposed to credit risk. Many derivatives contracts have zero net value at their inception. For example, swaps are typically initiated so the values of both sides of the swap are equal in value. For such contracts, there is no initial credit risk. Over time, though, market developments change the values of each side of the contract so one counterparty is a net loser while the other is a net gainer. Only the loser has an incentive to default (creditors do not default), and only the winner is exposed to credit risk.

¹⁸ In contrast to forward agreements, options have positive value at inception which accounts for the premium the buyer pays for them. Thus, a bank that purchases options is immediately exposed to credit risk. The problem of assessing changes in potential credit exposure is much the same, however, for options as for forward agreements.

¹⁹ Derivatives are sometimes very complex, making it more difficult to evaluate their price risk than the price risk of, say, Treasury securities. This valuation risk is discussed below in the context of operational risk.

²⁰ A well-known example of this phenomenon is the breakdown of the portfolio insurance strategy during the stock market break of October 1987.

²¹ Some caveats should be noted here. During the market break of October 1987, in particular, markets failed to function for significant amounts of time. Moreover, it is difficult to assess how bad conditions might have become in

the absence of timely intervention by regulatory agencies. While systemic collapses were averted, it is impossible to say how narrowly they were averted. For a detailed account of events during the October 1987 market break, the most severe disruption in recent years, see the report of the Brady Commission (U.S. Presidential Task Force on Market Mechanisms).

²² A risk related to cross-market disturbances is systemic risk, the possibility that a disruption by any participant or group of participants causes widespread difficulties throughout financial markets. To date, events that might have triggered such difficulties have successfully been controlled, but not without considerable efforts on the part of regulators and market participants (Board of Governors and others).

²³ The Global Derivatives Study of the Group of Thirty surveys current industry practices and recommends minimum operational and management standards that market participants should meet.

REFERENCES

- Bank of England. 1993. "Derivatives: Report of an Internal Working Group," April.
- Bank for International Settlements. 1989. "Report on Netting Schemes," Angell report, February.
- _____. 1990. "Report of the Committee on Interbank Netting Schemes of the Central Banks of the Group of Ten Countries," Lamfalussy report, November.
- Beckett, Sean. 1989. "The Prepayment Risk of Mortgage-backed Securities," Federal Reserve Bank of Kansas City, *Economic Review*, February, pp. 43-57.
- Board of Governors of the Federal Reserve System, Federal Deposit Insurance Corporation, and Office of the Comptroller of the Currency. 1993. "Derivative Product Activities of Commercial Banks," a joint study conducted in response to questions posed by Senator Riegle on derivative products, January 27.
- Calla, James J., and Sidney S. Pomper. 1993. "Interest Rate Swaps: A Derivative Product for Portfolio Management," *The Journal of Commercial Lending*, June, pp. 12-22.
- Group of Thirty, Global Derivatives Study Group. 1993. *Derivatives: Practices and Principles*, July.
- Hull, John C. 1993. *Options, Futures, and Other Derivative Securities*, Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Kling, Arnold. 1986. "Futures Market and Transaction Costs," in Myron L. Kwast, ed., *Financial Futures and Options in the U.S. Economy*, Board of Governors of the Federal Reserve System, pp. 41-54.
- Miller, Merton. 1987. "Financial Innovations and Market Volatility," a talk given in London, England at a seminar sponsored by Dimensional Asset Management, March 24, cited in Remolona.
- Morris, Charles S. 1989a. "Managing Stock Market Risk with Stock Index Futures," Federal Reserve Bank of Kansas City, *Economic Review*, June, pp. 3-16.
- _____. 1989b. "Managing Interest Rate Risk with Interest Rate Futures," Federal Reserve Bank of Kansas City, *Economic Review*, March, pp. 3-20.
- Morris, Charles S., and Thomas J. Merfeld. 1988. "New Methods for Savings and Loans to Hedge Interest Rate Risk," Federal Reserve Bank of Kansas City, *Economic Review*, March, pp. 3-15.
- Parkinson, Patrick, and Paul Spindt. 1986. "The Use of Interest Rate Futures by Commercial Banks," in Myron L. Kwast, ed., *Financial Futures and Options in the U.S. Economy*, Board of Governors of the Federal Reserve System, pp. 221-48.
- Remolona, Eli M. 1992-93. "The Recent Growth of Financial Derivative Markets," Federal Reserve Bank of New York, *Quarterly Review*, Winter, pp. 28-43.
- U.S. Presidential Task Force on Market Mechanisms. 1988. *Report of the Presidential Task Force on Market Mechanisms*, Washington, January.

Exchange Rate Regimes and Volatility

By Charles Engel and Craig S. Hakkio

The perception is widespread that foreign exchange rates are too volatile. In 1992, for example, the U.S. dollar rose more than 2 percent against the German mark in one day on seven separate occasions. While a 2 percent daily change may seem small, it nonetheless amounts to a change of more than 500 percent at an annual rate.

High volatility in exchange rates can have important adverse consequences. If investors equate volatility with risk, they may alter their investment decisions. As a result, long-term capital flows may be reduced, thereby retarding the efficient flow of capital in the world economy. Moreover, if the exchange value of foreign sales becomes more volatile, firms may be reluctant to engage in international trade. And, if exchange rate volatility spills over into the real economy or inhibits the smooth functioning of the financial system, monetary policymakers will be less able to achieve their policy goals.

To reduce exchange rate volatility, some observers recommend that the United States,

Japan, and Germany abandon their system of flexible exchange rates and adopt a target zone system. Under a target zone system, exchange rates are fixed within a narrow band that can be periodically adjusted, or realigned.

Exchange rates are kept within a target zone in the European Monetary System (EMS). The European experience has shown, however, that a new kind of exchange rate volatility is introduced under this system due to the possibility of exchange rate realignments. Since the fall of 1992, European foreign exchange markets have been in intermittent turmoil, with realignments in September and November of last year and January and May of this year.

This article examines the European experience with a target zone system to learn whether a target zone for the U.S. dollar, yen, and mark would reduce exchange rate volatility. The first section of the article shows that exchange rate volatility is different for EMS and non-EMS countries, which supports the view that volatility in a target zone would be different from volatility in a flexible exchange rate regime. The next two sections provide reasons why volatility is different in the two kinds of exchange rate regimes. The article concludes that exchange rate volatility would probably not decline if the United States, Japan, and Germany were to adopt a target zone system.

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VOLATILITY OF EMS AND NON-EMS EXCHANGE RATES

How can volatility in a system of flexible exchange rates be compared with volatility in a system of fixed, but adjustable, exchange rates? One approach is to compare the volatility of the dollar/mark exchange rate under the current flexible rate system with its volatility during the fixed, but adjustable, Bretton Woods system prevailing after World War II. This comparison may be misleading, however, since the current environment is significantly different from the 1950s and 1960s. A preferred approach is to compare dollar/mark volatility with French franc/mark volatility in the current period, since the French franc/mark exchange rate belongs to the EMS target zone. More generally, comparing volatility of non-EMS exchange rates, such as the dollar/mark rate, with volatility of EMS exchange rates, such as the franc/mark rate, can provide information about how exchange rate volatility might change if the United States, Japan, and Germany adopted a target zone system.

Accordingly, this section first discusses how to measure exchange rate volatility and then compares the volatility of eight EMS and non-EMS currencies. Most of the discussion focuses on two exchange rates, the dollar/mark and French franc/mark. Results are also reported for four other EMS exchange rates—the Italian lira, Belgian franc, Danish krone, and Dutch guilder—and two other non-EMS exchange rates—the Canadian dollar and Japanese yen. All currencies are measured relative to the Deutsche mark because Germany is the largest European country.

How to measure exchange rate volatility

For analytical purposes, it is useful to think of exchange rate volatility as consisting of three types—normal volatility, extreme volatility, and

all other volatility. Normal volatility refers to the ordinary variability of exchange rate changes—the modest rises and falls that commonly occur over time. Extreme volatility refers to the much larger changes in exchange rates that occur only occasionally. All other volatility are those changes that are neither normal nor extreme—that is, unclassified changes. Although terms like “ordinary,” “occasional,” and “large” are vague, they can be made precise.

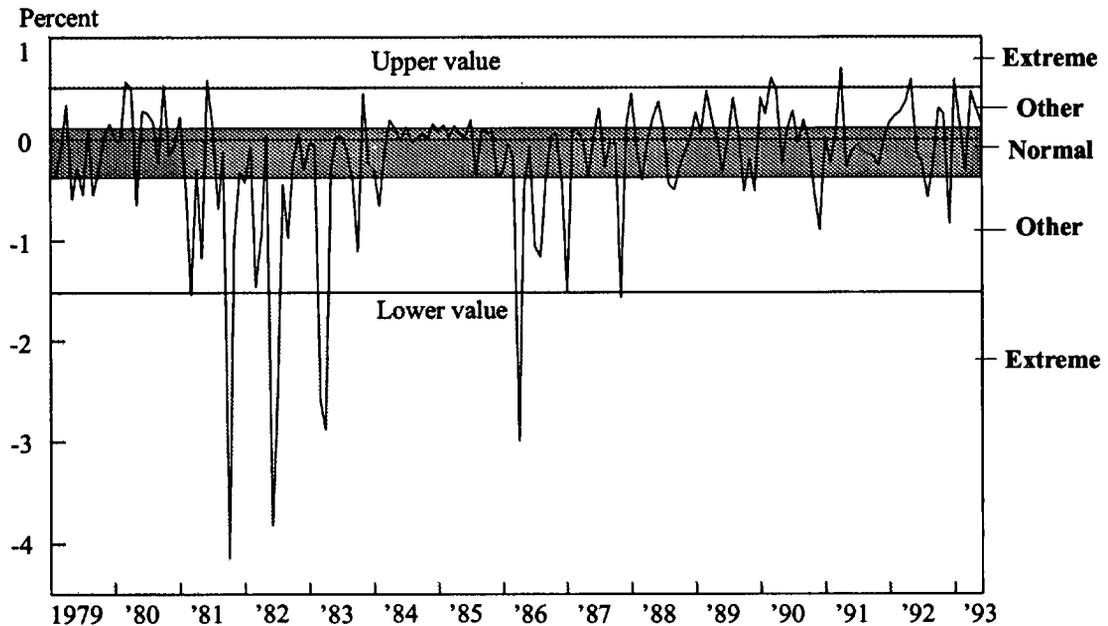
Normal volatility is illustrated in Chart 1, which shows the month-to-month percent change in the franc/mark exchange rate from March 1979 to May 1993.¹ One-half of the changes during this period are between -0.3 percent and 0.1 percent at an annual rate, as indicated by the darkly shaded band in the middle of the chart. Since normal volatility refers to the ordinary ups and downs of the exchange rate, and since changes in the franc/mark are ordinarily between -0.3 and 0.1 percent, normal volatility of the franc/mark rate is defined to be between -0.3 percent and 0.1 percent.

As shown by the example, normal volatility can be defined by a pair of numbers. The two numbers are chosen so that half of all exchange rate changes fall between the two numbers. More precisely, in looking at the distribution of franc/mark exchange rate changes in Chart 1, the 25th percentile is -0.3 percent and the 75th percentile is 0.1 percent. Since half of the exchange rate changes lie between the 25th and 75th percentiles, normal volatility is measured by these two numbers; that is, normal volatility is between -0.3 percent and 0.1 percent.

Extreme volatility, which refers to occasional large changes in the exchange rate, is also illustrated in Chart 1. To quantify the term “occasional,” two numbers called the “lower value” and “upper value” are chosen so that 5 percent of the time the exchange rate *falls more than* the “lower value,” and 5 percent of the time the exchange rate *rises more than* the “upper value.” Thus, the lower value is the 5th percentile, and

Chart 1

Exchange Rate Volatility: the French Franc/Mark Exchange Rate
 Monthly percent change



the upper value is the 95th percentile. Looking at the largest 5 percent of the negative exchange rate changes and the largest 5 percent of the positive exchange rate changes reveals that extreme volatility is indeed both “occasional” and “large.”

In Chart 1, extreme volatility is indicated by the lightly shaded area.² Within this area, five percent of the time the French franc falls more than 1.5 percent and 5 percent of the time the franc rises more than 0.5 percent. Extreme volatility for the franc, therefore, is defined by the pair of numbers -1.5 percent and 0.5 percent.

All other volatility, which is volatility that is neither normal nor extreme, is left unshaded in Chart 1. Using the definition of normal and extreme volatility, all other volatility refers to exchange rate changes that are between the 5th and 25th

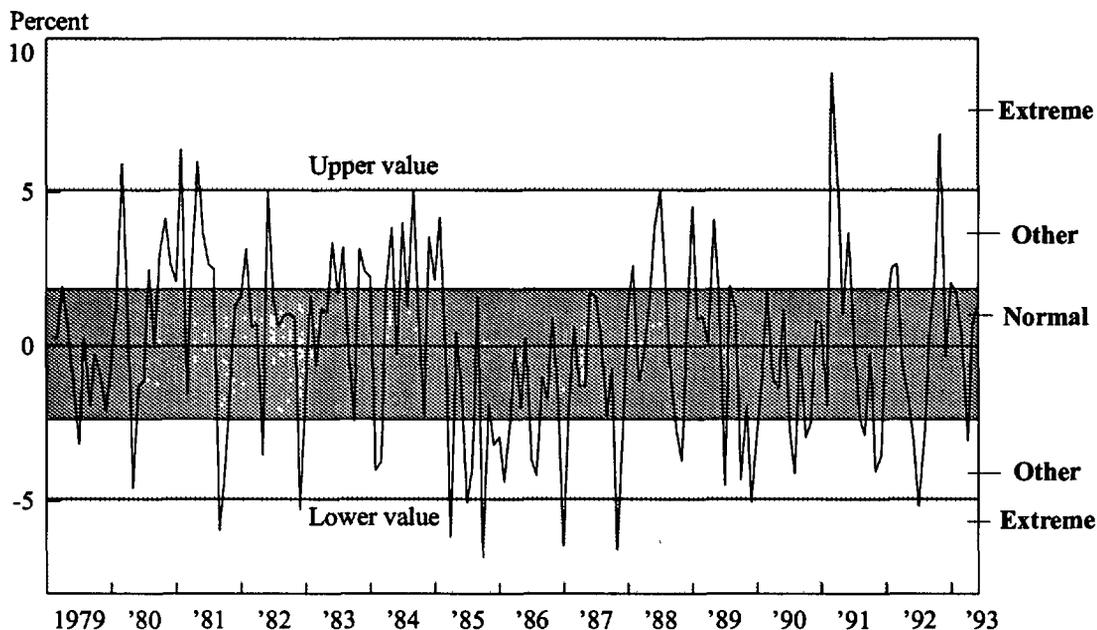
percentile, or between the 75th and 95th percentile. Since the three types of volatility—normal, extreme, and all other—are exhaustive, there is no need to formally study all other volatility in addition to normal and extreme volatility.

Comparing volatility

Exchange rate volatility for the EMS currencies differs from exchange rate volatility for the non-EMS currencies in both size and timing. This discussion focuses on volatility of month-to-month changes in the dollar/mark and French franc/mark exchange rates. The dollar/mark represents a flexible exchange rate and the franc/mark represents a fixed, but adjustable,

Chart 2

Exchange Rate Volatility: the U.S. Dollar/Mark Exchange Rate
 Monthly percent change



exchange rate. Numerical results are also reported for four other EMS exchange rates and two other non-EMS exchange rates to show that the dollar/mark and franc/mark results are not unusual.

Chart 2 shows the month-to-month percent change in the dollar/mark exchange rate from March 1979 to January 1993. As shown by the darkly shaded area, changes in the dollar/mark are ordinarily between -2.1 percent and 1.8 percent. Therefore, normal volatility is defined as between -2.1 percent and 1.8 percent. Also, as shown by the lightly shaded area, the dollar/mark *occasionally* falls more than 4.9 percent and rises more than 5.1 percent. Therefore, extreme volatility is defined as the pair of numbers -4.9 percent and 5.1 percent.

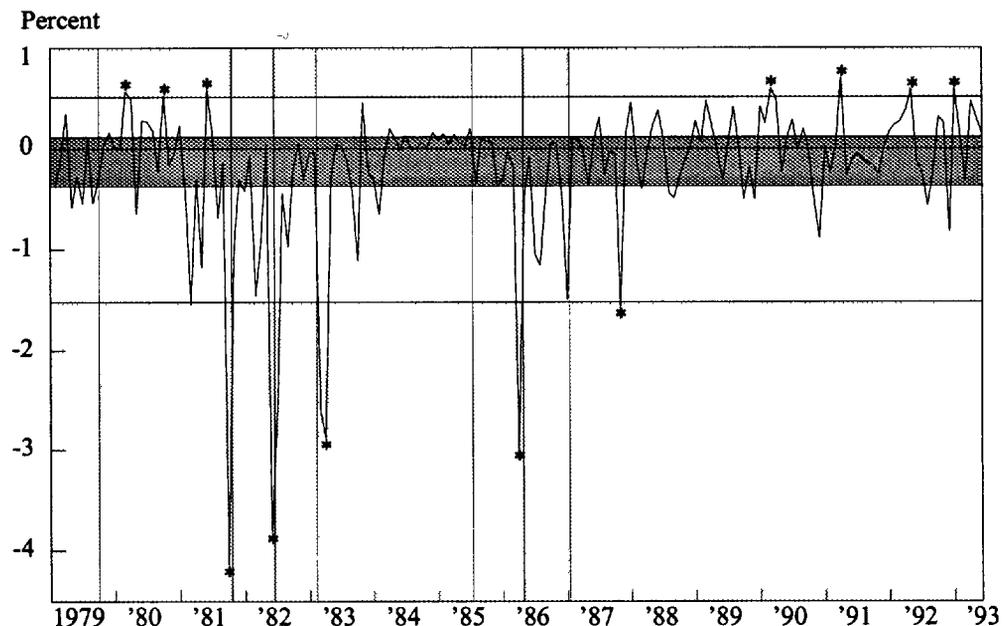
The volatility of the dollar/mark and

franc/mark rates differs in three important ways. First, normal volatility for the franc/mark is much less than for the dollar/mark. Normal volatility for the franc/mark is between -0.3 percent and 0.1 percent, while for the dollar/mark it is between -2.1 percent and 1.8 percent. Therefore, *ordinary* changes in the franc/mark are less than *ordinary* changes in the dollar/mark.

A second difference is that extreme volatility for the franc/mark is less than for the dollar/mark. Extreme volatility for the franc/mark is given by the numbers -1.5 percent and 0.5 percent, while for the dollar/mark it is given by -4.9 percent and 5.1 percent. Therefore, *occasional large* changes in the franc/mark are less than *occasional large* changes in the dollar/mark.

Chart 3

Volatility and Realignments: the French Franc/Mark Exchange Rate
 Monthly percent change



* Denotes an extreme change in the exchange rate. The vertical lines indicate the month of a realignment of the French franc/mark exchange rate.

A third difference is that extreme volatility for the franc/mark tends to occur at the time of a realignment, whereas extreme volatility for the dollar/mark does not occur at any particular time. Chart 3 illustrates this third difference. The dates of realignments in the franc/mark exchange rate are indicated with a vertical line.³ Extreme changes are indicated by an “*.” Most of the extreme changes in the franc/mark occur in the month of a realignment. In fact, of the seven realignments involving the franc/mark, four were characterized by extreme volatility. The probability that this would happen by chance is about zero.⁴ In contrast, the timing of EMS realignments and extreme changes in the dollar/mark exchange rate are not correlated.

The differences between the franc/mark and

dollar/mark exchange rates apply generally to EMS and non-EMS exchange rates, as shown in Table 1. Normal volatility, as measured by the pair of numbers that define *ordinary* changes in the exchange rate, is less for EMS exchange rates than for non-EMS exchange rates. Extreme volatility, as measured by the pair of numbers that define *occasional and large* changes in the exchange rate, is also less for EMS exchange rates than for non-EMS exchange rates. Extreme volatility and realignments are correlated for four of the five EMS exchange rates, but are independent for the non-EMS exchange rates.

In summary, volatility of EMS exchange rates differs from volatility of non-EMS exchange rates in three ways. First, EMS exchange rates have smaller normal volatility than non-EMS

Table 1

Differences between non-EMS and EMS exchange rates

<u>Exchange rate relative to the mark</u>	<u>Normal volatility</u>	<u>Extreme volatility</u>	<u>Is extreme volatility independent of realignments?</u>
<i>non-EMS exchange rates</i>			
U. S. dollar	(-2.1%, 1.8%)	(-4.9%, 5.1%)	yes
Japanese yen	(-1.4%, 2.0%)	(-3.9%, 4.6%)	yes
Canadian dollar	(-2.2%, 1.8%)	(-4.7%, 4.4%)	yes
<i>EMS exchange rates</i>			
French franc	(-.3%, .1%)	(-1.5%, .5%)	no
Italian lira	(-.6%, .1%)	(-2.4%, .7%)	no
Danish krone	(-.4%, .2%)	(-1.2%, .5%)	no
Belgian franc	(-.2%, .1%)	(-1.0%, .4%)	yes
Dutch guilder	(-.1%, .1%)	(-.4%, .4%)	no

Note: The column labeled "Is extreme volatility independent of realignments?" summarizes the result of Fisher's exact test for independence of extreme changes and EMS realignments. Fisher's exact test tests the hypothesis that extreme volatility and EMS realignment are independent. "Yes" means that the hypothesis cannot be rejected; "no" means that the hypothesis of independence can be rejected.

exchange rates. Second, EMS exchange rates have smaller extreme volatility than non-EMS exchange rates. The final difference highlights the important role played by realignments in understanding EMS volatility. Namely, extreme changes in EMS exchange rates occur around the time of a realignment.

These findings suggest some of the ways in which exchange rate volatility may change if the United States, Japan, and Germany adopted a target zone. Some analysts might conclude that volatility of exchange rates would decline if the United States adopted a target zone. Before evaluating such a claim, however, the reasons that volatility in a flexible exchange rate system differ from volatility in a fixed, but adjustable, exchange rate system must be addressed.

VOLATILITY IN A SYSTEM OF FLEXIBLE EXCHANGE RATES

Understanding why volatility differs in the two regimes is important to policymakers who want to reduce exchange rate volatility. This section examines the factors that help determine exchange rate volatility in a system of flexible exchange rates. The next section discusses why volatility is different in a system of fixed, but adjustable, exchange rates.

Determinants of the exchange rate

Because the exchange rate is the price of one currency relative to another, any factor that

affects the supply of or demand for either currency affects their rate of exchange. For expositional purposes, such factors can be grouped into two categories: (1) current market fundamentals and (2) market expectations. If current market fundamentals or market expectations change, so will the demand for or supply of either currency and so will the current rate of exchange.

Market fundamentals include such factors as the money supply and real income. A change in the money supply in either country will affect the exchange rate. For example, an increase in the U.S. money supply relative to the German money supply will cause the price of the dollar to fall. In short, the dollar will depreciate in terms of the German mark.⁵ A change in real income will also affect the exchange rate. For example, when real income in the United States rises, consumers will buy more goods produced at home and abroad. If consumers buy more German goods, the increased demand for marks will drive up the value of the mark relative to the dollar, thereby causing the dollar to depreciate.

Market fundamentals also include monetary and fiscal policies. Monetary policy is a market fundamental because it helps determine the money supply.⁶ In the same way, fiscal policy—the tax and spend policies of the government—is a market fundamental because it helps determine real income.

Additional factors included as market fundamentals are the profitability and riskiness of domestic and foreign assets. Just as firms demand dollars and marks to buy international goods and services, firms also demand dollars and marks to buy and sell foreign assets. Suppose a U.S. mutual fund decides that a German pharmaceutical company has good profit prospects. The mutual fund will demand marks so that it can buy shares of the German pharmaceutical, thereby causing an increase in the dollar price of marks.

Market expectations also help determine exchange rates. All current asset prices reflect

expectations about an asset's future price. For example, if investors expect gold prices to rise in the next month, investors will take action that will cause gold prices to rise immediately. The exchange rate is no different. If investors expect the dollar to decline, they will postpone their purchases in hope of buying dollars at a lower price. Thus, a depreciation expected in the future will cause a reduction in the current demand for dollars, leading to a drop in the current exchange rate. And, since exchange rates in the future will be influenced by the future value of market fundamentals, the expected value of future market fundamentals also affects today's exchange rate.

Determinants of exchange rate volatility

Exchange rate volatility stems in part from volatility in market fundamentals. Fluctuations in exchange rates, however, are sometimes too large to be explained solely by such factors. For example, exchange rates can change by two percentage points or more in a single day. But changes in market fundamentals—money supply, real income, or the relative quality of investment opportunities—do not change frequently or significantly enough to fully explain such exchange rate volatility.⁷ Other factors, therefore, must contribute to exchange rate volatility.

Much exchange rate volatility can be explained by volatility in market expectations. Expectations can change as investors gain new information about market fundamentals. Expectations can also change even without apparent news about market fundamentals.

New information leads to volatility. Knowing that future market fundamentals affect current exchange rates, investors have an incentive to base their decisions on all the available information. When new information becomes available, investors may change their expectations of future market fundamentals.

An important source of new information is

news of policy changes. For example, when the Federal Reserve announces new monetary growth targets, or when Congress or the Administration announces new tax or spending programs, expectations of future exchange rates may change, leading to immediate changes in exchange rates. In this way, changes in policy can make exchange rates volatile.

Speculative bubbles lead to volatility. Sometimes investors change their expectations about future exchange rates even without new information about market fundamentals. These changed expectations can also affect the current exchange rate. An example is when the exchange rate is affected by a "speculative bubble."

Suppose investors expect a particular currency to appreciate. This expectation need not be based on any knowledge of market fundamentals. Perhaps traders "charting" the day-to-day movements of the exchange rate conclude that the currency is ripe for a takeoff. Typically, such unfounded expectations lead to losses for any speculator who bases trades on them. But, imagine a situation where a significant number of speculators expect the currency to appreciate. The speculators will therefore buy the currency, leading to an increase in the value of the currency. If enough speculators act on the belief that the currency will appreciate, their actions will cause the currency to appreciate. Thus, the expectations become self-fulfilling.

It is easy to imagine a situation where a speculative bubble will grow. For example, some analysts might believe a particular currency will rise in value regardless of market fundamentals. As the speculative bubble causes the currency to rise, speculators' expectations tend to be confirmed, their confidence in the currency grows, and they buy more of the currency. Thus, the currency can take off on a steady or even spectacular climb with no change in market fundamentals backing the upward movement.

At any time, of course, a speculative bubble

is likely to burst. Investors may suddenly realize market fundamentals do not justify a rise in the value of the currency and will try to sell it, driving down sharply the currency's value.

Thus, actions by speculators can increase volatility of exchange rates under a floating exchange rate system. Bubbles can drive a currency upward for no fundamental reason, and then when the bubble bursts the currency can fall back down.

In a system of flexible exchange rates, exchange rate volatility depends on the volatility of market fundamentals and expectations. Hence, some analysts believe that if policymakers could reduce the volatility of market fundamentals or the volatility of expectations, exchange rate volatility might also decline.

VOLATILITY IN A FIXED, BUT ADJUSTABLE, EXCHANGE RATE REGIME

This section shows why volatility in a system of fixed, but adjustable, exchange rates differs from volatility in a system of flexible exchange rates. The key idea is that a system of fixed, but adjustable, exchange rates introduces a new kind of volatility: volatility caused by the expectations of exchange rate realignments. That is, volatility does not disappear when countries adopt a system of fixed, but adjustable, exchange rates; it simply takes a different form.

For analytical purposes, consider a system of absolutely fixed exchange rates. With the exchange rate fixed, investors need not form expectations about the future exchange rate because they can be certain the rate will always be within a narrow band. By eliminating the market's uncertainty about the future exchange rate, a system of absolutely fixed exchange rates reduces volatility.

Rates in a system like the EMS, however, are not absolutely fixed—they are fixed, but

adjustable. Investors know the exchange rate will stay within a band for some period of time, but the bands are able to be adjusted. In other words, a realignment may occur and exchange rate volatility will reflect this possibility. Expectations of the future exchange rate may be stable for some period of time, resulting in a stable exchange rate. But eventually expectations of a realignment—of its timing and magnitude—become important. As investors speculate about the realignment's size and timing, volatility will increase. Between realignments, exchange rate volatility will tend to be within normal limits, but around the time of realignments, exchange rate volatility can be extreme.⁸

Divergent market fundamentals lead to realignments.

Realignments become likely when exchange rates diverge from market fundamentals. Consider an investor in August 1992 trying to determine whether the Italian lira would be realigned. The previous realignment of the lira occurred in January 1987. From then until August 1992, the Italian money supply grew 8.0 percent annually, while the German money supply grew only 6.2 percent annually.⁹ More importantly, Italian inflation during that period was 5.7 percent, while German inflation was only 2.7 percent. With market fundamentals so different, a realignment seemed inevitable.

By late August 1992, it had become obvious that the lira was overvalued in real terms and a devaluation of the lira was imminent.¹⁰ Holding lira assets made little sense, when the alternative was holding German mark assets. Fairly certain that the lira would be devalued significantly against the mark, investors sold lira assets in favor of mark assets. As demand for the lira fell and demand for the mark rose by large amounts, additional pressure was put on European central banks to defend the EMS parities. Nonetheless,

over the September 12-13 weekend, the lira was devalued by 7 percent against the mark.

To see why the lira realignment was inevitable, a frame of reference such as the "equilibrium" exchange rate is needed. The equilibrium exchange rate is the value of the exchange rate implied by market fundamentals. If the equilibrium rate is trending upward or downward, then either the upper or lower band of a target zone will eventually be violated. Figures 1-4 illustrate this point. The official exchange rate is shown by the horizontal line in the middle of the chart. The two horizontal bands surrounding the official rate represent the upper and lower bands of the EMS target zone system. In the EMS, the bands are plus or minus 2.25 percent of the official rate.¹¹ In Figure 1, the heavy solid line is the equilibrium value of the mark relative to the lira, and it is shown to be trending upward over time.¹² The thin solid line is the actual price of the mark, which may differ from the equilibrium exchange rate.

The equilibrium exchange rate, as shown in Figure 1, will cross the upper band at time t_A with no change in economic fundamentals. A change in monetary or fiscal policy, however, could change the market fundamentals so that the exchange rate does not cross its upper band. As shown in Figure 2, for example, a reduction in Italian money growth would slow the rate of depreciation of the lira, or the rate of appreciation of the mark, so that no realignment is needed. However, if neither the German nor Italian authorities change their policies, then a realignment becomes inevitable.

Realignments lead to extreme volatility

When a realignment becomes likely, exchange rate volatility tends to increase—that is, volatility becomes extreme. In the same way that new information about market fundamentals leads to volatility in a flexible exchange rate

Figure 1 Realignment in the EMS

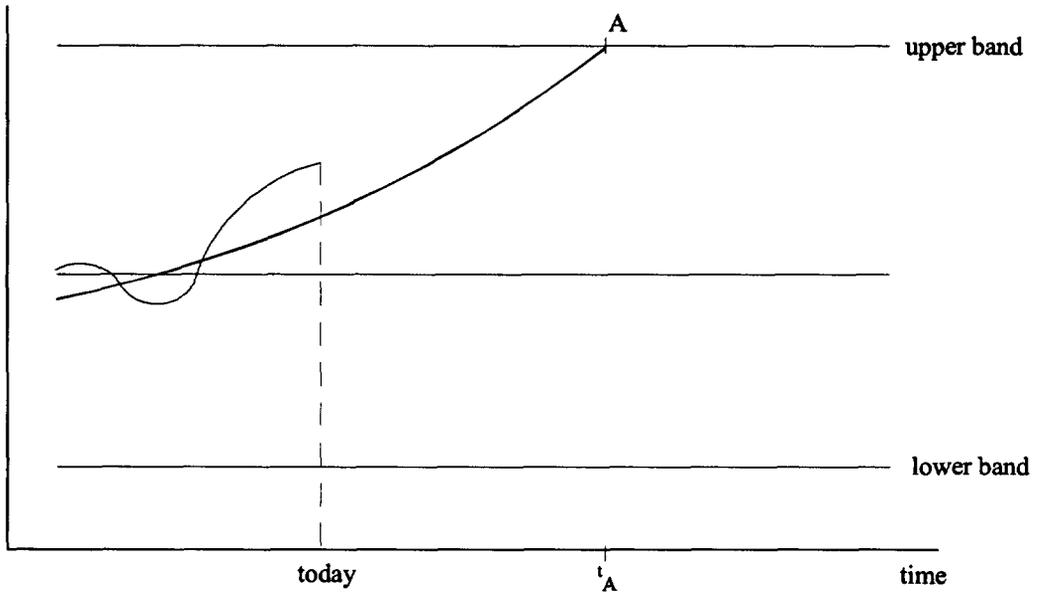
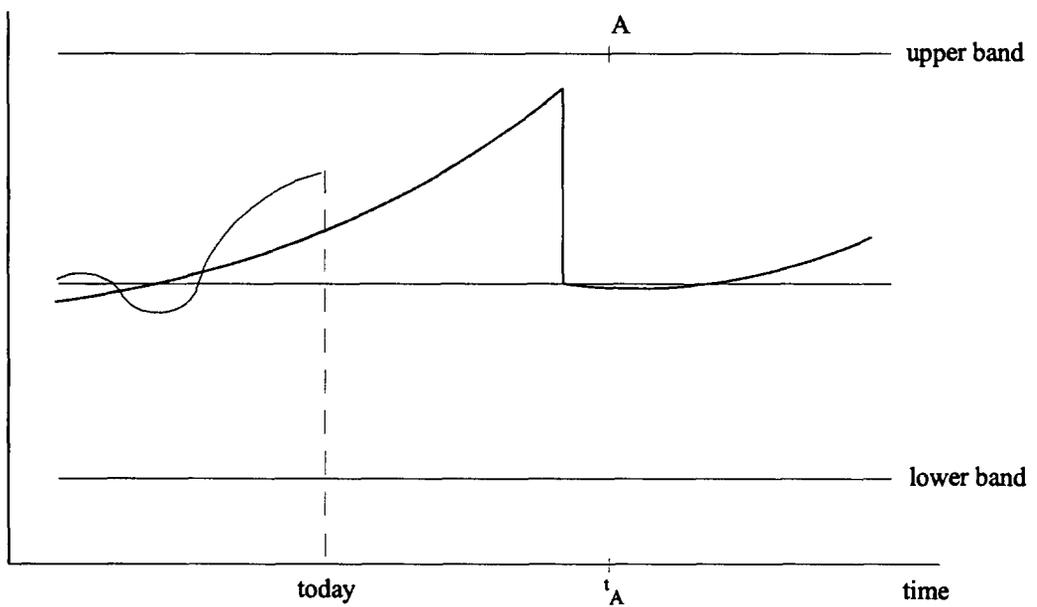


Figure 2 No Realignment



regime, new information about a possible realignment leads to volatility in an EMS-like regime.

New information about whether there will be a realignment contributes to volatility. Say, for example, the equilibrium exchange rate for the mark/lira is trending upward. If investors decide that a realignment will occur, they may try to buy marks before the government raises the official rate, causing the price of marks to rise quickly. But suppose the Italian government announces a rise in interest rates or declares that a realignment will not occur. With investors no longer expecting a realignment, the exchange rate will soon fall back. As investors continually revise their expectations about a possible realignment, exchange rates can rise and then fall, thereby contributing to volatility.

New information about the size of a realignment also contributes to volatility. Some analysts may believe a realignment of 7 percent is justified by the fundamentals, while others may believe a realignment of 10 percent is justified. As investors revise their expectations about the size of a realignment, the exchange rate will rise and fall, leading to volatility.

New information about the timing of a realignment further contributes to volatility. Consider a group of investors who decide a realignment will occur. If the investors expect an early realignment, the exchange rate will rise quickly to the upper band, as shown in Figure 3. Alternatively, if the Italian government raises short-term interest rates or announces that a realignment is unnecessary, investors may change their expectations about the timing of a realignment, as depicted in Figure 4. If investors believe the government will not keep interest rates high for long, they still believe a realignment will occur, but at a later date. Thus, the investors may reverse their decision to buy marks. As a result, the exchange rate may fall temporarily. Again, as investors change their expectations, the exchange rate becomes volatile.

If the equilibrium exchange rate is constant, rather than trending upward or downward, realignment volatility should not exist. A constant equilibrium exchange rate means that realignments are unnecessary because no fundamental economic forces are pushing the exchange rate through its upper or lower band. Although the actual exchange rate will be volatile, it will be volatile around a constant equilibrium value. Any move toward the upper or lower band will not generate expectations of a realignment because investors believe the equilibrium value is constant. Thus, under an EMS-type system with a constant equilibrium exchange rate, the extreme volatility arising from the uncertainty about a realignment should not be present.

Speculative attacks lead to volatility

A system like the EMS is not immune to exchange rate volatility due to speculation. When investors form expectations of realignments that are not based on market fundamentals, such a condition is called a speculative attack.

As an illustration, suppose that a significant number of investors believe the French franc will be devalued against the mark, despite the lack of market fundamentals to support such a belief. Investors will begin to sell franc assets to buy mark assets, causing the mark to rise relative to the franc. Other speculators will notice the demand for francs has fallen and the demand for marks has risen. Feeling confident that central banks will continue to keep the franc's official value pegged at the current rate, speculators will sell franc assets and buy mark assets, putting additional downward pressure on the franc. If the authorities decide to realign the official rate, the actions by speculators will have increased volatility by causing a realignment not based on market fundamentals. If the currency is not realigned, exchange rate volatility still increases

Figure 3 Early Realignment

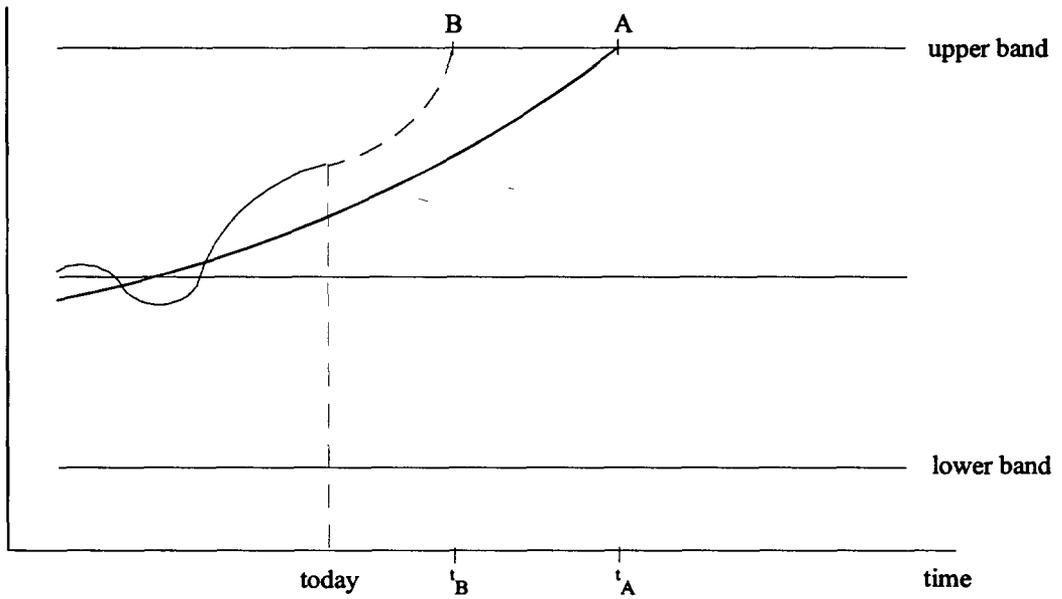
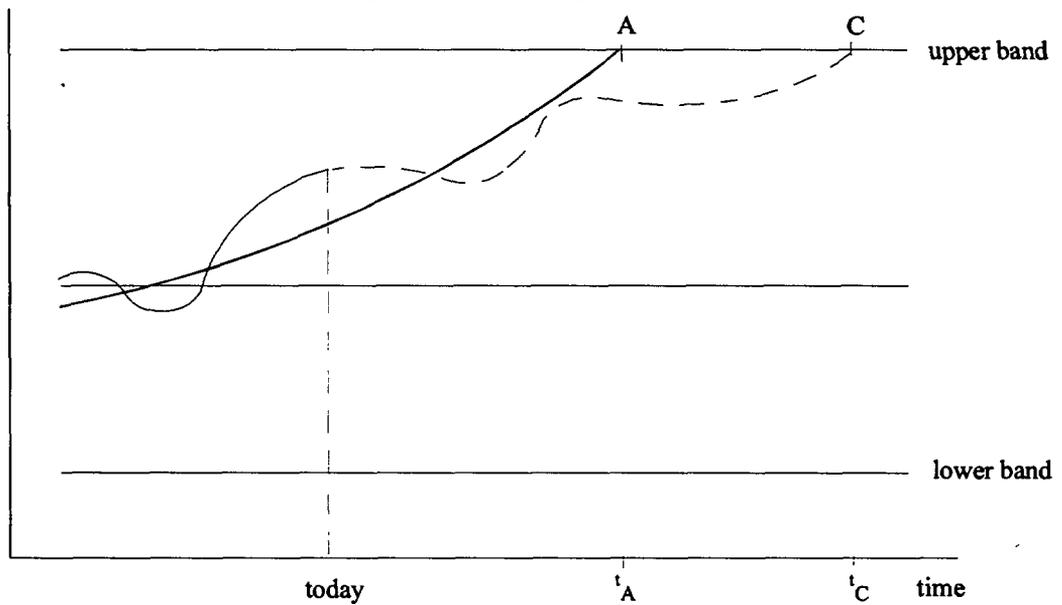


Figure 4 Late Realignment



as the currency is repeatedly attacked.

If market pressures ultimately force a realignment, exchange rate volatility increases despite market fundamentals that are stable. Thus, realignment volatility exists even though fundamentals are stable and the equilibrium exchange rate is constant.

Empirical evidence on volatility and realignments

Statistical evidence provides support for the hypothesis that exchange rate volatility in a system like the EMS is greater when the equilibrium value is rising than when it is constant. The relation between volatility and the trend in the equilibrium exchange rate is first investigated for the Italian lira and Dutch guilder. The hypothesis is then tested using five EMS exchange rates. However, before formally investigating the hypothesis, an estimate of the equilibrium value of the exchange rate is required.

Purchasing power parity (PPP) is one way to measure the dollar's equilibrium value.¹³ In its simplest form, PPP states that identical goods should cost the same in all countries. But before the cost of goods in different countries can be compared, prices must be converted to a common currency. After converting marks to dollars, for example, a sweater bought in Germany should cost the same as an identical sweater bought in the United States.

The above example can be generalized to say that the price of a basket of goods produced in two countries should be the same when expressed in a common currency. Since the Consumer Price Index can be viewed as the price of a basket of goods, the equilibrium exchange rate should equal the ratio of consumer prices in both countries. PPP also says that if U.S. inflation is greater than German inflation, the dollar will depreciate. With a cheaper dollar, Germans can

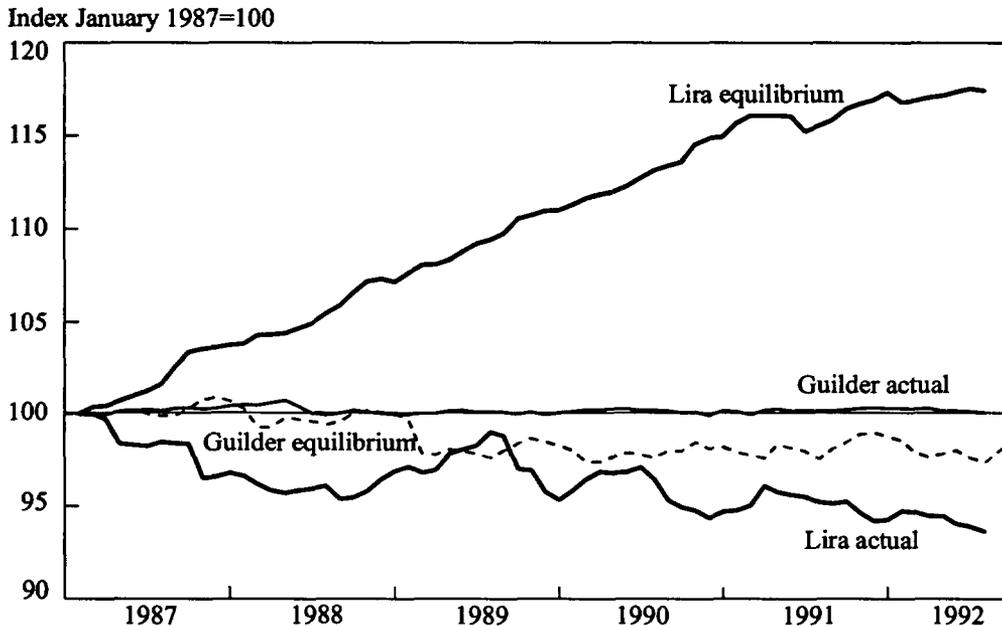
buy more dollars. But with high U.S. inflation, Germans also need more dollars to buy the same amount of goods. Thus, higher U.S. inflation and a lower dollar go hand in hand.

Chart 4 shows the actual and equilibrium value of the Italian lira and the Dutch guilder (relative to the mark) from January 1987 to August 1992. Exchange rates were realigned in January 1987 and September 1992. The actual and equilibrium exchange rates have been normalized so that they equal 100 in January 1987. Since Italian inflation was much greater than German inflation, the actual value of the lira fell relative to the mark. In addition, the lira became progressively overvalued, as measured by the growing discrepancy between the equilibrium value and the actual value of the lira. For example, right before the September 1992 realignment, the mark's equilibrium value had risen almost 20 percent above its value in January 1987. Dutch inflation, on the other hand, was about the same as German inflation. As a result, the equilibrium value of the Dutch guilder relative to the mark was approximately constant.

Since the trend in the lira is greater than the trend in the guilder, the theory implies that the volatility of the lira should be greater than the volatility of the guilder. The evidence supports the theory. Normal volatility for the lira—which is between -0.6 percent and 0.1 percent—is greater than normal volatility for the guilder—which is between -0.1 percent and 0.1 percent. Similarly, extreme volatility for the lira—which is defined by the pair of numbers -2.4 percent and 0.7 percent—is greater than extreme volatility for the guilder—which is defined by -0.4 percent and 0.4 percent.

Not only do the guilder and lira provide strong support for the theory, but all EMS exchange rates are consistent with the theory. That is, currencies with the greatest trend in their equilibrium value have the greatest amount of volatility. To test this hypothesis, the correlation

Chart 4
Actual and Equilibrium Exchange Rates



between the trend in the PPP exchange rate and the amount of normal and extreme volatility for the five EMS exchange rates are calculated. The correlation between the trend and normal volatility is 0.74. Thus, currencies with a large trend tend to have high normal volatility. In addition, the correlation between the trend and extreme volatility is 0.85. Both results confirm the hypothesis.¹⁴

The last two sections have discussed the reasons for exchange rate volatility in a flexible exchange rate system and in a fixed, but adjustable, exchange rate systems. Exchange rates in both systems are volatile because market fundamentals are volatile. In addition, expectations are volatile in both systems. In a flexible exchange rate system, investors form expectations about the future exchange rate. In a fixed,

but adjustable, exchange rate system, investors form expectations about a possible realignment.

CONCLUSIONS

Exchange rate volatility differs in the EMS and non-EMS systems. EMS exchange rates are characterized by small normal volatility and by small extreme volatility. In contrast, non-EMS exchange rates are characterized by high normal volatility and by high extreme volatility. It would be wrong to conclude, though, that exchange rate volatility would necessarily decline if the United States, Japan, and Germany adopted a target zone system, like the EMS.

Exchange rate volatility would not necessar-

ily decline because exchange rates in a target zone are subject to a type of volatility that does not affect exchange rates in a flexible exchange rate system. Realignment volatility arises from new information about possible exchange rate realignments. In the EMS, extreme volatility generally occurs around the time of a realignment. Therefore, to determine whether volatility would change if the United States, Japan, and Germany were to adopt a target zone, the key issue lies in determining whether realignments would occur.

Realignments depend on whether the economic fundamentals lead to a constant equilibrium exchange rate. If the equilibrium exchange rate is constant, then realignments are infrequent and volatility is reduced. If the equilibrium rate trends upward or downward toward the boundaries of the target zone, however, then realignments become inevitable, bringing with them extreme volatility.

Economic fundamentals differ in the United States, Japan, and Germany. For example, according to the International Monetary Fund, average real GDP growth for 1993-94 is expected to be 3.2 percent in the United States, 2.2 percent in Japan, and 0.2 percent in Germany.¹⁵ Average consumer price inflation for 1993-94 is expected

to be 3.0 percent in the United States, 1.2 percent in Japan, and 3.4 percent in Germany. With such divergent economic fundamentals, it is not likely that the equilibrium exchange rate would be constant, and realignments would become inevitable.

Monetary policy also differs in the United States, Japan, and Germany. In the EMS, it is generally agreed that the Bundesbank acts as the anchor for monetary policy. As a result, monetary policy in the EMS countries, while not identical, is similar. Normal and extreme volatility for EMS currencies, in turn, is less than for non-EMS currencies. It is unlikely, however, that a single central bank would act as a policy anchor for the United States, Japan, or Germany. Without such an anchor, if policy in one country diverges from the other two, the equilibrium exchange rate would not be constant and realignments would become inevitable.

In summary, it is doubtful that the United States, Japan, and Germany would be able to keep the equilibrium exchange rate between their currencies constant over time, which would make realignments inevitable. Consequently, exchange rate volatility would probably not decline if the United States, Japan, and Germany were to adopt a target zone system.

ENDNOTES

¹ March 1979 was chosen because the Exchange Rate Mechanism of the EMS began on March 13, 1979.

² Extreme volatility is not symmetric because the franc was generally depreciating over time. As a result, there are more negative changes than positive changes.

³ Some EMS realignments did not involve the franc/mark exchange rate. In particular, the EMS realignments in the fall of 1992 and spring of 1993 did not involve the franc.

⁴ Specifically, Fisher's exact test is used to test the null hypothesis that realignments and dates of extreme volatility are independent. The marginal significance level is 0.002.

Since the hypothesis of independence can be rejected, the article concludes that realignments and extreme volatility are "correlated."

⁵ The discussion assumes that all other factors are held constant. This allows the analysis to focus on the particular change.

⁶ Some changes in the money supply are unrelated to monetary policy decisions by the Federal Reserve. For example, if investors change the composition of their portfolio from money market funds to mutual funds, the money supply will change.

⁷ Flood and Rose (1992) argue that although fixed

exchange rates are less volatile than flexible exchange rates, the volatility of market fundamentals is about the same in both systems.

⁸ Volatility can also be extreme even without a realignment crisis due to extreme changes in expected market fundamentals or speculative bubbles.

⁹ The growth of German M3 is calculated as a weighted average of growth from January 1987 to December 1990, and from January 1991 to January 1992. The reason is that the German money supply jumped in January 1991 due to reunification. Money growth was 5.8 percent in the first period and 6.3 percent in the second period. The weights (0.7966 and 0.2034) were proportional to the relative size of the two sample periods.

¹⁰ Other factors also contributed to the expectation of a realignment. Denmark voted against the Maastricht treaty in early summer. The French were going to vote on the Maastricht treaty in mid-September; opinion polls showed that the vote was going to be close. With the future of European monetary union in question, investors began to believe that exchange rates could be realigned.

A question not addressed in this paper, and one for which there is no answer, is why investors did not expect a realignment earlier. The overvaluation did not suddenly occur in August 1992. It had been gradually occurring since the time of the previous realignment in January 1987. For some

reason, investors came to believe that governments would no longer realign exchange rates. While this belief may have been justified in 1991, it was no longer justified in September 1992. But why this belief was no longer justified in September, rather than July, is not known.

¹¹ For much of the period, the band for the lira was set at plus or minus 6 percent. In August, the bands for most other countries were widened to plus or minus 15 percent.

¹² The exchange rate has units of lira/DM.

¹³ See "Is Purchasing Power Parity a Useful Guide to the Dollar?" by Craig S. Hakkio, *Economic Review*, Third Quarter 1992, for further information about the different concepts of PPP and the use of PPP as a measure of the equilibrium value of the dollar.

¹⁴ For this calculation, normal volatility is measured by the absolute value of the 25th percentile plus the 75th percentile. Similarly, extreme volatility is measured by the absolute value of the 5th percentile plus the 95th percentile. Finally, the value of the trend in the PPP exchange rate is given by the coefficient on time in a regression of the log of the PPP exchange rate on a linear time trend over the period January 1987 to August 1992.

¹⁵ The projections come from the May 1993 *World Economic Outlook*, published by the International Monetary Fund.

REFERENCES

- Beckett, Sean, and Gordon H. Sellon, Jr. 1989. "Has Financial Market Volatility Increased?" Federal Reserve Bank of Kansas City *Economic Review*, June.
- Flood, Robert P., and Andrew K. Rose. 1992. "Fixing Exchange Rates: A Virtual Quest for Fundamentals," Institute for International Economics Studies, seminar paper no. 529, December.
- Hakkio, Craig S. 1992. "Is Purchasing Power Parity a Useful Guide to the Dollar?" Federal Reserve Bank of Kansas City *Economic Review*, Third Quarter.
- Iglewicz, Boris. 1983. "Robust Scale Estimators and Confidence Intervals for Location," in David C. Hoaglin, Frederick Mosteller, and John W. Tukey, eds., *Understanding Robust and Exploratory Data Analysis*, New York: John Wiley & Sons.

Manufacturing: A Silent Force in the Tenth District Economy

By Tim R. Smith

The economy of the Tenth Federal Reserve District is frequently identified by its rich supply of natural resources. While it is true that agriculture and mining are relatively more important to the district than to the nation, these sectors directly account for only a small share of the total value of goods and services produced in the district. The largest share of district output is owned by manufacturing. Yet the importance of manufacturing in district states is often understated, and the characteristics of the region's manufacturing sector are not widely known.

This article describes the dimensions of the district's manufacturing sector and considers the outlook for its key industries. The first section establishes the importance of manufacturing to the region's economy. The second section reviews the industrial composition of manufacturing output and employment in the district and identifies the district's three key industries: transportation equipment, industrial machinery, and food processing. The third section provides a more detailed description of the district's key industries and shows how important these indus-

tries are to individual district states. The final section explores how the outlook for the key industries will be shaped by such factors as domestic and foreign economic growth, regional trade developments, and defense spending cuts.

HOW IMPORTANT IS MANUFACTURING TO THE DISTRICT?

To determine the size of the manufacturing sector and understand its characteristics, analysts use two measures—output and employment. Considering these two measures together helps give a fuller picture of the manufacturing sector than using either measure alone. For example, productivity enhancements may lead to growth in output accompanied by shrinking employment. As a result, an industry may have only a small share of total manufacturing employment but a large share of output. The importance of such an industry to the manufacturing sector may therefore be understated if only employment is used to measure importance.

The district's manufacturing sector is often ignored because it accounts for a smaller share of economic activity in the region than in the nation.¹ Manufacturing accounts for 19.3 percent of the region's total output of goods and services as measured by gross state product

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(GSP), compared with 22.5 percent in the nation.² And manufacturing jobs account for 15.1 percent of the total number of nonagricultural jobs in the district, compared with 17.9 percent in the nation.

Still, manufacturing ranks as a major force in the district economy. Compared with the district's other economic sectors, manufacturing accounts for the largest share of output in the region and is a major source of employment (Chart 1). Manufacturing generates 19.3 percent of the region's total output of goods and services and 15.1 percent of its jobs. Moreover, many manufacturing jobs are among the highest paying jobs in the district (box).

The importance of manufacturing varies widely across the seven district states (Chart 2). Missouri is the district's most industrial state with 26.5 percent of its output and 19.0 percent of its employment in manufacturing. Kansas ranks a close second with about 22.1 percent of its output and 17.3 percent of its employment in manufacturing. Oklahoma, Colorado, and Nebraska depend somewhat less on manufacturing, while New Mexico and Wyoming rely very little on manufacturing.

THE DISTRICT'S MANUFACTURING PROFILE

Factory production is spread across many industries in the district, encompassing both durable and nondurable goods manufacturing. The shares of manufacturing output and jobs accounted for by the district's major industries are shown in Table 1. Examining these shares provides a profile of the district's manufacturing base and reveals the district's key industries.

Durable goods industries

Durables industries account for 62.7 percent

of district manufacturing, nearly the same share as in the nation. Durables industries also provide a large share of the region's factory jobs, accounting for 57.6 percent of the district's manufacturing employment, a somewhat larger share than in the nation.

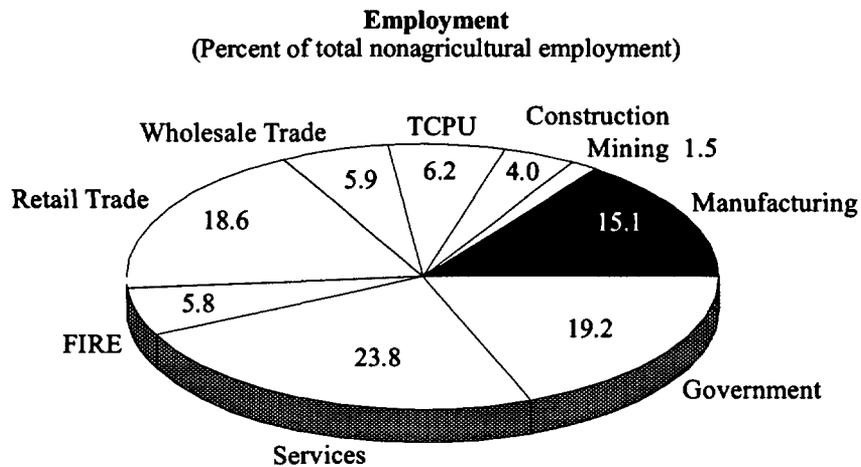
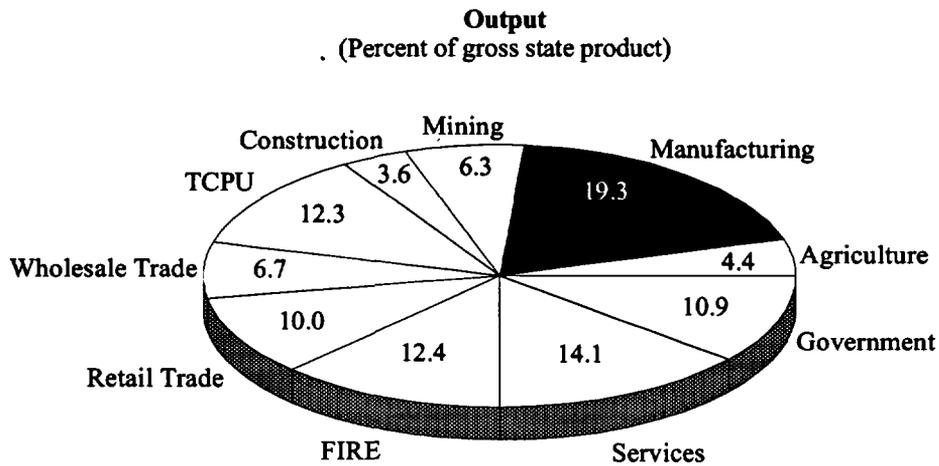
A handful of durable goods industries are primarily responsible for these large shares of district manufacturing output and employment. Transportation equipment and industrial machinery contribute the most to the district's manufacturing output, followed by electronic equipment and fabricated metals.

The largest durable goods industry in the district is transportation equipment. This industry, which includes automobile and aircraft manufacturing, generated over \$10 billion in real output and employed over 168,000 workers in 1989. The transportation equipment industry thus accounts for the largest share of the district's manufacturing activity—19.8 percent of its manufacturing output and 14.9 percent of its factory jobs. Compared with the nation, the district depends far more on transportation equipment for both factory jobs and output.

District manufacturing also depends heavily on industrial machinery. This industry, which produces goods ranging from grain drills to computer disk drives, turned out \$9.4 billion in real output and employed about 121,000 workers in 1989. Measured by its 17.7 percent share of the region's manufacturing output and its 10.8 percent share of factory jobs, the importance of the industrial machinery industry to the district's manufacturing sector is roughly the same as it is to the nation's.

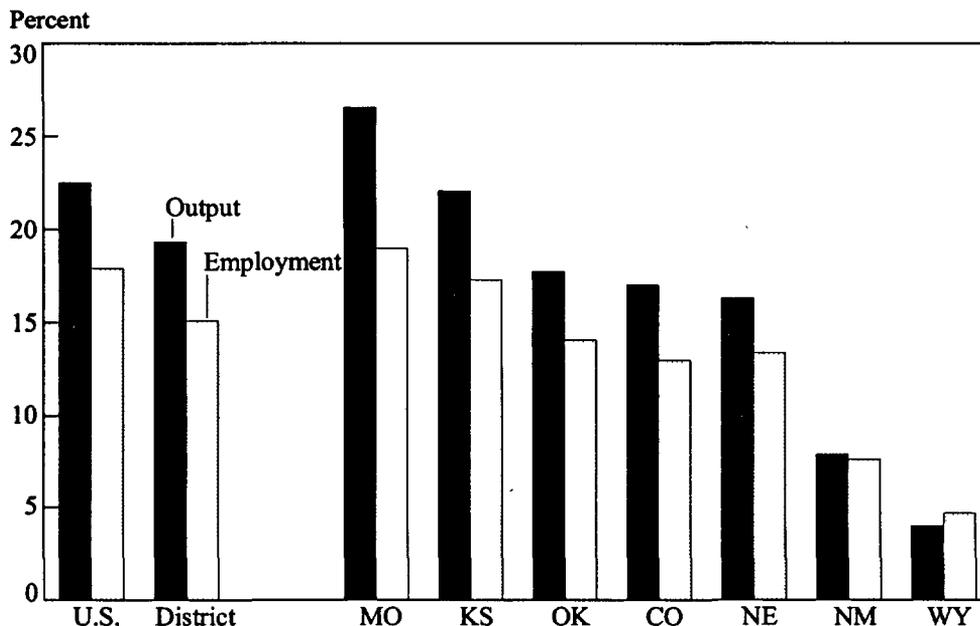
Two other durable goods industries are somewhat less important—fabricated metal products and electronic equipment. The fabricated metal industry, which makes products ranging from prefabricated metal buildings to pipe fittings for the energy and chemicals industries, accounts for about 5.8 percent of the district's manufacturing output and 8.0 percent of its factory jobs.

Chart 1
Economic Activity in the Tenth District



Source: U.S. Department of Labor and U.S. Department of Commerce.

Chart 2
Manufacturing Share of Output and Employment 1989



Source: U.S. Department of Commerce and U.S. Department of Labor.

The electronic equipment industry, which produces an assortment of goods from low-tech motors and generators to high-tech semiconductors, accounts for 8.1 percent of the district's manufacturing output and 7.3 percent of its factory jobs.

Nondurable goods industries

Nondurable goods production makes up a much smaller part of the district's manufacturing activity than durable goods production. Nondurable goods industries account for about 37 percent of both manufacturing output and employment in the district.

Table 1 shows that nondurables as a whole are overshadowed by durables in the district's mix of industrial output. Still, one nondurable goods industry—food processing—stands out as a key manufacturing industry in the district. Food and kindred products represent 11 percent of the district's manufacturing output and employment, the second largest share of jobs and the third largest share of output among the district's manufacturing industries. Moreover, the district's manufacturing sector depends much more heavily on food processing, both in terms of employment and output, than the nation's manufacturing sector.

Food processing is the only major nondurable goods industry in the district. But two other

Table 1

Manufacturing Employment and GSP Shares, 1989*(Percent of total manufacturing)*

<u>Industry</u>	<u>Employment</u>		<u>GSP</u>	
	<u>U.S.</u>	<u>District</u>	<u>U.S.</u>	<u>District</u>
<i>Durable Manufacturing</i>	55.8	57.6*	62.8	62.7
Lumber and wood products	3.7	2.4	2.8	1.5
Furniture and fixtures	2.7	1.7	1.3	1.0
Stone, clay, and glass products	2.7	1.7	1.3	1.0
Primary metal industries	3.8	2.5	4.0	2.2
Fabricated metal products	7.8	8.0	7.1	5.8
Industrial machinery and equipment	10.1	10.8	18.8	17.7
Electronic and other electronic equipment	8.3	7.3	9.8	8.1
Transportation equipment	9.5	14.9*	12.0	19.8
Instruments and related products	5.1	5.1	2.9	2.6
Miscellaneous manufacturing industries	2.0	1.6	1.7	1.1
<i>Nondurable Manufacturing</i>				
Food and kindred products	7.4	11.1	7.6	10.9
Tobacco products	.2	.0	.3	.0
Textile mill products	3.5	.3*	1.8	.1
Apparel and other textile products	5.5	3.7*	2.4	1.7
Paper and allied products	3.2	2.3	3.6	2.3
Printing and publishing	7.9	9.7	4.9	5.5
Chemicals and allied products	4.4	3.5	8.2	7.8
Petroleum and coal products	.6	.8*	4.8	4.7
Rubber and miscellaneous plastics products	4.6	4.7*	3.3	3.7
Leather and leather products	.6	1.3*	.3	.7

Source: U.S. Department of Commerce.

Note: Industry classifications are at the two-digit SIC level. Employment shares do not add to 100 because the Administrative and Auxillary category has been omitted from the table and because starred (*) numbers are estimates based on midpoints of ranges given for suppressed data.

nondurable goods industries—printing and publishing and chemicals and allied products—stand out among the other relatively small nondurable goods industries listed in Table 1. Printing and publishing's 9.7 percent share of factory jobs is significant, although its share of total manufacturing output is relatively small.³ By contrast, the chemical industry produces 7.8 percent of the district's manufacturing output, while providing a relatively small share of factory jobs.

THE DISTRICT'S KEY MANUFACTURING INDUSTRIES

A closer look at the district's three key manufacturing industries—transportation equipment, industrial machinery, and food processing—is needed to more fully understand how they shape the current and prospective performance of the region's manufacturing sector. While detailed output data are not available, the employment data in Table 2 show which manufacturing activities make up the key industries and how important these activities are to individual district states.⁴

Transportation equipment

The district's transportation equipment industry is dominated by three main categories of goods—motor vehicles, aircraft, and aerospace (Table 2). These three categories account for almost all of the transportation equipment jobs in the district. Moreover, the manufacturing sector in the district derives a larger share of its employment from each of these activities than in the nation.

Aircraft production provides the largest number of transportation equipment jobs in the district. The 88,000 workers engaged in fabricating aircraft and parts represent 7.8 per-

cent of the district's manufacturing jobs. The district, in fact, is a major aircraft producing region, accounting for 14.4 percent of the nation's aircraft jobs.

Aircraft production is a major source of jobs in two district states. In Kansas, aircraft-related manufacturing accounts for more than a fifth of the state's factory jobs. In Missouri, 8.5 percent of the manufacturing workforce is engaged in this activity. Missouri relies heavily on military aircraft. Kansas relies heavily on general aviation and commercial aircraft. Aircraft production also is a notable source of jobs in New Mexico and Oklahoma.

Motor vehicles is the second biggest segment of the district's transportation equipment industry.⁵ Six automobile or truck assembly plants across the district states employ 4.8 percent of the district's manufacturing workforce. Missouri is home to four of those plants and thus depends most heavily on the production of motor vehicles and related parts. This segment of the transportation equipment industry employs 6.8 percent of the state's factory workers. Oklahoma has only one auto plant and less than half as many workers as Missouri engaged in producing motor vehicles and parts, but its much smaller manufacturing sector is nearly as dependent on motor vehicle production. Production of motor vehicles and parts also accounts for modest shares of manufacturing jobs in Kansas, which has one automobile assembly plant, and in New Mexico, which has none.

Aerospace is the third notable segment of the district's transportation equipment industry. This segment, which includes guided missiles, space vehicles, and parts, accounts for only 2.2 percent of the district's manufacturing employment. But aerospace is quite important in Colorado where 9.3 percent of factory workers are engaged in some type of aerospace manufacturing. Missouri has a reputation as a home to aerospace because of its strength in related aircraft production. Yet aerospace directly pro-

Table 2

Key Manufacturing Industries in the Tenth District, 1989*(Percent of total manufacturing)*

Industry	U.S.	District	Colorado	Kansas	Missouri	Nebraska	New Mexico	Oklahoma	Wyoming
Transportation equipment	9.5	15.0*	9.3*	25.7	16.6	5.1	11.1	11.5	4.5*
Motor vehicles and equipment	3.8	4.8*	1.1	3.4	6.8	3.2	4.6*	6.5	.0
Aircraft and parts	3.1	7.8*	.7	21.1	8.5*	.4*	4.6*	4.1	.7*
Ship and boat building and repairing	1.0	.4*	.0	.3	.7	.1*	.0*	.3	.1*
Railroad equipment	.1	.1*	.0*	.2*	.1	.0*	.0	.1*	.0
Motorcycles, bicycles, and parts	.0	.0*	.0	.0*	.0*	.0	.0	.0*	.0
Guided missiles, space vehicles	1.1	2.2*	9.3*	.0	1.7*	.0	.5*	.0	.0
Miscellaneous transportation equipment	.3	.4*	.0	.7	.1	1.5	.2*	.5	2.1*
Industrial machinery and equipment	10.1	10.8	14.7	12.0	6.9	11.6	7.0	15.8	12.7
Engines and turbines	.5	.4*	.9*	.0*	.2*	.0	.0	1.1*	.0
Farm and garden machinery	.5	1.1*	.4*	2.6	.3	4.9	.2*	.2*	.1*
Construction and related machinery	1.1	1.7*	1.1	2.2	.7	1.0	1.0	5.4	4.1
Metalworking machinery	1.5	.7	.8	.7	1.0	.4	.3	.4	.0
Special industry machinery	.9	.7*	.5	1.1	.6	.5	.2*	.9	.1*
General industrial machinery	1.3	1.3*	.7	1.1	1.1	1.1	.5	2.9	.7*
Computer and office equipment	1.7	1.9*	8.4	.9*	.2*	.1*	2.0*	1.6	2.1*
Refrigeration and service machinery	1.0	1.2*	.4	1.5	1.6	.4*	.2*	1.3	2.1*
Industrial machinery, n.e.c.	1.7	1.9	1.8	2.2	1.3	3.3	2.7	2.1	3.9
Food and kindred products	7.4	11.1	11.0	13.3	8.5	24.8	8.6	7.8	9.9
Meat products	1.8	4.3	3.3	6.9	2.4	15.2	1.6	1.9	.3
Dairy products	.7	.9*	.8	.6	1.1	1.0	1.0*	.7	2.1*
Preserved fruits and vegetables	1.0	.7*	.4*	.9*	.6	1.8*	.4	.8	.1*
Grain mill products	.5	1.3*	.7	1.8	1.1	3.2	.5	.8	.7*
Bakery products	1.1	1.2*	1.4	1.4	.9	1.5	2.0*	1.3	.1*
Sugar and confectionery products	.5	.4*	.4*	.2*	.3	.4*	.4	.5*	4.5*
Fats and oils	.1	.2*	.1*	.3	.1	.5	.1	.2*	.0
Beverages	.8	1.6*	4.0*	.5	1.4	.6	1.0	1.3	2.1*
Misc. food and kindred products	.8	.7	.8	.9	.5	.8	1.4	.4	1.2

Note: Industry classifications are at the three-digit SIC level. Shares for individual product categories do not add up to industry shares due to estimates. (*) Estimates are based on midpoints of ranges given for suppressed data.

Source: U. S. Department of Commerce, "County Business Patterns."

vides only a small share of Missouri's manufacturing jobs.

Industrial machinery and equipment

The district's output of industrial machinery is spread across a larger number of products than its output of transportation equipment (Table 2). In fact, no single segment of the industry accounts for more than 2 percent of total manufacturing employment. Several product categories, however, are important in their home states. By this criterion, leading segments of the industrial machinery industry are computer equipment, construction machinery, and farm machinery. In addition, a category of miscellaneous industrial equipment accounts for significant shares of jobs in several district states. Employment in each of these industry segments is more concentrated in the district than in the nation.

Computer equipment is the largest segment of the district's industrial equipment industry. Makers of computer equipment employ about 22,000 workers, or 1.9 percent of manufacturing workers in the district. The lion's share of these jobs is in Colorado, where production of computers, storage devices, and other computer peripheral equipment in the Front Range cities accounts for 8.4 percent of the state's manufacturing employment.

Production of *construction machinery* is nearly as important to the district's manufacturing sector as the computer industry. Construction machinery includes equipment used in mining and in oil and gas drilling. Thus, the highest concentrations of employment in this category are in Oklahoma, Wyoming, and Kansas, the district's biggest producers of oil, natural gas, and coal. For example, makers of construction machinery in Oklahoma employ 5.4 percent of the state's manufacturing workforce.

Farm machinery is another notable segment of the industrial machinery industry. While the

region's manufacturing sector depends very little on farm and garden machinery overall, this category accounts for a much larger share of manufacturing employment in the district than in the nation. Moreover, the manufacturing sectors in Nebraska and Kansas rely on farm and garden machinery producers for significant shares of employment—4.9 percent in Nebraska and 2.6 percent in Kansas.

A category of *miscellaneous industrial machinery* accounts for the same number of manufacturing jobs as computer equipment, but is more evenly distributed across district states. All district states derive a significant share of their manufacturing jobs from this category, which includes such products as fluid power cylinders and pumps, and scales and balances not used in laboratories.

Food processing

The district's important food processing industry is dominated by a few product categories (Table 2). Meat products, grain mill products, bakery products, and beverages account for over three-fourths of the 125,000 food processing jobs in the district. In addition, the district's base of manufacturing jobs depends considerably more than the nation's on all of these categories except bakery products.

Meat products are the largest segment of the district's food processing industry. Consisting largely of meat packing plants, which process beef and pork, this segment employs nearly 50,000 workers across the district. At 4.3 percent of manufacturing employment, the share of meat-products jobs in the district is substantially greater than in the nation. Moreover, the manufacturing sectors in Nebraska and Kansas depend even more heavily on meat products. In Nebraska, meat-products plants employ about 15,000 workers, or 15.2 percent of manufacturing jobs. In Kansas, meat-products plants

employ roughly the same number of workers, but comprise a much smaller 6.9 percent share of the state's larger industrial job base.

The production of *beverages* is the second-largest segment of the district's food processing industry. Malt beverages, wines, distilled liquors, and bottled and canned soft drinks make up this segment, which accounts for 1.6 percent of district manufacturing jobs. Beverage production's strongest impact on manufacturing is in Colorado, where two large breweries help boost its share of manufacturing jobs to 4 percent. Across the other district states, employment in beverage production is generally smaller and varies widely.

Grain mill products are a more important part of manufacturing in the district than in the nation. This broad category includes flour, cereal breakfast foods, pet food, and prepared feeds, and accounts for 1.3 percent of the district's manufacturing jobs. These jobs are concentrated in Nebraska and Kansas, two of the nation's leading grain-producing states.

The *bakery products* segment of the food processing industry is a small, yet significant source of manufacturing jobs in most district states. Across the district, bakery products account for 1.2 percent of manufacturing jobs, about the same as in the nation. Five district states, however, depend more heavily than the nation on bakery products. Only Missouri and Wyoming have relatively insignificant shares of factory jobs based on bakery goods.

THE OUTLOOK FOR DISTRICT MANUFACTURING

The long-term outlook for manufacturing in the Tenth District depends largely on the performance of its key manufacturing industries. While smaller industries may prosper or decline in the years ahead, the district's large, well-established industries will be the major forces

influencing the manufacturing sector. The outlook for these key industries will be shaped in part by such factors as domestic and foreign economic growth, regional trade developments, and defense spending cuts.⁶

Transportation equipment

The outlook for the district's transportation equipment industry is mixed. Production of cars, trucks, and parts in the district may increase somewhat, while the aircraft industry faces formidable challenges in the years ahead.

Long-term prospects for the district's motor vehicles industry are good because its plants are among the most modern, technologically advanced facilities in the nation. Automobile and truck manufacturing may be boosted as the U.S. passenger car fleet ages and access to the rapidly expanding Mexican automobile market improves. New domestic models, such as Ford's new "world car" to be produced near Kansas City, will vie for new U.S. car sales with foreign manufacturers. And light trucks, assembled in Kansas City, are a rapidly growing segment of the motor vehicle market.

Prospects are less bright for the district's aircraft and aerospace manufacturers. The decline in defense spending is expected to continue throughout the decade, forcing makers of military aircraft and other aerospace hardware to continue to downsize their operations. Meanwhile, the financial problems of major airlines recently led to the announcement of massive job layoffs by district producers of commercial aircraft and parts over the next two years. Looking further ahead, improvement in the global economy later in the decade eventually should restore steady demand for airline and general aviation aircraft. For other aerospace manufacturers, the outlook depends on highly uncertain government funding for space exploration.

Industrial machinery and equipment

The outlook for the industrial machinery industry depends on both domestic and foreign economic growth. While district makers of computer storage devices are almost certain to benefit from the proliferation of computer technology during the 1990s, the prospects for other types of industrial equipment are less certain.

The vast array of computer equipment makes it difficult to assess the outlook for this category. These products range from microprocessors for personal computers to storage devices, such as hard disk drives and semiconductor memory chips. The market for computer equipment is expected to grow rapidly during the 1990s, but district manufacturers will continue to face stiff competition from abroad. One product category where U.S. manufacturers have held their ground against foreign competitors is storage devices. The prevalence of computer storage manufacturers in Colorado, therefore, bodes well for the district's computer equipment industry. District manufacturers of storage devices face a rapidly expanding domestic and international market as computer usage expands.

Prospects for manufacturers of *construction equipment* are likely to improve in the years ahead. Infrastructure building and replacement both here and abroad will help boost demand for construction machinery. Markets for mining equipment are expanding in developing countries. And while sales prospects for oil and gas field equipment will probably remain lackluster domestically, manufacturers can expect growth in overseas markets, especially in the oil-rich countries of the former Soviet Union.

The outlook for the district's *farm equipment* manufacturers is somewhat dim. Overcapacity is likely to remain a problem because most farm equipment is sold for replacement and growth in new sales is unlikely to expand rapidly. Exports may improve as modern farming techniques take hold in developing countries,

but domestic manufacturers must continue to compete with aggressive foreign manufacturers both overseas and in the U.S. market.

Food processing

Food processing in district states is likely to trend higher in the years ahead, with prospects for growth depending largely on product development, new technology, and exports to growing markets such as Mexico. State and local policymakers have made food processing—especially meat, grain milling, and bakery products—a target of their economic development efforts. However, distance from markets will remain an obstacle to more rapid expansion of the region's food processing activities.⁷

The important meat products segment of the district's food processing industry will likely prosper in the 1990s, even as U.S. consumers continue to substitute poultry for red meat in their diets. U.S. beef processing will continue to concentrate in the district, where the industry's most efficient plants turn out branded and other value-added products. Moreover, the region stands to gain from a more competitive pork industry, where a continuing trend toward common ownership of hog farms and processing plants will lead to lower costs and growing market share.⁸

Growth in the *beverage* segment of the food processing industry will probably be slow in the 1990s. Growth in the production of alcoholic beverages is likely to slow as health concerns curb domestic consumption. Stiff competition from foreign producers and potential increases in state and federal excise taxes could further dim the outlook for these beverages.

Grain mill products and *bakery products* are likely to remain a stable segment of the district's food processing industry. Demand for grain-based food products will likely improve in the 1990s as the USDA's new Food Guide Pyramid

encourages consumers to adjust their diets. This trend will boost grain mills in Kansas and Nebraska, even though they are distant from major markets for their products. Substantial growth in grain processing will depend to some extent on new transportation methods that will allow products to be shipped at lower cost. Meanwhile, bakeries across the district will continue to adjust their product mix to conform to consumers' healthier diets. Bakeries may also benefit from increased exports to the newly industrialized countries of east Asia, where wheat-based foods are becoming a more popular item in consumers' diets.

CONCLUSIONS

Despite its reputation for natural resource industries, the Tenth District's manufacturing sector is a major source of economic activity in the region. Manufacturing accounts for the largest share of the district's output, a much larger share than agriculture and mining combined. Moreover, the district's factories are important sources of jobs.

The manufacturing sector in the district is a collection of diverse industries, but three key industries dominate. Transportation equipment, industrial machinery, and food processing account for large shares of district output and employment. Within each of the key industries,

certain manufacturing activities stand out as important influences on the overall character of the key industries and the shape of the manufacturing sectors of individual states. For example, aircraft and automobiles are the most important components of the transportation equipment industry in Missouri, and meat products are the most important components of the food processing industry in Nebraska and Kansas.

The outlook for the district's manufacturing sector depends largely on the prospects for its key industries. The district's transportation equipment industry may be boosted by increased production of motor vehicles, but those gains are likely to be offset by a defense-related slowdown in aircraft and aerospace production. If domestic and foreign economic growth picks up, demand for the district's output of industrial equipment is also likely to pick up. Even under a less optimistic assumption about economic growth, the district's computer equipment manufacturers should benefit from the spread of computer technology expected to occur throughout the decade. The pace of growth in the food processing industry is likely to trend upward but will be limited by the pace of product development, technological change, and export growth. Overall, the outlook for the district's manufacturing sector looks promising as the slowdown in defense-related transportation equipment is likely to be balanced by gains in other key industries.

BOX

HIGH PAYING JOBS IN MANUFACTURING?

State and local policymakers often make manufacturing industries the target of their economic development efforts because these industries generally provide high paying jobs. Earnings across different manufacturing industries, however, vary considerably. Table A-1 shows the average hourly earnings in various manufacturing industries and in other major sectors of the U.S. economy. While manufacturing jobs pay more, on average, than retail, finance, and service jobs, they pay considerably less than industries such as mining and construction.

Within the manufacturing sector, earnings vary widely from industry to industry (Table A-1). Hourly earnings in durable goods industries average higher than in nondurable goods industries. The highest paying durable goods industry is transportation equipment, one of the Tenth District's key industries. Transportation equipment workers earn an average \$15.16 per hour. In contrast, workers in the furniture and fixtures industry earn only \$9.00 per hour.

Earnings among nondurable goods industries vary even more widely than among durable goods industries. At \$17.87 per hour, workers in the petroleum and coal products industry are the highest paid among workers in nondurable goods industries. The lowest paying manufacturing jobs are in the nondurable category of apparel and other textile products. Earnings in the district's important food processing industry are only slightly below the average for nondurable goods industries but are well below the average for all manufacturing industries.

Table A-1

**1992 Average Hourly Earnings
United States**

Industry	Dollars per hour
Total private	10.59
Mining	14.51
Construction	14.11
Manufacturing	11.45
Durable manufacturing	12.02
Lumber and wood products	9.43
Furniture and fixtures	9.00
Stone, clay, and glass products	11.64
Primary metal industries	13.67
Fabricated metal products	11.41
Industrial machinery and equipment	12.43
Electronic and other electronic equipment	11.01
Transportation equipment	15.16
Instruments and related product	11.93
Miscellaneous manufacturing industries	9.14
Nondurable manufacturing	10.71
Food and kindred products	10.19
Tobacco products	16.69
Textile mill products	8.60
Apparel and other textile products	6.95
Paper and allied products	13.09
Printing and publishing	11.75
Chemicals and allied products	14.45
Petroleum and coal products	17.87
Rubber and miscellaneous plastics products	10.37
Leather and leather products	7.40
Transportation and public utilities	13.49
Wholesale trade	11.40
Retail trade	7.14
Finance insurance and real estate	10.82
Services	10.54

Source: U.S. Department of Labor.

ENDNOTES

1 The Tenth District comprises Colorado, Kansas, Nebraska, Oklahoma, Wyoming, western Missouri, and northern New Mexico. Because most output and employment data used in this article are available only at the state level, this article looks at the region comprising the seven district states (often referred to as the district in this article) instead of the slightly smaller region defined by the Tenth District boundaries.

2 Estimates of gross state product (GSP) are published annually by the Commerce Department's Bureau of Economic Analysis. The GSP data are comprehensive measures of aggregate and industry output. For a detailed discussion of the benefits and uses of GSP data, see Miller 1989.

The most recent GSP data available are for 1989. Also, the most recent detailed employment data used elsewhere in this article are for 1989. Although aggregate employment data are available for more recent years, for comparability all data used in the article are for 1989.

3 See Miller 1993 for a detailed discussion of the district's printing and publishing industry.

4 This section uses three-digit employment data to

describe the reliance of district states on various segments of key industries. To avoid disclosure of data for individual firms, the County Business Patterns source suppresses employment levels for some industries in some states by giving only ranges. Where indicated, the shares in Table 2 have been estimated using the midpoints of these ranges. As a result, the profile of the district's key industries presented in this article should be viewed as an approximation based on limited data.

5 See Miller 1990 for a detailed discussion of the district's automobile industry.

6 The discussion of the long-term outlook for the district's key manufacturing industries is based largely on the U.S. Department of Commerce outlook for these industries (U.S. Department of Commerce).

7 For a complete discussion of the role of food processing in economic development of farm states, see Barkema, Drabenstott, and Stanley.

8 See Barkema for a discussion of the changes underway in the U.S. pork industry.

REFERENCES

- Barkema, Alan D. 1993. "The Changing U.S. Pork Industry: A Dilemma for Public Policy," Federal Reserve Bank of Kansas City, *Economic Review*, Second Quarter.
- _____, Mark Drabenstott, and Julie Stanley. 1990. "Processing Food in Farm States: An Economic Development Strategy for the 1990s," Federal Reserve Bank of Kansas City, *Economic Review*, July/August.
- Miller, Glenn H., Jr. 1989. "Changes in Tenth District Industrial Structure, 1963-86: Evidence from New State Data," Federal Reserve Bank of Kansas City, *Economic Review*, November.
- _____. 1990. "The Future for Automobile Production in Tenth District States," Federal Reserve Bank of Kansas City, *Regional Economic Digest*, First Quarter.
- _____. 1993. "Printing and Publishing in the Tenth District," Federal Reserve Bank of Kansas City, *Regional Economic Digest*, First Quarter.
- U.S. Department of Commerce. 1993. *U.S. Industrial Outlook 1993*.

Rural Banks and Their Communities: A Matter of Survival

By Deborah M. Markley and Ron Shaffer

As rural community banks chart their futures, they are challenged by economic and financial change. Today's rural communities are no longer isolated from global and national economic trends. Competition from abroad has hurt profit margins for rural businesses. Technical innovation, while boosting productivity, has softened the demand for rural labor. Many of the most educated rural workers have migrated to more urbanized areas in search of higher returns on their educational investment. And, many rural businesses are being drawn to urban centers where they can be closer to suppliers and customers.

Just as the economic landscape is changing, so is the financial environment in which rural community bankers must operate. Deregulation and new technology have brought larger financial institutions into the rural marketplace. And, as the regulatory burden on banks continues to change, rural bankers are finding it harder to compete on their home turf.

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This article explores the challenges that face rural communities and their community banks. The article also discusses strategies bankers might use to help themselves in the changing environment. The article concludes that to survive and prosper, rural community bankers need to play a more active role in fostering economic growth in their communities. Fundamentally, the success of rural community bankers is closely tied to the economic health of their rural communities.

CHANGING RURAL AND FINANCIAL ENVIRONMENTS

Just as the national economy is being shaped by changes in the global marketplace, the economies of rural communities are being shaped by national and global economic trends. As a result, a rural location no longer provides a buffer against the ebb and flow of distant markets. Indeed, many rural communities find themselves disadvantaged by recent economic and financial change. Bankers in rural communities are also finding themselves buffeted by change. Deregulation and the changing regulatory burden continue to redefine the competitive environment for banks, while advances in technology, products, and services are creating

new opportunities and new challenges.

Globalization of the U.S. economy

Advances in technology, travel, communications, and financial markets have created a global marketplace for most goods and services—a marketplace that offers both incentives and challenges to rural economies. Low-wage, low-skill rural manufacturers face stiffer competition from developing or emerging economies in the rest of the world. As rural communities adapt to the competitive pressure, those with a diversified economic base are likely to prosper. In contrast, the loss of a plant to an offshore location, for example, could cripple a rural community that lacks other employment opportunities.

Trade agreements may have a disproportionate impact on rural communities. While the effects of the North American Free Trade Agreement (NAFTA) cannot yet be adequately measured, some researchers suggest that the plants most likely to move as a result of NAFTA are concentrated in rural communities (Conroy and Glasmeier). At the same time, NAFTA may give a boost to communities in the heartland that depend on agricultural production.

Industrial restructuring within the United States

Several key changes in the world's industrial sector are reshaping the way that rural businesses must operate to remain competitive. As the industrial structure of rural communities evolves, rural community bankers must develop new tools to meet increased credit needs. And bankers must make difficult decisions about whether to lend to nontraditional businesses.

One key change occurring in the national

economy is the shift away from goods-producing industries toward service-producing industries. In rural areas, goods producers and low-skill service sector activities still tend to predominate (Deavers; McGranahan and Ghelfi). Attracting higher wage, higher skill producer services to rural communities will depend on a community's location, its quality of educational and job training resources, and its infrastructure investments, particularly in telecommunications.

To remain competitive, U.S. firms are being forced to rethink almost every aspect of the manufacturing process. Flexible manufacturing has become the objective for many firms. This change entails reorganizing the production process so that the firm can respond quickly to changes in final demand. The emphasis is on smaller, more adaptable production facilities, lower levels of inventory, higher skill levels for workers, and the latest technological innovations.

With the trend toward smaller and more flexible operations, outsourcing has become a more dominant practice. The emphasis now is on external economies of scale, that is, on developing relationships with other enterprises to permit flexibility in manufacturing and to take advantage of specialized production facilities in other firms. This change suggests that proximity to other potential suppliers is becoming increasingly important for many manufacturing firms.

Changes have also occurred in the traditional basic industries of rural America—agriculture, forestry, and mining. Consolidation in agriculture has resulted in fewer farms, fewer suppliers, and fewer processors of farm products. The search for increased productivity in forestry and mining has led to technological innovation and less demand for labor. Moreover, in all three of these traditional industries, expanded environmental regulations have made it difficult to match concerns for productivity and profitability with the need to protect the

environment.

Another key feature of industrial restructuring is the rising importance of the small business sector. Small businesses are producing more jobs and greater economic diversity, particularly in rural economies. Recognizing the key role of smaller enterprises has helped refocus economic development activities. Emphasis has shifted away from attracting large manufacturing firms toward assisting the creation and expansion of home-grown businesses.

Increased importance of agglomeration economies

In an era of globalization and industrial restructuring, agglomeration economies take on heightened importance. Agglomeration economies refer to a concentration of related business activities in one place. Concentration allows companies to benefit from networking and pools of resources, such as labor. Agglomeration economies may be particularly important for high-skilled producer-service industries. The lack of agglomeration economies may limit the ability of rural communities to attract these service firms, continuing their dependence on low-wage, low-skilled manufacturing and service sector jobs.

In the 1970s, industry tended to decentralize from cities to more rural areas. More recently, the value of agglomeration economies has increased, shifting the competitive advantage back to urban areas for some types of enterprises. Whether a rural community can cope with such a trend may depend on its particular characteristics. For example, a rural community may be better able to attract new firms if its industrial base is diversified. One research study found that rural areas with highly skilled labor, amenities, and proximity to urban areas will be able to compete for modernizing firms, while rural communities without such a base are at a

competitive disadvantage (Barkley and Hinschberger).

The challenge for community bankers will be to help create mechanisms that enable rural businesses, nonbank and bank alike, to capture the benefits of agglomeration. In addition, recognizing the importance of agglomeration economies to particular local industries may help community bankers assess the potential viability of a business and the economic development consequences of such lending.

Changes in the financial services industry

As rural economies undergo fundamental change, so does the financial services landscape. Several factors have dramatically altered the face of banking over the past ten years.

Banking deregulation has prompted much of the evolution in financial services. Mergers have decreased the number of lending institutions while increasing their size. Statewide branching and interstate banking have redefined the competitive environment, particularly for isolated rural community bankers.

Community bankers must now compete for increasingly sophisticated customers with other local and nonlocal lenders. To stay competitive, community bankers must consider offering the same mix of services as their larger competitors—for example, credit cards and leasing. And they must focus on meeting credit needs in a particular market niche.

Advances in technology, products, and services have created new opportunities and sources of competition for rural community bankers. Increasingly, rural residents have access to the same type of financial innovations available to urban residents. Credit card customers are solicited by mail, and money market funds can be established and accessed by phone. Close proximity to customers no longer guarantees rural community banks their traditional deposit base.

As a result, local deposits may prove insufficient, and gaining access to external funds may soon become critical to rural community banks.

As local bankers attempt to plot strategy for the next decade, questions arise about expanded regulation, particularly as it applies to banks reinvesting in the community. Because most rural community banks lend almost exclusively in the local community, they are less likely than urban banks to face official challenges through the federal Community Reinvestment Act. But the reporting requirements in the act still increase costs for community banks. Moreover, some states have begun to review and enact new legislation on community reinvestment and interstate banking—laws that will apply to rural community banks operating within their borders.

The increased reporting requirements resulting from the changing regulatory burden could require local bank staff to spend more time on paperwork and less time on assisting potential borrowers. For small community banks with limited specialized staff, the added costs of meeting regulatory requirements may make it even more difficult to compete with large regional and money center institutions that open branches in rural communities.

RESPONDING TO CHANGE: ROLE FOR COMMUNITY BANKERS

Rural community banks are in a unique position to respond to the economic and financial changes sweeping rural America and the financial services industry. No one knows the local rural economy better than the community banker. And, while deregulation has raised the specter of large banks entering rural markets, the reality is that most communities remain dependent on the community bank to finance their futures. Thus, rural community bankers and

businesses must work together to respond to a rapidly changing economic and financial environment. In many cases, the future of both the bank and the community is on the line.

Community bankers can use several strategies to improve growth prospects for themselves and their communities.¹ Rural community banks should, of course, continue their traditional role of lending to local businesses. But equally important, community bankers have special knowledge and skills that can be deployed more broadly to foster economic development. Banks can help find the capital—both debt and equity capital—that businesses need to modernize and remain competitive. Banks can also offer financial expertise to rural entrepreneurs who need help in starting small businesses. They can serve as an information link about credit and other programs available to encourage business development and economic growth. And, rural community bankers can provide leadership to help the community develop a vision for adapting to economic change.

Accessing new sources of capital

To meet the challenges ahead, rural communities and businesses must have access to capital. Rural communities need capital to support new business startup and expansion, and rural businesses need capital to modernize and remain competitive. While community bankers are the primary source of debt capital for local businesses, the ability of banks to meet new demands for capital may be limited for two reasons. One, traditional financial institutions continue to be constrained from providing equity capital. For startup enterprises and expanding industries, future capital needs may be for equity-like capital rather than debt. Two, regulated community bankers must always be sensitive to the risk involved in lending activities. As such, lending to support community economic growth may

involve loans with limited or nontraditional collateral, loans to new enterprises with limited business experience, or loans to existing firms that want to expand into new markets. This type of lending requires increased innovation by community bankers.

To meet the capital needs of local entrepreneurs, community bankers can form partnerships with other private and public entities. These partnerships can be forged with public sector institutions, such as state development finance programs, with private sector community development institutions, or with alternative financial institutions. These partnerships are necessary to pool limited resources and leverage funds to support economic growth. These relationships are also helpful in allowing banks to become more involved in financing local economic activities without incurring unacceptable levels of risk. Not only are funds pooled through these partnerships, but risk is shared as well.

Two prime examples show how partnerships can help banks provide access to new sources of debt capital to support community economic activities. Community bankers in Michigan are able to make moderately risky business loans through their participation in the Capital Access Program, an insurance pool funded by state programs, private lenders, and borrowers. Most of these bankers are making business loans that would not be made without the program. And in Illinois, community bankers can make loans to small businesses, including women-owned and minority-owned businesses, in partnership with a state lending program. Banks can also make loans to individuals, with state funds serving as a second mortgage for the borrower (Markley and McKee).

Access to equity-like capital is considerably more limited in rural communities. Community bankers, however, can develop partnerships with alternative financial institutions. For example, banks in North Carolina purchased stock to capitalize an alternative financial institution that

provides debt and equity-like financing to businesses.

Assisting new business formation

Community bankers have more than capital to offer a potential business borrower. The banker's financial expertise is an additional important resource to rural entrepreneurs since access to business assistance services in rural communities can be difficult. Yet, several surveys suggest that many smaller firms feel they are not being served by their local bank or are unaware of services offered (Steinbrink). Community bankers must be more focused on reaching out to the small business community and playing an active role in local economic development.

Small businesses represent a continuing experiment by individuals who think they have an idea the market will support. Often these ideas require serious revisions. While experienced business managers can anticipate potential financial pitfalls, new business managers or owners may not. The community bank can play a crucial role during the business formation process, therefore, by increasing access to management counseling and support.

Banks could pursue several options for providing this support. The bank could support business management education programs for new and current small business customers. Community banks can create separate affiliations, such as community development corporations and small business advisory committees, that enable the bank to actively support small business development while maintaining an "arm's length" relationship with potential borrowers.

Many private, nonprofit community development corporations also provide business assistance. Local bankers can work with these technical assistance providers, outlining the bank's lending criteria, discussing necessary financial

documentation, and referring potential borrowers to other professional advisers, such as marketing consultants. Having a local economic development organization share in these costs reduces the costs of making small business loans.

Providing community leadership

New economic realities are signaling that the days of passive community banking are over. Bankers must aggressively identify entrepreneurs, encourage and prod community leadership in the pursuit of economic growth, and support economic development activities (Taft, Pulver, and Staniforth). In other words, community bankers need to provide leadership to the community and help develop a vision for how the community can adapt to economic change.

Successful communities develop comprehensive strategies for guiding economic changes. Community bankers have an important role to play in formulating and implementing these strategies. Bankers can engage community groups in determining how the bank can respond to emerging community needs. Bankers can lend needed financial expertise in support of economic development endeavors and make prudent lending decisions in support of community economic change. Communities need to identify the internal investment opportunities that are necessary for successfully adapting to economic change. In turn, community bankers must weigh the potential returns from making short-term investments outside the community against the need for supporting the long-term investments identified as being necessary for growth within the community.

Community bankers in Wisconsin are active participants in the University of Wisconsin-Extension's Community Economic Analysis program, which seeks to help communities build economic development strategies. Their participation involves contributing to the discussion of

major issues facing the community, building strategies to address priority issues, and supporting implementation efforts that often require bank personnel and expertise rather than bank financing.

One particularly important way rural banks can demonstrate leadership in their communities is by relaying information. In most cases, the local bank is the first stop for a business needing capital for startup, expansion, or modernization. Bankers can serve as an information link for these enterprises by maintaining information about state development finance programs, equity investors in the state or region, technical assistance providers, university or state industry modernization programs, and other relevant business assistance providers.

In the early stages of business development, the banker may be able to assist a business most by providing information rather than capital. For example, bankers in Texas actively refer small businesses to business assistance resources available through the Business School at Pan American University. The small businesses can receive assistance in preparing business plans, evaluating financing needs, and preparing the financial documents necessary to apply for a bank loan.

CONCLUSION

The pace of change in the national and global economies demands that rural communities and rural community bankers find new ways of doing business in order to survive. Unfortunately, there is no single model for banks and communities to follow.

This article explores several strategies rural community bankers might embrace to become more active participants in their communities' economic development. Each community banker can customize these strategies to the unique set of circumstances under which the

bank operates. The strategies provide a way to meet both fiduciary and community economic development objectives by accessing new

sources of capital for rural businesses, assisting new business formation, and providing leadership to the community.

ENDNOTES

¹ Several publications review in greater depth potential strategies for community bankers and development finance

programs operated at the state or community level (Administrator; Hogwood and Shabecoff; Markley and McKee).

REFERENCES

- Administrator of National Banks. 1993. *Building Healthy Communities Through Bank Small Business Financing*. Washington, D.C.: Comptroller of the Currency.
- Armington, Catherine, and Marjorie Olde. 1982. "Sources of Job Growth: A New Look at the Small Business Role," *Economic Development Quarterly*, Fall, pp. 3-7.
- Barkley, David L., and Sylvain Hirschberger. 1992. Industrial Restructuring: Implications for Nonmetropolitan Areas," *Economic Development Quarterly*, February, pp. 64-79.
- Birch, David L. 1979. *The Job Generation Process*. Cambridge, Mass.: MIT Program on Neighborhood and Regional Change.
- Conroy, Michael E., and Amy K. Glasmeier. 1992. "Winners and Losers on the NAFTA 'Fast Track,'" *Administration Quarterly*, Autumn, pp. 1-20.
- Deavers, Kenneth L. 1991. "1980s: A Decade of Broad Rural Stress," *Rural Development Perspectives*, no. 3, pp. 2-5.
- Henry, Mark, Mark Drabenstott, and Lynn Gibson. 1986. "A Changing Rural America," Kansas City Federal Reserve Bank, *Economic Review*, July/August.
- Hogwood, Andrew W. Jr., and Alice Shabecoff. 1992. *Lending for Community Economic Development: A Guide for Small Town Rural Lenders*. Washington: The Community Information Exchange.
- Markley, Deborah, and Katherine McKee. 1992. *Business Finance as a Tool for Development*. Washington: The Aspen Institute.
- McGranahan, David A., and Linda M. Ghelfi. 1991. "The Education Crisis and Rural Stagnation in the 1980s" in *Education and Rural Economic Development: Strategies for the 1990's*. Washington: ARED-ERS-USDA, September, pp. 40-92.
- Neuendorf, David, and Ron Shaffer. 1991. "Job Generation in Wisconsin: Implications for Marginal Regions" in Marcel Leroy, ed., *Regional Development Around the North Atlantic Rim, Volume 2*. Swansea, Great Britain: University College, pp. 515-30.
- Otto, Dan, and Steve C. Deller, eds. 1992. *Alternative Perspectives on Development Prospects for Rural Areas*. Ames, Iowa: North Central Regional Center for Rural Development.
- Pulver, Glen C., and Glenn R. Rogers. 1986. "Changes in Income Sources in Rural America," *American Journal of Agricultural Economics*, December, pp. 1181-87.
- _____, and David Dodson. 1992. *Designing Development Strategies in Small Towns*. Washington: The Aspen Institute.
- Rosenfeld, Stuart, Philip Shapira, and Trent Williams. 1992. *Smart Firms in Small Towns*. Washington: The Aspen Institute.
- Shaffer, Ron, and others. 1989. *Rural Nonfarm Businesses' Access to Debt and Equity Capital*, University of Wisconsin-Madison, December.
- Steinbrink, Stephen R. 1992. "Keynote Address to Building Healthy Communities Through Small Business Financing" in *Building Healthy Communities Through Bank Small Business Financing*. Washington: Administrator of National Banks, Office of the Comptroller of the Currency, December.
- Summers, Gene F., Leonard E. Bloomquist, Thomas A. Hirschl, and Ron E. Shaffer, eds. 1988. *Community Economic Vitality: Major Trends and Selected Issues*. Ames, Iowa: North Central Regional Center for Regional Development.
- Taft, Stephen J., Glen C. Pulver, and Sydney D. Staniforth. 1984. *Are Small Community Banks Prepared to Make Complex Loans?* University of Wisconsin-Madison, April.

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