# R E V I E W

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THE FEDERAL RESERVE BANK of ST. LOUIS

**Federal Reserve Bank of St. Louis**
***Review***
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# In This Issue . . .

The U.S. agricultural economy endured one of the worst droughts in decades during 1988. In the first article in this *Review*, "The 1988 Drought: Its Impact on District Agriculture," Jeffrey D. Karrenbrock examines how the drought affected agriculture in both the U.S. and the Eighth Federal Reserve District.

Crop producers experienced sharp drops in yields, while livestock producers faced higher feed costs. Karrenbrock points out that, despite lower net farm income, both farmers and agricultural lending institutions were able to improve their financial positions on average during 1988. Factors helping to limit the financial damage to some farmers included higher grain prices, strong agricultural exports and continued government support. On net, the effect of the drought was to slow but not stop the agricultural recovery that started in 1984.

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In the second article in this *Review*, "Eighth District Banks: Back in the Black," Lynn M. Barry reports that, for banks in both the nation and the Eighth District, 1988 was a year of recovery from the lackluster earnings reported in 1987. Aggregate bank profit ratios in the United States and the Eighth District improved last year as many banks began to rebound from the negative earnings caused by increased loan loss provisions tied to foreign loans. Barry also reports that profits improved in 1988 across virtually every asset-size category. Propelled by stronger earnings and improved asset quality, bank performance at the largest District banks improved significantly in 1988. Further gains were made in 1988 by the smaller District banks, which posted higher earnings as loan loss provisions and loan charge-offs declined.

Barry expects continued improvement in the coming quarters. Asset quality problems, which have plagued some District banks, appear to be under control; thus, future loan problems should have a less severe effect on earnings.

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In this issue's third article, "The Eighth District Business Economy in 1988: Still Expanding, But More Slowly," Thomas B. Mandelbaum reports that the region's economy continued to expand in 1988, its sixth successive year of growth. Moreover, District income and employment reached record highs, while the regional unemployment rate declined to its lowest level of the decade.

Unlike the previous five years, however, in which regional employment growth approximated the national pace, the District's job growth was substantially slower than the national average last year. The author discusses the factors that caused this sluggishness and describes other significant developments in the Eighth District's business economy during

1988. In addition, suggests that a further slowing of the regional economy is likely in 1989.

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Evidence indicates that Treasury bill futures rates are better predictors of future Treasury bill rates than the forward rates implicit in observed spot rates. Moreover, evidence also shows that survey forecasts often are more accurate than the implicit forward rates. In the fourth article in this *Review*, "Comparing Futures and Survey Forecasts of Near-Term Treasury Bill Rates," R. W. Hafer and Scott E. Hein attempt to answer the question, "Does the Treasury bill futures rate provide a better forecast of future short-term interest rates than do survey forecasts?"

The authors use survey forecasts of the three-month Treasury bill rate gathered from the *Bond and Money Market Letter*. This survey polls about 40 to 50 financial market analysts asking for point forecasts for a variety of interest rates three and six months hence. These predictions are compared with the futures market forecasts, taken from futures contracts traded on the International Monetary Market of the Chicago Mercantile Exchange, of interest rates three months ahead and six months ahead.

Based on forecasts from March 1977 through October 1987, Hafer and Hein find that, in general, the futures market forecasts are as good or better than the survey forecasts. They also test the proposition that the futures market efficiently utilizes all publicly available information by testing whether information in the survey forecast could improve upon the futures market forecast. Based on these tests, there is little evidence to suggest that the survey forecast or its revision improves upon the futures rate prediction. Thus, in contrast to previous research, the evidence in this article indicates that the futures rate provides a useful measure of the market's expectation of future interest rates.

* * *

Why do we regulate the activities of banks? The reason for much of the current banking regulation in the United States rests on the notion that the banking system is vulnerable to runs that would disrupt the operation of the banking system and other forms of economic activity. Regulation, so the theory goes, is necessary to prevent such runs. In the final article in this *Review*, "Bank Runs and Private Remedies," Gerald P. Dwyer, Jr. and R. Alton Gilbert examine the history of banking in the United States prior to the formation of the Federal Reserve to determine whether the banking system, in fact, was vulnerable to such runs. While they find some episodes of runs on the banking system, they also find that there were many years with no evidence of runs at all; moreover, some periods without runs included recession years. The authors find only limited evidence that is consistent with the view that the runs had adverse effects on economic activity.

The reasons for the limited effects of the runs can be found in the private remedies developed by banks. Through their clearinghouses, banks created clearinghouse loan certificates, which had an impact on the operation of the banking system much like increases in the monetary base. In periods when banks could not meet the demand for currency by depositors through the creation of clearinghouse loan certificates, they acted jointly to restrict currency payments to depositors. Restricting currency payments was also a form of private remedy for runs, since it enabled banks to limit the declines in their assets and deposit liabilities.

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# The 1988 Drought: Its Impact on District Agriculture

NINETEEN eighty-eight will be remembered as the year of the drought. Crop producers experienced sharp drops in yields, while livestock producers faced higher feed costs. The drought slowed, but did not stop the agricultural recovery that started in 1984. Despite the drought, farmers and agricultural lending institutions improved their financial positions during 1988.

This article examines these and many other effects of the drought on the agricultural economy. The article first provides a brief overview of how the U.S. agricultural economy performed during 1988. The agricultural economy of states in the Eighth Federal Reserve District is then compared to U.S. agricultural performance.[1]

## U.S. AGRICULTURE AND THE DROUGHT

By mid-August, the drought had affected all of the United States, except for the naturally dry Southwest and the East coast, with substantial effects on agricultural production and distribution. Low rainfall combined with high temperatures caused corn and soybean yields across the United States to fall by 29 percent and 21 percent, respectively. The decreased supplies sent commodity prices upward throughout the summer which helped to limit the drought's impact on some farmers. In addition to reduced supplies, additional problems arose in moving grain products from elevators to processors and export markets. Low water levels on major waterways slowed, and sometimes completely stopped, barge movement of grain.

### *Farm Finances*

After four years of increases, net farm income is currently forecast to have shrunk to $40 billion in 1988.[2] Although this figure is down 14 percent from 1987, it is still three times larger than net farm income in 1983. The income statement of the farm sector since 1981 is shown in table 1. The 1988 forecast figures indicate that, while total farm receipts rose more than 9 percent in 1988, farm expenses climbed about 7 percent. Feed, fertilizer and machinery led the list of items increasing in cost. These increasing expenditures plus falling government payments and dwindling grain inventories resulted in lower net farm income.

[1]The Eighth Federal Reserve District includes all of Arkansas and parts of Illinois, Indiana, Kentucky, Mississippi, Missouri and Tennessee. The majority of this report, however, focuses only on the entire states of Arkansas, Kentucky, Missouri and Tennessee.

[2]U.S. Department of Agriculture, *Agricultural Outlook* (April 1989), p. 54, table 32.

Table 1

**Farm Sector Income Statement (billions of dollars)**

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988[1] |
|---|---|---|---|---|---|---|---|---|
| Farm receipts | $144.1 | $147.1 | $141.1 | $146.8 | $149.1 | $140.2 | $143.7 | $157.0 |
| Government payments | 1.9 | 3.5 | 9.3 | 8.4 | 7.7 | 11.8 | 16.8 | 14.0 |
| Total farm income | 166.4 | 163.5 | 153.1 | 174.9 | 166.1 | 159.8 | 169.8 | 172.0 |
| Total expenses | 139.4 | 140.0 | 140.4 | 142.7 | 134.0 | 122.3 | 123.5 | 132.0 |
| Net farm income[2] | 26.9 | 23.5 | 12.7 | 32.2 | 32.3 | 37.4 | 46.3 | 40.0 |
| Net cash income | 32.8 | 37.8 | 36.9 | 38.7 | 46.6 | 51.4 | 57.1 | 58.0 |

[1]Values for 1988 are forecasts.

[2]Total net farm income includes the value of inventory changes. Net farm income totals may not add due to rounding. Data are not adjusted for inflation.

SOURCE: *Agricultural Outlook* (April 1989), p. 54, table 32.

While net farm income was expected to fall in 1988, net cash income from farming, another indicator of farm finances, was expected to rise slightly (see table 1). The difference between net farm income and net cash income from farming is that net farm income measures income largely generated from a given calendar year's production, regardless of whether the commodities are sold, fed or placed in inventory during the year. Net cash income from farming measures the total income that farmers elect to receive from their operation in a given calendar year, regardless of the amount of production or the year the marketed output was produced. It approximates the income stream available to farmers for purchasing assets such as machinery or land, retiring loans and covering all other expenditures. Since production was low in 1988, net farm income was also lower. But, since some farmers were able to sell stored grain at high prices, net cash income from farming was up slightly in 1988.

When the number of farms is taken into consideration, the financial picture changes very little for 1988. Real net farm income per farm is expected to have dropped about 16 percent from 1987 to 1988, while real net cash income from farming per farm is expected to have fallen less than 1 percent.[3] Real U.S. net farm income and real cash income from farming per farm since 1950 are shown in figure 1. During the past 30 years, real net farm income per farm has been trending upward, while the real earnings of farmers have been constant to declining. With fewer and fewer farms, each remaining farm gets a larger share of the relatively constant total farm earnings.[4]

## Farm Balance Sheet

Despite declining net farm income, the balance sheet of the agricultural sector was expected to improve in 1988, chiefly because of rising land values. Farmland values were expected to increase approximately 4 percent in 1988.[5] While real estate values were improving, farmers continued to reduce their real estate debt, paying off nearly $4 billion in 1988. Non-real-estate debt increased about $1.1 billion, allowing total farm liabilities to fall for the fifth straight year to about $139 billion. Overall, the farm sector's debt-to-asset and debt-to-equity ratios improved for the third straight year (see figure 2).

## Agricultural Trade

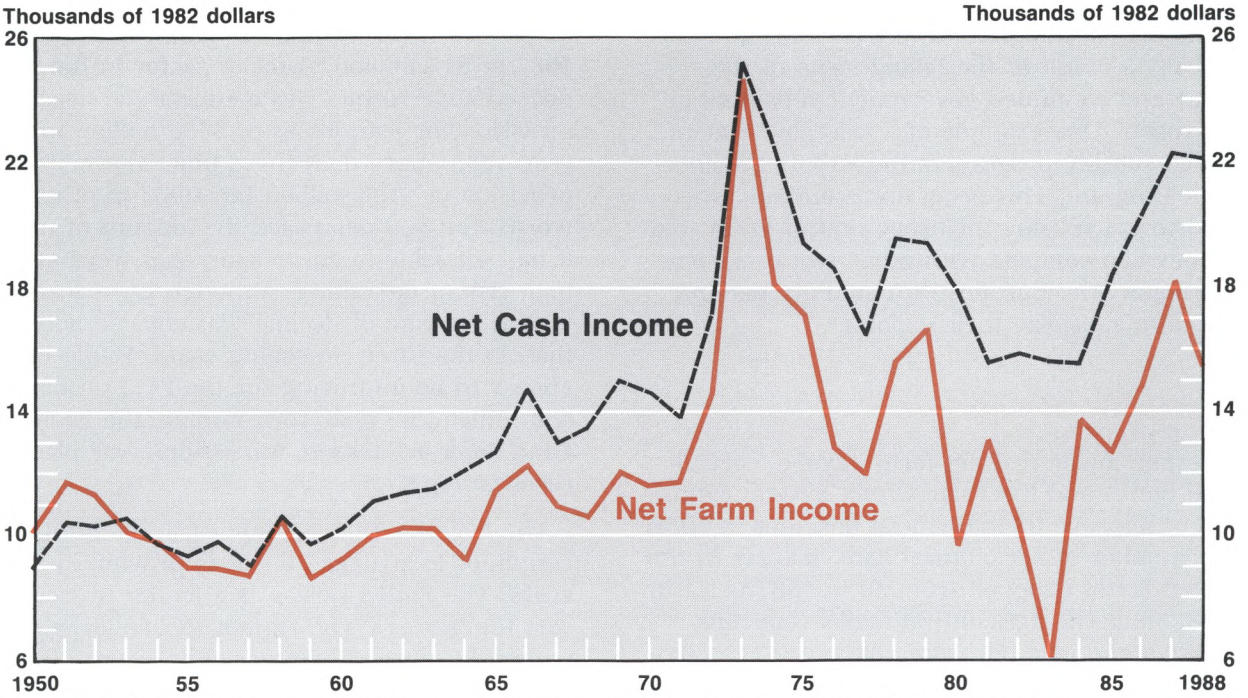
The summer drought had only a limited impact on agricultural exports. The carry-over of agricultural commodity stocks was large enough to handle increased export demand, despite decreased current year supplies. In 1988, net agricultural exports nearly doubled as exports

[3]The term "real" here refers to the fact that the data has been adjusted to take into account the impact of inflation.

[4]See Duncan (February 1989).

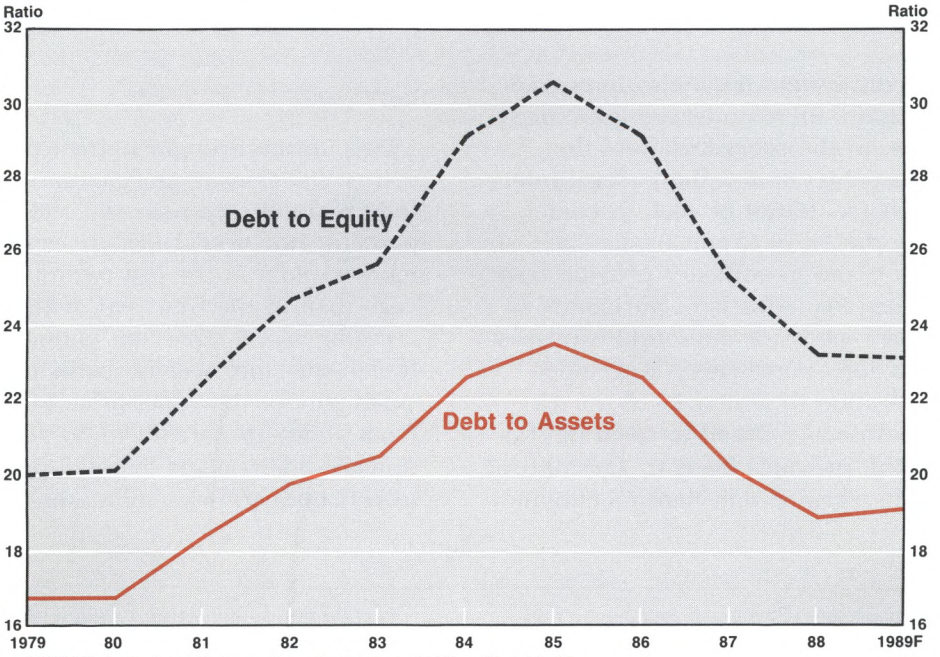
[5]U.S. Department of Agriculture (June 1988), p. 3.

Figure 1
## Real U.S. Net and Cash Farm Income per Farm




SOURCES: *Farm Income Data: A Historical Perspective*, 1986, p. 16 and *Agricultural Outlook* (April 1989), p. 54, table 32.

Figure 2
## U.S. Agricultural Balance Sheet Ratios




SOURCE: *Agricultural Outlook*, (January-February 1989), p.62, table 33.

reached their highest levels since fiscal year 1983. Simultaneously, agricultural imports reached a record high of $21 billion. Agricultural exports increased 27 percent in dollar value, while imports increased less than 2 percent.

The improved agricultural trade surplus was partially a result of the falling value of the dollar and continued government subsidization of exports. One example of a U.S. government export subsidy program is the Export Enhancement Program. This program essentially gives exporters a subsidy for every unit of grain sold so they can compete with other world exporters, mainly the European Community nations, who also subsidize their exports.[6]

## Agricultural Lenders

Despite lower real net farm income, agricultural banks and the Farm Credit System continued to improve their financial positions in 1988. The number of agricultural bank failures in the United States dropped from 53 in 1987 to 24 in 1988. Similarly, agricultural banks reporting negative earnings fell from 488 in 1987 to 261 in 1988. In addition, loans delinquent 30 days or more at agricultural banks dropped to 3.77 percent of all agriculture loans. This compares with a delinquency rate of 5.55 percent through the same period last year. Furthermore, agricultural banks' return on assets increased 0.26 of a percentage point to 0.92 percent, while return on equity jumped more than 2 percentage points to 9.69 percent.

The Farm Credit System (FCS) also improved its financial position while undergoing a reorganization in 1988. In the reorganization, the Federal Land Banks (FLB) and the Federal Intermediate Credit Banks (FICB) of each district merged to form the Farm Credit Bank. The Farm Credit Bank and its affiliates provide farmers with long-term loans for land purchases as well as short-term loans for operating expenses. The FCS's Banks for Cooperatives also underwent a reorganization in which 11 of the 13 Banks for Cooperatives merged to form the CoBank. The CoBank provides loans to agricultural cooperatives. The Farm Credit Bank in conjunction with the CoBank make up the Farm Credit System.[7]

The Farm Credit System's performance improved in 1988 when compared to 1987. The FCS reported a combined net income of $704 million for 1988, compared with a net loss in 1987 of $17 million. A major factor in the improved 1988 results was a substantial negative provision for loan losses of $680 million for the year 1988, more than three times the negative provision of $196 million for 1987. In other words, the FCS decreased the amount of money it had set aside to cover loans that were at a high risk of defaulting. Although gross loans declined, the rate of decline was considerably less than in the three preceding years. While things appear to be improving for the FCS, problems still remain; in 1988, for example, the Federal Land Bank in Jackson, Mississippi, was placed in receivership.[8]

The Farmers Home Administration (FmHA) continues to struggle, but is improving in some areas. The FmHA serves as a lender of last resort for farmers who cannot secure loans elsewhere. In 1988, delinquencies of insured individual farm ownership loans increased by 2 percent. New agricultural loan volume fell 30.6 percent in 1988 when compared to 1987. The FmHA's current-year operating loss on farmer program loans of $8.3 billion was substantially less than last year's loss of $15.7 billion. The large operating loss in 1987 was partially due to an increase in the FmHA's allowance for loan losses.

## Consumer Prices

Despite the drought's effect on commodity prices, the Consumer Price Index (CPI) for all food in 1988 rose near the 1987 rate, about 4 percent. However, food prices did increase more rapidly in the last two quarters of the year than in the first two, with food prices increasing at a 5.2 percent annual rate during the fourth quarter. Because commodity costs are a small part of the retail price of food, ranging from about 10 percent to 30 percent, only small upward adjustments in retail prices are needed to reflect farm price increases.[9]

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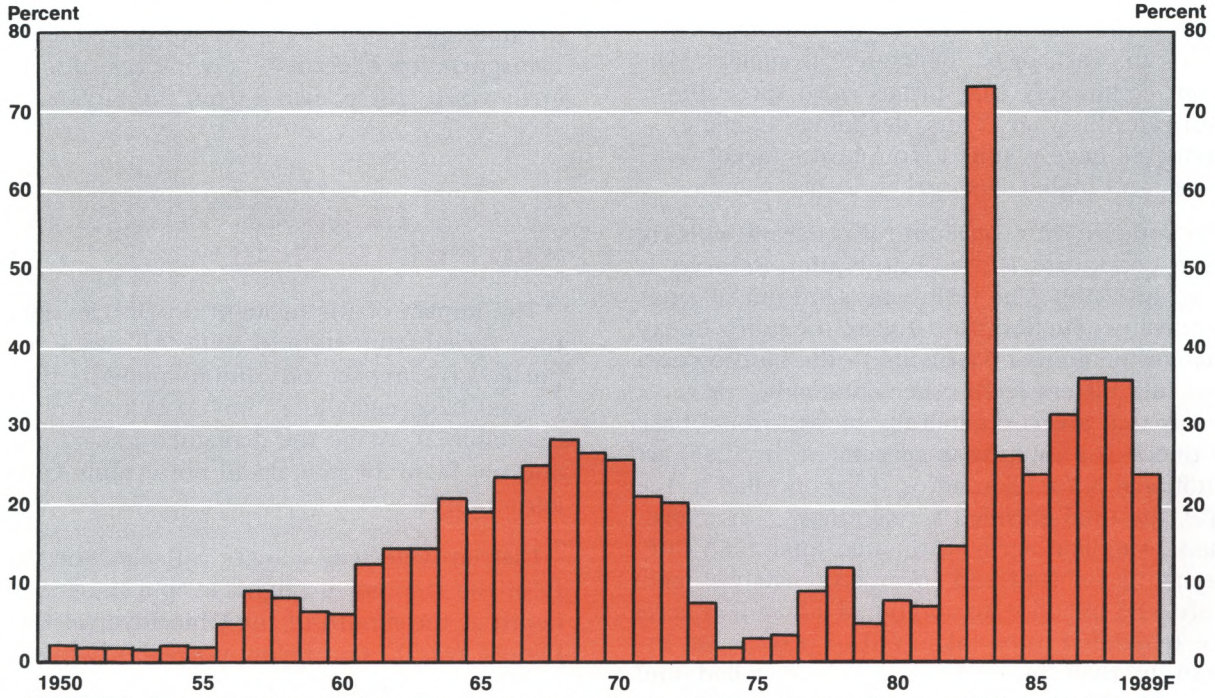
[6]See Coughlin and Carraro (November/December 1988).

[7]The Farm Credit System is a nationwide system of federally chartered agricultural lending institutions cooperatively owned by their borrowers.

[8]Federal Farm Credit Banks Funding Corporation (March 1, 1989).

[9]U.S. Department of Agriculture (July 1987), p. 12.

## Figure 3
## Government Payments / Net Farm Income




SOURCES: *Economic Indicators of the Farm Sector* and *Agricultural Outlook* (January-February 1989), p. 62, table 32.

Among food items, fresh fruit and poultry registered price increases of approximately 8.3 percent and 7.2 percent, respectively.[10] Other items with price increases of more than 5 percent included beef, fish, fresh vegetables and cereal and bakery products. While poultry price increases were, in part, due to drought-induced production losses, increased consumer demand also helped push retail prices higher. The United States Department of Agriculture estimates that the drought added only 0.5 percent to the food CPI in 1988.[11] The only major food item whose price declined was pork; its retail price fell about 3 percent last year.

## GOVERNMENT SUPPORT

Direct government payments provided more than 20 percent of U.S. net farm income for the sixth consecutive year in 1988. Government payments as a percent of net farm income have been abnormally high since the record level of 73 percent in 1983 when the Payment-In-Kind program was enacted.[12] Historical levels of government payments as a percentage of net farm income are shown in figure 3. Although direct government payments to farmers in 1988 declined more than 16 percent from 1987 levels, net farm income fell almost 14 percent. Thus government payments made up 35 percent of net farm income last year. In 1989, direct government payments to farmers are predicted to fall to $11 billion, or about 24 percent of net farm income.[13]

Commodity program outlays fell in 1988 and will continue to fall in 1989 for two main reasons. First, loan rates and target prices for most

[10]Based on comparison of the annual averages of each product's 1987 and 1988 CPI.

[11]U.S. Department of Agriculture, *Agricultural Outlook* (January/February 1989), p. 35.

[12]The Payment-In-Kind program compensated farmers for taking land out of production by paying them with government-owned grain. If a farmer took ground normally planted in corn out of production, he was compensated with government-owned corn.

[13]U.S. Department of Agriculture, *Agricultural Outlook* (April 1989), p. 54.

major commodities fell in 1988 and are scheduled to decline again in 1989. Second, higher grain prices resulting from the drought have decreased the amount of deficiency payments to farmers. Deficiency payments are the target price minus the loan rate, or the target price minus the cash price, whichever is smaller. All major commodity cash prices were above the loan rate this year. Thus, declining deficiency payments have resulted from lower target prices and higher cash prices.

In contrast, one agricultural program with rising expenditures is the Conservation Reserve Program (CRP). The CRP takes land out of agricultural production for 10 years or more in exchange for annual payments to the land owner. The CRP differs from other commodity programs that are run generally on an annual basis in that it is a multi-year agreement. In 1988, an additional 8.5 million acres were enrolled in the CRP; the total enrolled acreage now runs more than 24 million acres. Estimated total 1988 CRP payments for rent and cover crop establishment were $1.5 billion.[14] An additional 3.5 million acres are scheduled to be taken out of production in 1989. In 1989, fewer acres will be enrolled, and therefore less money will have to be spent establishing cover crops for erosion control.

Farmers also got an income boost to counteract the adverse effects of the drought from payments approved by Congress under the Disaster Assistance Act. Budgeted expenditures for the program are $3.9 billion.[15] These funds are to be paid out in 1988 and 1989. Corn farmers are expected to be the largest recipient of aid, getting about $1.7 billion. Payment rates differed depending on the extent of crop damage. For production losses between 35 percent and 75 percent, the payment rate was for 65 percent of the normal amount of the crop grown on the farm. For losses more than 75 percent, the payment rate was 90 percent of normal production. Disaster payments to crop producers were limited to $100,000 per person.[16] Any person with revenues more than $2 million was not eligible for assistance.

Drought-stricken livestock producers also received disaster assistance. The Secretary of Agriculture had several options by which to provide assistance. The two options used most extensively included selling Commodity Credit Corporation-owned feed grain at 75 percent of the county loan rate and partially reimbursing livestock producers for purchased feed and transportation expenses. Low-interest disaster loans were also available from the FmHA.

## EIGHTH DISTRICT AGRICULTURE AND THE DROUGHT

The impact of the drought on District agriculture varied from state to state. All states reported growing season rainfall amounts that ranged from eight to 11 inches below normal (see table 2). While the drought reduced output and net farm income, it did not cripple District agriculture.

District waterway activity reflected the severity of the summer drought. In mid-June, water depth at the mouth of the Ohio River at Cairo, Illinois, was 17 feet below normal. Channel widths on parts of the river system narrowed from 500 feet to 200 feet. At Memphis in early August, the Mississippi River flow was 46 percent below normal for that time of year.

Despite low water levels, total grain shipments on the Illinois and Mississippi waterways in 1988 were actually larger than total 1987 shipments. Grain shipments, however, did fall below average from June through November. Monthly grain shipments in 1988 are compared with 1981-87 average monthly grain shipments in figure 4. July saw the sharpest drop in movement of grain from average, with shipments falling 20 percent.

Barge rates skyrocketed in the last week of June as navigation problems became widespread. For example, rates from Peoria to New Orleans averaged $17.44 per ton in that week in contrast to $6.37 per ton the prior week. Rates, however, declined through August, then started climbing again as prospects for Soviet corn buying increased in September. In August, barge

[14]Calculated as (total acreage taken out of production x average weighted rental rates for land in CRP) + (estimated cost sharing for cover crop establishment x new acreage enrolled in 1988). Numbers used in this estimation were obtained from the Agricultural Stabilization and Conservation Service.

[15]U.S. Department of Agriculture, *Agricultural Outlook* (September 1988), p. 28.

[16]The $100,000 limit per person generally meant a $100,000 limit per farm. The ASCS reviewed each application and determined how much aid each applicant could receive.

Table 2

**Growing Season Rainfall for Selected Areas (inches)**

| | 1988 rainfall April-September | Normal[1] rainfall April-September | Departure from normal |
|---|---|---|---|
| N. Little Rock, AR[2] | 28.45 | 37.76 | –9.31 |
| Paducah, KY | 15.21 | 23.79 | –8.58 |
| St. Louis, MO | 11.77 | 21.65 | –9.88 |
| Memphis, TN | 14.62 | 25.80 | –11.18 |

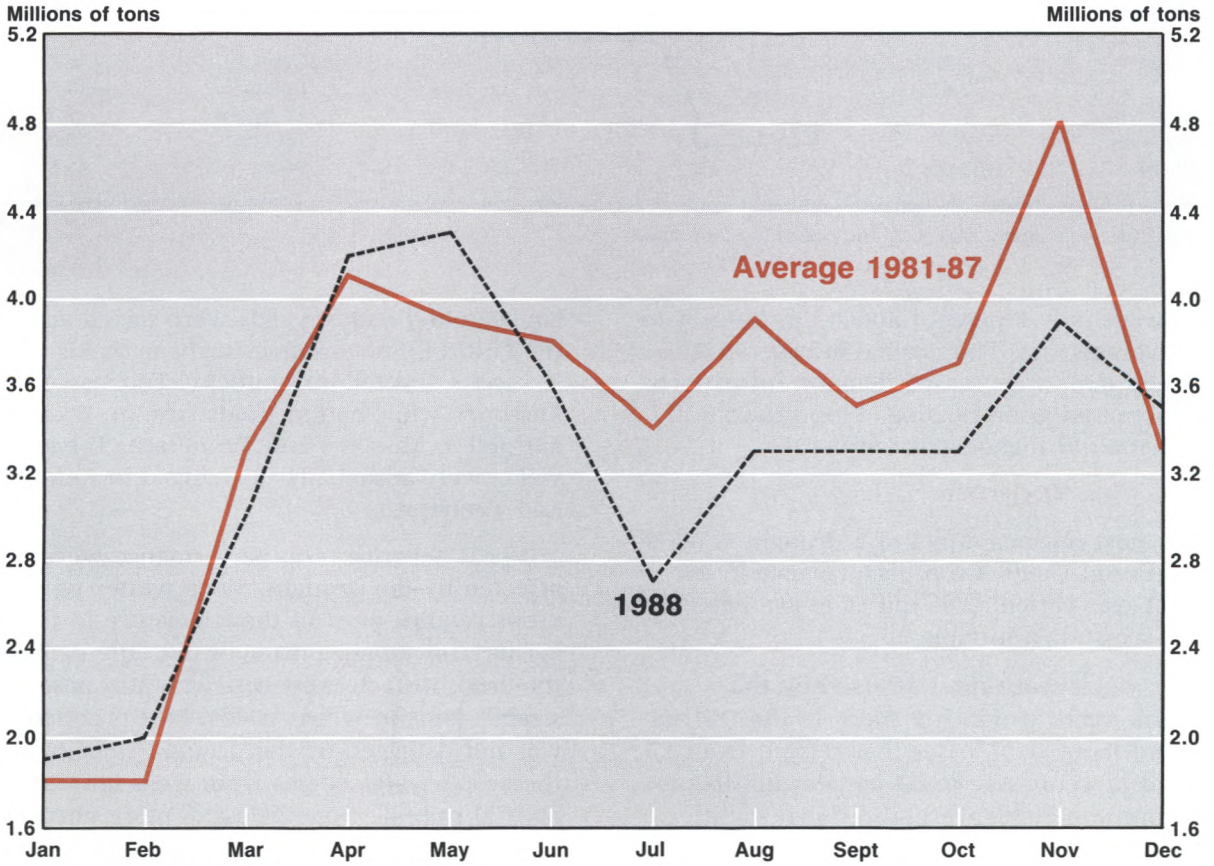
[1]Normal is defined as a 30-year average.

[2]Cumulative rainfall, January through September.

SOURCE: Agricultural Statistical Service of the individual states.

Figure 4

**Grain Shipments**[1]




SOURCE: Mississippi River Barge Traffic, U.S. Army Corps of Engineers, Rock Island District.

[1] Grain shipments on the Illinois Waterway and Mississippi River, (Locks 11-22).

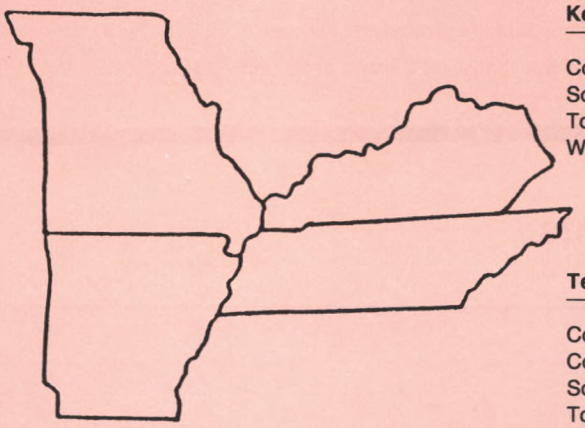
Table 3

**District Crop Yields: 1988 vs. 1985-87 Average Yield**

| United States | Percent Difference |
|---|---|
| Corn | –28.8% |
| Cotton | –0.6 |
| Rice | –0.5 |
| Sorghum | –6.3 |
| Soybeans | –20.5 |
| Tobacco | –0.3 |
| Wheat | –7.2 |

| Missouri | Percent Difference |
|---|---|
| Corn | –32.7% |
| Cotton | –9.4 |
| Sorghum | –2.4 |
| Soybeans | –22.0 |
| Wheat | 27.1 |

| Kentucky | Percent Difference |
|---|---|
| Corn | –26.5% |
| Soybeans | –12.6 |
| Tobacco | –1.0 |
| Wheat | 34.0 |



| Arkansas | Percent Difference |
|---|---|
| Cotton | 4.7% |
| Rice | 2.9 |
| Sorghum | –1.0 |
| Soybeans | 7.9 |
| Wheat | 39.5 |

| Tennessee | Percent Difference |
|---|---|
| Corn | –16.7% |
| Cotton | –15.0 |
| Soybeans | –1.3 |
| Tobacco | 0.0 |
| Wheat | 41.5 |

SOURCE: Agricultural Statistical Service of the four states.

rates were only 6 percent above the January-to-May average rate. The decline in rates in August was due to decreased demand for exports and increased grain holdings by producers in anticipation of higher grain prices.[17]

## *Crop Production*

The most obvious effect of a drought is its effect on crop yields. Crop performance in the District was varied. U.S. and state average crop yields are shown in table 3.

Corn yields were most affected by the drought. Major producing states in the District suffered large yield losses that ranged from 17 percent in Tennessee to 33 percent in Missouri.[18] Sorghum yields were also down slightly. Soybean and cotton yields were mixed across the District. For example, soybean yields rose in Arkansas and fell in Kentucky, Tennessee and Missouri, while cotton yields rose in Arkansas and fell in Missouri and Tennessee. Tobacco yields were essentially unchanged in Kentucky and Tennessee.

Wheat and rice crop performance were less affected by the drought. Since winter wheat crops require most of their moisture in the spring, the summer drought did little damage to the crop. In fact, most District states posted sizable gains in wheat yields. Rice production was not damaged by the drought since much of the crop's water comes from wells and not natural rainfall. Nonetheless, a more normal

[17]U.S. Department of Agriculture (January 1989), pp. 25-27.

[18]Arkansas is not a major corn-producing state.

rainfall pattern in the southern states did help rice and other crops throughout the summer.

On a state basis, Arkansas fared the best overall with yield increases in all crops except sorghum. Tennessee and Kentucky, while experiencing decreased yields, faced losses that were generally less-than-average U.S. yield losses. Missouri experienced large yield losses in both of its most important cash crops, soybeans and corn.

## Livestock Production

Red meat production in the District increased by about 3 percent in 1988.[19] Kentucky led the District with a 9.4 percent increase in red meat production. Missouri also increased red meat production, while Arkansas and Tennessee decreased production.

U.S. broiler production increased more than 4 percent in 1988 to about 16.1 billion pounds, after increasing nearly 9 percent in 1987. Arkansas, the nation's largest broiler producer, increased production about 3.5 percent in 1988.

## District Farm Income

District net farm income increased by 26 percent in 1987, after falling the two previous years. District 1988 data is available with a one-year lag, but with 1988 U.S. net farm income expected to drop 14 percent, District farmers can expect similar results.[20] Similar to the nation, total farm cash receipts in the District for the first three quarters of 1988 were well ahead of cash receipts for the same period a year ago. All District states were reporting increased crop receipts and livestock receipts.

While farm receipts were up, so were expenditures for District farmers. Especially hard-hit were hog producers. Profit margins were squeezed from both sides as increased inventories pushed hog prices lower and the drought pushed input prices higher. Cattle producers, while also facing higher input costs, enjoyed market prices that were generally higher than 1987 prices.

Broiler producer net returns went as high as 20 cents per pound during July and averaged nearly 5 cents for the year. Higher broiler prices were likely a result of heat stress on production and increased retail sales efforts by fast food restaurants and grocers.

## District Agricultural Lenders

District agricultural bankers improved their financial position again in 1988, outperforming, on average, U.S. agricultural banks as a whole. U.S., District and state data pertaining to agricultural bank performance are shown in table 4.

In 1988, District banks had both higher returns on assets and equity than did the U.S. agricultural banks on average.[21] The District's agricultural loan net losses as a percent of all agricultural loans was below the national average, while the District's 30-day-or-more delinquent agriculture loans as a percent of total agricultural loans was higher than the U.S. average. The District's non-performing agricultural loans fell for the third straight year to 5.06 percent of all agricultural loans. The number of agricultural banks with negative earnings fell in both the nation and the District.

With respect to the individual states, Tennessee agricultural banks had the highest return on assets and Indiana the lowest. Missouri had the highest return on equity, while Illinois had the lowest return on equity. All District states improved their agricultural losses as a percent of total agriculture loans during 1988. Furthermore, non-performing agricultural loans as a percent of total agricultural loans fell in all states except Tennessee.

Mississippi agricultural banks saw a substantial improvement over 1987. Returns on both assets and equity went from negative to positive values in 1988. Return on assets increased 1.4 percentage points and return on equity jumped 17.8 percentage points.

Both of the District's Farm Credit Banks improved their financial positions during 1988.[22]

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[19]Red meat production includes total beef, veal, pork, lamb and mutton slaughtered in federally inspected and other plants, but excludes animals slaughtered on farms.

[20]Carraro (1988) notes that District net farm income closely follows U.S. net farm income.

[21]Based on fourth-quarter FDIC Reports of Condition and Income for Insured Banks.

[22]The two Farm Credit Banks in the District are the St. Louis branch, covering the states of Arkansas, Illinois and Missouri, and the Louisville branch, covering Indiana, Kentucky, Ohio and Tennessee.

Table 4

## U.S. and District Agricultural Banking Data

| | U.S. 1988 | U.S. 1987 | District 1988 | District 1987 |
|---|---|---|---|---|
| Banks with negative earnings | 261 | 488 | 11 | 29 |
| Return on assets | 0.92 | 0.66 | 1.04 | 0.76 |
| Return on equity | 9.69 | 7.21 | 10.9 | 8.1 |
| Ag. loan losses/Total ag. loans | 0.59 | 1.88 | 0.4 | 2.49 |
| Ag. nonpf. loans/Total ag. loans[1] | 3.77 | 5.55 | 5.06 | 6.94 |

| | Arkansas[2] 1988 | Arkansas[2] 1987 | Illinois[2] 1988 | Illinois[2] 1987 | Indiana[2] 1988 | Indiana[2] 1987 | Kentucky[2] 1988 | Kentucky[2] 1987 |
|---|---|---|---|---|---|---|---|---|
| Banks with negative earnings | 5 | 5 | 1 | 11 | 1 | 1 | 0 | 1 |
| Return on assets | 1.05 | 0.96 | 0.94 | 0.7 | 0.9 | 0.51 | 1 | 0.91 |
| Return on equity | 10.34 | 9.17 | 10.14 | 7.71 | 10.34 | 5.94 | 10.27 | 9.51 |
| Ag. loan losses/Total ag. loans | 0.31 | 1.13 | 0.29 | 3.03 | 1.01 | 2.49 | 0.5 | 2.2 |
| Ag. nonpf. loans/Total ag. loans[1] | 2.75 | 3.08 | 5.73 | 8.36 | 7.41 | 10.93 | 4.92 | 5.54 |

| | Mississippi[2] 1988 | Mississippi[2] 1987 | Missouri[2] 1988 | Missouri[2] 1987 | Tennessee[2] 1988 | Tennessee[2] 1987 |
|---|---|---|---|---|---|---|
| Banks with negative earnings | 0 | 2 | 4 | 8 | 0 | 1 |
| Return on assets | 0.98 | −0.42 | 1.17 | 0.86 | 1.21 | 0.91 |
| Return on equity | 11.54 | −6.26 | 12.32 | 9.13 | 11.25 | 9.02 |
| Ag. loan losses/Total ag. loans | 0.34 | 3.31 | 0.45 | 2.26 | 1.36 | 8.51 |
| Ag. nonpf. loans/Total ag. loans[1] | 4.14 | 9.9 | 5.96 | 7.4 | 4.82 | 3.08 |

[1]Nonperforming loans are defined as those loans that are 30 days or more delinquent.

[2]State data only includes banks within the Eighth District.

SOURCE: Fourth-Quarter FDIC Reports of Condition and Income for Insured Commercial Banks.

The St. Louis branch had a net income of $99.3 million in 1988, up from $10.4 million last year. The Louisville branch generated a $3.6 million net income, which included an extraordinary $92 million loss on the restructuring of high-cost debt. This is the first year since 1983 that the Louisville branch has had positive net income; in 1987, the branch lost $25.1 million.

## SUMMARY

The summer drought of 1988 has left its mark on the agricultural economy. Real net farm income is lower, consumer prices are slightly higher and drought conditions remain in some areas. Despite lower yields and higher input costs, the average U.S. and District farmer improved his balance sheet in 1988. While most of the results of the drought were negative, the drought has had one positive effect on the farm economy. The combination of lower production and continued strong consumption has left grain stocks at their lowest level in years. These low grain stocks will provide price support for commodities in 1989.

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# Eighth District Banks: Back in the Black

FOR COMMERCIAL banks in both the nation and the Eighth Federal Reserve District, 1988 was a year of recovery.[1] Aggregate bank profit ratios in the United States and the Eighth District improved as many of the nation's larger banks began to recoup from losses associated with foreign loans. Further gains were made by smaller District banks, which posted higher earnings as loan loss provisions and loan charge-offs declined. Asset quality also improved at small banks as nonperforming loans and actual loan losses decreased.

This article compares the performance of Eighth District commercial banks with their national counterparts across several asset-size categories.[2] An analysis of bank earnings, asset quality and capital adequacy provides useful information on the financial condition, regulation compliance and operating soundness of the District's banking industry.

## EARNINGS

Eighth District banks reported year-end earnings of $1.1 billion in 1988, an increase of $191.6 million from 1987. The U.S. banking industry earned $25.1 billion in 1988, up sharply from $3.2 billion in 1987. Sixty-eight banks, 5.3 percent of all District banks, reported negative earnings in 1988, down from 86 in 1987. Nationally, 13.7 percent of commercial banks reported net losses for the year compared with 18.2 percent in 1987. Much of the improvement in both District and U.S. bank earnings can be traced to lower loan loss provisions, which had a positive effect on earnings.

### *Return on Assets and Equity*

In analyzing bank earnings, there are two standard measures of bank performance: the return on average assets (ROA) and the return on equity (ROE) ratios.[3] The ROA ratio, calculated by dividing a bank's net income by its average annual assets, shows how well a bank's management is using the company's assets. The ROE ratio, obtained by dividing a bank's net income by its equity capital, indicates to shareholders how much the institution is earning on their investment.[4]

[1]The Eighth Federal Reserve District consists of the following: Arkansas, entire state; Illinois, southern 44 counties; Indiana, southern 24 counties; Kentucky, western 64 counties; Mississippi, northern 39 counties; Missouri, eastern and southern 71 counties and the City of St. Louis; Tennessee, western 21 counties.

[2]For more specific bank performance statistics on each Eighth District state, see the Federal Reserve Bank of St. Louis' June 1989 issue of *Pieces of Eight.*

[3]A major concern with ROA, ROE and other performance measures is that they are calculated using the book values of assets, liabilities and equity not the current market value.

[4]Equity capital includes common and perpetual preferred stock, surplus, undivided profits and capital reserves.

## Table 1
## Return on Average Assets and Return on Equity

**Return on Average Assets (ROA)**

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 0.93% | 0.83% | 0.80% | 0.11% | 0.87% | 0.62% | 0.84% | 0.68% |
| <$25 million in assets | 0.80 | 0.31 | 0.68 | 0.15 | 0.68 | 0.02 | 0.71 | 0.27 |
| $25-$50 million | 0.96 | 0.62 | 0.90 | 0.46 | 0.85 | 0.44 | 0.80 | 0.67 |
| $50-$100 million | 1.01 | 0.78 | 0.95 | 0.66 | 0.92 | 0.60 | 0.95 | 0.74 |
| $100-$300 million | 0.97 | 0.81 | 0.94 | 0.76 | 0.87 | 0.70 | 0.97 | 0.84 |
| $300 million-$1 billion | 1.01 | 0.66 | 1.07 | 0.61 | 0.66 | 0.59 | 0.54 | 0.76 |
| $1-$10 billion | 0.82 | 0.79 | 0.51 | 0.52 | 0.98 | 0.75 | 0.87 | 0.85 |
| >$10 billion | — | 0.96 | — | −0.65 | — | 0.57 | — | 0.50 |

**Return on Equity (ROE)**

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 11.72% | 13.02% | 10.28% | 1.81% | 11.26% | 9.60% | 10.85% | 10.65% |
| <$25 million in assets | 8.24 | 3.15 | 7.16 | 1.55 | 7.37 | 0.20 | 7.68 | 2.75 |
| $25-$50 million | 10.65 | 6.98 | 10.13 | 5.27 | 9.77 | 5.11 | 9.25 | 7.70 |
| $50-$100 million | 11.46 | 9.16 | 10.90 | 7.88 | 10.93 | 7.46 | 11.41 | 9.11 |
| $100-$300 million | 11.89 | 10.30 | 11.71 | 9.80 | 11.09 | 9.29 | 12.42 | 11.22 |
| $300 million-$1 billion | 12.95 | 9.52 | 13.67 | 8.76 | 8.81 | 8.45 | 7.04 | 10.34 |
| $1-$10 billion | 12.50 | 12.39 | 7.96 | 8.29 | 14.59 | 11.72 | 13.47 | 13.54 |
| >$10 billion | — | 19.11 | — | −14.88 | — | 10.71 | — | 10.00 |

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

As table 1 reports, the 1988 average ROA and ROE for Eighth District banks was 0.93 percent and 11.72 percent, respectively. Nationally, banks reported an average ROA of 0.83 percent and an average ROE of 13.02 percent. For each of the years presented, District ROA averages outperformed national averages. In 1988, ROAs for both the District and the nation improved significantly over 1987, when they were depressed by poor earnings associated with suspect foreign loans at the nation's largest banks.

Table 1 also shows ROAs and ROEs for seven asset-size categories of commercial banks. Across virtually every category, both District-wide and nationwide, 1988 was a year of improvement. Of particular note are the strong earnings at banks with assets between $1 billion and $10 billion. District banks in this asset range reported average ROAs of 0.82 percent in 1988, up from 0.51 percent in 1987. Nationally, these banks reported a jump in ROA from 0.52 percent to 0.79 percent. ROA for banks with assets more than $10 bilion (none of which are in the Eighth District) was the highest of the size groupings at 0.96 percent, a substantial improvement from −0.65 in 1987.

Another bright note in 1988 was the continued earnings improvement at smaller banks. For the periods reported in table 1, 1988 was the year in which District banks with assets less than $100 million earned their highest ROAs and ROEs. Higher earnings for these banks were the direct result of lower loan loss provisions and a decline in loan charge-offs.

## *Margin Analysis*

The financial success of a bank depends on its management's ability to generate sufficient revenue while controlling costs. Two important measures of management's success are net interest and net noninterest margins.

Net interest margin is the difference between what a bank earned on loans and investments and what it paid its depositors, divided by

## Table 2
## Net Interest Margin

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 4.26% | 4.27% | 4.27% | 4.09% | 4.40% | 4.18% | 4.31% | 4.21% |
| <$25 million in assets | 4.33 | 4.55 | 4.45 | 4.61 | 4.68 | 4.73 | 4.58 | 4.77 |
| $25-$50 million | 4.29 | 4.56 | 4.35 | 4.59 | 4.56 | 4.75 | 4.21 | 4.60 |
| $50-$100 million | 4.21 | 4.56 | 4.33 | 4.59 | 4.56 | 4.77 | 4.16 | 4.52 |
| $100-$300 million | 4.26 | 4.59 | 4.39 | 4.59 | 4.44 | 4.68 | 4.54 | 4.84 |
| $300 million-$1 billion | 4.49 | 4.56 | 4.55 | 4.56 | 4.46 | 4.65 | 4.61 | 4.75 |
| $1-$10 billion | 4.17 | 4.45 | 3.97 | 4.36 | 4.14 | 4.25 | 4.07 | 4.41 |
| >$10 billion | — | 3.85 | — | 3.39 | — | 3.60 | — | 3.49 |

NOTE: Interest income has been adjusted upward for the taxable equivalence on tax-exempt state and local securities.

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

average earning assets.[5] This ratio indicates how well interest-earning assets are being employed relative to interest-bearing liabilities.[6]

Higher net interest margins were one of the driving forces behind stronger earnings at the larger banks in both the District and the United States in 1988.[7] As table 2 shows, District banks with assets between $1 and $10 billion reported an average net interest margin of 4.17 percent, a 20 basis-point increase from 1987. Nationally, these banks reported average net interest margins of 4.45 percent, up from 4.36 percent in 1987. The largest banks in the nation, those with assets more than $10 billion, recorded an average net interest margin of 3.85 percent, up 46 basis points from 1987 averages. At banks with assets less than $1 billion, net interest margins declined both Districtwide and nationwide in 1988. Banks across the nation, however, outperformed banks in the Eighth District for each of the asset-size categories reported in table 2.

For District banks, interest income rose from 9.35 percent of average earning assets in 1987 to 9.63 percent in 1988. As figure 1 shows, interest income as a percent of earning assets was, on average, lower at District banks than at U.S. banks for each year except 1986. Nationally, interest income as a percent of earning assets rose from 9.62 percent in 1987 to 10.31 percent in 1988. In contrast, interest-related expenses, while rising from 5.08 percent of earning assets in 1987 to 5.37 percent in the District in 1988, were lower than the 1988 national average of 6.04 percent.

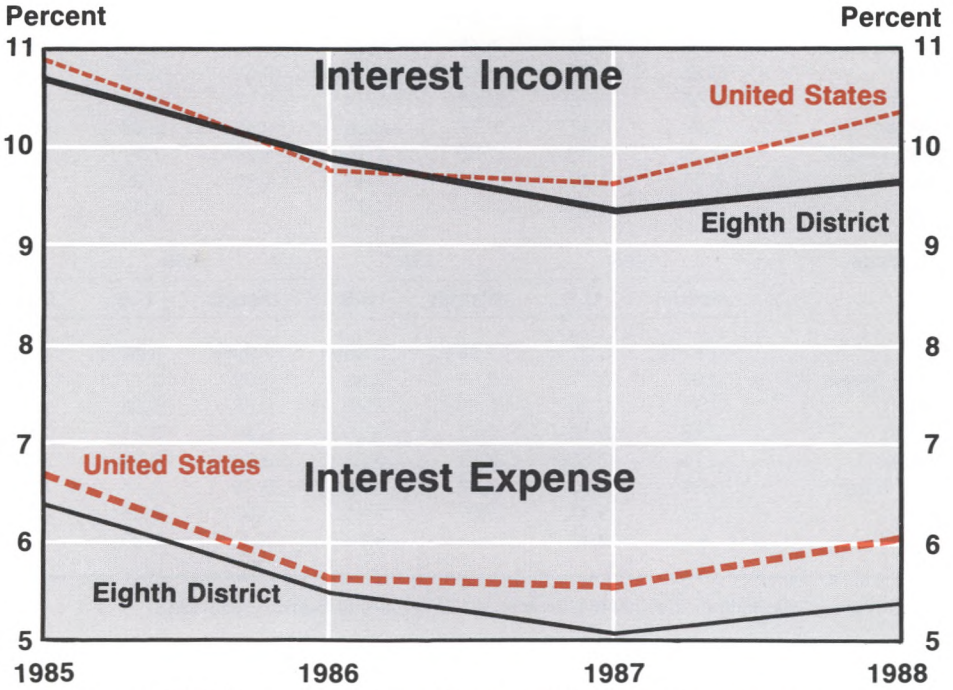
The net noninterest margin is an indicator of the efficiency of a bank's operations and its pricing and marketing decisions. The net noninterest margin is the difference between noninterest income (other) and noninterest expense (overhead) as a percent of average assets. Since noninterest expense generally exceeds noninterest income, the calculation yields a negative number; it is common practice, however, to report the net noninterest margin as a positive number. Thus, smaller net noninterest margins indicate better bank performance, holding all other things constant.

[5]Earning assets include: loans (net of unearned income) in domestic and foreign offices; lease financing receivables; obligations of U.S. government, states and political subdivisions and other securities; assets held in trading accounts; interest-bearing balances due from depository institutions; federal funds sold and securities purchased under agreements to resell.

[6]On the asset side, this includes both interest income and fees related to interest-earning assets. Examples include: interest on loans; points on loans; income on tax-exempt municipal loans and bonds and income from holdings of U.S. government securities. On the liability side, interest expense includes: the amount paid on all categories of interest-bearing deposits; federal funds purchased and capital notes.

[7]Bank management should be concerned not only with the level of the net interest margin, but also with its variability over time. With volatile interest rates, the stability of the net interest margin indicates that the interest sensitivity of assets and liabilities is matched.

# Figure 1
## Interest Income and Interest Expense as a Percent of Average Earning Assets




Source: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

To supplement income generated from interest-earning assets, banks have attempted to generate more fee-related income. For example, service charges on deposit accounts, leasing income, trust activities income, credit card fees, mortgage servicing fees and safe deposit box rentals.

Noninterest expense includes all the expense items involved in overall bank operations, such as employee salaries and benefits as well as expenses of premises and fixed assets. Noninterest expense also covers such items as directors' fees, insurance premiums, legal fees, advertising costs and litigation charges.

For the periods presented in table 3, District banks have lagged national averages in terms of generating noninterest sources of revenue. Noninterest expense, on the other hand, has continually been lower at District banks than for banks across the nation. In 1988, noninterest income continued to average around 1 percent of average assets at District banks. Noninterest expense also remained virtually flat at about 3 percent of average assets. Noninterest expenses generally have been declining, particularly at District banks with assets between $300 million and $1 billion. In recent years, banks have undertaken numerous consolidation and cost-control measures to reduce fixed overhead costs. For many banks, cost reductions, including staff cuts, could have been a main contributor to profits in 1988.

### *Loan and Lease Loss Provision*

Declining loan and lease loss provision levels helped boost earnings both in the District and the nation last year. In 1987, many large banks allocated huge sums to their loan and lease loss provision account to allow for their deteriorating foreign loan portfolio. This was a precau-

Table 3

**Noninterest Income and Noninterest Expense as a Percentage of Average Assets**

| Noninterest Income | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 0.98% | 1.44% | 1.00% | 1.39% | 1.01% | 1.27% | 0.94% | 1.18% |
| <$25 million in assets | 0.58 | 0.89 | 0.57 | 0.95 | 0.55 | 0.85 | 0.55 | 0.79 |
| $25-$50 million | 0.55 | 0.75 | 0.53 | 0.70 | 0.52 | 0.70 | 0.52 | 0.72 |
| $50-$100 million | 0.55 | 0.78 | 0.53 | 0.74 | 0.52 | 0.74 | 0.53 | 0.74 |
| $100-$300 million | 0.74 | 0.87 | 0.77 | 0.88 | 0.73 | 0.88 | 0.73 | 0.86 |
| $300 million-$1 billion | 1.23 | 1.08 | 1.39 | 1.10 | 1.25 | 1.11 | 1.14 | 1.08 |
| $1-$10 billion | 1.51 | 1.49 | 1.52 | 1.44 | 1.69 | 1.39 | 1.63 | 1.43 |
| >$10 billion | — | 1.84 | — | 1.77 | — | 1.53 | — | 1.28 |

| Noninterest Expense | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 2.97% | 3.27% | 2.98% | 3.26% | 2.98% | 3.20% | 2.97% | 3.13% |
| <$25 million in assets | 3.07 | 3.77 | 3.08 | 3.83 | 3.09 | 3.77 | 3.04 | 3.69 |
| $25-$50 million | 2.71 | 3.29 | 2.69 | 3.28 | 2.65 | 3.28 | 2.62 | 3.24 |
| $50-$100 million | 2.56 | 3.18 | 2.57 | 3.19 | 2.59 | 3.21 | 2.57 | 3.18 |
| $100-$300 million | 2.76 | 3.23 | 2.81 | 3.23 | 2.74 | 3.24 | 2.76 | 3.24 |
| $300 million-$1 billion | 3.32 | 3.33 | 3.37 | 3.36 | 3.46 | 3.45 | 3.63 | 3.42 |
| $1-$10 billion | 3.27 | 3.42 | 3.27 | 3.41 | 3.30 | 3.35 | 3.28 | 3.44 |
| >$10 billion | — | 3.13 | — | 3.10 | — | 2.95 | — | 2.69 |

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

tionary measure to absorb expected future losses. Having taken this action in 1987, many banks saw little need to increase provision levels in 1988.

Loan and lease loss provision totaled $450.6 million at District banks in 1988, down $246.6 million from 1987 levels. As reported in table 4, Eighth District banks decreased their provision for loan and lease losses to 0.37 percent of average assets, a sharp drop from 0.60 percent in 1987. This decrease can be traced primarily to the largest District banks. For those banks, provision for loan and lease losses fell from 0.97 percent of average assets in 1987 to 0.46 percent in 1988.

Nationally, banks decreased their loan and lease loss provision by $20.2 billion and, at year-end 1988, the account stood at $17.2 billion. As a percent of average assets, loan and lease loss provision was 0.51 percent in 1988, a substantial decline from 1.24 percent in 1987. As with the District, the largest banks were primarily responsible for the decrease as their ratio fell from 2.02 percent in 1987 to 0.42 percent in 1988.

## ASSET QUALITY

As it has for some time, asset quality continues to be a primary factor influencing the banking industry's earnings pattern. With loan losses rising over the past few years at many commercial banks, investors and regulators alike are focusing on asset quality in assessing the health of the banking industry.

Asset quality typically is measured by two indicators. The first measure, the nonperforming loan rate, indicates both the current level of problem loans as well as the potential for future loan losses. The second indicator, the ratio of net loan losses to total loans, shows the percentage of loans actually written off the bank's books.

### *Nonperforming Loans and Leases*

The level of nonperforming assets includes all loans and lease financing receivables that are 90 days or more past due, are in nonaccrual status or are restructured because of a deterioration in the financial position of the obligor. In the District, nonperforming assets decreased $246.5

## Table 4
## Loan and Lease Loss Provision as a Percentage of Average Assets

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 0.37% | 0.51% | 0.60% | 1.24% | 0.59% | 0.78% | 0.59% | 0.67% |
| <$25 million in assets | 0.30 | 0.60 | 0.49 | 0.82 | 0.68 | 1.15 | 0.80 | 1.07 |
| $25-$50 million | 0.32 | 0.53 | 0.43 | 0.72 | 0.67 | 0.97 | 0.76 | 0.88 |
| $50-$100 million | 0.30 | 0.47 | 0.41 | 0.60 | 0.62 | 0.85 | 0.64 | 0.81 |
| $100-$300 million | 0.36 | 0.47 | 0.45 | 0.56 | 0.64 | 0.75 | 0.53 | 0.63 |
| $300 million-$1 billion | 0.36 | 0.59 | 0.42 | 0.70 | 0.68 | 0.85 | 0.61 | 0.63 |
| $1-$10 billion | 0.46 | 0.63 | 0.97 | 0.90 | 0.46 | 0.67 | 0.43 | 0.57 |
| >$10 billion | — | 0.42 | — | 2.02 | — | 0.80 | — | 0.70 |

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

## Table 5
## Nonperforming Loans and Leases as a Percentage of Total Loans

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 1.62% | 2.96% | 2.11% | 3.49% | 2.16% | 2.77% | 2.49% | 2.83% |
| <$25 million in assets | 1.80 | 2.65 | 2.13 | 3.16 | 2.66 | 3.76 | 3.26 | 3.73 |
| $25-$50 million | 1.74 | 2.45 | 2.14 | 2.76 | 2.61 | 3.19 | 3.05 | 3.31 |
| $50-$100 million | 1.67 | 2.16 | 2.05 | 2.45 | 2.45 | 2.93 | 2.67 | 3.06 |
| $100-$300 million | 1.70 | 1.89 | 1.95 | 2.20 | 2.04 | 2.53 | 2.11 | 2.57 |
| $300 million-$1 billion | 1.25 | 2.38 | 1.47 | 2.29 | 2.33 | 2.51 | 2.65 | 2.45 |
| $1-$10 billion | 1.65 | 1.91 | 2.44 | 2.41 | 1.81 | 2.06 | 2.19 | 2.24 |
| >$10 billion | — | 4.48 | — | 5.26 | — | 3.37 | — | 3.34 |

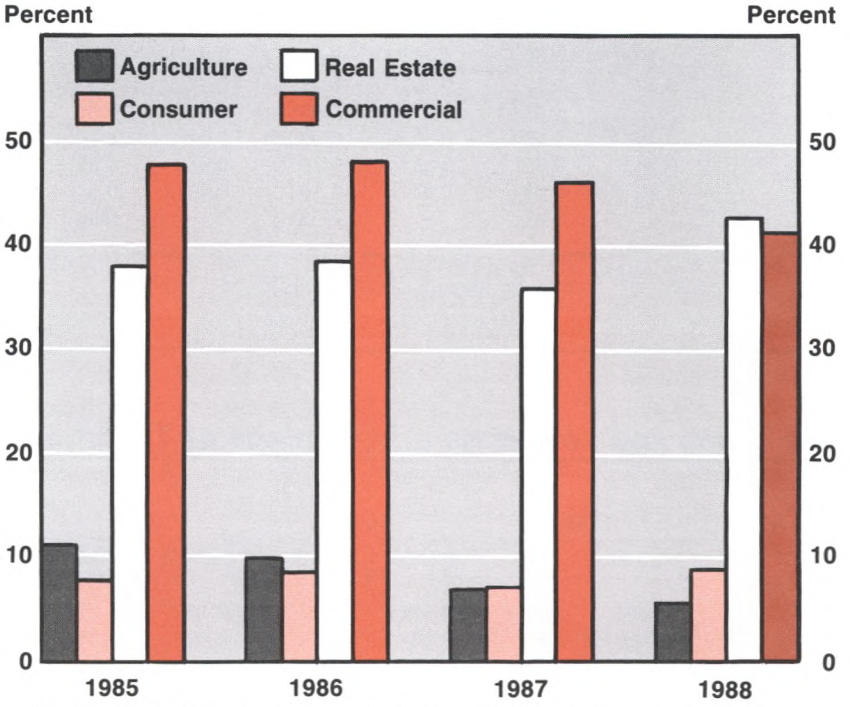
SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

million from 1987 to 1988. As reported in table 5, Eighth District banks' nonperforming loans and leases as a share of total loans fell from 2.11 percent in 1987 to 1.62 percent in 1988. Banks across the nation experienced a similar decline as the nonperforming loan rate dropped from 3.49 percent to 2.96 percent.

Across all asset-size categories, District banks reported a decrease in nonperforming loans and leases in 1988. District banks with assets less than $25 million saw nonperforming loans and leases fall from 2.13 percent of total loans in 1987 to 1.80 percent in 1988. The largest District banks saw their nonperforming loan rate drop from 2.44 percent to 1.65 percent during the same one-year period. Nationally, this pattern also held true as most asset-size categories reported a decline in the nonperforming loan rate. The only exception was at banks with assets between $300 million and $1 billion where nonperforming loans and leases rose to 2.38 percent of total loans, up from 2.29 percent in 1987.

Figure 2 shows the distribution of nonperforming loans by loan type for Eighth District banks. At year-end 1988, nonperforming agricultural loans as a percent of total nonperforming loans was 5.45 percent, down from 6.84 percent in 1987. The percentage of nonperforming commercial loans fell from 45.91 percent of the total to 41.14 percent. Consumer nonperforming loans, which accounted for 6.88 percent of the total in 1987, rose to 8.61 percent in 1988. Nonperforming real estate loans had a fairly substantial increase in 1988, rising from 35.81 percent in 1987 to 42.45 percent.

# Figure 2
## District Distribution of Nonperforming Loans by Loan Type




Source: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.
Note: Percentages may sum to greater than 100 because agricultural loans are included in other categories as well.

## *Loan and Lease Losses*

The most direct measure of a bank's loan problems is the percentage of loans and leases charged-off during the year. Net loan and lease losses (adjusted for recoveries) amounted to $510.8 million at District banks in 1988, an increase of $46.7 million from 1987. Nationally, banks charged-off $17.6 billion in 1988, $1.5 billion more than in 1987. As table 6 shows, the average charge-off rate at banks in the Eighth District rose slightly in 1988, from 0.70 percent of total loans in 1987 to 0.72 percent. Nationally, the average charge-off rate rose from 0.89 percent of total loans in 1987 to 0.93 percent in 1988. Across virtually every asset-size category, charge-off rates at District banks were lower than at their national counterparts. The only exception was at the largest District banks where net loan losses and leases to total loans jumped sharply in 1988, from 0.68 percent in 1987 to 1.18 percent.

Table 7 shows the distribution of loan losses by type of loan. For both the nation and the District, commercial loan losses contributed the greatest percentage to overall loan loss. The percent of District commercial loan charge-offs fell in 1988, from more than 50 percent of total loan losses in 1987 to approximately 44 percent. Farm-related charge-offs declined further in 1988 and now account for slightly more than 2 percent of total District loan losses. The percentage of District consumer loan charge-offs also declined in 1988, falling from 23.24 percent in 1987 to 17.88 percent of total loan losses. Only one category, loans held in foreign offices, increased in 1988. Loan losses for this category increased to 17.51 percent of overall loan loss, up substantially from 1.79 percent in 1987.

## Table 6
### Net Loan and Lease Losses as a Percentage of Total Loans

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 0.72% | 0.93% | 0.70% | 0.89% | 0.88% | 0.94% | 0.89% | 0.81% |
| <$25 million in assets | 0.60 | 1.13 | 0.95 | 1.50 | 1.32 | 2.02 | 1.52 | 1.71 |
| $25-$50 million | 0.51 | 0.88 | 0.73 | 1.17 | 1.16 | 1.61 | 1.38 | 1.38 |
| $50-$100 million | 0.46 | 0.71 | 0.70 | 0.96 | 1.07 | 1.35 | 1.09 | 1.22 |
| $100-$300 million | 0.50 | 0.66 | 0.67 | 0.78 | 0.99 | 1.03 | 0.72 | 0.84 |
| $300 million-$1 billion | 0.42 | 0.79 | 0.71 | 0.88 | 0.92 | 0.99 | 0.78 | 0.74 |
| $1-$10 billion | 1.18 | 0.94 | 0.68 | 0.86 | 0.57 | 0.73 | 0.59 | 0.64 |
| >$10 billion | — | 1.06 | — | 0.88 | — | 0.89 | — | 0.77 |

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

## Table 7
### Distribution of Loan Losses

| | 1988 | 1987 | 1986 | 1985 |
|---|---|---|---|---|
| District | | | | |
| Agriculture | 2.24% | 8.26% | 16.10% | 19.44% |
| Commercial | 44.42 | 51.51 | 62.22 | 65.60 |
| Consumer | 17.88 | 23.24 | 18.56 | 14.03 |
| Real estate | 16.63 | 19.10 | 17.05 | 18.18 |
| Foreign[1] | 17.51 | 1.79 | 0.16 | 0.37 |
| United States | | | | |
| Agriculture | 0.77% | 3.35% | 7.66% | 10.35% |
| Commercial | 36.47 | 45.18 | 55.73 | 61.07 |
| Consumer | 26.39 | 28.66 | 26.89 | 23.13 |
| Real estate | 13.42 | 15.20 | 11.76 | 8.59 |
| Foreign[1] | 19.70 | 6.30 | 1.13 | 2.55 |

[1]Loans held in foreign offices, Edge and Agreement subsidiaries and International Banking Facilities (IBFs).

NOTE: Percentages may sum to greater than 100 because agricultural loans are included in other categories as well.

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

## CAPITAL ADEQUACY

Bank regulators have a strong interest in ensuring that banks maintain adequate financial capital. Bank capital is intended to absorb losses, cushion against risk, provide for asset expansion and protect uninsured depositors. Given its importance, the regulatory agencies have set minimum standards of 5.5 percent primary capital to assets and 6 percent total capital to assets.[8] These standards have been revised recently and, on December 16, 1988, the Federal Reserve Board approved new risk-based capital guidelines intended to encourage banks to make safer investments.[9]

The improved performance of District banks had a favorable effect on their capital levels. As table 8 indicates, improvement in bank primary capital ratios is apparent throughout most asset-size ranges. Average primary capital ratios for banks both in the District and nationwide are well above the current minimum standards established by the regulatory agencies. Nationally, an average primary capital ratio of 7.92

[8]The components of primary capital as defined in the FDIC Consolidated Report of Condition and Income are: common stock; perpetual preferred stock; surplus; undivided profits; contingency and other capital reserve; qualifying mandatory convertible instruments; allowance for loan and lease losses and minority interests in consolidated subsidiaries, less intangible assets excluding purchased mortgage servicing rights. (For the purposes of this paper, only the goodwill portion of intangible assets was deducted.) Secondary capital is limited to 50 percent of primary capital and includes subordinated notes and debentures, limited-life preferred stock and that portion of mandatory convertible securities not included in primary capital. Each bank's secondary capital is added to its primary capital to obtain the total capital level for regulatory purposes.

[9]The guidelines establish a systematic framework whereby regulatory capital requirements are more sensitive to differences in risk profiles among banking organizations. In addition, off-balance sheet activity is evaluated for risk exposure. The guidelines provide for a phase-in period through the end of 1992 at which time the standards become fully effective. Starting December 31, 1990, the level of capital that banks are required to hold will increase to 7.25 percent of qualifying total capital to weighted risk assets and, finally, to 8 percent in 1992.

Table 8

**Primary Capital Ratios**

| | 1988 | | 1987 | | 1986 | | 1985 | |
|---|---|---|---|---|---|---|---|---|
| | District | U.S. | District | U.S. | District | U.S. | District | U.S. |
| All banks | 8.73% | 7.92% | 8.73% | 7.80% | 8.47% | 7.56% | 8.38% | 7.44% |
| <$25 million in assets | 10.44 | 10.82 | 10.14 | 10.59 | 9.97 | 10.36 | 9.88 | 10.58 |
| $25-$50 million | 9.70 | 9.68 | 9.53 | 9.49 | 9.27 | 9.30 | 9.21 | 9.33 |
| $50-$100 million | 9.49 | 9.24 | 9.37 | 9.07 | 9.08 | 8.82 | 8.91 | 8.78 |
| $100-$300 million | 8.86 | 8.62 | 8.71 | 8.53 | 8.50 | 8.26 | 8.37 | 8.17 |
| $300 million-$1 billion | 8.55 | 7.90 | 8.50 | 7.87 | 8.30 | 7.81 | 8.35 | 8.07 |
| $1-$10 billion | 7.66 | 7.45 | 7.89 | 7.50 | 7.52 | 7.31 | 7.18 | 7.12 |
| >$10 billion | — | 7.58 | — | 7.26 | — | 6.87 | — | 6.51 |

SOURCE: FDIC Reports of Condition and Income for Insured Commercial Banks, 1985-1988.

percent was reported, up slightly from 1987. While District aggregate primary capital ratios remained the same in 1988, some asset-size groups showed notable improvement. In particular, the smallest District banks reported an average primary capital ratio of 10.44 percent in 1988, up from 10.14 percent in 1987. In contrast, the largest District banks reported a decline in their average primary capital ratio, falling from 7.89 percent in 1987 to 7.66 percent in 1988.

As of December 1988, six banks or 0.5 percent of all District banks fell short of the minimum regulatory primary capital standards. This number was down from 15 banks in 1987. Nationally, 465 banks had deficient primary capital ratios at year-end 1988, compared with 474 in 1987.

## CONCLUSION

1988 marked a year of recovery from the overall poor earnings reported by banks across the nation in 1987. Bank performance in the Eighth Federal Reserve District improved in 1988, propelled by lower loan loss provisions. Aggregate bank profit ratios improved as many of the District's largest banks began to rebound from the negative earnings associated with increased loan loss provisions tied to foreign loans. Profits recouped across virtually every asset size category of Eighth District commercial banks. The smaller District banks employed higher earnings as both loan losses and loan loss provisions levels declined.

As with most of the banking industry, better asset quality helped to improve earnings at District banks last year. Finally, a majority of Eighth District banks improved their primary capital ratios in 1988 and are positioned well above the minimum standards set by bank regulators.

The banking industry in the Eighth District has returned to profitability, and, barring any shocks, should continue to improve in the coming quarters. With a continued positive economic environment, loan problems that have plagued District banks should abate and as the level of nonperforming loans declines, future loan problems should be less severe.

**Thomas B. Mandelbaum**

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# The Eighth District Business Economy in 1988: Still Expanding, But More Slowly

THE BUSINESS economy of the Eighth Federal Reserve District continued to expand in 1988, its sixth successive year of growth. District income and employment reached record highs, while the regional unemployment rate declined to its lowest level of the decade. Unlike the previous two years, in which regional economic growth approximated the national pace, however, the District economy grew substantially slower than the rest of the nation last year.[1] This article discusses the factors that caused this sluggishness and describes other significant developments in the Eighth District's business economy during 1988. In addition, it provides a perspective on future economic conditions in District states.

## PERSONAL INCOME AND CONSUMER SPENDING

As figure 1 shows, District personal income growth during the current expansion has exceeded the national rate only in 1984. After approaching the nation's 3.2 percent gain in 1987, District real income growth slowed to 2.6 percent in 1988, while U.S. real income rose 3 percent.[2]

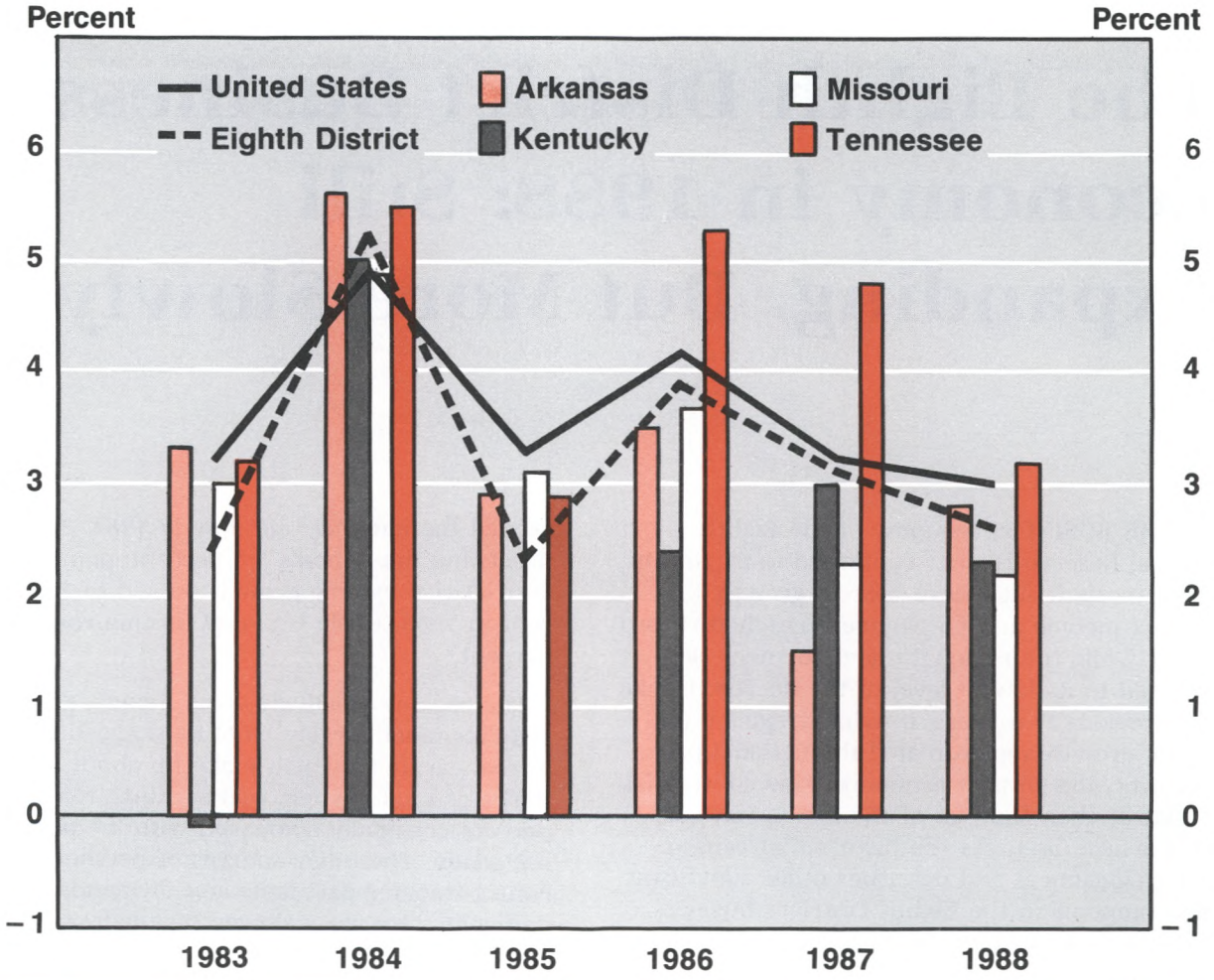
The region's relatively weak income growth in 1988 stemmed largely from its sluggish growth in real earnings, which make up about two-thirds of total income: real earnings rose 2.3 percent regionally compared with 2.7 percent nationally. The other sources of personal income—transfer payments and dividends, interest and rent—also grew slower regionally than nationally in 1988.

The drought caused real personal farm income to fall sharply in Kentucky and Missouri last year, but had little direct effect on the expansion of total personal income. Personal income earned from farms has accounted for less than 2 percent of the region's or nation's total in recent years. Excluding it from income did not substantially change regional or national 1988 growth rates.

[1]Data from Arkansas, Kentucky, Missouri and Tennessee are used to represent the Eighth District.

[2]Growth rates compare data for the entire year with the average of previous years. The substantially slower growth of District income does not necessarily imply that District output also grew slower than the national average. For example, while the annual growth rate of District income between 1982 and 1986 was 0.4 percentage points less than the national rate, the growth rate of total output was just 0.1 percentage points lower. See Mandelbaum (1988/89).

# Figure 1
## Annual Percent Change in Real Personal Income

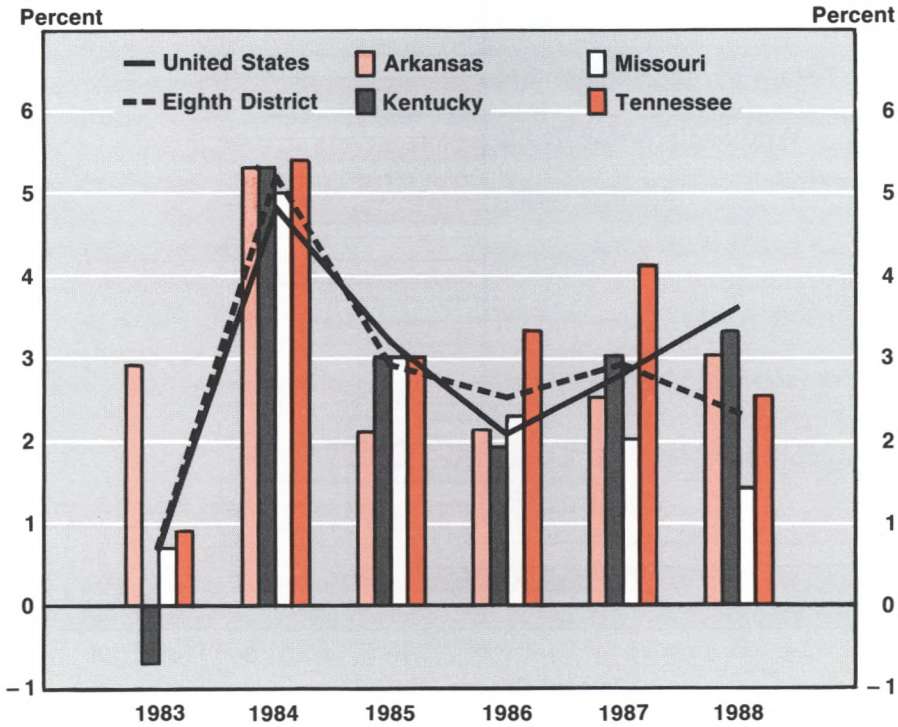



Though District personal income growth trailed the national average in 1988, it was typical of states in the nation's interior. In 1988 and throughout the recovery, the economies of most interior states have grown more slowly than those of states on either coast.[3] Between III/1987 and III/1988, for instance, the District's growth of real nonfarm income matched that of non-coastal states, but was a full percentage point slower than the 4 percent rate posted by coastal states.

Much of the strong coastal growth last year stemmed from the sharp expansion of earnings in service-producing industries, construction and, in many states, durables manufacturing. Earlier in the decade, the rapid expansion of

[3]This comparison excludes Alaska and Hawaii. See Coughlin and Mandelbaum (1988) for an overview of regional growth of per capita income in the 1980s.

Figure 2
**Annual Percent Change in Payroll Employment**




high-tech industries, often related to defense projects, fueled coastal growth as well. Meanwhile, the economic expansion of some interior states was hampered by the decline in commodity prices, particularly energy prices. Despite some strengthening during the year, relatively low energy prices continued to depress growth in energy-producing states in 1988.

In 1986 and 1987, the District's income growth was able to approach the national average largely because of Tennessee (see figure 1). Unlike most interior states, the Tennessee economy expanded much faster than the national average. In 1988, when Tennessee's income growth fell back to near the national average, the District's income growth fell further below the national average, as did most of the nation's interior.

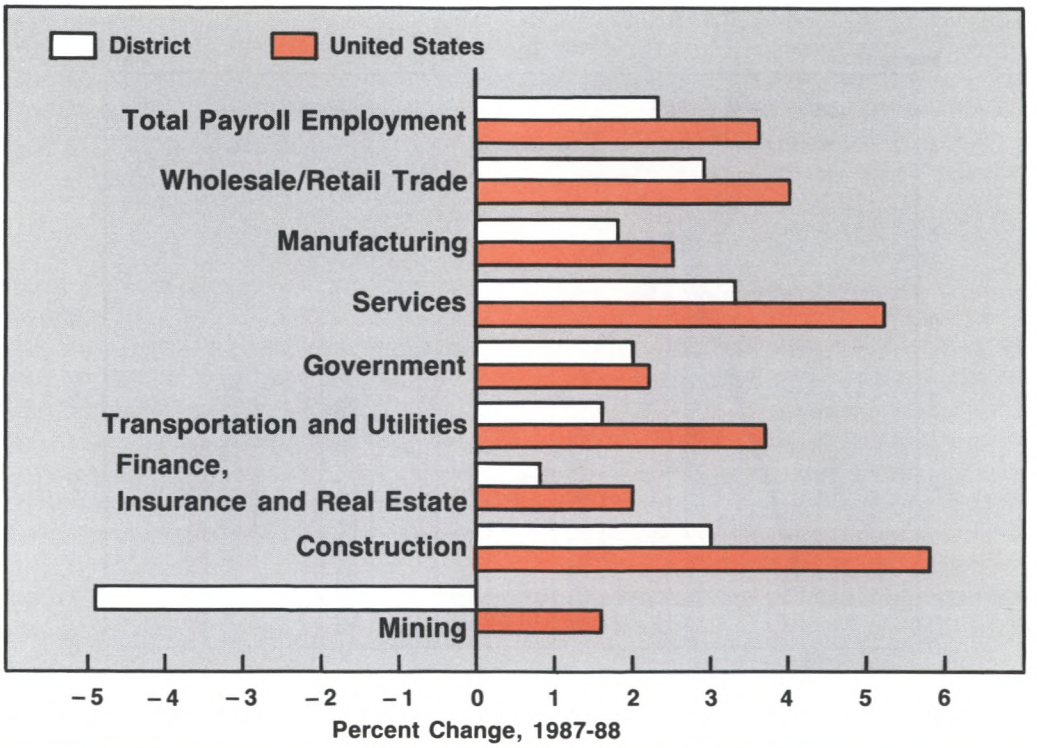
District retail sales have followed national trends during the first five years of the recovery, but expanded more slowly in 1988. Between 1982 and 1987, sales rose at 3.6 percent and 3.8 percent annual rates in the District and nation, after adjusting for inflation. In 1988, District real retail sales growth was a weak 1.6 percent compared with a national increase of 2.6 percent.

## LABOR MARKETS

Employment data, presented in figure 2, tell essentially the same story as the income and sales data told: the District's expansion continued in 1988 but at a slower pace compared with either the previous few years or the national average. Nonagricultural payroll employment rose 2.3 percent last year in the District, while growing a robust 3.6 percent nationally. The District's weaker growth contrasts with the similarity of regional and national growth during the previous years of the the recovery: between 1982 and 1987, payroll employment grew at a 2.9 percent annual rate in the District and at a 2.7 percent rate nationally.

The District's 1988 unemployment rate was the lowest this decade. It averaged 6.5 percent,

# Figure 3
## Percent Change in Employment




down from 7.2 percent in the previous year and 10.8 percent in 1983. Although civilian employment (upon which the jobless rate is based) rose only 1.8 percent in 1988, the unemployment rate fell as the labor force grew even more slowly, rising by only 1 percent.

The relatively sluggish District job growth raises two questions. First, where in the nation have these new jobs been created? As was true of personal income, a disproportionate share of the nation's new jobs in 1988 were created in coastal states. California, Florida, New York and Virginia gained the most jobs, for example, generating approximately one quarter of the nation's new jobs last year. Illinois, Ohio, Pennsylvania and Texas also posted large job gains.

The second question raised by the pattern of job growth is why the District's job growth was slower this year, after several years of near-national growth. As was true of income growth, Tennesee's faster-than-national employment expansion allowed the District workforce to grow at nearly the national pace in most previous years of the recovery (see figure 2). In 1988, however, employment in Tennessee grew at well below the national rate and District employment growth followed suit.

Another way to understand the factors that account for the relatively slow District job growth in 1988 is to consider the performance of the District economy's major sectors. As figure 3 shows, employment in all major sectors of the District economy grew more slowly in 1988 than the national average. In the figure, the eight divisions of payroll employment are ordered in descending size, ranging from the wholesale and retail trades sector, which employed almost a quarter of the 1988 District workforce, to mining, which employed less than 1 percent. The largest four sectors—trades, manufacturing, services and government—account for more than four-fifths of all total payroll employment.

## GOODS-PRODUCING SECTORS

Although the 1.8 percent increase in District *manufacturing* employment last year trailed the nation's 2.5 percent increase, it represents a

slight acceleration from the 1.2 percent annual rate of increase over the previous five years. In 1988, manufacturing growth was stimulated by a surge in exports. The value of U.S. manufactured exports rose 26.3 percent in 1988. Producers of nonelectrical machinery, an industry that includes computers and most capital goods, accounted for much of the rise in exports. Employment in the District's nonelectrical machinery industry rose 3 percent in 1988 compared with the nation's 6.7 percent rise.

Among the District's other large manufacturing industries, the fabricated metals and electrical equipment sectors also experienced moderate growth last year. The number of jobs in the apparel and textiles mill products declined, however, because of a fashion shift away from denim products and rising textile inventories. Transportation equipment employment also declined. The District transportation equipment sector is dominated by defense-related aerospace production—in which employment rose—and motor vehicles production—in which periodic layoffs, strikes and a Missouri auto assembly plant closure led to job losses.

After expanding sharply in the first two years of the recovery, District *construction* activity had leveled off in subsequent years until 1988, when building weakened substantially. The real value of District building contracts fell 8.3 percent last year. District building activity has followed national trends during the current recovery, although last year's drop in building contracts was somewhat more severe than the nation's 5.3 percent decline.

The weaker District performance stemmed from the residential sector; District residential contracts dropped by 11.8 percent in 1988, almost twice the national decline. Building permit data also show that residential activity declined last year: District housing permits fell 6.1 percent in 1988 while dropping 4.7 percent nationally. Both single-family and multi-family residential building weakened last year.

Throughout the recovery, District residential construction has expanded more slowly than the national average (reflecting the region's slower population growth), while nonresidential building has been stronger than at the national level. In 1988, the real value of nonresidential contracts dropped 4.3 percent regionally and 6.6 percent nationally.

While *mining* employment rose 1.6 percent nationally, it dropped 4.9 percent in the District. This differential is due largely to differences in the composition of mining. Nationally, oil and gas extraction accounts for most mining jobs while coal mining dominates the District mining workforce. The nation's increase in mining jobs last year was due entirely to increases in oil and gas extraction; employment was flat in the remaining mining sectors.

Coal production has remained strong in recent years, as much of the the nation's expanding industrial activity has been fueled by coal-generated electricity. Mine production in Kentucky, which accounts for most of the District's mining output, reached its highest point of the decade in 1987, then fell slightly, by 1.9 percent, in 1988. Rapidly increasing productivity allowed a more severe 6.3 percent drop in Kentucky coal mine employment in 1988.

## SERVICE-PRODUCING SECTORS

The *wholesale and retail trades* sector is the District's largest in terms of employment. Since its growth is related to a region's income growth, the slower 1988 growth of District trades is not surprising. Trades employment rose 2.9 percent regionally and 4 percent nationally in 1988. During the first five years of the recovery, both the District and national trades sectors grew at annual rates of a little less than 4 percent.

Much of the slower District employment growth is attributable to the slower expansion of the *services* sector. Approximately half of the services jobs are in business and health services with the remainder in legal, personal and miscellaneous services. At both the regional and national levels, services has generated more new jobs—in 1988 and throughout the recovery—than any other sector. The increase of District services jobs of 3.3 percent in 1988, however, fell far short of the national average of 5.2 percent. The District's 1988 growth rate also represented a deceleration from its 4.9 percent annual pace over the previous five years. To some extent, the slower growth of the District services sector is related to the relatively sluggish growth of District manufacturing, for which the services sector provides business and legal services.

*Government* employment grew at a 1.4 percent annual rate during the first five years of the recovery in both the District and the nation. In 1988, growth was slightly stronger as govern-

Table 1

**1988 Growth of Selected Economic Indicators**

| | U.S. | District | Arkansas | Kentucky | Missouri | Tennessee |
|---|---|---|---|---|---|---|
| Real personal income | 3.0% | 2.6% | 2.8% | 2.3% | 2.2% | 3.2% |
| Payroll employment | 3.6 | 2.3 | 3.0 | 3.3 | 1.4 | 2.5 |
| Manufacturing | 2.5 | 1.8 | 3.7 | 4.4 | 0.4 | 0.8 |
| Construction | 5.8 | 3.0 | 0.0 | 8.6 | 0.6 | 3.2 |
| Mining | 1.6 | −4.9 | 3.7 | −6.3 | −1.7 | −4.7 |
| Wholesale and retail trade | 4.0 | 2.9 | 2.9 | 5.0 | 2.3 | 2.2 |
| Services | 5.2 | 3.3 | 4.4 | 4.0 | 2.0 | 3.9 |
| Government | 2.2 | 2.0 | 2.2 | 0.9 | 1.1 | 3.7 |
| Finance, insurance and real estate | 2.0 | 0.8 | 0.5 | 1.2 | 0.7 | 0.8 |
| Transportation and public utilities | 3.7 | 1.6 | 1.7 | 0.4 | 0.6 | 3.7 |
| Real value of building contracts[1] | −5.3 | −8.3 | −17.4 | −7.2 | −6.1 | −8.6 |

[1]Excludes nonbuilding construction. SOURCE: F. W. Dodge *Construction Potentials.*

ment employment rose by 2 percent in the District and 2.2 percent nationally.

In addition to directly providing jobs, the federal government influences the District economy through its spending in District states. Federal expenditures include grants-in-aid, direct payments to individuals and procurement contracts as well as salaries and wages. In fiscal year 1988, federal government spending in District states totaled $55.4 billion, or 2.6 percent more than in the previous year. Expenditures increased in each of the District states, ranging from 2.3 percent in Arkansas to 3.1 percent in Kentucky. Of the District total, $7.9 billion was received in the form of defense procurement contracts, down 4 percent from 1987. The decline was largely due to an 8.2 percent drop in Missouri, which received $5.5 billion in defense contracts in fiscal year 1988. Defense contracts have declined in recent years following rapid growth during the first half of the decade.

After identical 4.2 percent annual growth rates between 1982 and 1987, employment in both the District and national *finance, insurance and real estate* sectors grew more slowly in 1988, rising by just 0.8 percent regionally and 2 percent nationally. Consolidations among banks and thrifts and a slowdown in the sales and construction of homes contributed to the slowdown.

Employment in the District's *transportation and public utilities* firms rose just 1.6 percent in 1988, after growing at a slightly stronger 2.3 percent rate during the previous five years. In 1988, as well as throughout the recovery, much of the District's weakness was concentrated in Kentucky and Missouri.

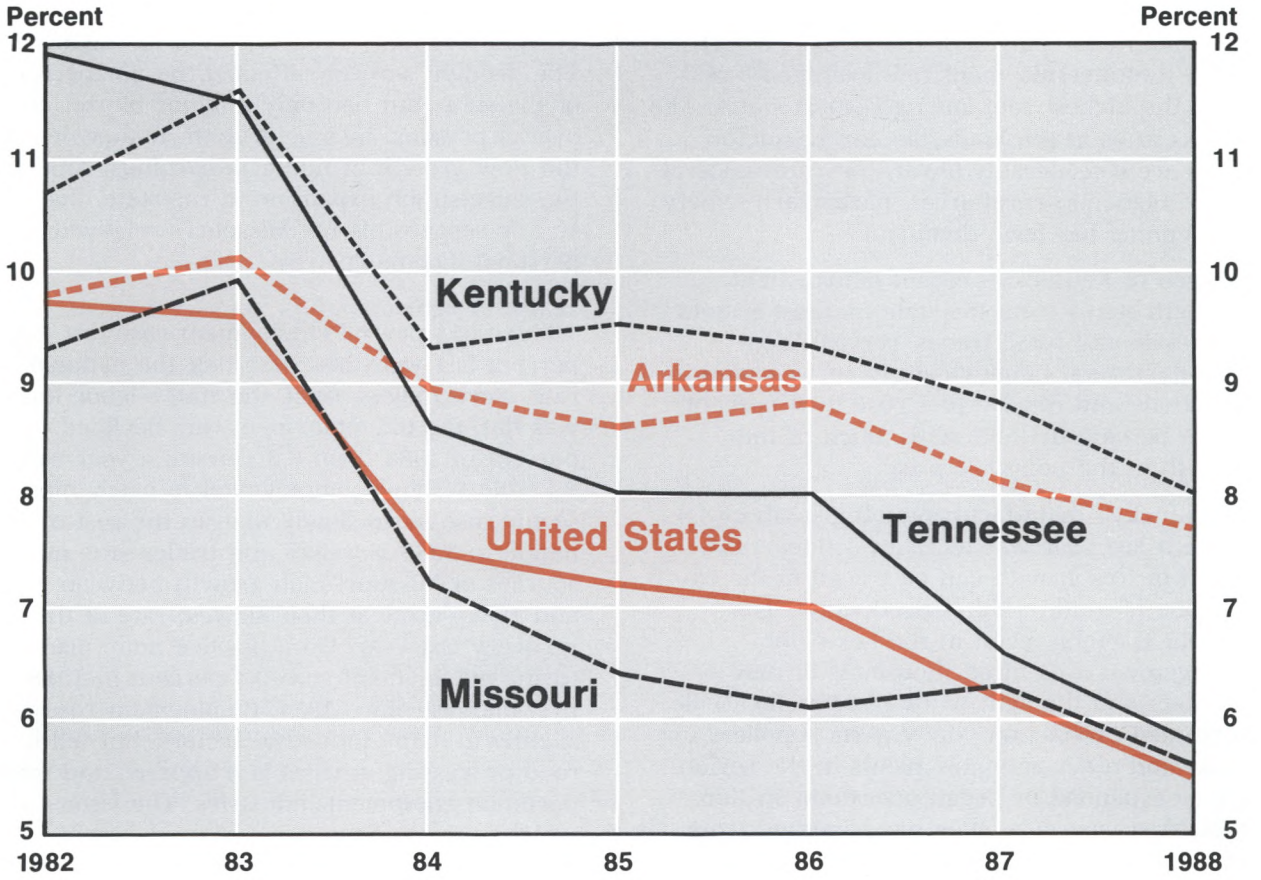
## INTERSTATE COMPARISONS

Although discussions of the District's economy provide an overview of broad regional trends, they obscure substantial differences among individual states. Wide variations in annual income and employment growth, for example, can be seen in figures 1 and 2 as well as in table 1. This section highlights these and other differences among the state economies.

### *Arkansas*

Arkansas enjoyed moderate economic growth during 1988, despite a sharp decline in construction activity. As figure 1 shows, the state's 2.8 percent rise in real personal income was just slightly below the national average. The earnings component of personal income rose marginally faster in Arkansas than in the nation, in part because of the strong growth from farms. Arkansas' income growth was impeded, however, by the relatively slow expansion of transfer payments and dividends, interest and rent.

# Figure 4
## Unemployment Rates: United States and District States




Payroll employment rose at a moderate 3 percent in 1988, the same rate as during the first five years of the recovery. Manufacturing, one of the state's chief strengths in the period, continued strong in 1988, with manufacturing jobs growing by 3.7 percent. Employment in factories making fabricated metals and transportation equipment rose rapidly. Although the state lacks a major vehicle-assembly plant, parts suppliers expanded in response to the growing needs of car and truck makers throughout the region. Employment growth in food processing– the state's largest manufacturing industry–slowed in 1988 to 1.9 percent from a 5.1 percent pace during the previous five years.

As figure 4 shows, unemployment rates fell in Arkansas, as they did in each of the District states in 1988. Arkansas' rate has declined relatively slowly during the recovery, however. The 7.7 percent jobless rate for 1988 is just 2.1 percentage points below its 1982 rate, compared with a 4.2 percentage-point drop nationally.

Construction activity, weak throughout the recovery, declined sharply in 1988 (see table 1). After rising in 1983 and 1984, the real value of building contracts declined each subsequent year and dropped 17.4 percent in 1988, the most severe decline among the District states. Both residential and nonresidential building declined sharply last year.

### *Kentucky*

Kentucky's economic growth during 1988 was mixed. While employment growth was fairly

strong, income growth was rather weak and construction activity declined. Real personal income rose 2.3 percent in 1988. The drought was partially responsible for this sluggish increase. Kentucky's 2.6 percent rise in nonfarm personal income matched the District average. Payroll employment rose 3.3 percent last year, the second consecutive year of moderate growth. Despite these job gains in recent years, the state's unemployment has remained high. In 1988, the unemployment rate averaged 8 percent, the highest rate among District states. The jobless rates in the Louisville and Lexington areas are considerably lower, but rates generally are higher in rural areas, particularly where coal mining has been dominant.[4]

Much of Kentucky's recent employment strength stems from the state's largest sectors: wholesale and retail trades, services and manufacturing. Employment in services and in wholesale and retail trades rose by 4 percent and 5 percent in 1988, with much of the growth in the Louisville area.

Kentucky's manufacturing job growth of 4.4 percent last year was its highest since 1984. Much of this growth can be traced to the expansion of motor vehicle production. The Toyota assembly plant in the Lexington-Georgetown area hired thousands of new workers and the light truck plant in Louisville expanded production. Many parts suppliers for these and other assembly plants in the region either expanded or began operations in Kentucky last year. The state has benefited from the shift to "just-in-time" inventory strategies during the 1980s which require parts suppliers to be near assembly plants. Fabricated metals plants in Kentucky also sharply increased their workforces in 1988, largely because of increased orders from motor vehicle parts suppliers.

After growing by nearly 5 percent a year between 1982 and 1987, the real value of construction contracts fell 7.2 percent in 1988, with both residential and nonresidential building contracts falling. Residential building contracts in the Louisville and Lexington areas remained strong, however, falling only slightly.

## *Missouri*

Missouri's economic expansion has slowed to a sluggish pace in recent years. In the recovery's first four years, personal income and employment rose moderately, expanding at near the the national rate (see figures 1 and 2). In 1987 and 1988, however, growth trailed the national and District averages. Personal income rose 2.2 percent last year, after adjusting for inflation. The drought severely affected the northern part of the state, but had only a minor impact on overall personal income growth. Rather, it was the slow growth of nonfarm earnings, reflecting the sluggish job expansion in the state, that was largely responsible for Missouri's relatively slow personal income growth.

Missouri's payroll employment rose just 1.4 percent last year, less than half the national rate. Nevertheless, since the state's labor force was flat, the unemployment rate declined to 5.6 percent in 1988 from 6.3 percent a year earlier. As table 1 shows, employment in every major sector rose more slowly than in the rest of the nation in 1988. Services and trades—the major sources of Missouri's job growth between 1982 and 1987—grew at their slowest rate of the recovery last year. On a positive note, manufacturing employment rose 0.4 percent in 1988, its first increase since 1984. Employment rose slightly in many industrial sectors, but fell in food processing, textiles and apparel, and transportation equipment industries. The latter, which employs almost one of every six of Missouri's manufacturing workers, experienced job gains in aircraft manufacturing but had larger losses among producers of motor vehicles and parts.

As in the other District states, the real value of construction contracts fell in 1988 in Missouri. The decline in the residential sector was particularly severe, with most of the weakness in the multi-family housing market. Last year's construction decline contrasts with strong growth during the first five years of the recovery.

[4]Throughout the nation, unemployment rates tend to be higher in nonmetropolitan areas than in metropolitan areas. In the fourth quarter of 1988, for example, the average U.S. unemployment rate outside of metropolitan areas (not seasonally adjusted) was 5.8 percent compared with 4.9 percent in metropolitan areas. See U.S. Department of Labor (1989), pp.79-80. For a discussion of the slower economic growth in nonmetropolitan areas during the 1980s, see Carraro and Mandelbaum (1989).

## *Tennessee*

Although moderate, Tennessee's economic growth in 1988 was considerably slower than in 1986 and 1987 (see figures 1 and 2). Personal income increased by 3.2 percent in 1988, a drop from approximately 5 percent in each of the previous two years. Payroll employment rose 2.5 percent in 1988, after increasing 4.1 percent in 1987. Tennessee's 1988 income growth, however, exceeded the national average, while its job growth was sufficient to allow the unemployment rate to fall to 5.8 percent in 1988 from 6.6 percent in 1987.

Growth in most sectors of the Tennessee economy slowed last year. The 1988 employment increases in Tennessee's services and trades sectors were the smallest in several years. Manufacturing employment growth rose 0.8 percent last year. Employment shrank in many nondurables sectors, such as chemicals and textiles and apparel, while most of the sectors producing durables rose moderately. Employment in the Memphis area rose only slightly in 1988 after several years of strong gains. The impending construction of a $1.2 billion cereal plant should help boost Memphis area job growth in 1989, however.

The real value of construction contracts awarded in Tennessee fell 8.6 percent last year after growing 8 percent in 1987. The 1987 strength stemmed from the sharp expansion of nonresidential building. In 1988, nonresidential contracts rose only marginally, while residential contracts plunged 16.4 percent after adjusting for price changes.

## OUTLOOK FOR 1989

Projections from academic and governmental institutions in each District state suggest that the states' economies will continue to grow in 1989, but at a slower rate than in 1988. This slowing reflects the strong ties between the states' economies and the national economy, whose growth is also expected to slow. Many observers of the national economy feel that it cannot continue to expand at the pace of the last few years, given the low level of unemployment and high rates of capacity utilization.[5]

### Table 2
### Economic Projections for District States

| | 1988 | 1989 |
|---|---|---|
| Unemployment Rate | | |
| United States | 5.5% | 5.5% |
| Arkansas | 7.7 | 8.1 |
| Kentucky | 8.0 | 7.2 |
| Missouri | 5.6 | 6.1 |
| Tennessee | 5.8 | 6.3 |
| | **Percent change[1]** | |
| | **1988** | **1989** |
| Payroll employment | | |
| United States | 3.6% | 2.2% |
| Arkansas | 3.0 | 1.5 |
| Kentucky | 3.3 | 1.3 |
| Missouri | 1.4 | 1.1 |
| Tennessee | 2.5 | 1.1 |
| Manufacturing employment | | |
| United States | 2.5 | 0.6 |
| Arkansas | 3.7 | 2.5 |
| Kentucky | 4.4 | 1.5 |
| Missouri | 0.4 | N.A. |
| Tennessee | 0.8 | 0.4 |
| Personal income (current dollars) | | |
| United States | 7.3 | 7.9 |
| Arkansas | 7.0 | 4.6 |
| Kentucky | 6.5 | 7.0 |
| Missouri | 6.4 | 8.3 |
| Tennessee | 7.5 | 7.1 |

[1]Percent changes compare entire year with previous year.
SOURCES: United States: DRI/McGraw-Hill, *Review of the U.S. Economy,* January 1989; Arkansas: University of Arkansas at Little Rock, *Arkansas Economic Outlook,* January 1989; Kentucky: Kentucky Finance and Administration Cabinet based on DRI/Mcgraw-Hill projections, January, 1989; Missouri: College of Business and Public Administration, University of Missouri-Columbia, *Missouri Economic Indicators;* 2nd Quarter, 1988; Tennessee: Center for Business and Economic Research, University of Tennessee, Knoxville, *An Economic Report to the Governor of the State of Tennessee On the State's Economic Outlook*, January 1989.

Table 2 presents actual data for 1988 and projections for 1989 for several economic in-

[5]The *Blue Chip* consensus forecast (from February 1989) of 51 private economists, for example, indicates that real GNP growth will slow to 2.7 percent in 1989 (full year-over-year comparison) from its 3.8 percent increase in 1988.

dicators. Projections for the national economy made by DRI/McGraw-Hill also are provided. Although different methodologies were used to generate the various projections, they are all consistent in their forecast of an employment slowdown in 1989. U.S. payroll employment growth is expected to slow to 2.2 percent in 1989 from its 3.6 percent rise last year. Employment in each of the states is expected to grow even more slowly than in nation. Reflecting the slow job growth, unemployment rates are expected to rise in Arkansas, Missouri and Tennessee. Lower rates are anticipated in Kentucky, however.

To the extent that the projections are correct, manufacturing will provide fewer new jobs in 1989 than in 1988. Nationally, manufacturing employment growth is expected to slow to a 0.6 percent rise from the 2.5 percent increase in 1988. Each of the District states for which data are available show a similar pattern of deceleration. In Arkansas, manufacturing growth is expected to slow, in part, because anticipated higher interest rates may slow orders for durables goods, particularly those related to residential investment. In Tennessee, a continuation of the weakness in the textiles, apparel, lumber and wood products sectors are expected to retard manufacturing growth in 1989.

In contrast to employment, national personal income, measured in current dollars, is expected to grow faster in 1989 than in 1988. There are several reasons for this. First, expected higher inflation in 1989 raises the year's estimated nominal income figure. Second, DRI expects interest rates will be higher in 1989 which will raise interest income. Finally, transfer payments, particularly for Medicare and Medicaid, are expected to grow rapidly. Personal income is expected to grow more slowly in 1989 than in 1988 in Arkansas and Tennessee, while accelerating in Kentucky and Missouri.

## CONCLUSION

The Eighth District's business economy during 1988 was strong and growing, albeit at a slower rate than in the previous two years. The unemployment rate fell to its lowest level of the decade, and personal income and employment in most sectors continued to expand. Regional growth was weaker than at the national level, however, as job growth in each of the major sectors of the economy trailed the national average and District construction activity declined more severely. Although projections suggest that economic growth may slow this year, it is expected that 1989 will be the seventh successive year of growth for both the Eighth District and the nation.

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# Comparing Futures and Survey Forecasts of Near-Term Treasury Bill Rates

PREVIOUS research indicates that Treasury bill futures rates are better predictors of the future Treasury bill rate than forward rates. In a recent paper, MacDonald and Hein (1989) analyze 44 separate contracts delivered during the period 1977-87 for forecast horizons ranging from two days ahead to 91 days ahead. Their evidence shows that the Treasury bill futures rate generally delivers a smaller forecast error of the three-month Treasury bill rate than the forward rate implicit in the spot market, and that the forward rate adds little information about future Treasury bill rates that is not already incorporated into the futures rate. There also is evidence from other studies that survey forecasts of future Treasury bill rates contain information that improve upon forward rate forecasts. Studies by Friedman (1979) and Throop (1981), for example, reveal that survey forecasts often are more accurate than the forecasts from implicit forward rates.

Given the results of this research, a natural question to ask is "Does the Treasury bill futures rate provide a better forecast of future short-term interest rates than do survey forecasts?" In addition, since theories of financial market efficiency suggest that financial asset prices should include all available information, a related question is "Could one improve upon the Treasury bill futures forecasts using the information contained in the survey projections?"

Addressing these questions, the object of this paper, is interesting for several reasons. One is that forecasts of future interest rates are a crucial factor in forming investment strategies or purchasing plans. Incorrect interest rate forecasts can have large effects on investors' wealth. Moreover, to the extent that interest rate risk is directly related to the level of interest rates, accurately predicting the future level of rates is an important avenue to reducing interest rate risk exposure.[1] In a related vein, policymakers often consider the effect on interest rates as an important factor in predicting the outcome of policy changes. Knowing that the futures market provides an accurate gauge of the market's expectation for future rates provides a practical benchmark prediction

[1]On this, see Belongia and Santoni (1987).

to which policymakers can compare their forecasts.[2]

This article compares futures market and survey forecasts of short-term Treasury bill rates in two ways. First, considering general accuracy, we compare forecasting results of the two predictions over the 10-year period, 1977-87. General forecast accuracy is compared along with the extent of bias in the two reported forecasts.[3] Second, we investigate whether information in the survey forecast could reduce the forecast error of the Treasury bill futures market prediction. This relates to the efficiency of the Treasury bill futures market, an issue that previously has been addressed by comparing futures and forward rates in terms of the arbitrage opportunities that differentials in these two rates indicate.[4]

## THE DATA

This study uses two quarterly interest rate forecasts: one from a widely circulated survey of market participants; the other from the Treasury bill futures market.

### *Survey Forecasts*

The survey forecasts are published in the *Bond and Money Market Letter*.[5] This survey has been taken quarterly since 1969. On each survey date, approximately 40 to 50 financial market analysts representing a variety of financial institutions are asked for their point forecast of a number of different interest rates, three months and six months hence.[6] In this study, we focus on the survey forecasts of the three-month Treasury bill rate. The respondents' forecasts are compiled, and the mean value is published in the *Letter*. Since the approximate date of the survey response is easily identified, these forecasts can be easily matched with futures market rates for similar dates.[7] This feature makes the survey more attractive than other existing surveys for empirical comparison with interest rate forecasts from the futures market.[8]

### *Futures Market Rates*

Trading in Treasury bill futures contracts takes place on the International Monetary Market (IMM) of the Chicago Mercantile Exchange between the hours of 8 a.m. and 2 p.m.[9] The futures contracts traded call for delivery of $1 million of Treasury bills maturing 90 days from the delivery day of the futures contract. The instrument and maturity of the deliverable instrument match well with the survey forecasts of the Treasury bill rate. These contracts call for delivery four times a year: March, June, September and December.[10]

The futures market forecasts were gathered so that the futures market rate was taken on the same approximate date that the survey

[2]As Poole (1978) notes, "Unless policymakers have solid evidence that their own forecasts are more accurate than market forecasts, they cannot afford to ignore the T-bill futures market." (p. 18)

[3]Belongia (1987) also compares the relative accuracy of futures and survey forecasts of Treasury bill rates, using the semiannual survey published by the *Wall Street Journal*.

[4]For examples of such studies, see Hegde and Branch (1985) or MacDonald, et al (1988) and the references cited therein.

[5]We would like to thank the publishers of the *Letter* for allowing us to use their survey results in this study. For previous analyses of this survey data, often referred to as the Goldsmith-Nagan survey, see Prell (1973), Friedman (1980), Throop (1981) and Dua (1988).

[6]The survey actually asks for forecasts of 11 different interest rates, ranging from the federal funds rate to conventional mortgage rates.

[7]The newsletter in which the survey results are published also provides the interest rates on the day the questionnaires are mailed and the latest close before publication, a period of about two weeks.

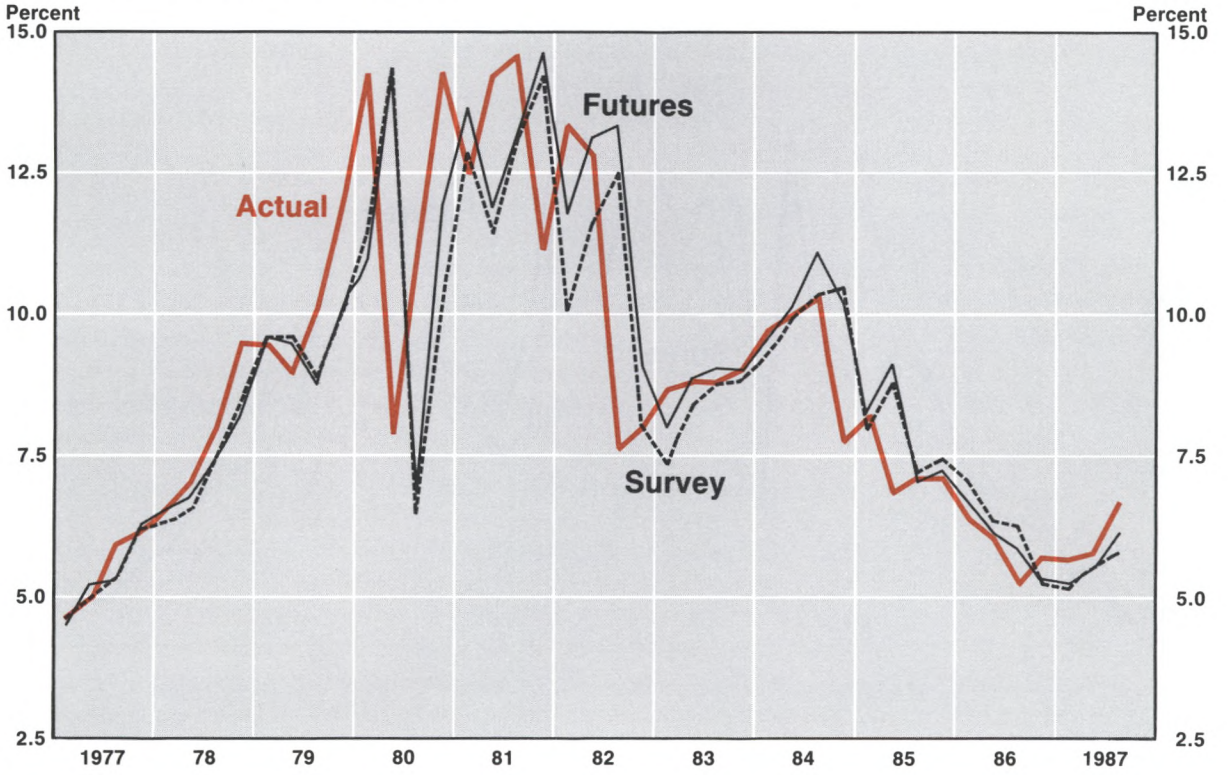
[8]One such survey is conducted by the American Statistical Association-National Bureau of Economic Research (ASA-NBER). This quarterly survey also asks participants to forecast the Treasury bill rate one quarter and two quarters ahead. Unfortunately, the questionnaire does not ask respondents for a forecast of the rate on any certain date in the future. It is unclear, therefore, whether the resulting forecast is a quarterly average, the peak rate for the quarter or the rate expected to hold at quarter's end.

Another interest rate survey already referred to is the semiannual *Wall Street Journal* poll of financial market analysts. This survey asks participants for their forecast of the three-month Treasury bill rate six months hence. Because this survey has been conducted only since December 1981, the limited number of forecasts restricts its usefulness for the type of empirical analysis used in this study.

[9]The discussion of the futures contract is based on information available in the *1983 Yearbook* of the IMM and the *1987 Yearbook*, volume 2, of the Chicago Mercantile Exchange.

[10]The volume of futures contracts traded on the IMM grew substantially from their introduction in January 1976, when the total volume for all delivery months was 3,576 contracts, through August 1982, when the number of contracts traded reached 738,394. Since 1982, however, the number of contracts traded has decreased: in December 1987, the total number of contracts was 131,575. The decline in the Treasury bill contracts also coincides with the introduction of a Eurodollar futures contract. This new contract may be viewed as a substitute for the Treasury bill contract.

Figure 1
**T-Bill, Futures and Survey Forecasts**
**Forecast Horizon: Three Months**




forecast was made. It is the approximate date, because the exact date when each survey respondent made his or her forecast cannot be determined. For example, the questionnaire asking "At what level do you see the following rates on September 30, 1987, and December 31, 1987?" was mailed to survey participants on June 16, 1987. The results of this survey subsequently were published on July 2, 1987.

To make the analysis in this study tractable, we have chosen the midpoint of this two-week interval between the mailing date and publication date as the representative forecase date. Continuing with the example, two Treasury bill futures contracts were gathered from the *Wall Street Journal* for June 24, 1987: those for the September and December 1987 delivery dates.[11] These futures market predictions are then directly compared with the three-month and six-month-ahead Treasury bill rate survey forecasts published on July 2, 1987. For example, the July 1987 survey forecase of the September 30, 1987, Treasury bill rate was 5.81 percent. The futures market forecast was slightly higher, 6.15 percent. The actual rate turned out to be 6.64 percent.

## A PRELIMINARY LOOK AT THE FORECASTS

To illustrate the overall relationship between the different series over the full sample period, we plotted the actual three-month Treasury bill rate and the different forecasts for the full sample period, from March 1977 through October 1987. These are shown in figures 1 and 2.

[11]It also should be noted that a slight disparity between the date of the two forecasts is expected to prevail. The survey participants presumably are projecting rates for the last business day of each quarter. Alternatively, the futures market is concerned with rates on the delivery day of the futures contract, usually the third Thursday of the final month in each quarter. The maximum disparity, however, is only six business days.

Figure 2
**T-Bill, Futures and Survey Forecasts**
**Forecast Horizon: Six Months**


## *Three-Month-Ahead Forecasts*

Figure 1 presents the two different three-month-ahead forecasts along with the actual three-month Treasury bill rate. The general pattern shown is similar for both forecasts. In fact, both appear to have a closer relationship to each other than they do to the actual Treasury bill rates. For example, both forecasts overpredicted the actual rate in 1980.[12] The forecast error (actual minus predicted) for June 1980 from the futures market was −630 basis points; for the survey it was −642 basis points. Another relatively large forecasting error occurred when the actual rate fell sharply in late 1982. For September 1982, the futures market forecast error is −571 basis points compared with the survey forecast error of −487 basis points. Since 1984, although the differences have become smaller, the forecast errors from the futures market and the survey have tended to systematically overpredict rates.

To provide some statistical basis for assessing the accuracy of these two forecasts, table 1 presents summary measures of the relative accuracy of the two three-month Treasury bill forecasts over the full period and two subperiods.[13] Both the mean absolute error (MAE) and the root mean squared error (RMSE) are reported for the forecasts. As a benchmark, we also report the results based on a simple no-

[12]The Special Credit Control program was administered during this period. For a description of the program and a discussion of monetary policy during this period, see Gilbert and Trebing (1981).

[13]These subperiods represent those during which monetary policy was thought to be influenced by the behavior of the monetary aggregates (1980-82) and the behavior of interest rates (1983-87). Gilbert (1985) and Thornton (1988) suggest that the behavior of policy under borrowed reserve targeting was quite similar to that under a federal funds rate targeting procedure.

Table 1

**Summary Forecast Statistics, Three-Month Treasury Bill Rate**

| | March 1977-October 1987 | | March 1980-December 1982 | | March 1983-October 1987 | |
|---|---|---|---|---|---|---|
| Forecast | MAE | RMSE | MAE | RMSE | MAE | RMSE |
| | | | Three-month forecasts | | | |
| Futures | 1.18% | 1.90% | 2.79% | 3.32% | 0.53% | 0.86% |
| Survey | 1.25 | 1.97 | 2.92 | 3.44 | 0.62 | 0.93 |
| Naive | 1.20 | 1.91 | 3.10 | 2.53 | 0.54 | 0.79 |
| | | | Six-month forecasts | | | |
| Futures | 1.52 | 2.28 | 2.94 | 3.64 | 1.03 | 1.48 |
| Survey | 1.60 | 2.23 | 3.10 | 3.63 | 1.03 | 1.30 |
| Naive | 1.68 | 2.31 | 3.12 | 3.63 | 0.83 | 1.01 |

NOTE: MAE is the mean absolute error; RMSE is the root mean squared error.

change forecast model, where the no-change model's forecast is the spot three-month Treasury bill rate observed on the same day that the futures rate forecast also is gathered.

The overall forecast accuracy of the three-month-ahead futures and survey predictions are quite close. For the full period, the MAE is 1.18 percent for the survey and 1.25 percent for the futures rate, both about the same as the no-change forecast (1.20 percent). The RMSEs also are quite similar across forecasts. The subperiod results reflect the difficulty in forecasting the Treasury bill rate during the early 1980s: the MAEs for the different forecasts are, on average, five times greater during the 1980-82 period than the 1983-87 period. Still, the forecast statistics indicate that the relative accuracy of the forecasts is similar.[14]

## Six-Month-Ahead Forecasts

Figure 2 is a plot of the six-month-ahead forecasts together with the actual Treasury bill rate. The size and pattern of the two six-month-ahead forecast errors contrasts sharply with the three-month-ahead forecasts. Note, for example, the relative magnitude of the forecast errors during 1980 in figure 2 contrasted with figure 1. The prediction error for December 1980 from the futures rate was −704 basis points and, for the survey forecast, −744 basis points. For the three-month-ahead forecasts, the respective errors were positive and smaller: 239 basis points for the futures market forecast and 409 basis points for the survey forecast. Note also the magnitude of the post-1984 overprediction in figure 2 relative to figure 1.

The summary statistics in table 1 reveal that the accuracy of the six-month-ahead futures and survey forecasts is comparable for the full period and the subperiods. Generally, there is little difference between the MAEs and RMSEs for the two forecast series.

## Bias Tests

Observers generally argue that rational individuals do not make the same forecasting mistake over and over again, because forecasts that consistently over- or underpredict the actual series presumably reduce the investor's wealth relative to forecasts that are unbiased. Consistent with the notion of wealth-maximization and rationality, forecasts therefore should be unbiased.

[14]This observation is corroborated by a statistical test of the futures and survey forecasts' mean square errors (MSE). This test, suggested by Ashley, Granger and Schmalensee (1980), revealed that one could not reject the hypothesis that the futures market and survey forecasts' MSEs are equal.

To test forecasts for bias, researchers usually estimate a regression of the form

(1) $r_t = \alpha + \beta_{t-s} r_t^E + u_t$ ,

where $r_t$ is the actual rate of interest at time t, ${}_{t-s}r_t^E$ is the expectation of the rate for time t held at time t-s, and $u_t$ is a random error term.[15] The null hypothesis, that expectations are unbiased, implies the testable hypothesis that the estimated values of the coefficient $\alpha$ is zero *and* the coefficient $\beta$ is unity. Moreover, the error term ($u_t$) should not display characteristics of autocorrelation.[16]

A problem in estimating equation 1 arises if the actual and forecast series are characterized by unit root processes.[17] In such a case, estimating equation 1 will produce downward-biased coefficient estimates, an increased probability of rejecting the null hypothesis and, therefore, an incorrect finding of bias when it doesn't exist.[18]

As an alternative to estimating equation 1 directly, one can test for bias by imposing the null hypothesis conditions and determine whether the data reject them. Imposing the null restrictions yields the relationship

(2) $r_t - {}_{t-s}r_t^E = u_t$ .

If the actual interest rate series and the forecasts are characterized by unit root processes and the forecasts are unbiased, then the data also should reject the hypothesis that the forecast error ($u_t$) has a unit root. Moreover, it should be the case that $E(u_t) = 0$.

To implement this test procedure, we first test for unit roots in the actual and forecast interest rate series. Again, if it is shown that the actual interest rate series has a unit root, then so should the forecast series under the assumption of rational expectations.[19] To test for unit roots, the Dickey-Fuller (1979) test procedure is used wherein the change in each series is regressed on a constant and one lagged value of the serie's level. Specifically, a regression of the form

(3) $\Delta X_t = \alpha_0 + \lambda X_{t-1} + e_t$

is estimated, where $\Delta$ is the difference operator (i.e., $\Delta X_t = X_t - X_{t-1}$). If the t-ratio associated with the lagged variable is less than the relevant critical value, then we can reject the existence of a unit root.

The results of this test for the Treasury bill rate and its forecasts are reported in the upper half of table 2. In every instance, we find that the estimated t-ratio on the lagged level of the selected variable is greater than the 5 percent critical value, about $-3.50$.[20] This evidence indicates that we cannot reject the notion that each series has a unit root.

Given this finding, the forecast errors are examined to determine whether they do not contain unit roots, as hypothesized under the con-

[15]Webb (1987) has argued that such tests may lead one to reject the null hypothesis when it is true. He argues that rejection of unbiasedness may reflect several factors, all of which are known to the econometrician *ex post* but not to the forecaster *ex ante*. He argues that forecasts that fail bias tests may in fact have originally been formulated optimally. This criticism is most forceful for examining forecasts of series that are revised many times following the original forecast date. Such a problem does not exist, however, with the interest rate series used here.

[16]This restriction, as Friedman (1980) notes, strictly applies only to the one-step-ahead forecasts.

[17]If the fundamental moving-average representation of some series X has an autoregressive representation, then it can be written in the form

$[1-a(L)] X_t = e_t$ ,

where L is the lag operator (i.e., $LX_t = X_{t-1}$ and $a(L) = \Sigma a_i L^i$. The polynomial in the lag operator a(L) can be written as $a(L) = (1-B_1 L)B(L)$. If there exists a root $B_1$ that is equal to unity, then the series X is characterized by a unit root. It is useful to note that a random walk is a particular type of unit-root process.

[18]We would like to thank Jerry Dwyer for pointing this out. This issue is discussed at length in Dwyer, et al (1989) from which the following draws.

[19]In other words, the process generating the expectations should be the same as the one generating the actual series.

[20]The critical value is taken from Fuller (1976), table 8.5.2. We should note that Schmidt (1988), extending the work of Nankervis and Savin (1985), argues that these critical values are incorrect in the presence of significant drift in the variable. Given the estimated constant terms found in the upper panel of table 2, the critical value to test for unit roots according to Schmidt is about -1.86 at the 5 percent level and about -2.60 at the 1 percent level. Using these critical values, our estimates suggest that, while unit roots are rejected at the 5 percent level, they are not at the 1 percent level.

If we take the results using the 5 percent level, then it is possible to estimate equation 1 directly. Doing so gives the following results: the calculated F-statistic and related marginal significance level testing the joint hypothesis that $\alpha = 0$ and $\beta = 1$ in equation 1 is 2.51 (0.09) for the three-month futures forecast; 3.26 (0.05) for the six-month futures forecast; 1.66 (0.20) for the three-month survey forecast; and 1.80 (0.18) for the six-month survey forecast. Except for the six-month futures forecast, these results indicate that unbiasedness cannot be rejected.

Table 2

**Unit Root Tests on Actual Treasury Bill and Forecasts Sample: March 1977-October 1987**

| Actual series | Estimated coefficient[1] Constant | Lagged level |
|---|---|---|
| Treasury bill | 2.17 | −0.239 |
| | (2.34) | (−2.40) |
| Futures (3-month) | 2.40 | −0.263 |
| | (2.40) | (−2.48) |
| Survey (3-month) | 2.84 | −0.321 |
| | (2.70) | (−2.79) |
| Futures (6-month) | 2.21 | −0.240 |
| | (2.26) | (−2.34) |
| Survey (6-month) | 2.07 | −0.234 |
| | (2.26) | (−2.32) |
| **Forecast errors** | | |
| Futures (3-month) | −0.112 | −1.203 |
| | (−0.37) | (−7.66) |
| Survey (3-month) | 0.201 | −1.214 |
| | (0.64) | (−7.76) |
| Futures (6-month) | −0.122 | −0.698 |
| | (−0.35) | (−4.55) |
| Survey (6-month) | 0.128 | −0.702 |
| | (0.37) | (−4.59) |

[1]Values of t-ratios are reported in parentheses. The 5 percent critical value taken from Fuller (1976) is about −3.50.

dition of unbiasedness.[21] Regressing the change in the respective forecast error on a constant and a lagged level of the forecast error produces the results reported in the lower half of table 2. For both the three-month and six-month forecasts, the futures market and survey forecasts of the Treasury bill rate satisfy the condition of unbiasedness: the calculated t-ratio is always less than the critical value. These results indicate that the imposed restrictions associated with unbiased forecasts are not rejected.

The different forecast error series also are examined to decide whether their mean values differ from zero. In every instance, the hypothesis that the mean forecast error is not statistically different from zero could not be rejected. In fact, the largest t-statistic calculated is far below unity. Thus, the evidence is largely consistent with the notion that the futures market and survey forecast errors are unbiased.[22]

## MARKET EFFICIENCY TESTS

The evidence to this point tells us little about the efficiency of the Treasury bill futures market. The hypothesis of market efficiency asserts that financial markets use all available information in pricing securities. If this is true, there should be no more accurate forecast of future security prices than that in today's price.

To investigate the efficiency of the futures market forecasts, a test proposed by Throop (1981) is used to determine whether knowledge of the survey forecast of Treasury bill rates could reduce the forecast error made by the futures market. The answer to this question can be found by estimating the regression

$$(4)\ r_t - {}_{t-s}r^F_t = \delta({}_{t-s}r^S_t - {}_{t-s}r^F_t) + e_{s,t}\ ,$$

where $r_t$ is the three-month Treasury bill rate at date t, ${}_{t-s}r^F_t$ is the futures market rate at t-s for delivery at t, ${}_{t-s}r^S_t$ is the survey forecast taken at t-s for rates prevailing at t and $e_{s,t}$ is a random error term.[23] The hypothesis of market efficiency requires that the estimated value of the coefficient $\delta$ is zero, indicating that the information in the survey forecast already is incorporated in the futures market's projection. To see this, rewrite equation 4 as $r_t = \delta_{t-s}r^S_t + (1-\delta)_{t-s}r^F_t$. Under the market efficiency requirement that $\delta = 0$, the survey forecast drops

[21]As Dwyer, et al (1989) state, "A unit root in the forecast errors would indicate that the distribution of the forecast errors has a random walk component which has no counterpart in the innovations in the events being forecast." (p. 15)

[22]The bias of the no-change forecasts also was tested. Like the results based on the futures market and survey forecasts, the reported t-ratios allow us to reject the hypothesis of a unit root in the forecast errors of the no-change models. Moreover, the mean forecast error is not statistically different from zero.

[23]Throop (1981) used this approach to test the efficiency of Treasury bill forward rate projections and found evidence of inefficiencies in the forward market. Kamara and Lawrence (1986) and MacDonald and Hein (1989) use this approach and find that Treasury bill futures rates are more accurate forecasts when compared with the forward rates. Other examples employing a similar type of analysis are Fama (1984a,b) and French (1986).

## Table 3

### Efficiency Test Regressions Sample: March 1977-October 1987

Estimated Equations:

A) $r_t - {}_{t-s}r_t^F = \delta_1({}_{t-s}r_t^S - {}_{t-s}r_t^F)$

B) $r_t - {}_{t-s}r_t^F = \delta_2(r_{t-s} - {}_{t-s}r_t^F)$

| Equation | Estimated coefficients $\delta_1$ | $\delta_2$ | $\bar{R}^2$ | DW |
|---|---|---|---|---|
| | **Three-month forecasts** | | | |
| A | 0.08 (0.16) | | −0.02 | 2.41 |
| B | | 0.44 (0.95) | 0.02 | 2.50 |
| | **Six-month forecasts** | | | |
| A | 0.71 (1.54) | | 0.05 | 1.40 |
| B | | 0.44 (1.36) | 0.04 | 1.58 |

NOTE: Absolute value of t-statistics in parentheses.

from the equation and one is left with $r_t = {}_{t-s}r_t^F + e_{s,t}$.

If the estimated value of $\delta$ is different from zero, however, knowledge of the differential between the survey forecast and the futures rate would significantly reduce the forecast error in the futures rate.[24] This would be inconsistent with the notion that market participants efficiently utilize all available information. In the terminology of Fama (1970), our test is a "semi-strong" form test of market efficiency, since all the information in the survey projections would not have been publicly available when the futures market was sampled.

Estimates of equation 4 to test the efficiency of both the three-month-ahead and the six-month-ahead Treasury bill futures market forecasts are reported as equation A in table 3.[25] The evidence indicates that the hypothesis of a semi-strong form of market efficiency cannot be rejected at the 5 percent level of significance. Using the information differential between the survey forecast and the futures rate, the estimated value of $\delta$ is only 0.08 (t = 0.16) for the three-month forecast horizon. For the six-month horizon, the estimated value of $\delta$ is 0.71 (t = 1.54). In both instances, we cannot reject the hypothesis of efficiency as applied to the futures market forecast. A weak-form market efficiency test also was considered by replacing the survey forecast with the current spot market rate. The result is reported as equation B in table 3. When compared with the no-change forecast, efficiency again cannot be rejected for the futures rate: the results indicate that, for the three-month and six-month forecasts, the estimated value of $\delta$ is never significantly different from zero.

Rewriting equation 4 as above also indicates that it imposes the restriction that the sum of the weights on the two forecasts sum to unity. We have re-estimated the equation without this restraint and found that we still could not reject efficiency of the futures rate forecasts when compared with either the survey or no-change forecasts.

## *The Role of the Revision in the Survey Forecast*

Since the survey participants are asked for their three- and six-month-ahead forecasts every three months, they essentially are providing two forecasts of the same event, taken at two different points in time. For example, survey participants are asked in December of the previous year and then again in March to forecast the June Treasury bill rate. One piece of new information that survey respondents have in making their March forecasts is the revision of the December forecast itself. Nordhaus (1987) has suggested that, for forecasts to be efficient, the information in the revision also should be incor-

[24]This same procedure can be used to test if there is information in the futures rate that is not present in the survey forecast. In this case, the left-hand side of equation 4 is the forecast error from the survey prediction. The results from this test (not reported) indicate that the survey forecasts are efficient with respect to the futures market forecasts.

[25]The results reported are those excluding a constant term in the regression. Including a constant term does not alter the conclusions reached. Also, White's (1980) test failed to reject the null hypothesis of homoskedasticity in the residuals.

porated in the current forecast. Knowledge of the revision should not allow a reduction in the forecast error under the hypothesis of efficiency.

A similar argument can be applied to the futures rate forecasts. In particular, knowledge of the revision in the survey forecast of future Treasury bill rates should not help reduce the futures market's forecast error if the latter is formed efficiently. The survey's revision is part of today's information set and should already be incorporated into the market's projection.[26] To test whether knowledge of the survey's revision could help reduce the forecast error in the futures market, equation 4 is modified to include the survey revision itself:

$$(5)\ r_t - {}_{t-1}r_t^F = \alpha_0 + \gamma_1({}_{t-1}r_t^S - {}_{t-1}r_t^F) + \gamma_2({}_{t-1}r_t^S - {}_{t-2}r_t^S) + e_t\ .$$

The term $({}_{t-1}r_t^S - {}_{t-2}r_t^S)$ reflects the revision in the survey's forecast of next quarter's Treasury bill rate. Efficiency requires not only that the futures rate contains all the information in the survey forecast, but also that it reflects the survey forecast revision. If the futures rate forecast is efficient, estimated values of both $\gamma_1$ and $\gamma_2$ in equation 5 should not be different from zero.

The results from estimating equation 5 (with absolute value of t-statistics in parentheses) are:[27]

$$(6)\ r_t - {}_{t-1}r_t^F = \underset{(0.20)}{-0.066} + \underset{(0.18)}{0.104}({}_{t-1}r_t^S - {}_{t-1}r_t^F) - \underset{(1.86)}{0.312}({}_{t-1}r_t^S - {}_{t-2}r_t^S)$$

$\bar{R}^2 = 0.034 \qquad DW = 1.92$

The intercept of the equation is not statistically different from zero, indicating no bias in these projections. We also find that the estimated slope coefficients ($\gamma_1$ and $\gamma_2$) are not significantly different from zero using a conventional 5 percent level of significance. This outcome is consistent with the efficient markets hypothesis that there is little information in the survey forecast or its revision that is not already incorporated into the futures rate forecast.[28]

## CONCLUSION

In this study, we compared futures market and survey forecasts of the three-month Treasury bill rate both three and six months ahead. Our test results generally support the perception that the forecasts are unbiased predictors of future rates. Moreover, futures market forecasts of near-term interest rates usually are as accurate as those produced by professional forecasters. Compared with a popular survey of professionals used in this study, we find little difference in the relative forecasting accuracy of the two. Our results also indicate that no information in the survey forecast or its revision could reliably improve upon the futures rate prediction.

This conclusion about market efficiency contrasts sharply with that found for the forward market. Previous evidence has shown that the Treasury bill forward rate does not incorporate all of the information contained in the same survey considered here. Such a conclusion, along with the evidence presented in this paper, is consistent with the belief that there is a time-varying premium in the forward rate that apparently is absent in the Treasury bill futures rate.

The results presented here should not be interpreted as proof that the Treasury bill futures market rate is always the most accurate interest rate forecast. The evidence does suggest, however, that for investment decisions and monetary policy discussions, the futures rate provides a useful measure of the market's expectation of future interest rates. Consequently, it is a valuable benchmark to which other forecasts can be compared.

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[26]The reader again is reminded that this is a semi-strong form efficiency since the information in the survey revision would not have been released to the public at the time that we sampled the futures rates.

[27]White's (1980) test indicated that we could not reject the null of homoskedastic residuals.

[28]We should note, however, that the $\gamma_2$ slope coefficient is significant at about the 7 percent level. Based on this level of significance, the result of estimating equation 5 is consistent with the notion that the futures rate forecasts may not be the optimal projection of the Treasury bill rate. Given the results in equation 6, the optimal forecast $({}_{t-1}r_t^0)$ would take the form

$${}_{t-1}r_t^0 = {}_{t-1}r_t^F - 0.312({}_{t-1}r_t^S - {}_{t-2}r_t^S)\ .$$

This result implies an overreaction on the part of the futures market to a revision. That is, if the survey revises its interest rate forecast upward, the optimal forecast would scale down the forecast from the futures market.

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# Bank Runs and Private Remedies

CURRENT banking regulation in the United States is based in part on the notion that both the banking system and the economy must be protected from the adverse effects of bank runs. An example often cited as typical is the string of bank runs from 1930 to 1933, which conventional wisdom holds responsible for thousands of bank failures and the Banking Holiday of 1933 when all banks closed. The runs on savings associations in Ohio and Maryland in 1985 are more recent examples.

This conventional view is reflected in a recent comment on the "Panic of 1907" in the *Wall Street Journal* (1989):

> Long lines of depositors outside the closed doors of their banks signaled yet another financial crisis, an all-too familiar event around the turn of the century.

Research in the last few years on bank runs indicates that the conventional view is mistaken. Runs on the banking system were not commonplace events, and their impact on depositors and the economy easily can be overstated. Prior to the formation of the Federal Reserve System in 1914, banks responded to runs in ways that lessened their impact. These private remedies did not solve the problem of runs, but they did mitigate the effects of the runs on the banks and the economy. In this article, we explain the private remedies for runs and provide some evidence on the frequency and severity of runs on the banking system.

## BANK RUNS: THE THEORY

Before examining the history of bank runs, it is useful to consider why banks are vulnerable to runs. This examination establishes a framework for determining the kinds of observations that would be consistent with their occurrence.

### *Runs on Individual Banks*

In a run, depositors attempt to withdraw currency from a bank because they think the bank will not continue to honor its commitment to pay on demand a dollar of currency for a dollar of deposits.[1] One aspect of the contract banks make with their customers is central to understanding why depositors would run on their bank. Banks make contractual promises that they cannot always honor: exchange of gold or

[1]Salant (1983) provides a general analysis of the breakdown of such arrangements as bank redemption of its liabilities at par. The mapping from speculative attacks into bank runs is discussed by Flood and Garber (1982).

currency at par value for bank liabilities.[2] When banks issued notes as a form of currency, the promise was a contractual agreement to deliver specie (gold or silver) in exchange for the bank's notes at par value. Banks currently promise to deliver U.S. currency to depositors on demand at par value. Because banks hold reserves that are only a fraction of their liabilities payable on demand, they cannot honor this promise if all of their depositors try to convert deposits into currency at the same time.

Fractional-reserve banking by itself is not sufficient to make it impossible for banks to honor their promises to deliver currency in exchange for deposits on demand. Banks always could honor a promise to pay currency at a variable exchange rate of currency for deposits. If all depositors want to exchange their deposits for currency at the same time, banks do not have sufficient currency (or other reserves that can be transformed into currency on a dollar-for-dollar basis instantaneously) to meet that demand for currency at a price of one dollar of currency for one dollar of deposits.[3]

In the normal course of affairs, the inability of all depositors to exchange their deposits for currency is irrelevant. As some depositors withdraw currency from a bank, others deposit it. The low probability of every depositor closing his or her account at the same time is the reason a bank usually can operate with fractional reserves and pay currency on a dollar-for-dollar basis.

A low probability is not the same as a zero probability though. Information or rumors which suggest a capital loss by a bank may induce its depositors to attempt to convert their deposits to currency.[4] The mere expectation that other depositors will attempt the same conversion also can cause a run on a bank. A run on a single bank is unlikely, however, to have substantial effects on the economy. The primary effect of a single bank closing is that the bank winds up its affairs and no longer operates.

The effects of a run by depositors on one bank can be illustrated by an example. Table 1 shows the balance sheet of a hypothetical national bank in New York City in the national banking period (1863 to 1914). Its liabilities include deposits and national bank notes backed by securities deposited with the Treasury. In the event of the bank's failure, the notes were guaranteed by the U.S. Treasury, whether or not the deposited bonds were sufficient backing for the notes. Apparently as a result of this guarantee, runs on banks in the national banking era were runs by depositors, not by note holders.[5]

During this period, national banks in New York City were required to maintain reserves of specie and legal tender equal to 25 percent or more of deposits, with the required ratio of reserves to deposits lower for national banks in other cities. Banks generally held excess reserves as a buffer stock to meet deposit withdrawals, but we use a reserve ratio of 25 percent to keep the numerical example simple. The second part of table 1 shows the initial loss of reserves upon withdrawal of $2 million of deposits, while the last part indicates the reaction of the bank to the decrease in deposits. An individual bank can replenish its reserves by selling assets; in the example, the bank returns its reserve ratio to 25 percent by selling $1.5 million in assets. At least part of the reserves are from other banks, thereby transmitting the reserve loss to other banks.

In a run on a single bank, the specie and legal tender withdrawn from the bank are likely to be largely deposited in other banks. As a result, a run on a single bank is not likely to drain reserves from the banking system or increase currency held by the public. If the currency withdrawn is deposited in other banks, the net effect on the bank's balance sheet is that shown in table 1, and the deposit and reserve loss at this bank is matched by a similar increase in deposits and reserves at other banks.

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[2]Whether this promise is a result of market forces or government regulation is an open question. Davis (1910) summarizes the laws in the United States in the 19th century, and Schweikart (1987) provides the historical development of these laws in the South in the 19th century.

[3]Promises that cannot be kept in all states of the world are hardly unique to banking. For instance, firms often cannot make payments on debt if there is a large decrease in the demand for their products. The common legal word for failure to honor contractual commitments is "default." While default generally is not the expected outcome of a contract, it does happen.

[4]Among others, Diamond and Dybvig (1983) and Gorton (1985a) present models of runs.

[5]In banking panics prior to the national banking era, customers of banks attempted to redeem their bank notes for specie. For details on the backing for notes in the national banking era, see Friedman and Schwartz (1963), pp. 20-23, 781-82.

Table 1

**Balance Sheet of a National Bank in New York City with a Large Withdrawal of Deposits (millions of dollars)**

INITIAL BALANCE SHEET

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves (specie and legal tender) | $ 2.5 | Deposits | $10.0 |
| | | Notes | 1.0 |
| Interest-earning assets | 11.0 | Net worth | 2.5 |
| Total assets | $13.5 | Total liabilities | $13.5 |

IMMEDIATELY AFTER WITHDRAWAL OF $2 MILLION BY DEPOSITORS

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | $ 0.5 | Deposits | $ 8.0 |
| | | Notes | 1.0 |
| Interest-earning assets | 11.0 | Net worth | 2.5 |
| Total assets | $11.5 | Total liabilities | $11.5 |

AFTER RESTORATION OF RESERVE RATIO TO 25 PERCENT

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | $ 2.0 | Deposits | $ 8.0 |
| | | Notes | 1.0 |
| Interest-earning assets | 9.5 | Net worth | 2.5 |
| Total assets | $11.5 | Total liabilities | $11.5 |

## *Runs on the Banking System*

Runs on a single bank can develop into runs on the banking system.[6] An important, if seemingly obvious, aspect of banking is that the likelihood of a bank's default on its deposit agreement is not known with certainty by depositors. Instead, depositors estimate this likelihood as best they can with available information. One type of information that can be useful in estimating the value of a bank's assets is information on the value of assets at other banks. News about the failure of one bank can cause depositors at other banks to raise their estimate of the probability that their bank will default. Contagious bank runs can be defined as runs which spread from one bank or group of banks to other banks.

A term sometimes used for a period of a run on the banking system is a "banking panic," a term that has a connotation of unreasoning fear or hysteria. Contagious runs, however, can be based on the optimal use of all information by all agents. As a simple example, suppose that two banks are identical in all respects known by depositors, and one of the two fails because of loan losses. Because of the first failure, depositors will increase their estimate of the probability that the second bank will fail. If this estimate increases sufficiently, depositors will run on the second bank, even though no other information has appeared. This use of information is quite consistent with rational behavior. Depositors use the information available, and one part of that information is the condition of other banks.

Simultaneous runs on many banks need not be contagious runs though. For example, an exogenous event can increase simultaneously de-

[6]Gorton (1985a) and Waldo (1985) provide models of aspects of the process which we discuss in this section.

Table 2

**Balance Sheet of the Banking System with a Large Withdrawal of Deposits (millions of dollars)**

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | $ 250 | Deposits | $1,000 |
| | | Notes | 100 |
| Interest-earning assets | 1,100 | Net worth | 250 |
| Total assets | $1,350 | Total liabilities | $1,350 |

After withdrawal of $200 million by depositors:

| Assets | | Liabilities | |
|---|---|---|---|
| Reserves | $ 50 | Deposits | $ 200 |
| | | Notes | 100 |
| Interest-earning assets | 500 | Net worth | 250 |
| Total assets | $ 550 | Total liabilities | $ 550 |

positors' estimated probability that many banks will fail to redeem at par. Myers (1931) suggests that bank runs in 1914 resulted from the public's expectation that the war would result in a restriction of convertibility of notes and deposits into specie.[7]

Whether a contagious or a simultaneous run, a run on the banking system is associated with a drain of reserves from the banking system. The effect of this withdrawal of reserves is shown in table 2, which illustrates the effect of a $200 million increase in the demand for currency. For each bank individually, the initial impact is a withdrawal of reserves. Banks no longer have a reserve ratio of 25 percent, and, as a result, they attempt to increase their holdings of reserves by selling assets. The sale of assets by one bank drains reserves from other banks though, and these banks then sell some of their assets to acquire reserves. Unlike the previous example, the $200 million of reserves is gone from the banking system. As table 2 shows, the result of this process is a contraction of deposits and assets that is a multiple of the initial decrease in reserves.

If banks sell relatively large amounts of their assets quickly in a run, they can drive down the market value of their assets and drive up market interest rates. Table 2 could be modified to reflect this effect, with an additional decline in the value of bank assets and their net worth. If the declines in net worth are large enough, the response of the banks to the run indicated in table 2 will cause some banks to fail. Thus, an additional effect of a bank run might be a rise in the rate of bank failure.

## *Observations Consistent with the Occurrence of Runs*

The definition of a run is based on depositors' estimated probability of non-par redemption by banks. While it is possible to use an economic model to estimate this probability, we use a less-demanding basis to examine data for evidence

[7]See Myers (1931), p. 421. Empirically distinguishing between contagious runs and simultaneous runs is a tricky issue, which requires distinguishing between bank runs due to information that affects banks' assets and those due to information about *some* banks' assets. One way of doing this is to define contagious bank runs as those that would not have occurred without runs on earlier banks. There is at least one successful attempt at providing detailed evidence of a contagious run: Wicker's (1980) analysis of the runs in November and December 1930.

of runs: we examine the data for consequences of runs.[8]

A leading example of an event consistent with a run on the banking system is a joint restriction of convertibility by banks. Without an official central bank, banks can limit the effects of a run by jointly agreeing to restrict currency payments to depositors.[9] The effects of such a restriction can be illustrated by referring to table 2. Suppose that, after depositors withdraw $50 million in currency, the banks agree to stop making currency payments. In this illustration, deposits decline by only $200 million, to $800 million. The demand for more currency by depositors will not cause a further decline in deposits because some or all of that demand is refused by the banks.

Hence, one observation that provides clear evidence of a run on a banking system is a restriction of currency payments by banks in the system. An individual bank resorts to a restriction of currency payments if it cannot meet its commitment to pay currency to depositors on demand. Banks will resort to this action jointly if they face a common problem of currency withdrawals.

If the restriction of payments results in significant restrictions on depositors' ability to transform deposits into currency, a market for transforming currency into deposits may develop. If there is such a market, there will be a premium for currency in terms of deposits.[10]

A bank run need not result in restriction though. The following developments also would be consistent with the occurrence of a run on a banking system, although they are not inevitable effects of runs and they can occur in the absence of a run. Perhaps most importantly for our purposes, these indicators of runs can be lessened by a restriction of payments to depositors. They are:

1. a decline in the ratio of reserves to deposits.
2. a rise in the ratio of currency to deposits.
3. for a given monetary base, a decline in the money supply (because the decline in deposits is a multiple of the decline in bank reserves).

## RESTRICTION OF CONVERTIBILITY

The view that the banking system is vulnerable to runs may be based primarily on the experience of the early 1930s, but the most relevant period to examine for evidence of runs is before the operation of the Federal Reserve System. Prior to late 1914, the United States had no official central bank.[11] We focus on the banking system beginning with the 1850s. While events in earlier years also are of interest, 1853 marks the beginning of a weekly data set on reserves and deposits in banks in New York City which is very useful. In addition, by the 1850s, New York City was the most important financial center in the United States. Many banks in other parts of the country held correspondent balances in New York City banks, and pressures affecting banks in the rest of the country affected New York City banks through these balances.[12]

### *Restrictions on Payments*

As table 3 indicates, banks in New York City restricted payments on five occasions

[8]Gorton (1988) does estimate a particular model for runs and finds them generally consistent with our analysis. He also defines runs on the banking system, or in his terms "banking panics," as periods when convertibility was restricted in New York City, clearing house loan certificates were authorized by the New York Clearing House or both (1988, pp. 222-23). We prefer not to identify periods with runs based on a single criteria. If we were to pick a single criteria, it would be restriction of payments by banks. With any penalties on nonpar payments, banks will not do this unless they at least believe that they cannot continue payments at par indefinitely. For the use of a multiple set of criteria along our lines, see Bordo (1986).

[9]The names "restriction of cash payments" or "restriction of convertibility of deposits into currency" are suggested by Friedman and Schwartz (1963, p. 110, fn. 32) rather than the traditional name of "suspension of currency payments." Following this suggestion avoids confusion of "suspension of currency payments" with "suspension of operations" and is more consistent with the fact that banks commonly did not completely stop converting deposits into currency. Currency payments were non-price rationed, not suspended. Evidence for the post-Civil-War period that payments generally were restricted, not suspended, is presented by Sprague (1910), pp. 63-65, 121-24, 171-78, 286-90, and Andrew (1908), pp. 501-02.

A more general and precise, but also quite pedantic, name for restrictions would be "restriction of convertibility at par of bank liabilities with promised par redemption on demand."

[10]As we show below, banks remained open for deposits. Hence, a discount on currency could not persist.

[11]Friedman and Schwartz (1963) and, in more detail, Timberlake (1978) discuss the central banking activities by the Treasury in the national banking period. As argued forcefully by Dewald (1972), the New York Clearing House acted as a central bank at times.

[12]See Myers (1931) and Sprague (1910).

Table 3

**Dates of General Restriction of Payments in New York City, 1857 to 1933**

| Year | Beginning date | Ending date |
|---|---|---|
| 1857 | October 13 | December 11 |
| 1861 | December 28 | April 1862 |
| 1873 | September 24 | October 22 |
| 1893 | August 3 | September 2 |
| 1907 | October 26 | December 28 |
| 1933 | March 3 | March 15 |

Sources: see data appendix available on request.

between the 1850s and 1914.[13] In the episodes from 1857 to 1907, banks across much of the country restricted currency payments, but the restrictions were not universal.[14] The last such restriction was the banking holiday of March 1933. In the banking holiday of 1933, the federal government closed all banks in the country and gradually reopened those that regulators judged to be in satisfactory financial condition. In the earlier restrictions, in contrast, banks remained open and processed transfers of deposits for their customers.

Other than for the restriction of payments in 1907, it is difficult to obtain precise estimates of how widespread or binding these restrictions were. Shortly after the panic of 1907, A. Piatt Andrew surveyed banks in 147 cities in the United States with populations greater than 25,000. Andrew (1908) found that, of the 145 cities for which he had responses, 53 had no restriction of payments or emergency response. Of the remaining 92, the only restriction of payments in 20 cities was a request by the banks that larger depositors mark their checks as "payable only through the clearing house." In the remaining 72 cities, limits on withdrawals were often discretionary. Even in the 36 cities where there was joint agreement between the banks in the city to limit withdrawals, there was substantial variations across them. For example, in Atlanta, depositors could withdraw up to $50 per day and $100 per week from their banks. At the same time, depositors in two of these 36 cities, South Bend, Indiana, and Youngstown, Ohio, could withdraw nothing from their checking accounts.

## *The Relative Price of Currency and Deposits*

During the periods of restrictions of currency payments in the national banking era, markets developed in New York City for the exchange of currency for certified checks. Holders of certified checks marked "payable through the clearing house" could obtain currency in this market if they were willing to accept less than the face amount of the certified checks. Figure 1 shows the premiums on currency quoted in these markets in the three periods of restrictions in New York City in the national banking era. These markets operated for about four months in this period. The maximum premiums on currency are about 4 percent to 5 percent, but for most of the days in which these markets operated, the premiums are much smaller. Nonetheless, the important issue is whether the premiums are nonzero, which they are.

## *Clearinghouses and Restriction*

During these restrictions of payments, banks remained open for much of their regular business and processed checks for their customers as they usually did. In some parts of the country, banks in a local area processed checks bilaterally, but in other areas, banks used clearinghouses to process checks. From 1857 to 1914, these clearinghouses developed an emergency currency used during restrictions for clearing checks.

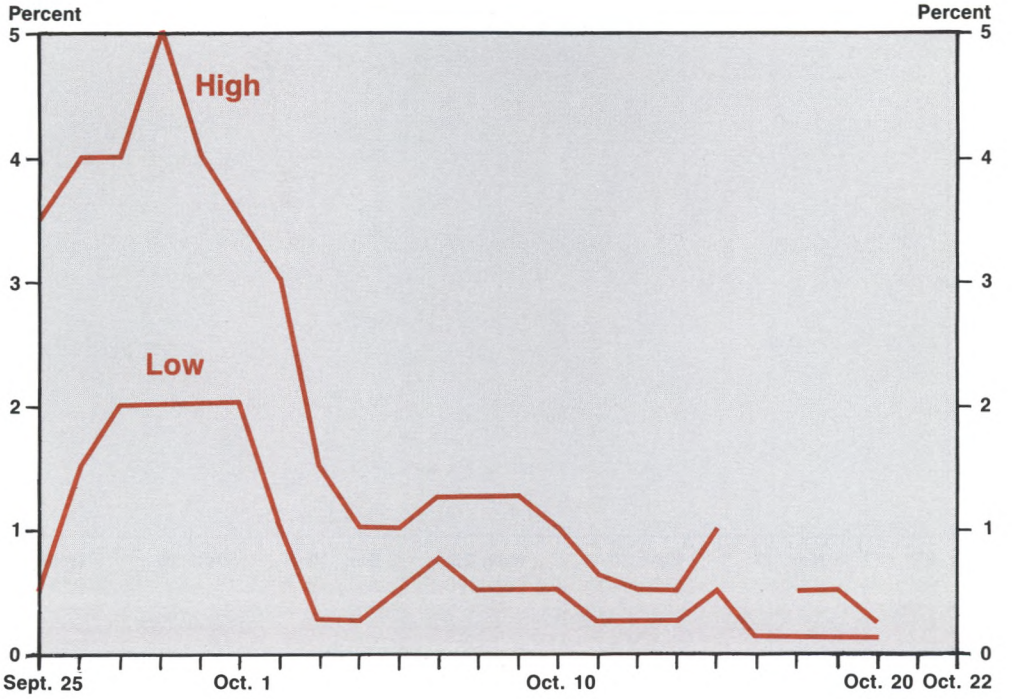
***Clearinghouses for banks*** — In the second half of the nineteenth century, banks in many cities established clearinghouses to decrease the resources used in clearing checks and exchanging gold and currency with other banks.[15] Rather than sending checks received to the offices of each bank for collection, members of a clearinghouse sent checks drawn on other member banks to the clearinghouse. Those with net

[13]A data appendix, available on request from the authors, gives the sources of these dates and the other data in this paper.

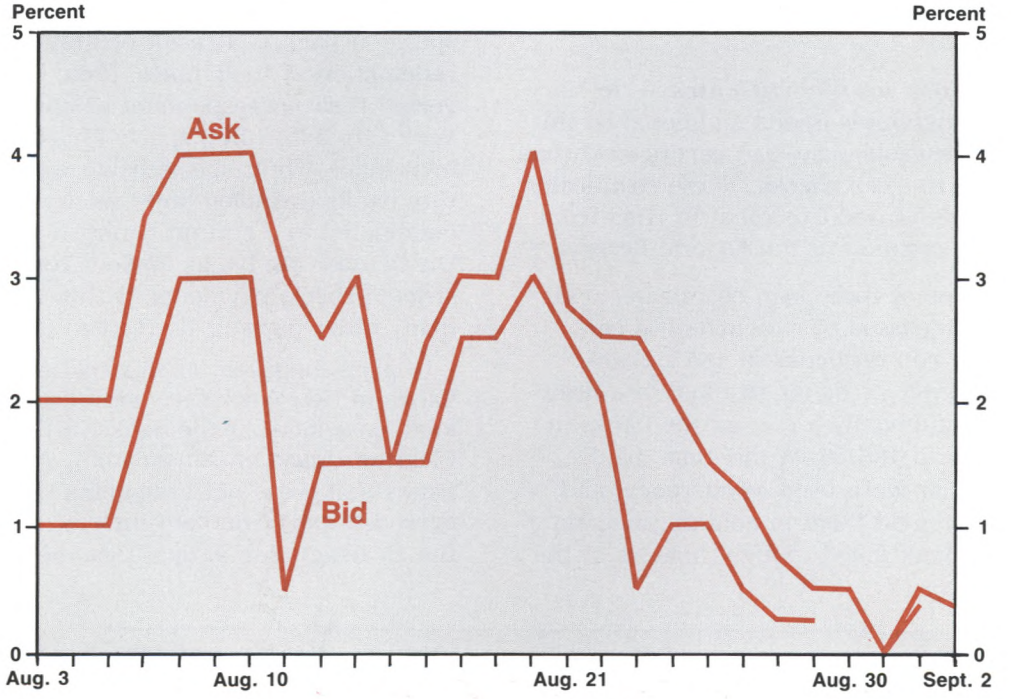
[14]For a discussion of 1873 and 1893, see Sprague (1910), pp. 63-74, 168-69. Andrew (1908) presents the results of a survey for 1907.

[15]Descriptions of clearinghouses are provided by Cannon (1910), Myers (1931), pp. 94-97, and Redlich (1968), ch. XVII.

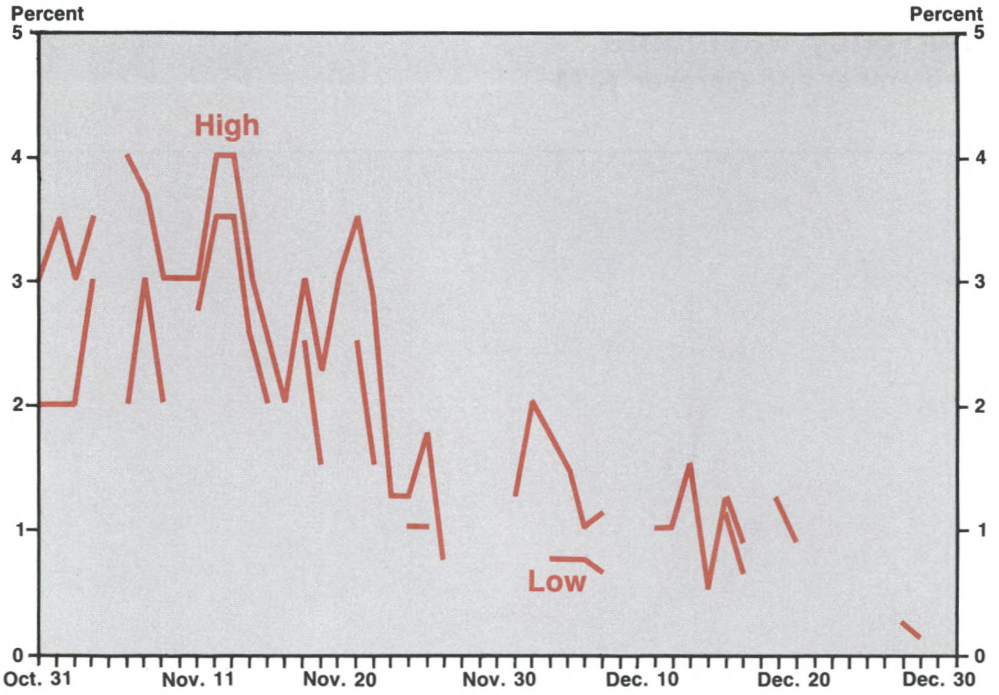
Figure 1
**Currency Premiums during Restrictions of Currency Payments**
**September and October 1873**




**September and October 1893**



**November and December 1907**




outflows of deposits at the clearinghouse paid those with net inflows in gold and currency or, more conveniently, with clearinghouse certificates. These certificates were receipts for banks' deposits of gold and legal tender at the clearinghouse.

***Clearinghouse loan certificates*** — In some periods, clearinghouses issued additional certificates called "clearinghouse loan certificates" that could be used to clear checks. These certificates were a commonly used expedient in runs from 1860 until the creation of the Federal Reserve.[16]

The precursor of these loan certificates was an extraordinary issue of clearinghouse certificates in the run on banks in 1857. Fears about the solvency of banks resulted in a drain of specie and ultimately a run on the banks in New York City in 1857.[17] At this time, banks issued notes that were used as currency, and the banks redeemed them in gold or silver on demand. If a bank failed though, holders of the notes could wind up with less than the promised amount of specie. In 1857, holders of banknotes were concerned about the likelihood that banks in various parts of the country would be able to continue converting their notes into specie at par. As a result of the continuing redemption of their notes, these banks converted their correspondent balances in New York City banks into specie for redeeming their own notes. Thus, specie balances in New York City banks dwindled and this drain of reserves culminated in a run on banks in New York City. On October 13, banks in New York City restricted specie payments, with restriction in many other parts of the United States following.

In part, the effect of this specie drain on banks in New York City was alleviated by a joint agreement of the banks in the New York Clearing House on November 7. New York state banks that were not redeeming their notes agreed to pay 6 percent interest on them, and the clearinghouse agreed that the notes of the

[16]This section owes much to the analyses in Timberlake (1984) and Gorton (1985b).

[17]This account is based on Gibbons (1859), ch. XIX; Myers (1931), pp. 97-99, 141-44; Calomiris and Schweikart (1988), pp. 31-56.

banks could be used as backing for clearinghouse certificates. Until they were gradually retired, these certificates were used for clearing checks just as if they were clearinghouse certificates backed by deposits of specie.

Clearinghouse loan certificates were first issued in 1860. In anticipation of war, Southerners converted their deposit balances in Northern banks into specie and, just as in 1857, banks in New York City were confronted with a drain of their specie reserves.[18] After the election of Abraham Lincoln in November, the banks in the New York Clearing House responded to the drain by jointly agreeing to allow bonds issued by the federal government and the state of New York to be used as backing for certificates, called "clearinghouse loan certificates," which could be used for clearing checks.

The procedure adopted in 1860 was basically the same as in every later instance when such certificates were issued. A loan committee was established which examined collateral and issued certificates based on the collateral. Upon using a loan certificate, a bank was required to pay interest, at a rate fixed by the clearinghouse, to any bank that held its loan certificates.[19] The members of the clearinghouse, however, were jointly liable for any loss attendant on holding a loan certificate. In addition, the clearinghouse agreements specified a date at which loan certificates would no longer be acceptable for settling balances at the clearinghouse.

Several features of the practices of clearinghouses indicate that, in issuing loan certificates, members of a clearinghouse were pooling their resources to deal with a common problem of withdrawals. Clearinghouse members pledged to absorb any losses on loan certificates as a group, with losses allocated according to each bank's capital. Losses were not likely, however, because the borrowing banks pledged assets with the clearinghouse, receiving loan certificates for a fraction of the value of the assets. In some panics, clearinghouse members stopped the weekly publication of their individual balance sheets and published combined balance sheets of their members, thus withholding information on the relative weakness of individual members.[20]

Clearinghouse loan certificates were created several times in the 55 years from 1860 to 1914. Table 4 shows the dates when these certificates were issued by the New York Clearing House.[21] As a quick comparison of tables 3 and 4 shows, clearinghouse loan certificates were issued whenever convertibility of deposits into currency was restricted. This is no coincidence, because clearinghouse loan certificates were an important part of banks' strategy for staying open after a run on the banking system.

Although first issued in 1860 in New York City only, the use of clearinghouse loan certificates became widespread over time (Stevens 1894; Andrew 1908; Cannon 1910). In 1873, the clearinghouses in New York City, Boston, Cincinnati, New Orleans, Philadelphia and St. Louis issued them. In 1884, New York City again was the only clearinghouse to issue loan certificates, but in 1890 it was joined by Boston and Philadelphia. In 1893, clearinghouses in at least 12 cities issued loan certificates, and in 1907, banks in 42 of 145 cities in the United States with more than 25,000 people used such certificates.

***Loan certificates and restrictions*** — Even with access to clearinghouse loan certificates, banks could provide currency in a run only until they exhausted their inventories of specie and legal tender.[22] During restrictions, banks rationed currency, meeting the requests by some customers for their customary withdrawals of currency and denying requests by others. Banks that were members of the clearinghouse continued to accept checks drawn on other clearinghouse members when deposited by their customers. As a result, depositors could make payments by writing checks drawn on their accounts or with certified checks issued by their banks. The major limitation was that the checks generally could not be exchanged for specie or currency by the recipient of the check.

[18]Swanson (1908) provides a detailed account of this episode.

[19]The annual rates were 7 percent in 1860 and 1873 and 6 percent in every other instance when they were issued. Comptroller of the Currency (1915, vol. 1), p. 103.

[20]Members of the New York City Clearing House agreed to pool reserves in the panic of 1873 but not in the following panics. Sprague (1910), pp. 46, 120; Myers (1931), pp. 408-20.

[21]The New York Clearing House authorized but did not issue loan certificates in December 1895 and August 1896. Gorton (1985b), p. 280, fn. 11.

[22]This section draws heavily on Sprague (1910).

Table 4

**Clearinghouse Loan Certificates Issued by the New York City Clearing House: Dates, Duration and Magnitudes (dollar amounts in millions)**

| Year | Date first issued | Months until all redeemed | Maximum amount created | Deposits |
|---|---|---|---|---|
| 1860 | November 23 | 3 1/2 | $ 6.9 | $ 99.6 |
| 1861 | September 19 | 7 1/4 | 22.0 | 99.3 |
| 1863 | November 6 | 2 3/4 | 9.6 | 159.5 |
| 1864 | March 7 | 3 1/4 | 16.4 | 168.0 |
| 1873 | September 22 | 3 3/4 | 22.4 | 174.8 |
| 1884 | May 15 | 4 1/4 | 21.9 | 317.2 |
| 1890 | November 12 | 2 3/4 | 15.2 | 386.5 |
| 1893 | June 21 | 4 2/3 | 38.3 | 398.0 |
| 1907 | October 26 | 5 | 88.4 | 1023.7 |
| 1914 | August 3 | 4 | 109.2 | |

Sources: see data appendix available on request.

If a check was not deposited at the issuing bank but at another bank in the local clearinghouse, the issuing bank could obtain more loan certificates to settle with the bank that accepted the check. If the check was deposited at a bank in another area, the receiving bank could deposit the certified check with a correspondent in the clearinghouse of the issuing bank.

Initially, these certificates were used only as a means of payment by other members of the clearinghouse, but in later years, they also were used as currency.[23] In 1893, clearinghouse loan certificates were issued in small denominations by some clearinghouses as a substitute for currency. In addition, banks in several cities with no clearinghouse issued notes that were jointly guaranteed by the banks in the cities. In 1907, banks in many parts of the country created loan certificates which temporarily were used as currency. In 53 of the 71 larger cities in which banks jointly created loan certificates, banks issued the certificates to the public as currency. These issues of currency, which were extra-legal, were given legal status by the Aldrich-Vreeland Act, which permitted associations of national banks to issue temporary currency. National banks used that privilege in 1914.

## RESERVES, CURRENCY AND MONEY

### *Ratio of Reserves to Deposits*

Clearinghouse loan certificates were at least a partial remedy for runs on the banking system because, with access to them, banks could operate with relatively low reserve ratios.[24] Figure 2 shows the reserve ratios for banks in New York City weekly from 1853 through 1909. The vertical lines in the figure indicate the first week when the extraordinary certificates of 1857 or clearinghouse loan certificates were issued. As one can see, the reserve ratios generally drop around the dates when the New York clearinghouse issued loan certificates, reflecting the effects of bank runs. During several periods when they used loan certificates to cover adverse clearings among themselves, the reserves of banks in New York City fell below required levels (25 percent of deposits after 1874) for at least a short period.

[23]Andrew (1908) and Cannon (1910), pp. 107-112, ch. XI, discuss this aspect of clearinghouse loan certificates. Stevens (1894), pp. 145-48, provides some information for 1893 based on contemporary correspondence. Timberlake (1981) discusses the significance of private money in non-panic periods.

[24]It also was possible for the banks to create sufficient loan certificates that interest-earning assets as well as deposits expanded. According to some authors [Cannon (1910), pp. 75-136; Sprague (1910), pp. 45-46, 171], one of the objectives of clearinghouses in authorizing loan certificates was to expand loans by clearinghouse members.

In 1873, 1893 and 1907, the banks in the New York City clearinghouse restricted convertibility shortly after they had begun borrowing clearinghouse loan certificates. The reserve ratio rose sharply after the banks restricted payments, and they built up substantial excess reserve positions before resuming payments to depositors. The New York City banks also built up their excess reserves substantially after they created these certificates in 1860 and 1884, and after the creation of the extraordinary certificates of 1857.

The decreases in reserve ratios at the time of runs were short-lived. Indeed, the quarterly data in figure 3 for all banks in the United States from 1853 to 1935 do not show these sharp declines in the reserve ratio. They do show, though, the increases in the ratio after banks restricted convertibility.

### *Ratio of Currency to Deposits*

We would expect a rise in the ratio of nonbank money held by the nonbank public to bank money in a run on the banking system, at least until banks limited the reserve outflow by restricting payments. The year-end data for 1856 and 1857 show some indication of an effect of withdrawals in the panic of 1857, which occurred in the fall of that year. The ratio of specie held by the public relative to bank notes and deposits rose from 47 percent in December 1856 to 57 percent in December 1857. Figure 4 shows these data and quarterly data on the currency-to-deposit ratio for the U.S. banking system from 1867 to 1935. This ratio generally increases around the dates when banks in New York City issued clearinghouse loan certificates or restricted currency payments.

The most extreme rise in the currency ratio in figure 4 occurs in the early 1930s. Friedman and Schwartz (1963) argue that the rise in the currency ratio was more extreme in the early 1930s than before the operation of the Federal Reserve System because, rather than restricting currency payments, the banks expected the Fed to provide reserves. In the event, the Federal Reserve failed to provide sufficient reserves.[25]

### *Money Growth*

As the example in table 2 illustrates, a bank run results in a decrease in the money stock for a given monetary base. Table 5 shows the quarters with relatively large decreases in the money stock from 1867 to 1935 and zero or positive growth of the monetary base. Every quarter with a decrease in the money stock at greater than a 2 percent annual rate and nonnegative growth of the monetary base is included in the table.

Of the six periods in table 5, only one — 1877 to 1878 — is not associated with a restriction of convertibility or the creation of clearinghouse loan certificates in New York City. The decreases in the money supply in 1877 and 1878 occur during the Treasury's retirement of greenbacks prior to resumption of dollar convertibility into gold on January 1, 1879.[26] All of the dates of general restriction — 1873, 1893, 1907 and 1933 — are periods in which the money stock fell and the base increased for at least one quarter. The year 1884 has some characteristics of bank runs: banks in New York City created clearinghouse loan certificates, but conversion of deposits into currency was not restricted. As the table indicates, the highest rates of decrease in the money stock occurred from 1931 to 1933, after the Federal Reserve was established.

## EFFECTS OF BANK RUNS

While the previous section presents evidence that there were several episodes of runs on the U.S. banking system before the Federal Reserve was formed, it provides little indication of the importance of their effects. This section provides some perspective on the impact of those runs.

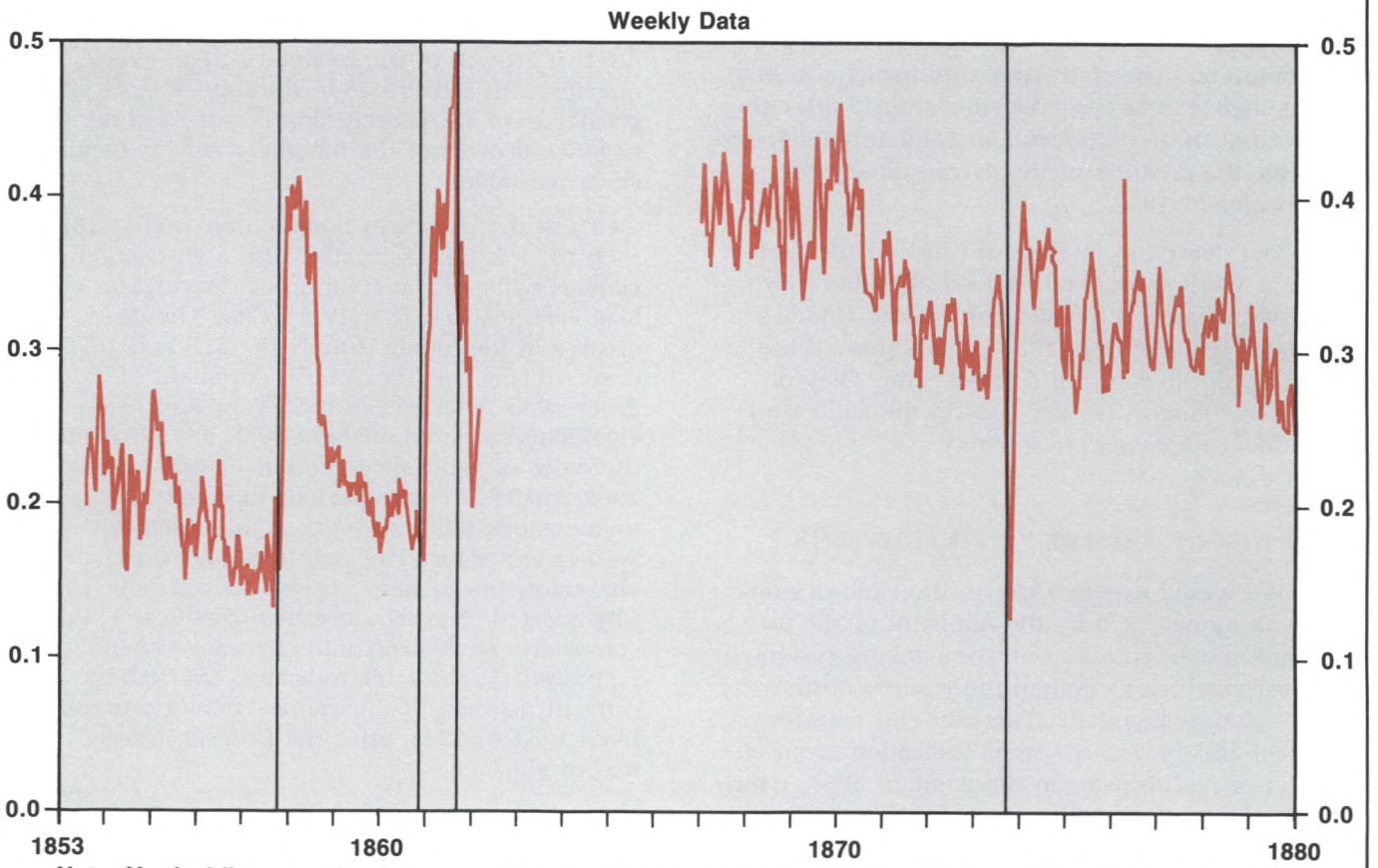
### *Losses by Depositors*

The premiums on currency provide one measure of the cost of runs to bank depositors. In terms of currency, depositors suffered a loss on their deposits during these periods. The premiums indicate that, immediately after runs on the banking system, some people were willing to exchange currency for certified checks at 96 cents or more on the dollar and, within a

[25]See Friedman and Schwartz (1963), pp. 167-72, 308-12.

[26]Friedman and Schwartz (1963), ch. 2, discuss this period in detail. They attribute these movements to runs on banks outside New York City. Friedman and Schwartz (1963), pp. 56-58, 82.

# Figure 2
## Reserve Ratio




**Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.**

month, the currency premiums were less than 2 percent.[27]

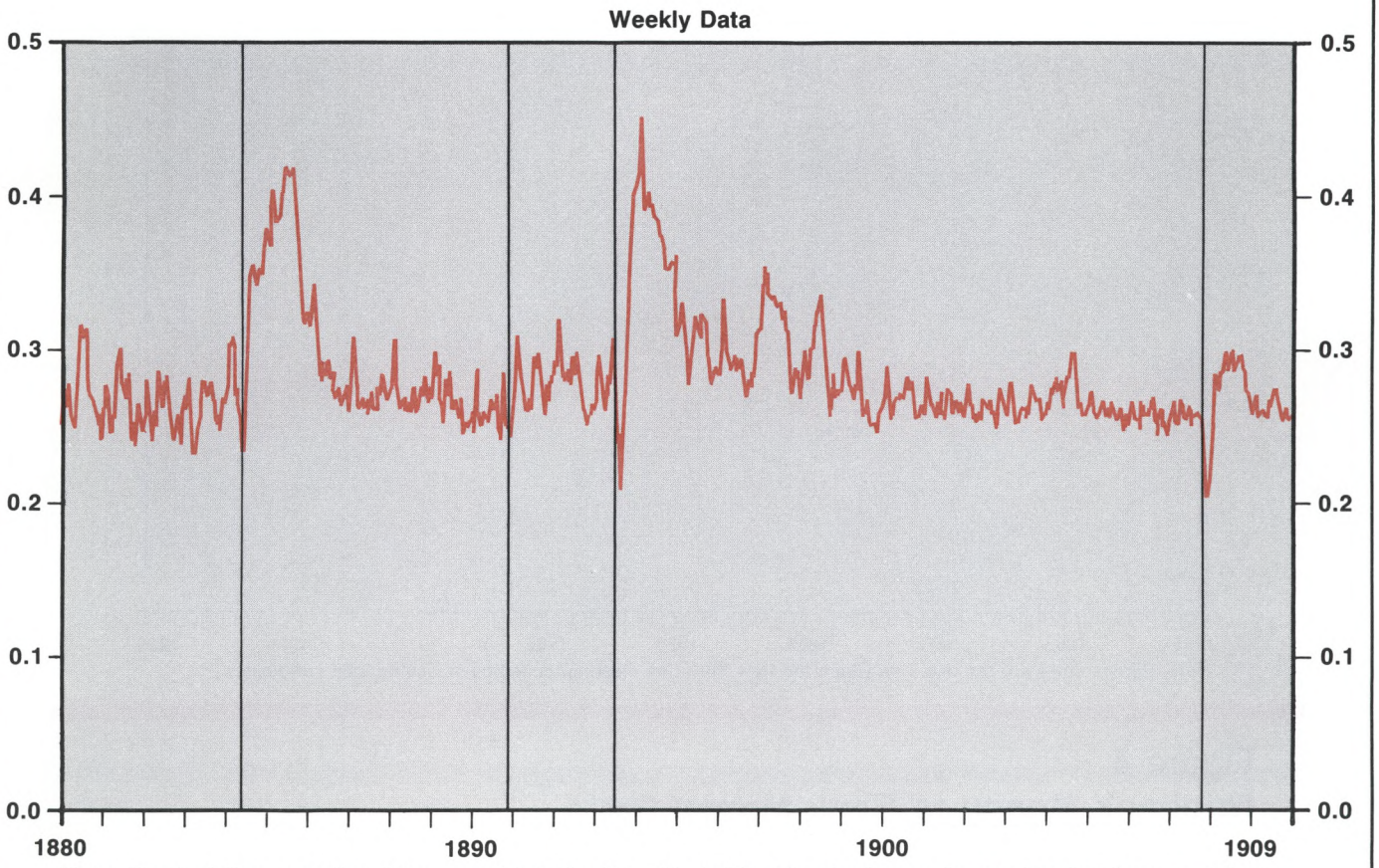
Depositors also suffered losses when banks closed. The total losses borne by depositors in closed banks from 1865 through 1933 were at an annual rate of .21 percent of total deposits. Before the Great Depression, the general trend of these loss rates was downward. The loss rates were .19 percent in 1865-80, .12 percent in 1881-1900, .04 percent in 1901-20, and rose to a peak of .34 percent in 1921-33.

These figures are for all years and understate the loss rates in years with runs. Depositors' losses on total deposits exceed .25 percent in 12 years: 1873, 1875-78, 1884, 1891, 1893 and 1930-33. The average loss rate in these 12 years is .78 percent of total deposits. In all but two of these periods, either convertibility of deposits was restricted or clearinghouse loan certificates were issued in New York City. In only one year was convertibility of deposits into currency restricted, loan certificates issued, and the loss rate less than .25 percent: 1907.[28]

In the 1930s, for which data on individual years are available, it is possible to get reasonably accurate estimates of loss rates borne by the depositors in closed banks. The losses were not borne evenly across the population: an average loss rate per dollar of total deposits of .47 percent of total deposits in 1930 does not

[27]It is worth noting that these losses by depositors were counter-balanced at least in part by gains by holders of currency. The bid-ask spread would be a measure of the direct real resource cost of nonpar trades.

[28]Unfortunately, the data before 1920 are provided only as averages for periods of several years; we know that the loss rates in 1907 and 1908 were not as high as .25 percent, but we do not know more about them.




**Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.**

convey the losses borne by individual depositors in individual banks. The average loss rates for depositors in banks that failed are about 28 percent in 1930 and 15 percent in 1933.[29]

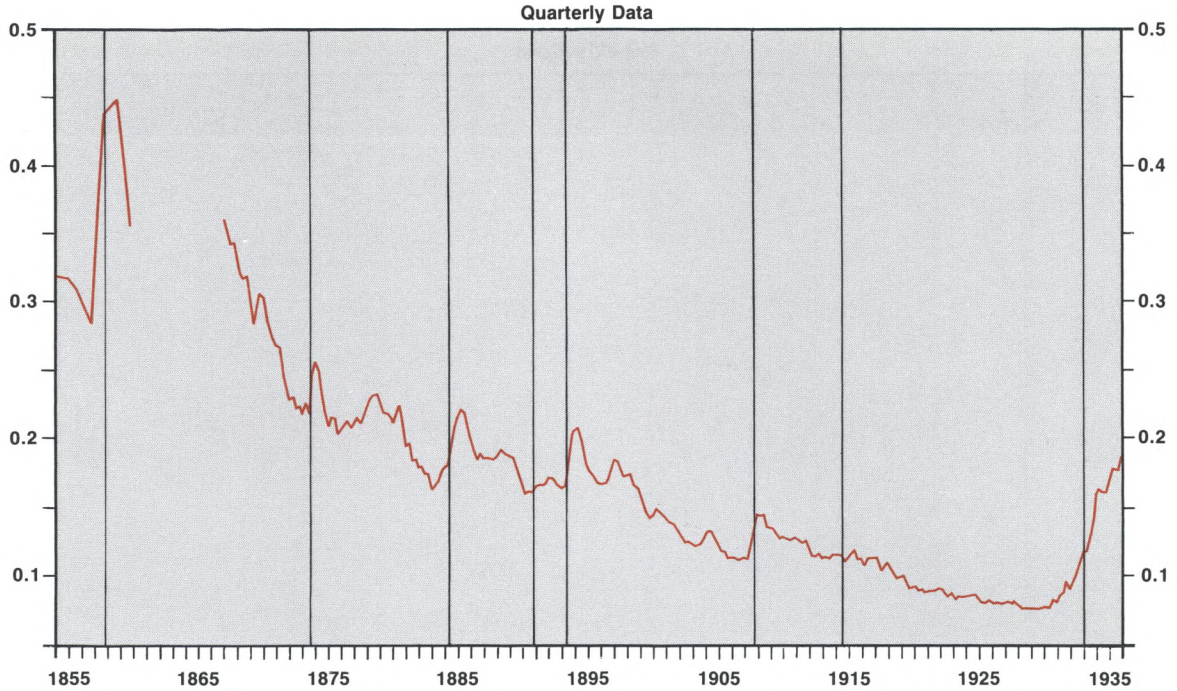
In sum, two things seem to be clear from these data. First, some holders of bank liabilities did bear significant losses during periods with runs. These losses were not necessarily caused by the runs themselves. The runs and the losses both may have been triggered by events outside the banking system. It is possible, though, that the runs increased the losses from what they might have been under different institutional arrangements.

Second, before the creation of the Federal Reserve, depositors' loss rate from failed banks were declining over time. In this regard, it is worth noting that depositors' loss rate in 1907 was not as high as in as many previous periods, even though the panic of 1907 was the apparent impetus for the creation of the Federal Reserve System.

[29]The loss rates in closed banks for every year from 1921 through 1929 are higher than from 1930 to 1933. This decrease in depositors' loss rate in banks closed in years with runs is not necessarily surprising because runs can force banks to liquidate with positive net worth or net worth less negative than it might be otherwise. This latter observation is consistent with the FDIC's observation that loss rates are less after the 12 "crisis years" than in other non-crisis years. FDIC (1940), pp. 65, 69.

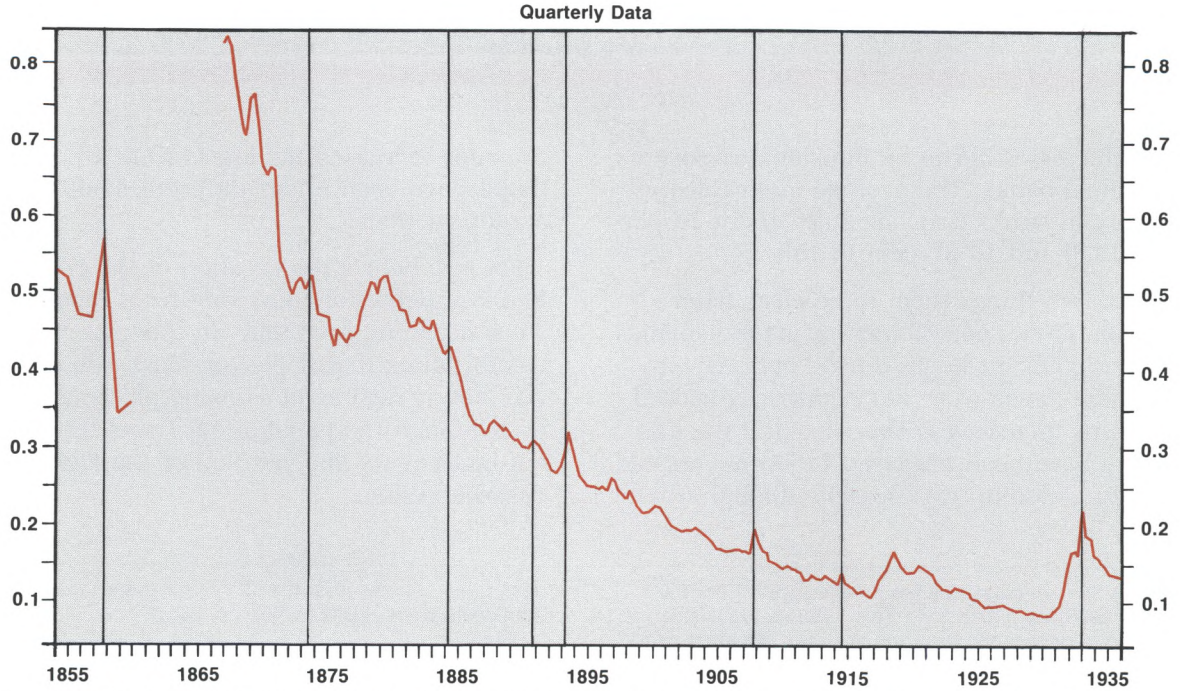
The loss rates for the national banking period are substantially, but not always, lower than some of the loss rates estimated by King (1983) and Rolnick and Weber (1988) for the earlier free banking period (1838 to 1863).

Figure 3
## Reserve to Bank Money Ratio




Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.

Figure 4
## Nonbank Money to Bank Money Ratio




Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.

Table 5

**Growth Rates of the Money Supply and the Monetary Base in Periods in Which the Money Supply Declined at More Than a 2 Percent Annual Rate and the Growth Rate of the Monetary Base was Zero or Positive: 1867 through 1935 (annual growth rates of quarterly data, seasonally adjusted)**

| Period | | Money supply | Monetary base |
|---|---|---|---|
| 1873: | 4 | −13.7% | 2.5% |
| 1877: | 2 | −4.5 | 0.1 |
| | 3 | −3.8 | 0.1 |
| | 4 | −7.2 | 1.1 |
| 1878: | 1 | −4.9 | 1.1 |
| | 2 | −3.5 | 4.3 |
| 1884: | 3 | −2.6 | 8.0 |
| 1893: | 2 | −8.7 | 2.9 |
| | 3 | −10.7 | 16.9 |
| 1907: | 3 | −8.0 | 0.0 |
| | 4 | −11.1 | 41.3 |
| 1908: | 1 | −5.5 | 2.1 |
| 1929: | 1 | −3.1 | 1.9 |
| 1931: | 2 | −11.2 | 12.5 |
| | 3 | −14.7 | 11.2 |
| | 4 | −30.8 | 13.3 |
| 1932: | 2 | −13.6 | 13.9 |
| | 3 | −5.9 | 5.7 |
| 1933: | 1 | −39.8 | 20.7 |

Sources: see data appendix available on request.

## *Losses by Bank Shareholders: Bank Failures*

During restrictions, two things happened. Banks were able to stop the drain of reserves and possibly the sale of assets at distress prices. In addition, they were able to take stock and determine which banks might survive the panic. The importance of this effect perhaps is most clearly indicated by a comparison of Illinois and Wisconsin banks just before the Civil War. Banks in Illinois did not restrict specie payments and, ultimately, 93 out of 112 of the banks closed. With similar portfolios of assets, banks in Wisconsin did restrict specie payments and fewer of them, 50 out of 107 banks, ultimately closed.[30]

Another way of getting an idea of the costs to banks is to compare failure rates in banking panics before 1933 with the failure rate in 1933. At the onset of the Depression, banks did not issue clearinghouse loan certificates or restrict currency payments. While the Federal Reserve increased the monetary base, the base was not increased sufficiently to prevent repeated runs until the restriction of payments in the Banking Holiday. As a result, 1933 provides a contrasting indicator of how serious banking panics can be.

Figure 5 shows that banking panics can indeed be associated with relatively large numbers of banks failing. Nonetheless, it is noteworthy that, before 1933, the only year with restriction and a large increase in the failure rate is 1893.

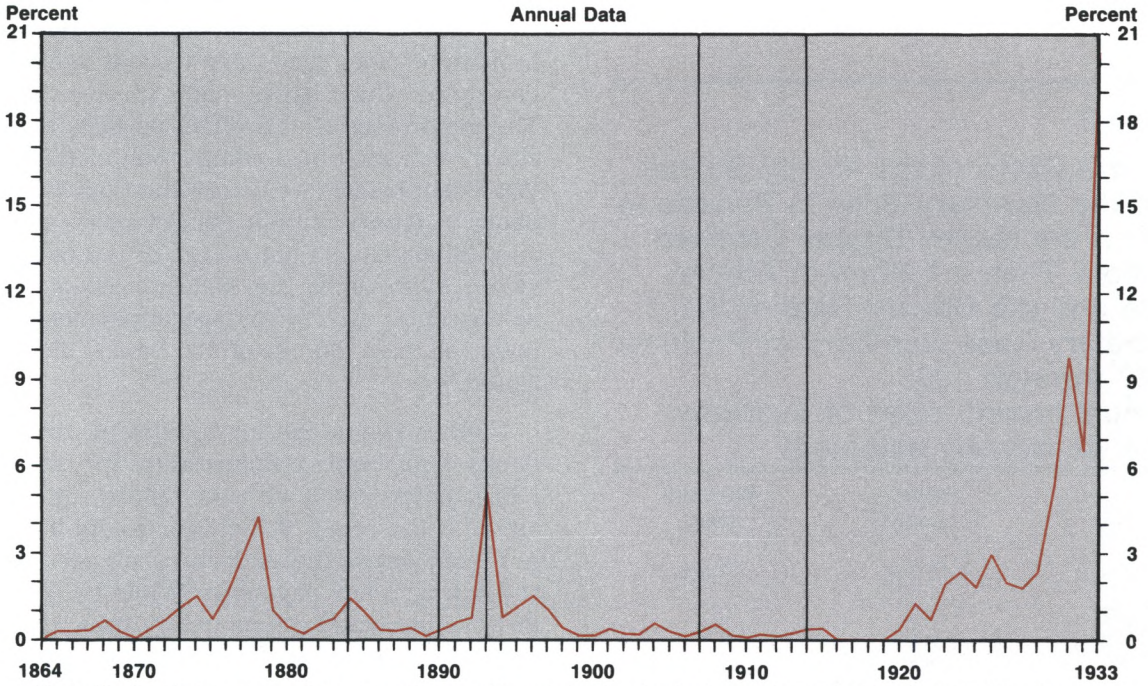
## *Macroeconomic Effects*[31]

Figure 6 shows the monthly average call loan rate for 1857 through 1935. Call loans are overnight loans with stock as collateral that are callable without notice. Because call loans were a part of their assets that they were not contractually obligated to continue for longer periods, banks in New York City reduced their call loans when they wished to convert part of their assets into reserves. In figure 6, vertical lines denote the periods when banks in New York City restricted convertibility or had large drains

[30]See Dowrie (1913), Krueger (1933) and Economopoulos (1988).

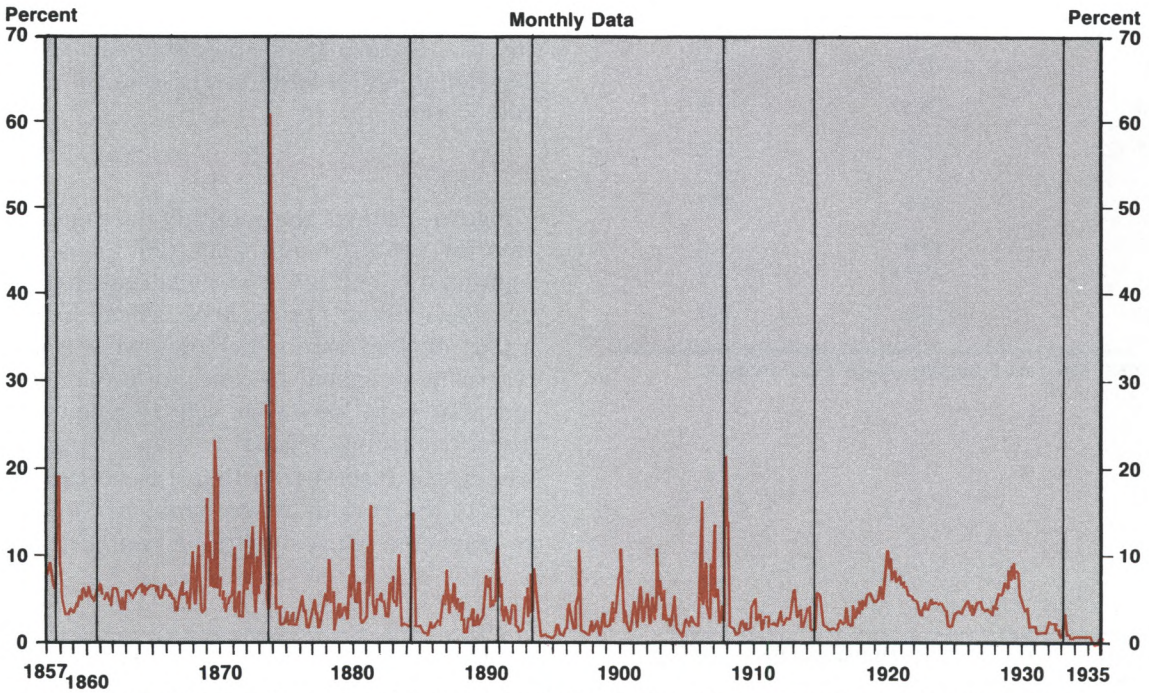
[31]For other discussions of the macroeconomic effects of bank runs, see Friedman and Schwartz (1963), Bernanke (1983), Bordo (1986), Gorton (1988), Kaufman (1988), Tallman (1988) and Grossman (1989).

## Figure 5
## Bank Suspension and Failure Rate




Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.

## Figure 6
## Call Rate




Note: Vertical lines are the dates on which the New York City clearinghouse began issuing loan certificates.

Table 6

**Bank Runs and the Timing and Severity of Recessions 1857 to 1933**

| Recession peak | Recession trough | Clearinghouse loan certificates issued | Restriction of currency payments | Percentage change in production |
|---|---|---|---|---|
| June 1857 | Dec. 1858 | [1] | Oct. 1857 | n.a. |
| Oct. 1860 | June 1861 | Nov. 1860 | | n.a. |
| April 1865 | Dec. 1867 | | | n.a. |
| June 1869 | Dec. 1870 | | | –2.8% |
| Oct. 1873 | March 1879 | Sept. 1873 | Sept. 1873 | –19.3 |
| March 1882 | May 1885 | May 1884 | | –13.7 |
| March 1887 | April 1888 | | | –9.2 |
| July 1890 | May 1891 | Nov. 1890 | | –29.2 |
| Jan. 1893 | June 1894 | June 1893 | Aug. 1893 | –54.9 |
| Dec. 1895 | June 1897 | | | –21.9 |
| June 1899 | Dec. 1900 | | | –6.7 |
| Sept. 1902 | Aug. 1904 | | | –20.0 |
| May 1907 | June 1908 | Oct. 1907 | Oct. 1907 | –50.8 |
| Jan. 1910 | Jan. 1912 | | | –21.1 |
| Jan. 1913 | Dec. 1914 | Aug. 1914 | | –45.8 |
| Aug. 1918 | Mar. 1919 | | | –8.8 |
| Jan. 1920 | July 1921 | | | –71.3 |
| May 1923 | July 1924 | | | –53.8 |
| Oct. 1926 | Nov. 1927 | | | –17.9 |
| Aug. 1929 | Mar. 1933 | | March 1933 | –85.6 |

[1] Banks created certificates backed by bank notes.

Sources: see data appendix available on request.

of reserves to which they responded by issuing clearinghouse loan certificates. While the increases in the call loan rate associated with restrictions and drains are not unique, some are extraordinary.

Evidence that would support the view that bank runs had adverse effects on the economy would be as follows: bank runs occurred just prior to the onset of recessions, and more severe recessions followed banking panics. Table 6 provides information on the timing and severity of recessions and the timing of bank runs. The data do not support a simple conclusion on the macroeconomic effects of bank runs. Other than the episode in 1873, banks created clearinghouse loan certificates and restricted currency payments several months after the beginning of the recessions. While some of the more severe recessions occurred when banks restricted currency payments, this is consistent with two very different conclusions: restrictions led to severe recessions, or severe recessions led to restrictions.

Table 6 also indicates that several recessions occurred without runs on the banking system. These observations provide information about the stability of the U.S. banking system without a federal safety net. Several recessions, with declines in real output and losses to businesses, occurred apparently without undermining the confidence of the public in the safety of bank deposits to the point of starting runs on the banking system.

## CONCLUSION

The federal safety net for the banking system includes the Federal Reserve as the lender of last resort, federal deposit insurance, and bank supervision and regulation designed to limit the risk assumed by banks. The rationale for this safety net is that, in its absence, the banking system would be vulnerable to the kind of run on the banking system that occurred in the early 1930s. The run in the early 1930s, however, was, perhaps, the most extreme run on the banking system in U.S. history.

While several runs on the banking system took place before the formation of the Federal Reserve System in 1914, banks took actions that limited their effects. By issuing clearinghouse loan certificates that other banks accepted to clear checks, banks operated temporarily with relatively low reserve ratios. In the more severe runs, bankers jointly restricted payments but continued operating. Moreover, even prior to the creation of the federal safety net in the United States, runs on the banking system were infrequent. The banking system can operate for many years without runs on the banking system, even in recessions.

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