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# Causes of the Recent Increase In Bank Security Holdings

*By William R. Keeton*

While bank security holdings have increased sharply in recent years, there is widespread disagreement about the significance of the increase. Some analysts argue that the increase is not a cause for concern because it results from temporary factors such as the business cycle. Others argue that the increase represents a permanent shift in bank portfolio preferences from loans to securities, which could cause banks to look more like mutual funds. If the latter view is true, small firms that rely on banks for credit may be unable to fund new investment. Moreover, monetary policy may be less able to influence total spending in the economy by affecting bank lending.

This article seeks to determine how much of the surge in bank security holdings can be explained by temporary factors. The first section discusses possible explanations for the recent increase in bank security holdings. The second section presents empirical evidence based on the aggregate behavior of bank portfolios over the previous 30 years. The article concludes that more than half the increase in security holdings cannot be explained by temporary factors, suggesting that bank portfolio preferences may have permanently changed.

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## *POSSIBLE EXPLANATIONS FOR THE INCREASE IN BANK SECURITY HOLDINGS*

Is the recent increase in bank security holdings unusually large by historical standards? In comparing the recent increase with past increases, it is important to take into account the tendency for inflation and long-run economic growth to increase bank security holdings. Over time, the dollar values of all bank assets and liabilities should increase with the price level. And as aggregate output grows, so should the size of the banking system and the real values of all bank assets and liabilities, including security holdings.

One way of adjusting the change in security holdings for both inflation and long-run economic growth is to measure security holdings relative to potential GDP. Potential GDP is the amount of output the economy can produce at full employment, valued in current dollars. Because potential GDP measures output at full employment, it provides a better measure of long-run economic growth than actual GDP, which varies over the business cycle. And because potential GDP is measured in current dollars, it increases with the price level.

Adjusted for inflation and long-run economic growth, the recent increase in total bank security holdings far exceeds past increases (Chart 1).<sup>1</sup> From the fourth quarter of 1989 to the second quarter of

1993, the ratio of bank security holdings to potential GDP increased 2.7 percentage points. During the previous 30 years, by contrast, the largest increase in the ratio over a period of 3 1/2 years or less was only 1.9 points. Possible explanations for the recent increase can be grouped into two categories—temporary and permanent.<sup>2</sup>

### *Temporary explanations*

One factor that may have caused a temporary increase in security holdings is the slowdown in economic activity and the accompanying fall in short-term interest rates during the 1990-91 recession. Another factor is that short-term rates continued falling after the recession ended, in contrast to previous cycles. A third factor is that excessive borrowing and lending in the 1980s may have led to a bigger and more prolonged decrease in the demand for and supply of bank loans during this recession than past ones.<sup>3</sup>

*Normal cyclical response.* Bank security holdings tend to increase during a recession and early recovery for two reasons. First, banks find lending to be less attractive during recessions. The slowdown in economic activity reduces businesses' and households' demand for credit, decreasing the interest rates that banks can charge on loans and, thus, the expected return from lending. Recessions also increase the risk of default, which reduces the amount banks are willing to lend even without any change in the expected return from lending. These factors tend to reduce the attractiveness of loans. One way banks may respond is by shrinking their total size—that is, by cutting back on loans and reducing large time deposits and other borrowed funds. Another way banks may respond is by shifting out of loans into securities, keeping their total assets unchanged.

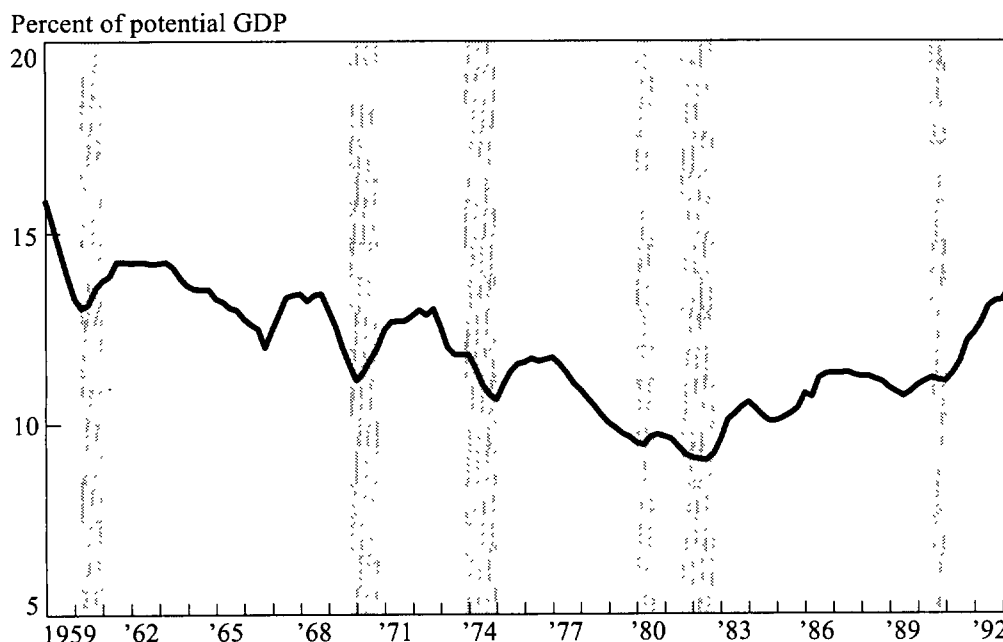
A second reason bank security holdings may increase during a recession and early recovery is that easier monetary policy increases the amount of funds banks have to invest. The Federal Reserve

usually pushes down short-term interest rates during recessions to stimulate the economy. The immediate effect of such a reduction in interest rates is typically to increase the public's demand for core deposits—checkable deposits and small time and savings deposits. But the decline in interest rates may not immediately stimulate lending. For example, loan demand may be unresponsive to the cost of borrowing in the short run. Or it may take time for lower open-market rates to increase loan demand indirectly by stimulating the economy. Thus, when the Fed eases, banks may enjoy a temporary surplus of funds. One way banks may respond is by reducing their large time deposits and other borrowed funds, which tend to be more expensive than core deposits. Another way is by acquiring more securities.

Chart 1 confirms that it is normal for bank security holdings to increase during recession and early recovery. The typical pattern is for the ratio of bank security holdings to potential GDP to start declining sometime before the business cycle peak, turn upward sometime before the business cycle trough, and then continue increasing for a while. The most recent increase in the security ratio started a little earlier and has been significantly larger than in the last five recessions. However, the increase in the security ratio may have been larger this time because the recession and recovery themselves were different. Thus, from Chart 1 alone, it is impossible to tell whether the recent increase in security holdings is a normal cyclical response.

*Unusual behavior of short-term rates during the recovery.* In past recessions and recoveries, the Fed stopped easing by the time the recession ended (Chart 2). Thus, during recoveries, short-term rates remained stable or increased. During the most recent recovery, in contrast, short-term rates continued falling until late 1992—a year and a half after the recession technically ended. Because decreases in short-term rates tend to raise the public's demand for deposits faster than borrowers' demand for loans, the continued fall in

Chart 1

**Security Holdings of Commercial Banks**

Note: Vertical bands indicate recessions.

Source: Board of Governors of the Federal Reserve System.

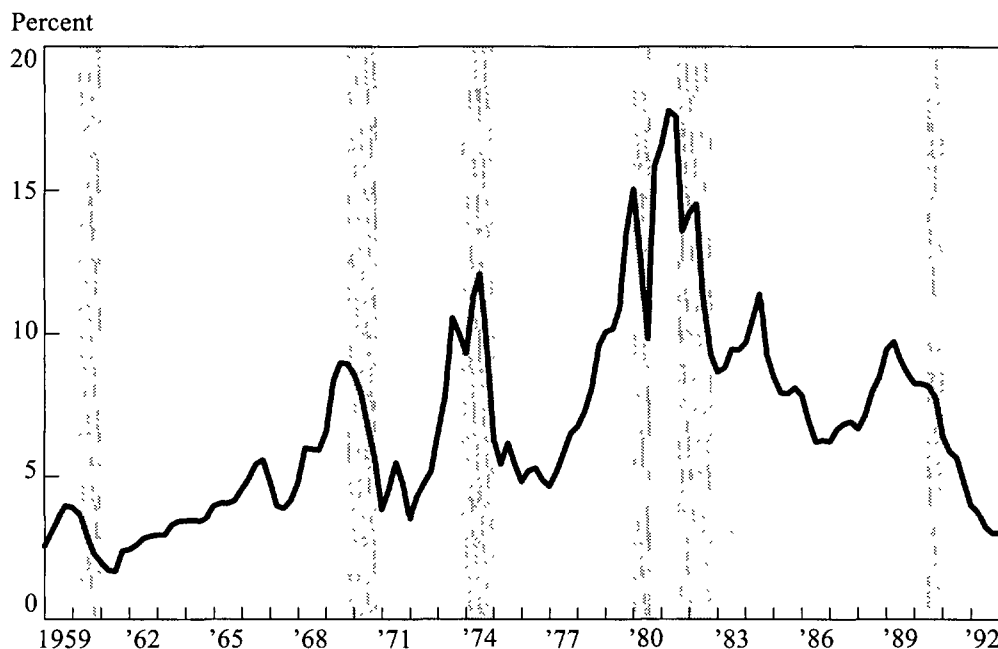
short-term rates during this recovery may have caused banks to temporarily increase their security holdings.<sup>4</sup>

*Unusual temporary decline in loan demand and supply.* As noted above, recessions decrease the attractiveness of lending by reducing the interest rates borrowers are willing to pay and the amount of default risk banks are willing to assume. This effect suggests bank loans should decline relative to potential GDP during recessions. Chart 3 confirms this fact; as a percent of potential GDP, bank loans typically peak near the start of the recession and then decline for a while before resuming their increase. The chart also shows, however, that bank loans have fallen much more sharply during the recent recession and recovery

than in the 1970, 1980, and 1981-82 recessions and recoveries. Loans also have fallen more than in the 1973-75 recession and recovery, though the difference is smaller.

Two explanations have been offered for the unusually steep decline in bank loans during the recent recession and recovery (Bernanke and Lown; Cantor and Wenninger; Johnson). The first is a temporary decrease in the demand for loans by borrowers. According to this explanation, businesses and households have been especially reluctant to borrow because they overborrowed in the 1980s and want to restructure their balance sheets. The second explanation is a temporary decrease in the supply of loans by banks. According to this explanation, banks have been more reluctant to take

Chart 2

**Federal Funds Rate**

Note: Vertical bands indicate recessions.

Source: Board of Governors of the Federal Reserve System.

on default risk than in past recessions, either because their heavy loan losses during the late 1980s made them more risk-averse or because regulators put unusual pressure on them to avoid risk.

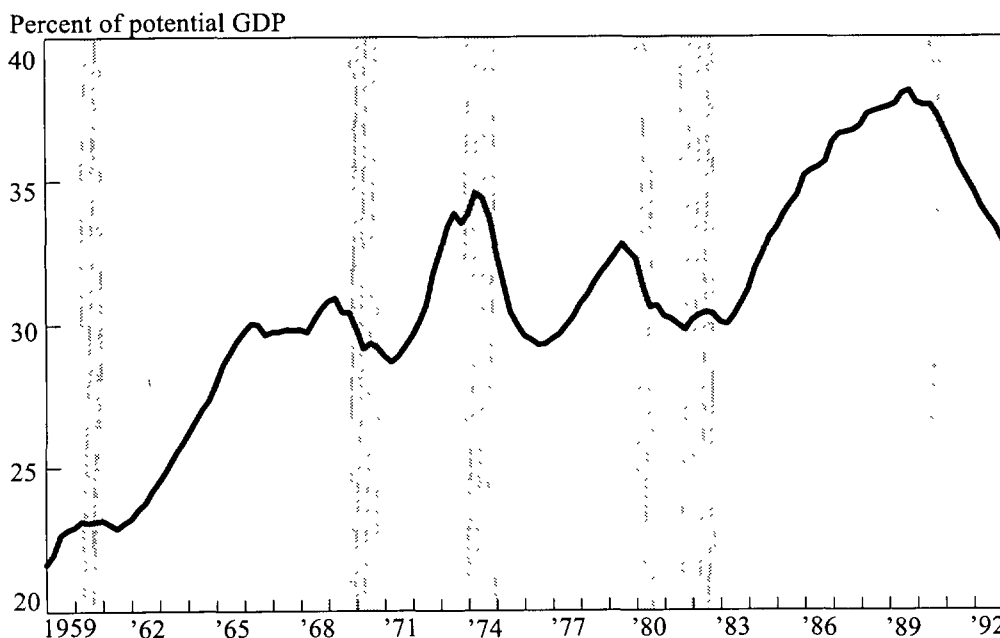
Whether the unusual weakness in lending results from reduced demand or reduced supply, banks can be expected to respond either by cutting back on their large time deposits and other borrowings or by increasing their security holdings. A good case can also be made that the effect on bank portfolios should be temporary. Once borrowers finish restructuring their balance sheets, the demand for bank loans will presumably revive. And as the memory of the 1980s fades and the economy fully recovers, banks and their regulators could become less risk averse.

*Permanent explanations*

Two factors may have led to a permanent increase in bank security holdings—the adoption of risk-based capital standards, and increased pessimism about the long-term prospects for bank lending.

*Risk-based capital standards.* New capital standards announced in 1989 may have made securities more attractive to banks. Under the new system, banks must satisfy a minimum ratio of capital to risk-adjusted assets. Business and consumer loans have a weight of 100 percent in risk-adjusted assets, while most securities carry weights of zero or 20 percent.<sup>5</sup> Because increases in securities have little or no effect on risk-adjusted

Chart 3

**Total Loans at Commercial Banks**

Note: Vertical bands indicate recessions.

Source: Board of Governors of the Federal Reserve System.

assets, a bank can use deposits or other borrowed funds to purchase securities without having to raise a large amount of capital to satisfy the risk-based requirement. And because decreases in loans have a one-for-one effect on risk-adjusted assets, a bank can reduce its required capital without shrinking total assets by shifting to securities from loans.<sup>6</sup>

Economists disagree on the plausibility of this explanation for the recent increase in bank security holdings. Skeptics argue that most banks were unaffected by the risk-based requirement because they already exceeded it by a substantial margin. They also point out that credit unions, which were not subject to risk-based capital requirements, also shifted heavily into securities (Greenspan; Mullins).

And they cite studies showing that banks exceeding the risk-based capital requirement increased their security holdings just as much as banks that did not (Baer and McElravey; Berger and Udell; Hancock and Wilcox). Proponents of the risk-based capital explanation concede that relatively few banks were affected by the risk-based requirement. However, they counter that these banks were primarily large banks and thus accounted for a disproportionate share of industry assets. And they cite other research suggesting that banks exceeding the risk-based capital requirement increased their security holdings *less* than banks that did not (Haubrich and Wachtel; Jacklin).

*Pessimism about the long-run profitability of lending.* A final possibility is that banks have

undergone a permanent shift in portfolio preferences unrelated to recent changes in capital requirements. As a result of increasing competition from securities markets and nonbank lenders, banks may have decided they can earn adequate profits from lending only by focusing on their best customers and making fewer loans. To be sure, the competitive position of banks has eroded gradually over many years, making it unclear why they would suddenly decide to shift out of loans. But perhaps the heavy loan losses of the late 1980s delivered the coup de grace, convincing banks once and for all that lending was less profitable. One way banks might respond is by shifting into securities.

### *EMPIRICAL EVIDENCE*

To the extent that temporary factors fail to account for the recent increase in bank security holdings, it can be argued that banks may have made a long-term decision to withdraw from traditional forms of lending and operate more like mutual funds. To determine whether the increase in bank security holdings is temporary or permanent, this section uses regression analysis to estimate how much of the increase can be attributed to the three temporary factors cited above—normal cyclical response, the unusual fall in short-term interest rates, and the unusual decline in loan demand and loan supply.<sup>7</sup>

All the empirical results are based on a vector autoregression (VAR) estimated with quarterly data on the aggregate economy and bank balance sheets. In a VAR, each variable is regressed on its own lags and the lags of each other variable in the model. Such an approach has two major advantages. First, it allows for feedback among the variables. And second, because all variables are included in each regression equation, fewer arbitrary decisions are made as to the structure of the model.<sup>8</sup>

The VAR includes four lags of three macroeconomic variables and four balance sheet variables,

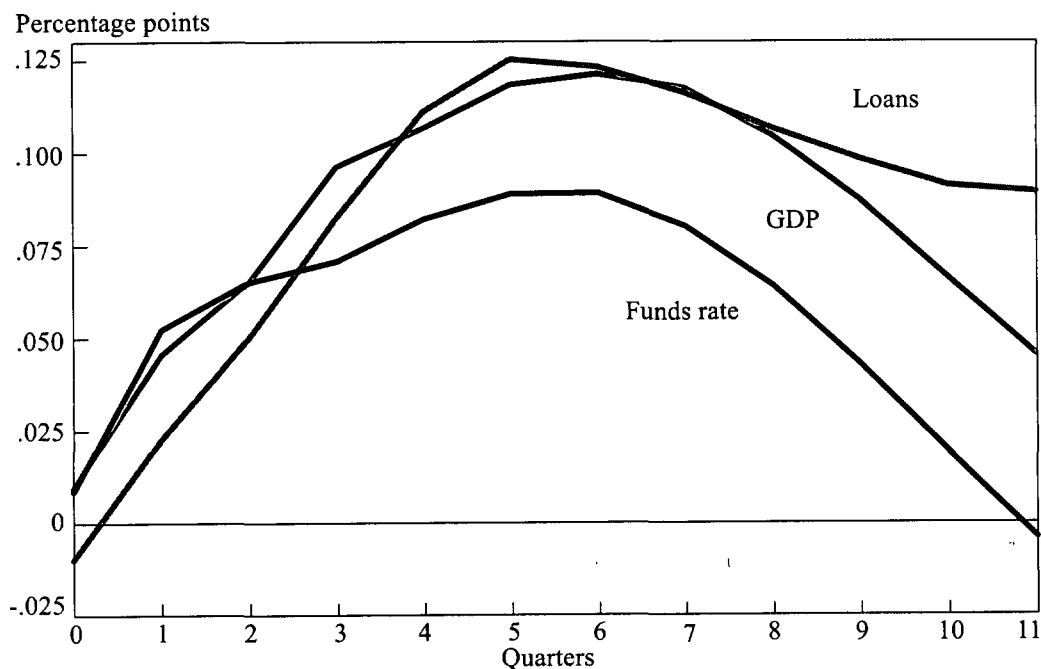
and is estimated in levels.<sup>9</sup> The macro variables are the federal funds rate, the ratio of actual GDP to potential GDP, and the rate of inflation as measured by the GDP deflator. The funds rate and GDP ratio are included to capture the first two temporary explanations for the increase in security holdings—normal cyclical response and the unusual behavior of short-term rates. Although no one has suggested that the recent increase in bank security holdings is due to the behavior of inflation, this variable is included because of its potential effects on bank portfolio decisions and because of its important influence on monetary policy decisions.

The bank balance sheet variables are securities, loans, core deposits (checkable deposits plus small time and savings deposits), and large time deposits.<sup>10</sup> Loans are included in the VAR to capture the effect on bank security holdings of the lending slowdown. Core deposits and large time deposits are included because banks may respond to a shortfall in loans by reducing deposits rather than increasing securities.<sup>11</sup> All four variables are seasonally adjusted and measured as ratios to potential GDP. Also, a dummy variable is included after 1982 to account for the impact of deposit deregulation on core deposits.<sup>12</sup>

The model is estimated over the 1960-89 period. The estimation starts in 1960 partly because of data availability and partly because large negotiable CDs, which are an important alternative to securities for funding loans, were not introduced until 1961. The estimation ends in 1989 because that was the year when securities and loans both started to deviate significantly from previous trends.

The VAR yields three forms of evidence on the causes of the recent increase in security holdings. First are the “impulse responses” for the 1960-89 period. These responses indicate the typical effect on bank security holdings of various shocks—for example, unexpected changes in GDP, interest rates, or loans. Second is the “decomposition of variance” for the 1960-89 period. This decomposition indicates how much of the past variation in

Chart 4

**Response of Bank Security Holdings to Different Shocks***Cumulative change in ratio of securities to potential GDP*

bank security holdings was due to each possible kind of shock. Third, and most important, is the “decomposition of change” for the 1989-93 period. This decomposition estimates how much of the *recent* increase in security holdings is due to each kind of shock, assuming banks respond to such shocks the same way as in 1960-89.<sup>13</sup>

*Impulse responses for 1960-89*

Based on past behavior, how plausible are the business cycle, the behavior of short-term interest rates, and the slowdown in lending as explanations for the recent increase in security holdings? As a first step in answering this question, Chart 4 shows

how the ratio of bank security holdings to potential GDP typically responds to three different shocks—an unexpected decline in the ratio of actual GDP to potential GDP, an unexpected decline in the federal funds rate, and an unexpected decline in the ratio of total loans to potential GDP. In each case, the change in the variable is unexpected in the sense that it cannot be predicted from the VAR. And in each case, the change is equal in magnitude to the typical unexpected change over the 1960-89 period.<sup>14</sup>

Chart 4 shows that bank security holdings increase in response to all three shocks. In all three cases, the ratio of security holdings to potential GDP reaches a maximum after about a year and a half and then declines. Thus, impulse responses

Table 1

**Variance Decomposition for Ratio of Securities to Potential GDP**

1960-89

Percent of variance over 3 1/2 years due to shocks in

|                     |     |
|---------------------|-----|
| Funds rate          | 10  |
| GDP                 | 19  |
| Inflation           | 27  |
| Loans               | 24  |
| Core deposits       | 2   |
| Large time deposits | 5   |
| Securities          | 13  |
| Total               | 100 |

for the 1960-89 period suggest that negative shocks to GDP, the funds rate, and lending may account for at least some of the increase in security holdings since 1989. The extent to which the three shocks explain the recent increase depends, however, on how big the shocks have been relative to the change in security holdings, something the impulse responses cannot reveal.

*Variance decomposition for 1960-89*

Table 1 takes the analysis a step further by showing the extent to which various kinds of shocks explain changes in bank security holdings during the 1960-89 period. This information is relevant because the more a particular kind of shock helps explain past changes in bank security holdings, the more plausible it is that the same kind of shock can explain the recent change.

Table 1 shows how much of the unexpected

variation in the security ratio over a period of 3 1/2 years tended to be due to various shocks. A horizon of 3 1/2 years is used because the purpose of this article is to explain the change in security holdings from the end of 1989 to mid-1993. Each row in the table corresponds to a different variable and shows the percentage of variation in the security ratio due to that variable. For example, the first row shows that over a 3 1/2-year period, 10 percent of the variation of the security ratio from the level expected at the beginning of the period tended to be due to unexpected changes in the funds rate.

The table shows that shocks to the three macroeconomic variables and to loans account for much of the past variation in the security ratio. After 3 1/2 years, shocks to these four variables tend to explain 80 percent of the variation in the security ratio from the level initially expected (10 + 19 + 27 + 24). Thus, based on past behavior, it seems plausible that the business cycle, the post-recession drop in the funds rate, and the slowdown in lending could account for most of the increase in the security ratio from 1989 to 1993.

Like the impulse response functions, the variance decomposition is suggestive but cannot prove which shocks account for the recent increase in bank security holdings. For example, the variation in bank security holdings due to shocks in the three macroeconomic variables and shocks in loans might have been high over the 1960-89 period only because the shocks themselves were very large. From Table 1, there is no way to tell whether shocks to these variables have also been large enough in the recent period to explain most of the change in security holdings.<sup>15</sup>

*Decomposition of change for 1989-93*

To better assess the causes of the recent increase in security holdings, Table 2 uses the VAR to attribute the actual change in the security ratio from 1989:Q4 to 1993:Q2 to various shocks.<sup>16</sup> The



Table 2

***Decomposition of Change in Ratio of Securities to Potential GDP***

Percentage point change, 1989:Q4 to 1993:Q2

|                         |     |
|-------------------------|-----|
| Actual change           | 2.7 |
| – Expected change       | -.1 |
| = Unexpected change     | 2.8 |
| Change due to shocks in |     |
| Funds rate              | .6  |
| GDP                     | 1.1 |
| Inflation               | -.8 |
| Loans                   | .9  |
| Core deposits           | -.2 |
| Large time deposits     | -.3 |
| Securities              | 1.5 |
| Total                   | 2.8 |

first row shows the actual change in the ratio of securities to potential GDP over the period. The second row shows the expected change in the security ratio—the change that could have been anticipated given conditions at the start of the period and underlying trends. The actual change minus the expected change equals the unexpected change. As the third row shows, the unexpected change in the security ratio was 2.8 percentage points. The next seven rows of the table show how much of this 2.8 percentage point increase was due to shocks in each of the seven variables in the VAR.<sup>17</sup>

According to the table, shocks to the three macroeconomic variables and to loans explain a significant part of the recent increase in bank security holdings. Shocks to the funds rate, GDP, and inflation accounted for a total of 0.9 percentage points of the increase in the security ratio from

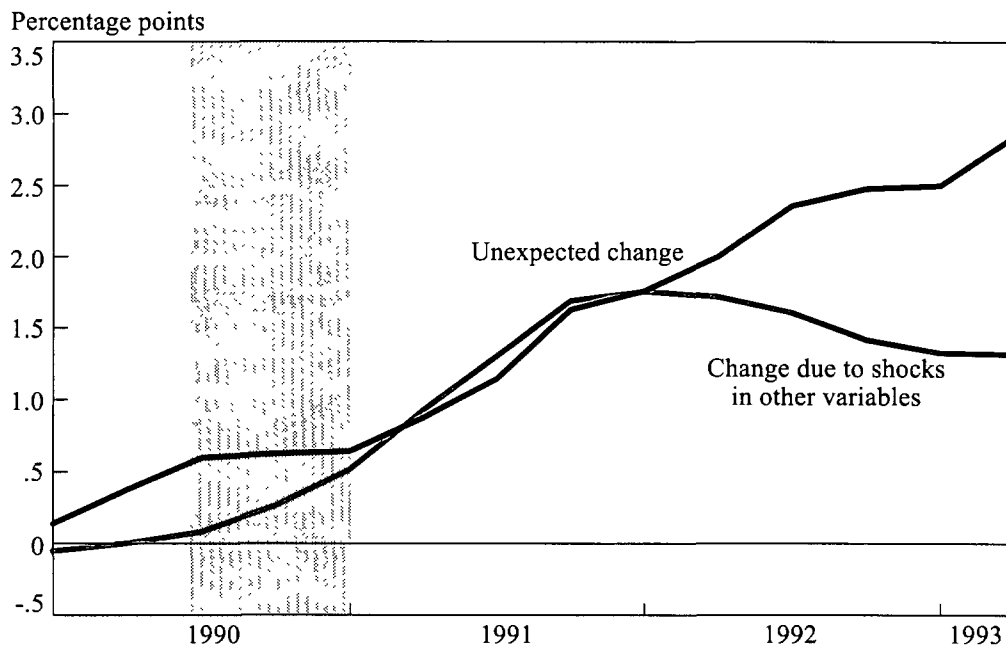
1989:Q4 to 1993:Q2 ( $0.6 + 1.1 - 0.8$ ). And the unusually steep drop in loans—whether due to reduced demand or reduced supply—contributed another 0.9 points to the increase in bank security holdings.

Although macroeconomic shocks and loan shocks explain much of the increase in the security ratio, the rest of the table shows that more than half the increase remains unexplained. Sharper-than-expected declines in core deposits and large time deposits should have reduced the security ratio by a total of 0.5 points ( $0.2 + 0.3$ ). Thus, the unexplained increase in the security ratio—the portion due to shocks to securities rather than to shocks to other variables—amounts to 1.5 percentage points ( $2.8 - 0.9 - 0.9 + 0.5$ ). Put another way, shocks to securities account for 53 percent of the total unexpected increase in the security ratio over the 3 1/2 years from the end of 1989 to mid-1993 ( $1.5/2.8$ ). During the 1960-89 period, by contrast, shocks to securities accounted for only 13 percent of the unexpected variation in the security ratio over a 3 1/2-year horizon (Table 1).

Chart 5 shows that the unexplained change in the security ratio did not emerge until the second quarter of 1992, a year after the recession ended. The solid line in the chart shows the unexpected change in the security ratio from 1989:Q4. The dotted line shows the portion of the change that can be explained by shocks to other variables. From Chart 5, it can be seen that the security ratio increased significantly more than expected from 1989:Q4 to 1992:Q1—1.5 percentage points. The chart shows, however, that all the unexpected increase in the ratio up to that point can be explained by shocks to other variables.<sup>18</sup> After 1992:Q1, the security ratio continues increasing more than expected, but the change due to shocks to other variables levels off, causing the gap between the two curves to grow.<sup>19</sup>

These findings suggest that about a year into the recovery, securities became unusually attractive to banks. One possibility suggested earlier is that banks experienced a permanent shift in

Chart 5

**Change in Ratio of Security Holdings to Potential GDP***Cumulative change from 1989:Q4*

Note: Vertical band indicates recession.

preferences from loans to securities—for example, due to risk-based capital requirements or increased pessimism about the long-run prospects for lending.<sup>20</sup> Another possibility is that banks began to respond differently to temporary declines in GDP, the funds rate, and loans. For example, as loans continued to decline during the recovery, banks may have decided to use more of their surplus funds than normal to buy securities, intending to sell the securities when loans finally revived.

**CONCLUSIONS**

Based on the behavior of bank portfolios over the previous 30 years, the recent increase in bank security holdings appears highly unusual. To be

sure, the business cycle, the post-recession drop in interest rates, and the unusual decrease in loan demand and loan supply explain a substantial part of the recent increase in security holdings. But a little more than half the total increase in the ratio of bank security holdings to potential GDP from 1989 to 1993 remains unexplained. The possibility cannot be dismissed that the unexplained increase in the security ratio reflects a change in banks' response to temporary shocks in GDP, interest rates, and loans. If so, security holdings may go back down as the recovery progresses. On the other hand, the unexplained increase in the security ratio may well reflect a permanent shift in bank portfolio preferences from loans to securities. If so, security holdings will remain high, causing banks to look more like mutual funds and justifying fears of a reduced role for bank lending.

## ENDNOTES

<sup>1</sup> Data in this article include all government and private securities held by domestically chartered commercial banks and U.S. offices of foreign banks. At the end of 1989, U.S. Treasury securities accounted for 27 percent of total bank security holdings; federally guaranteed mortgage-backed securities accounted for 21 percent; other U.S. Government securities for 17 percent; state and local securities for 22 percent; and private securities for 14 percent.

<sup>2</sup> For other discussions of the possible causes of the increase in bank security holdings, see Greenspan; Mullins; Neuberger; Rodrigues.

<sup>3</sup> Another temporary explanation suggested by some analysts is that an unusually steep yield curve encouraged banks to shift from short-term loans to long-term government bonds (Rodrigues). However, when a measure of the steepness of the yield curve is included in the empirical model in the next section, the variable explains none of the recent increase in bank security holdings. This result should not be surprising. To the extent the steep yield curve reflected market expectations of higher short-term interest rates in the future, banks would have little to gain from shifting from short-term investments to long-term investments. They would earn higher profits in the short run, while short-term interest rates were low, but lower profits in the long term, when short-term interest rates were high. The only reasons a bank might make such a shift are because it believed it could outguess the market or because it wanted to gamble.

<sup>4</sup> For evidence that an unexpected change in short-term rates causes a change of opposite sign in bank security holdings, see Bernanke and Blinder.

<sup>5</sup> The weight is zero for U.S. Treasury securities and mortgage-backed securities directly guaranteed by the Government National Mortgage Association (Ginnie Mae); 20 percent for general obligation municipal bonds and mortgage-backed securities guaranteed by the Federal National Mortgage Association (Fannie Mae) or the Federal Home Loan Mortgage Corporation (Freddie Mac); and 50 percent for municipal revenue bonds and privately issued mortgage-backed securities.

<sup>6</sup> Banks must also satisfy a leverage requirement in the form of a minimum ratio of capital to total assets (Keeton). The new capital standards increase the attractiveness of securities only for banks that exceed the leverage requirement but not the risk-based requirement.

<sup>7</sup> The assumption here is that borrowers' decreased willingness to borrow and banks' decreased willingness to take on

default risk are temporary changes due to the excesses of the 1980s. If this assumption is false, that portion of the increase in security holdings due to the lending slowdown may also reflect a fundamental change in bank behavior.

<sup>8</sup> As is well known, such decisions cannot be avoided altogether. To calculate the impulse responses, variance decomposition, and decomposition of change, certain assumptions must be made about the contemporaneous correlations of the variables (the "ordering" assumptions).

<sup>9</sup> In time series jargon, all seven variables appear to be integrated of order one over the sample period. A common approach in such circumstances is to estimate the model in first differences rather than levels. However, the Johansen test strongly suggests the existence of a cointegrating vector, implying that it would be inappropriate to difference the data.

<sup>10</sup> The data were obtained from the Board of Governors and correspond to Table 1.24 in the *Federal Reserve Bulletin*.

<sup>11</sup> Because bank assets and liabilities must sum to zero, the VAR also has implications for the residual item consisting of other liabilities minus other assets. Other liabilities include RPs, federal funds borrowed from nonbanks, and Eurodollar borrowing, while other assets include cash.

<sup>12</sup> Although the deregulation of core deposits began in 1978 with the introduction of the 6-month money market certificate, the biggest step by far was the introduction of MMDAs at the beginning of 1983. From the data, this event appears to have led to a permanent increase in core deposits.

<sup>13</sup> One limitation of the VAR is that it assumes an increase in any variable has the same size effect as a decrease in that variable—for example, declines in GDP during a recession have the same effect on bank balance sheets as increases in GDP during a boom.

<sup>14</sup> In particular, the shock to each variable is one standard deviation in size. To compute impulse response functions, some choice must also be made as to the ordering of the variables. The earlier a variable comes in the ordering, the more exogenous the variable is assumed to be. Specifically, shocks to a particular variable are allowed to cause contemporaneous changes in those variables that come later in the ordering but not in those variables that come earlier. In the present case, the variables are ordered as follows: the funds rate, GDP, inflation, loans, core deposits, securities, and large time deposits. The funds rate is put first because it is a policy instrument which appears to respond only with a lag

to economic conditions (Bernanke and Blinder). Loans and core deposits are put before securities and large time deposits on the grounds that banks use securities and large time deposits as buffers against changes in loans and core deposits. Although this particular ordering seemed the most plausible, the results are not significantly affected when different orderings are used.

<sup>15</sup> It should also be noted that the recent increase in the security ratio is much larger than the typical unexpected change over the 1960-89 period. The security ratio increased 2.7 percentage points from the end of 1989 to mid-1993. For the 1960-89 period, by contrast, the standard deviation of unexpected changes in the security ratio over a 3 1/2-year horizon was only 0.7 percentage point. Thus, to account for the same percent of the recent change in the security ratio as of past changes, shocks to the three macroeconomic variables and loans would have to be larger than average.

<sup>16</sup> This decomposition involves two steps. The first step is to estimate the actual shocks to each variable over the period from the end of 1989 to mid-1993. The second step is to use the impulse response functions to determine the effects of each set of shocks on the security ratio.

<sup>17</sup> Table 2 shows the effect on securities of shocks to other variables but does not show the sign or magnitude of those shocks. One way of summarizing this information is to calculate the cumulative change in each other variable due to shocks to that variable. This "own effect" equals -4.5 percent

age points for the funds rate, -2.8 points for GDP, 2.6 points for inflation, -4.5 points for loans, -1.1 points for core deposits, and -0.4 point for large time deposits. These figures confirm that the funds rate, GDP, and loans were all subject to large negative shocks after 1989. They also indicate that the inflation rate was subject to positive shocks (inflation should have declined even more than it did), while core deposits and large time deposits were subject to negative shocks.

<sup>18</sup> Although not shown in the chart, macroeconomic shocks contributed 1.0 percentage point to the increase in the security ratio up to 1992:Q1, and loan shocks contributed another 0.5 point.

<sup>19</sup> A two-standard-error confidence band was computed around the unexplained change in the security ratio—the gap between the two curves in Chart 5—using the Monte Carlo technique in the RATS software package (Doan). This confidence band lies entirely above zero after 1992:Q3.

<sup>20</sup> It is not obvious why banks would wait until 1992 to become more pessimistic about long-run lending prospects. However, one reason banks might have waited this long to respond to the new risk-based capital requirements is that FDICIA, the banking law passed in November 1991, tended to make the requirements more binding (Baer and McElravey). The law did this by forcing banks to exceed capital requirements by a wide margin to receive the most favorable regulatory treatment.

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