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## Contents

# M1: The ever-changing past

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Monetary policy hinges on the growth of M1 and its relationship to the rest of the economy. Newly released money supply data play a vital role in the policy process by providing information on current monetary conditions and the effect of recent policies. However, the initial money supply figures contain a high level of error[1] which may cause recent monetary growth to appear more erratic than it actually was. This makes it difficult for policymakers to determine if unexpected movements in initial M1 data reflect fundamental changes in economic behavior that require a new policy response.

Historical data are not as likely to exaggerate the volatility of money growth because over time the early data errors are reduced through frequent and often substantial revision. The various types of revision correct for reporting errors, incorporate data collected at infrequent intervals, comply with changes in money definition, and revise the factors that adjust the series for seasonal fluctuation. After several years, the data are more representative of actual economic history because they are based on more complete information. The volatility of the data is influenced most by the seasonal factor revisions since the other types of revision primarily affect the level, not the movement, of the series.

The relatively greater error in the most recent data may cause M1 growth to appear more variable in the current period than it was in the past. Policymakers may be led to believe that the monetary environment has suddenly become more volatile when in fact they are merely observing a statistical artifact.[2]

In this paper we examine the M1 data available to policymakers in every year since 1965 to see if initial perceptions of monetary behavior could have been seriously obscured by preliminary data errors.[3] We find that M1 growth often appeared to be significantly more variable in the most recent two-year period than it had been in the previous two years. However, in 50 to 60 percent of the cases this evidence of increased monetary uncertainty disappeared after two years of data revision.

These results suggest that perceptions of monetary relationships should not be dominated by the most recent unrevised data. Extreme preliminary values should not be considered strong indications of emerging trends unless there are compelling institutional or policy reasons to expect a change. Often, older data that have been through revision are a more reliable guide for monetary policy.

The overstated variance of initial M1 data has discouraging implications for the use of structural models to evaluate changes in economic relationships. The errors in the preliminary data will enhance the errors in recent estimations of such models, thereby increasing the probability of falsely detecting a structural change. This problem is more serious for models with more explanatory power. Since such models can account for more of the variance in the dependent variable, data errors will contribute a greater percentage of the total error. The errors will therefore exert proportionately more influence on tests for structural change.

## Tests for distortion in newly released M1 data

This paper examines past experience with newly released M1 data to determine how seriously initial data errors could have distorted policymakers' view of their current monetary environment. In particular, we assess the influence such errors might have had on initial perceptions of the volatility or behavior of M1 growth.

Of all the revisions of M1 data, the recalculation of the seasonal adjustment factors is most likely to affect the variability of recorded money growth. There is a seasonal factor revision at least once a year which recomputes the factors for past years and calculates new factors for the upcoming year. The revised seasonal factors are calculated using

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nonseasonally adjusted money supply data through December of the previous year. The entire historical money supply series is readjusted with each seasonal factor revision. In recent years, these revisions have usually taken place in February or March.

The latter years in the money supply series are affected most by the seasonal factor revisions because recent seasonal factors are often changed substantially by the incorporation of another year of data. Normally, the seasonal factors for each year are calculated with data from the three previous years, the year itself, and the three future years. Preliminary seasonal adjustment factors must be estimated for the current year and years in the recent past because information on the future money supply is lacking for those years. As one more year of data is added with every revision, the seasonal factors for the three previous years are updated. (See box for detailed description of the seasonal adjustment process.)

We begin our study of initial data errors by recreating the monthly M1 data that was available to policymakers at the end of each year from 1965 through 1981.[4] For each of those 17 years we collected a series of M1 data which begins in 1959 and was adjusted by the most recent seasonal factor revision of the time. Each series incorporates every data revision made through December of its final year. For example, the series for 1980 extends from 1959 through 1980 and includes the latest revision of each number as of December 1980. The data in the 1980 series were seasonally adjusted under the seasonal factor revision of 1980.[5] Thus, we have 17 series of the most current data available to policymakers each year before they established money growth targets at the February FOMC meeting.

Next, we reconstruct the view policymakers had of the monetary volatility of their time by computing the variance of M1 growth in two-year intervals for each of the 17 series. We use an F test to determine if there were significant differences between the observed money growth variances in the three most recent two-year intervals in each series. Evidence of such differences could have suggested to policymakers that there had been a recent shift in monetary behavior.

The F tests for variance differences over the three two-year intervals are distorted by initial data errors because newly released data

are compared to data that have undergone several years of revision. The time line in Figure 1 describes the three stages of data revision captured by the three data intervals in each series. Figure 2 illustrates the three stages with examples for the 1980 and 1979 data series. The most recent two-year interval in each series is in what we call the first stage of data revision. The seasonal factors applied at this stage are based on M1 data through the earlier of the two years in the interval. The next two-year period as we look back in time falls into the second stage of data revision. In this stage, one year is adjusted by seasonal factors which are missing two years of future data, and the other has factors missing one year of future data. The data interval furthest in the past is in the third stage of data revision in which the seasonal factors are based on a full three years of future data.

Because our collection of past data series ends with the 1981 series, the F tests are applied to two-year periods which go through all three stages of data revision. Thus, we can see how the F tests, our proxy for past policymakers' view of changes in money behavior, are affected by two years of data revision. First, we test each interval when it is in the first stage of revision to see if its variance is greater than that of the previous interval which is in the second stage. Then we perform the same test as it would have been two years later by comparing the variances of the same two periods once they move into the second and third stages of revision. This allows us to see how often initial evidence of shifts in monetary volatility is changed when more completely revised data become available.

Our collection of past data series can be used to further examine the effects of initial data errors on measured money behavior by following each period as it moves through the three revision stages. We calculate the changes in M1 growth variance for each interval as it travels from the first stage to the second stage and then from the second stage to the third.

## Results of tests on newly released M1 data

The 17 overlapping two-year periods beginning in years 1964 through 1980 are tested to see if policymakers might have perceived them to be significantly more or less variable

than previous years. At the five percent significance level, ten of the two-year intervals have significantly greater variance in the first stage of data revision than the preceding intervals have in the second stage. (See the first column in Table 1.) Thus, in 59 percent of the cases

the newly released M1 data provided evidence that monetary volatility had increased. The F tests on the other seven intervals in the first stage of revision show that their variances are not significantly different at the five percent level than that of the preceding intervals. No

### Figure 1
### Three stages of data revision illustrated on time line

Future

Present

**First stage of data revision**

Year 1: The seasonals are based on data through December of the previous year.

Year 2: The seasonals are based on data which include the current year but lack three future years.

**Second stage of data revision**

Year 3: The seasonals are based on data lacking two future years.

Year 4: The seasonals are based on data lacking one future year.

**Third stage of data revision**

Year 5: No future data are missing from calculation of the seasonals

Year 6: No future data are missing from calculation of the seasonals.

Past

### Figure 2
### Examples of three stages of data revision for data available in 1979 and 1980

| Data available in 1979 | Data available in 1980 |
|---|---|
| Future | Future |
| Present | Present |

**First stage of data revision**

| 1979 | 1980 |
| 1978 | 1979 |

**Second stage of data revision**

| 1977 | 1978 |
| 1976 | 1977 |

**Third stage of data revision**

| 1975 | 1976 |
| 1974 | 1975 |

Past  Past
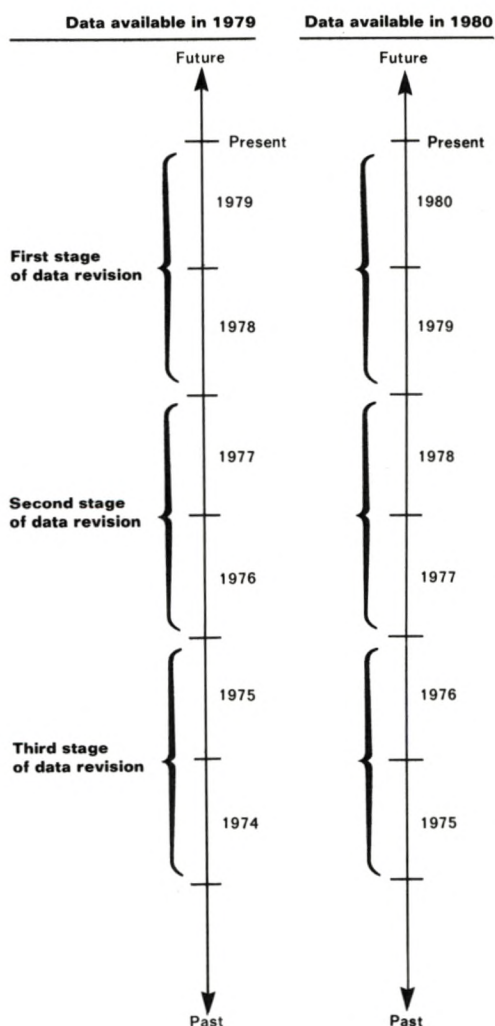
intervals in the first stage have significantly *less* variance than the earlier intervals in the second stage.

When intervals in the second stage of data revision are compared to earlier intervals in the third stage, the pattern of significantly reduced variance does not continue. The variance in the second stage is significantly greater than the variance in the third stage in only four out of the 17 periods. In three cases, the variance of intervals in the second stage is significantly less than the variance of intervals in the third stage, and in ten instances there is no significant difference between the variance of the intervals in the two stages.[6]

The F test results (at a five percent significance level) for the individual two-year periods are shown in Table 2. The four intervals which remain significantly more volatile than preceding periods after the two years of revision are clustered in the mid-60's and early 80's. Several events increased the uncertainty of the financial environment at both times, so there were good reasons to accept the initial evidence of increased monetary volatility. Both periods experienced severe credit crunches which in-

duced large gyrations in money holdings. The introduction of ATS accounts in late 1978 and NOW accounts in late 1980 broadened people's options for managing transactions and savings balances. Shifts between new and old accounts contributed to erratic movements in measured money supply. In fact, in 1980 the Federal Reserve introduced two new money definitions (M1A and M1B) to prepare for various possible scenarios of the transition to the new accounts. The Federal Reserve's adoption of new operating procedures in 1979 was also a major financial change during the early 80's.

The findings in Table 1 suggest that the variance of M1 growth is vastly reduced by revisions during the two years after the data are first published, but that subsequent revisions do not have as large an impact. For the 17 two-year periods in our sample, the average variance fell by 34 percent as the data in each period moved from the first to the second stage of revision. (See Table 3.) The changes ranged from an 80.4 percent decrease to a 3.6 percent increase. After two more years of data revision, the average change in money growth variance

### Table 1
### Two-year variance of seasonally adjusted M1 growth compared to that of the preceding period at different stages of data revision
### 1964-1981

|  | Number of comparisons | |
|  | 5% significance level | 10% significance level |
| --- | --- | --- |
| Money growth variance in first stage and second stage of revision compared |  |  |
| First stage greater than second stage | 10 | 12 |
| First stage less than second stage | 0 | 1 |
| Insignificant difference | 7 | 4 |
| Money growth variance in second stage and third stage of revision compared |  |  |
| Second stage greater than third stage | 4 | 6 |
| Second stage less than third stage | 3 | 3 |
| Insignificant difference | 10 | 8 |

**Table 2**
**Results of tests for increased money growth**
**volatility for each two-year period**
**(F tests at 5% significance level)**

| Period initially more variable than preceding years | | Period not initially more variable than preceding years | |
| --- | --- | --- | --- |
| More variable after data revision | Not more variable after data revision | Not more variable after data revision | More variable after data revision |
| | 1964-65 | | |
| 1965-66 | | | |
| 1966-67 | | | |
| | 1967-68 | | |
| | | 1968-69* | |
| | | 1969-70 | |
| | 1970-71 | | |
| | | 1971-72 | |
| | | 1972-73 | |
| | | 1973-74 | |
| | 1974-75 | | |
| | 1975-76 | | |
| | | 1976-77* | |
| | | 1977-78* | |
| | 1978-79 | | |
| 1979-80 | | | |
| 1980-81 | | | |

*These periods were significantly *less* variable than the preceding period after two years of data revision.

**Table 3**
**Change in two-year variance of seasonally adjusted M1 growth**
**as each period moves through the three stages of data revision**

| Two-year period | Variance change from first stage to second stage | Variance from second stage to third stage |
| --- | --- | --- |
| 1964-65 | -80.4% | -16.9% |
| 1965-66 | -65.4 | 14.2 |
| 1966-67 | 1.4 | 3.7 |
| 1967-68 | -23.8 | -13.9 |
| 1968-69 | -26.2 | .2 |
| 1969-70 | 3.6 | -8.2 |
| 1970-71 | -27.9 | -3.5 |
| 1971-72 | -41.2 | -26.0 |
| 1972-73 | -14.7 | -21.2 |
| 1973-74 | -41.9 | 7.7 |
| 1974-75 | -59.0 | 29.2 |
| 1975-76 | -18.3 | 3.9 |
| 1976-77 | -76.0 | 36.0 |
| 1977-78 | -58.7 | -5.1 |
| 1978-79 | -44.7 | -4.4 |
| 1979-80 | .7 | 9.1 |
| 1980-81 | -4.1 | 6.0 |
| 1981-82* | -33.1 | n.a. |
| 1982-83* | -29.4 | n.a. |
| Average change | -33.9 | .6 |

*These years are not included in the average change or the F-test sample because they have not gone through all three stages of data revision.

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## Seasonal adjustment of the monetary aggregates

The procedure that the Federal Reserve uses to seasonally adjust the monthly money supply data is based solely on the behavior of the series itself. Using both past and future data, the process attempts to separate the seasonal movement in the data from movements due to the business cycle, long-term growth, and irregular shocks. These four components multiplied together are assumed to comprise the total money supply. To keep up with trends in the components, the seasonal factors for each year are based on weighted moving averages of the data over several surrounding years. Future and past data are weighted symmetrically in the calculation, with the greatest weight given to the years closest to the year being adjusted.

The precision of the adjustment is enhanced by computing separate seasonal factors for the different components of the monetary aggregates. The adjusted components are summed to obtain the total seasonally adjusted series.

Since 1982, the Fed has used the X-11-ARIMA seasonal adjustment procedure.[1] This method is a variant of the Bureau of the Census X-11 method. X-11-ARIMA and X-11 are identical when it comes to adjusting historical data, but they differ for data in the most recent years. The future data normally used for seasonal adjustment are not available for recent years, and the two methods cope with this problem differently.

For historical data, X-11-ARIMA and X-11 go through two iterations to separate the series into seasonal, trend-cycle, and irregular factors. In the first round, the trend-cycle component for each month is estimated with a moving average of the series over the 12 surrounding months. Each average is centered on the month in question. The trend-cycle components are divided into the unadjusted series to estimate the combined seasonal and irregular factors, which are called seasonal-irregular (S-I) ratios.

Monthly seasonal factors are then estimated with weighted averages of each month's S-I ratios over the previous two years, the current year, and the future two years. The weights are symmetric around the central year, and greater the closer they are to the central year. These averages of the S-I ratios smooth out the irregular shocks and thus provide initial approximations of each month's seasonal nature.

The estimated seasonals are then refined by reducing the influence of outliers in the data. Estimates of the irregular components, calculated by dividing the seasonal factors back into the S-I ratios, are used to identify such outliers. A moving standard deviation of the irregulars indicates which shock terms are extreme in value. The original series of S-I ratios is then corrected for outliers by removing or reducing ratios that have irregular terms larger than 1.5 times the moving standard deviation. Revised seasonal factors are calculated from this modified series of S-I ratios.

The process uses these revised seasonals to begin a second round of steps which refines the estimated trend-cycle and irregular terms and produces the final seasonal factors. First, the original data are adjusted by the revised seasonal factors so that a combination of the trend-cycle and irregular components remains. A second estimate of the trend-cycle is derived by applying a weighted average to this series. The length of this weighted average is determined by the relative variability of preliminary irregular and trend-cycle estimates. To smooth out the influence of the irregulars sufficiently, the span is made longer the greater the variability of the irregulars relative to that of the trend-cycle. Conversely, the span is shorter if the trend-cycle appears more variable. This allows trend-cycle shifts to be reflected better in the average.

The new trend-cycle component is then factored out of the unadjusted series to obtain revised S-I ratios. A centered seven-year moving average of the new S-I ratios yields new estimates of the seasonal factors. As before, the irregular terms are computed and the S-I ratios are modified for extreme values.

The final seasonal factors are then calculated by taking another seven-year weighted moving average of these modified S-I ratios. The factors are applied to the original data to get the final seasonally adjusted money supply series.

This procedure cannot be completely applied to recent data because it requires three years of future data. Therefore, the seasonal factors for the most recent three years are estimated at first and then revised in later years as the necessary data become available. X-11-ARIMA and X-11 have different methods for estimating the preliminary seasonals.

To calculate the seasonals for the most recent year, X-11 uses a different pattern of weights that applies only to past data. These weights are not symmetric, but they still put the greatest emphasis on the most current data. As future data become available, year by year, X-11 reestimates the seasonal factors with new sets of asymmetric weights that also cover the added data.

X-11-ARIMA computes the preliminary seasonal factors from past data and forecasts of the next year's data. It applies the weights X-11 uses when only one year of future data is available. The forecasts come from ARIMA (autoregressive integrated moving average) models. Such models provide minimum mean square error forecasts based on the past values of a series.

The seasonal adjustment process may be modified if an unusual sequence of events is known to have affected money supply behavior. Before the seasonals are computed, the effects of such events are identified and removed from the unadjusted money data with a statistical technique called intervention analysis. The seasonals calculated from the modified data are then applied to the unadjusted data to obtain the final seasonally adjusted series. The money supply data were corrected in this manner to remove the effect of the 1980 Credit Restraint Program.

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[1]X-11-ARIMA was adopted at the recommendation of the Committee of Experts on Seasonal Adjustment Techniques which advised that it might reduce the magnitude of money supply revisions. See Board of Governors of the Federal Reserve System (1981).

was only 0.6 percent. Again, the experience of individual periods was quite different, ranging from a 26 percent decrease to a 36 percent increase in growth variance.[7]

The large diversity in the variance reductions suggests that false detection of structural change cannot be easily avoided by stiffening the statistical test for such change, that is by lowering the acceptable p-values of F tests on the initial data.[8] The effect of data revisions on measured monetary volatility is so variable that a simple rule cannot correct the data error problem in all situations. In our sample, the 1964-65 period was initially found to be more variable than the preceding period with a very low p-value of 0.004. However, two years later the period was not significantly more variable at the five percent level than the previous period. Conversely, initial evidence that the 1980-81 period was significantly more variable with a very similar p-value of 0.002 was not overturned by a five percent test after two years of data revision.[9]

The large and rapid decline in money growth variance is simply a statistical phenomenon that occurs as incorporation of more data allows the seasonal factors to capture more of the seasonal movement in the data. Changing patterns in seasonality will be reflected more accurately in the seasonal factors as data for the current year and one or two future years are included in the calculation. These improved factors will reduce the variance of the adjusted series in two ways. First, they can remove the seasonal variance from the series more completely. Second, because the revised

seasonals are better estimates of actual seasonality they do not introduce as much variance into the data through error as the preliminary seasonals do.

Money growth variance can also be reduced if the addition of data for the current year causes some of the variance in the unadjusted series, whether seasonal or not, to be attributed *directly* to seasonal fluctuation. While attempts are made to minimize absorption of current nonseasonal variance into the seasonals, some of the reduction in money growth variance that we observe may be due to this effect.

After a few years the revisions do not affect the variance of seasonally adjusted money as much because they do not produce large changes in the seasonal factors. The future data incorporated in the later revisions carry little weight in the computation of the seasonal factors, so their addition does not alter the seasonals or the seasonally adjusted data substantially. This accounts for the small changes in money growth variance between the second and third stages of data revision.

While the pattern of variance changes that we observe has a simple statistical explanation, the problem it poses for policymakers is quite serious. Out of the ten sample cases in which the current environment appeared more volatile than the previous two-year period, only four were still significantly more variable after two years of revision. Thus, there was a 60% chance that an apparent increase in money growth variability would disappear from the data within two years. At the 10 percent significance level, initial indications of increased volatility were eliminated by data revision in 50 percent of the cases. Six out of the total 17 periods, or 35 percent, under either significance level yielded false signals that the monetary environment had grown more erratic. The exaggerated picture of money growth volatility provided by recent money supply numbers could lead policymakers to take unnecessary corrective measures.

## Implications for structural models

Errors in the preliminary money supply data can create problems for models which include M1 either as a dependent or an independent variable. Models of money growth are subject to data error bias when they are used to test for recent changes in the relationship between money and certain economic factors. Such tests compare the variance of the model errors before and after a change is presumed to have taken place. A statistically significant increase or decrease in error variance is considered evidence of a shift in monetary behavior. Preliminary data errors could distort these tests by adding to the noise observed for the model in the most recent period. This may so raise the variance of recent errors relative to that of earlier errors that tests for structural shifts in the model will find false significant evidence of change.

In fact, the F tests of M1 growth variance provide an example of the bias initial data errors introduce into tests of economic models. The F test is equivalent to a test for change in a simple model of M1 growth which includes only an intercept term and a dummy variable equal to one during the more recent two-year period. The model's predicted values for the two periods in question are equal to the means of M1 growth in those periods. Therefore, the variances of the model errors used in a test for structural change between the two periods are identical to the variances of M1 growth used in our F tests.

Unfortunately, tests for change in money growth models that include additional explanatory factors will experience greater bias due to preliminary data errors than our F tests. This is because the more sophisticated models explain more of the variance in M1 and so have lower errors. Initial data errors will contribute a larger share of the errors in such models so long as the data errors are uncorrelated with the model's independent variables. As a result, the recent model errors are more likely to appear significantly larger than earlier errors simply because of noise in the unrevised data. Therefore, our finding that 50 to 60 percent of detected variance changes prove to be statistical artifacts may represent the lower bound of this bias problem.

Preliminary data errors can cause four types of bias in models where M1 appears as an explanatory variable. First, the errors in the M1 data will increase the variance of measured model errors, so that tests for structural change may be biased for these models as well. Second, M1 data errors will cause the estimated coefficients of the M1 variables to be biased toward zero. Third, models which include lagged values of M1 may have longer lags and

lower coefficients on the recent lags than they should.[10] As a result, such models will give the impression that the dependent variable's relation to M1 has slower response time and more memory than it actually does.

Finally, the added noise in current M1 data will increase the variance of predictions from such models. This effect is greater if the M1 variable has a large coefficient. The influence of preliminary data errors on prediction variance is more complicated for models with lagged values of M1 because the total effect will be determined by the pattern of the M1 coefficients over time. For example, if a model has twelve lagged M1 variables with approximately equal coefficients, the effects of errors in the seasonals will be largely cancelled out. Aside from this restrictive case, it is difficult to estimate the full influence of initial M1 data errors on predictions.

However, even though initial data errors may bias models of M1's relationships with other economic variables, it is not necessarily preferable to use nonseasonally adjusted M1 data instead. The variance of unadjusted M1 data is dominated by the variance of the seasonal component; from 1959 through 1984, the variance of the estimated seasonal component was 28 times greater than the variance of the nonseasonal component. Thus, any model which uses unadjusted M1 data must model the seasonal patterns very accurately before it could possibly capture the economic behavior of money. Since the seasonal and nonseasonal components must be estimated simultaneously, it is difficult to obtain a model which is not contaminated throughout by the seasonality of the data.

## Conclusion

Our examination of the money supply data that was available to policymakers in the years from 1965 through 1981 shows that newly released numbers often provided misleading information about the monetary environment. The preliminary money supply data frequently indicated that money growth was more variable in the current period than it had been before. However, the evidence of increased volatility was often merely an artifact of the incomplete nature of the initial seasonal adjustment factors. In 50 to 60 percent of the cases where money growth seemed to have

grown significantly more variable, the evidence of greater variance was eliminated after two years of data revision. While our work is not extensive enough to offer a correction for this problem, it does suggest that preliminary seasonally adjusted M1 values which seem extreme should be interpreted and used in economic modelling with great caution.

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[1] We use the word "error" to refer to the difference between the initial M1 estimates and the final revised figures. However, because the revision process is imperfect, this difference may not always accurately reflect the true errors in the preliminary data.

[2] The effect of errors in preliminary money supply data has been recognized as a problem by the Board of Governors research staff for some time. Pierce (1980) derives the statistical properties of seasonal factor revision under several seasonal adjustment methods. He then calculates the standard deviation of the seasonal factor revisions for M1 and the commercial paper rate in the mid-1970's. Pierce (1981) uses the standard deviation of all noise in the monetary aggregates to determine how long an observed deviation from trend growth must persist to be statistically significant evidence of a shift in trend. This work is concerned with the magnitude and behavior of initial data errors and the influence such errors have on measures of money and money growth levels. Such information is useful to determine if money growth is off target.

[3] Federal Reserve policy did not target M1 at all times over this period. However, we include as many years as possible in our sample in order to refine our tests for the influence of preliminary data errors on measured volatility of M1.

[4] For 1980 and 1981 we recreate the M1B data that was available to policymakers because that money definition was adopted as the new M1 measure at the end of 1981.

[5] For years in which there was more than one historical revision we concentrate on the most recent one because it provides a complete series through the end of the calendar year.

There was no seasonal factor revision in 1972. The money supply numbers during that year were seasonally adjusted under the November 1971 seasonal factor revision. Thus, for 1972 we examine the behavior of the November 1971 money supply series as it existed at the end of 1972.

[6] The F test results are virtually the same when the influence of the Credit Restraint Program of 1980 is reduced by leaving the months of March and April 1980 out of the sample.

[7] It is possible that the switch from the X-11 method to X-11-ARIMA in 1982 may have reduced the errors in the initial seasonals. (See box for explanation of this change.) X-11-ARIMA will lower errors caused by unusual current observations because it assigns less importance to the most recent data. However, X-11-ARIMA cannot reduce the noise in the early numbers if such errors are caused by the failure of the seasonal adjustment process to pick up rapid trend changes in seasonality. In this case, X-11-ARIMA would actually exacerbate the problem by reinforcing the influence of past seasonal patterns on the preliminary seasonal factors.

Our sample does not cover any data after the conversion to X-11-ARIMA because those years have not yet moved through all three stages of data revision. However, preliminary evidence on the effectiveness of X-11-ARIMA is offered by the experience of the 1981-82 and 1982-83 intervals which have gone through the first two stages of data revision. The money growth variance in these two periods declined 33 and 29 percent respectively between the most recent and the middle stages of revision. These declines are so near the average change for the intervals in the sample that they suggest that X-11-ARIMA has not substantially reduced the excessive variance in recent seasonally adjusted money data.

Hein and Ott (1983) also find that initial monthly data are still biased with X-11-ARIMA. However, they cite evidence from Stone and Olsen (1978) that weekly numbers are closer to later revised data when adjusted by X-11-ARIMA.

[8] The p-value is the probability that the variance is not greater in the more recent period for each value of the F statistic. In other words, it is the probability of accepting a false hypothesis at each point on the F distribution. It is standard practice to accept a hypothesis if the probability of being wrong is five percent or less, i.e. if the p-value is less than or equal to 0.05.

[9] This p-value was for the test when March and April 1980 were excluded from the sample in order to nullify the influence of the Credit Restraint Program. When these months were included in the sample, the p-value was 0.0002.

[10] Telser (1981), pp. 233-256.

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# Wealth effect of geographical deregulation: The case of Illinois

*John J. Di Clemente and James Kolari*

In 1981, bank holding companies in Illinois were granted the legal authority to operate more than one full-service banking office through the acquisition of additional banks. Thus, although a single bank is limited to one full-service office, a bank holding company (BHC) could establish a network of such offices in specific regions in the state. Figure 1 outlines the banking regions in Illinois. Under the liberalizing legislation, BHCs are permitted to own banks in their home regions and a region contiguous thereto. Although BHCs were constrained to operate in specific regions, it appeared that the multibank law would be especially advantageous to relatively large holding companies with access to capital for acquisition purposes.[1]

An early analysis of the effects of this legislation showed the cautious approach taken by BHCs in Illinois in response to the new acquisition opportunities, and suggested that this response pattern reflected the combination of a severely depressed economy and overpriced small banks.[2] The present study, however, takes a different tack. It examines the stock market's response to the legislation. Specifically, stock return data for the four largest BHCs in Chicago (and Illinois) that were most able to avail themselves of the Act's acquisition benefits are analyzed after adjusting for risk. These BHCs include Continental Illinois Corporation, First Chicago Corporation, Harris Bankcorp, Inc., and Northern Trust Corporation. The principal concern of the study is whether the securities market perceived these likely beneficiaries of the Act as being positioned to obtain real benefits through expansion. It is important to bear in mind that we are not analyzing any particular acquisition; rather, we are concerned with the creation of potential benefits through the liberalizing legislation.

If returns to these banking organizations were abnormally high during this period, it would suggest the possibility that real benefits would be forthcoming once the BHCs embarked on an expansion program. A long list of motivations for acquisitions has been assembled. Generally, it is agreed that there is not necessarily a single cause for an acquisition.[3]

Among the possible causes are 1) the search for efficiencies (economies) in the production, distribution, and marketing of a product; 2) the satisfaction of managerial needs and wants; 3) the capture of speculative gains; and 4) the desire for increased market share through the elimination of a competitor (but only insofar as the elimination through acquisition results in the ability to increase price above competitive norms, or in other words, the creation of market power). This list is only illustrative of the possible motivations for and benefits to be derived from acquisition.
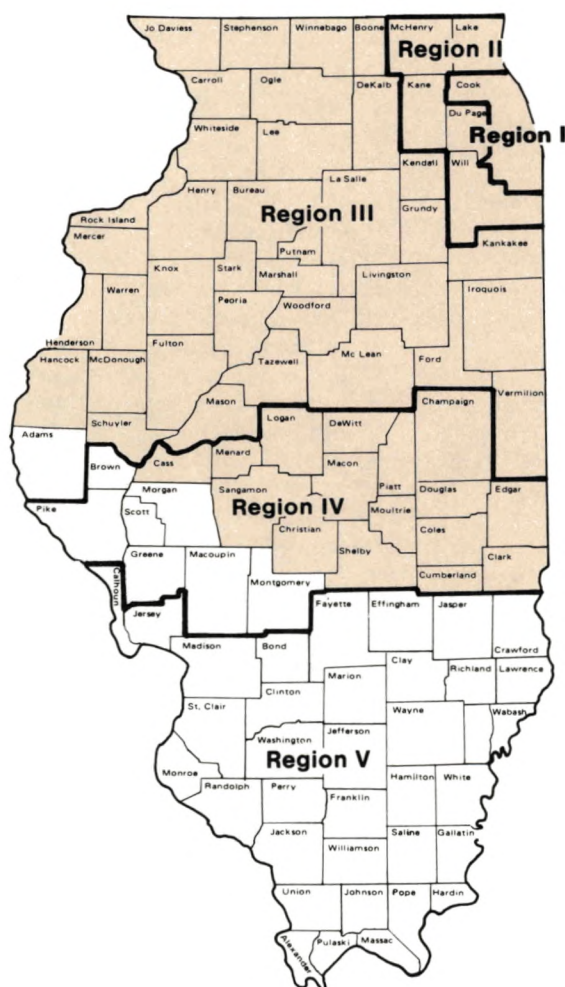
An important issue concerns how the benefits from acquisitions are divided between acquirer and target. Thus, if the benefits are captured in toto by the target firm, the value of the acquirer should remain unaffected. Given their ability to expand for the first time, did the stock market view the four large Chicago holding companies as primed to "take advantage" of the opportunity to gather for themselves the potential benefits associated with additional bank acquisitions?

## Methodology

The Sharpe market model is an empirical representation of security returns consistent with the Capital Asset Pricing Model, an economic theory of capital market equilibrium.[4] Despite the restrictive assumptions underlying

**Figure 1**
**Illinois Banking Regions**

Seventh District
portion of Illinois

where $\tilde{R}_j(t)$ is the return on stock $j$ in period $t$, $Rm(t)$ represents the return on a value-weighted market index in period t, and $\tilde{u}_j(t)$ is the error term of the linear model. $\alpha$ and $\beta$ are parameters to be estimated. The value of $\beta_j$, or beta, indicates the relative riskiness of the stock in comparison with the market as a whole.

As it appears above, equation (1) represents a single-index market model of the return generating process which controls for marketwide influences on security returns. It is likely, however, that returns on different securities in the same industry are highly correlated. To adjust for industrywide as well as general economic movements, an equal-weighted bank stock index (calculated to be uncorrelated with the market index) was added to equation (1), above.

Thus, the return generating equation used as a base to detect variations from normal return patterns takes the form

$$\tilde{R}_j(t) = \tilde{a}_j + \beta_{1j}\tilde{R}m(t) + B_{2j}\tilde{R}I(t) = \tilde{u}_j(t) \qquad (2)$$

where $RI(t)$ represents the return on a bank stock index uncorrelated with the market index; all other notation remains the same. $\beta_2$ can be interpreted to represent the relative riskiness of a particular bank stock in comparison with the banking industry as a whole.

Equation (2), then, is used to generate returns for the shares of Continental Illinois, First Chicago, Northern Trust, and Harris, given returns to the market and industry indexes. This formulation represents the normal return process. *Abnormal* returns (which may be thought of as prediction errors) are defined as

$$PE_j(t) = R_j(t) - \alpha_j - \hat{\beta}_{1j}Rm(t) - \hat{\beta}_{2j}RI(t) \qquad (3)$$

where $PE(t)$ represents the difference between the *actual* return in period T and the return that would be expected given the parameters estimated for equation (2). The *PEs* are assumed to have a mean of zero and to fluctuate randomly in the absence of any specific event which might cause them to take a distinct pattern. Figure 2 is a stylized graphical presentation of *PE* patterns reflecting different events that have impacts on such patterns.

the model, it has been found useful in event studies involving the impact of new information on market returns.[5]

The model, simply put, is a regression model of form

$$\tilde{R}_j(t) = \alpha_j + \beta_j\tilde{R}m(t) = \tilde{u}_j(t) \qquad (1)$$

Figure 2
**Interpretation of prediction errors
around an event date**

This graph implicitly supports a technical analyst's view of
the world since it says that it takes a while to adjust stock
prices after the appearance of new information.

cumulative production errors
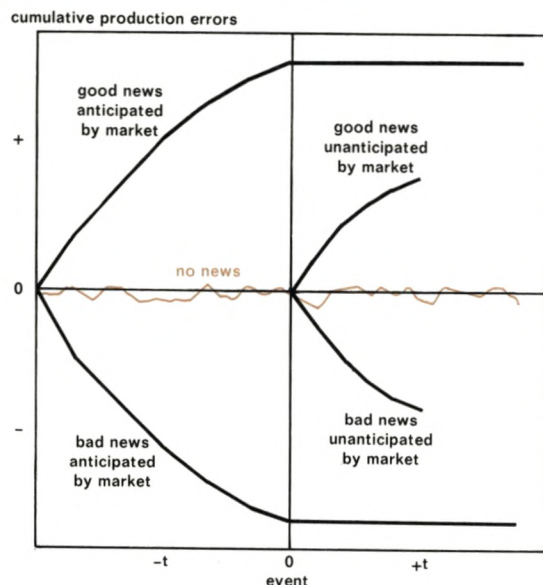


In order to ensure that the estimation of
parameters $\alpha$, $\beta_1$ and $\beta_2$ are free from "con-
tamination" resulting from anticipatory effects
of the Act, these coefficients are estimated using
daily return data for the period January 1,
1980 to December 31, 1980. In addition, a
buffer period is set aside from January 1, 1981
to March 24, 1981. The analysis of abnormal
returns is performed during the interim March
25, 1981 to January 1, 1982, the effective date
of the Act. March 25 represents the date of the
first reading of the bill in the Illinois legislature
that ultimately became the Act. (See box.)

Abnormal returns were tested for signif-
icance around three event dates: first reading
of the bill, passage of the bill by both houses
of the legislature, and the signing of the bill
into law by the Governor. The hypothesis
tested for each of these dates was whether stock
returns to holding the Chicago-based BHCs
were abnormally high. If the returns were not
abnormally high, the relevant inference is that
passage of the Act was neutral with respect to
its effect on the valuation of these BHCs in the
eyes of the market. However, should the pat-
tern of returns to the BHCs be abnormally
high, the implication is that these large BHCs

were perceived to benefit by the Act. There is
also the possibility that shifts in risk may be
associated with the event dates in question.
Risk shifts are also tested for significance.

An analysis of the results of the tests indi-
cates that the model used to generate returns
to BHC shareholders adequately captures the
risk and return characteristics of the holding
companies under study. In all cases, the risk
measures, or betas ($\hat{\beta}_1$ and $\hat{\beta}_2$), are highly sig-
nificant. (See Table 1.) With the exception of
First Chicago, the industry beta estimate ($\hat{\beta}_2$)
is more significant than the market beta esti-
mate ($\hat{\beta}_1$), indicating the importance of the in-
dustry factor in the return generating process
in banking.

We next tested for significant abnormal
returns for each of the four BHCs at time peri-
ods surrounding the major events associated
with enactment of the Act (first reading, pas-

**Time Line**

There are three periods of interest in
the study of the stock market's reaction to
the change in Illinois banking law. First,
the Estimation Period (1/1/80-12/31/80) in
which the parameters of the return gener-
ating model are estimated for each of the
four BHC stocks under consideration.
Second, a Buffer Period (1/1/81-3/24/81) is
set aside. This is to ensure that consider-
ation of the Act by the legislature did not
affect the estimation of the parameters of
the return generating model. Finally, the
Analysis Period (3/25/81-1/1/82) may be
subdivided into three timeframes—the As-
signment Period, when the bill that was to
become the Act was first read in the legis-
lature and assigned; the Legislative Period,
during which the bill was passed by both
houses of the legislature; and the
Enactment Period, representing the time
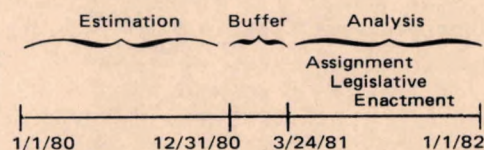from passage to gubernatorial approval.

## Table 1
## Statistical results for capital market models

Multiple regression models for each company

| Parameters | Estimates | Standard Error | t*-Value ($H_0$: Parameter=0) | Probability > \|t*\| | $R^2$ (Adjusted $R^2$)[a] | Overall F Value (Probability > \| F\|) |
|---|---|---|---|---|---|---|
| **1. Continental** (n=260) | | | | | | |
| $\hat{\alpha}$ | −0.0000 | 0.0009 | −0.11 | 0.9107 | 32.07% | 39.48 |
| $\hat{\beta}_1$ | 0.6288 | 0.0815 | 7.72 | 0.0001 | (31.55%) | (.0001) |
| $\hat{\beta}_2$ | 0.7834 | 0.0993 | 7.89 | 0.0001 | | |
| **2. First Chicago** (n=260) | | | | | | |
| $\hat{\alpha}$ | −0.0004 | 0.0013 | −0.32 | 0.7458 | 21.27% | 29.21 |
| $\hat{\beta}_1$ | 0.7454 | 0.1209 | 6.17 | 0.0001 | (20.66%) | (.0001) |
| $\hat{\beta}_2$ | 0.8288 | 0.1473 | 5.63 | 0.0001 | | |
| **3. Harris** (n=260) | | | | | | |
| $\hat{\alpha}$ | 0.0001 | 0.0009 | 0.06 | 0.9549 | 13.31% | 24.82 |
| $\hat{\beta}_1$ | 0.2471 | 0.0868 | 2.85 | 0.0048 | (12.49%) | (.0001) |
| $\hat{\beta}_2$ | 0.5891 | 0.1058 | 5.57 | 0.0001 | | |
| **4. Northern Trust** (n=260) | | | | | | |
| $\hat{\alpha}$ | 0.0000 | 0.0006 | 0.04 | 0.9700 | 16.29% | 17.41 |
| $\hat{\beta}_1$ | 0.2317 | 0.0536 | 4.33 | 0.0001 | (15.67%) | (.0001) |
| $\hat{\beta}_2$ | 0.3661 | 0.0652 | 5.61 | 0.0001 | | |

[a]The adjusted $R^2$ corrects for the number of independent variables in the model. The general formula used to make this adjustment is $R_a^2 = 1 - \left(\frac{n-1}{n-p}\right)\left(\frac{SSE}{SSTO}\right)$, where $n$ and $p$ are the number of observations and parameters, respectively.

sage by both houses, and Governor approval). In only one instance was the abnormal return significantly positive (at the 0.10 level of significance). By virtue of the preponderance of the empirical evidence, it is clear that shareholder wealth positions were unaffected by the Act.

The lack of any return change, however, does not preclude a change in the market valuation of bank risk. That is, $\hat{\beta}_1$ and/or $\hat{\beta}_2$ may have been affected. Tests for shifts in systematic risk between the estimation and analysis periods were unable to distinguish any significant changes in risk, with one exception. Risk as measured relative to both the market ($\hat{\beta}_1$)

and industry ($\hat{\beta}_2$) increased significantly in the analysis period for Harris. No specific reason for this reaction is manifest, and none will be conjectured.

## Conclusions

The present case study of four, large BHCs considered likely to benefit from a change in banking structure law leads to the conclusion the stock market did not perceive these large holding companies as being able to achieve any significant net benefits from passage of what is, in effect, a liberalized branching law. Questions remain as to why the market reacted as it did. One distinct possi-

bility is that antitrust restrictions were viewed as a substantial impediment to the creation of monopoly power through acquisition by the large banking organizations. If this is a major cause for the results of the study it would confirm the potency of antitrust restrictions as presently construed by the bank regulatory agencies and the Department of Justice. More corroborative evidence is needed to validate this conjecture. Yet, if antitrust remains potent in the eyes of the market, such a finding would have broad implications relative to the ongoing debate on geographic banking deregulation at the state level and interstate.

Aside from possible antitrust inhibitions, it is possible that the market did not view the ability to acquire additional banks in a fairly narrowly specified area of the state as facilitating the achievement of economies of scale or scope. It might well be that the four large holding companies with which the study is concerned have exhausted possible scale economies. As for scope economies, the prospect of an acquisition of an additional bank would not appear to broaden significantly the product offerings of the BHCs so as to achieve significant complementarities.

Yet another possible explanation of the results lies in the respective bargaining positions of the BHCs studied and those banks that might have been viewed as likely targets for acquisition. If the benefits flowing from an acquisition are captured by the target, then there is little reason to believe that the value of the acquiring institution will be enhanced. As we noted at the outset, overpriced small banks were viewed as a reason why Illinois BHCs took a cautious approach to the broadened acquisition opportunities. Perhaps one reason why these smaller banks demanded rather healthy premiums resulted from the fact that the Illinois legislation prohibited BHCs from expanding *de novo* through the establishment of new banks. Therefore, the only means available for expansion was through the acquisition of already existing banks. The effect of the *de novo* prohibition would be to preserve the franchise value of existing banks. One means

of ascertaining whether acquisition benefits were expected to be captured by the smaller Illinois banks (i.e., the banks most likely to be acquisition targets) is to test for abnormally high returns for a sample of small bank stocks around the specific event dates associated with passage of the Act in much the same fashion as we have done for the four largest BHCs.

Whether or not current antitrust proscriptions are adequate to effectively control excessive concentration upon the dismantling of barriers to interstate banking is a significant issue. The results reported here of the wealth effects of a limited dismantling of geographic restrictions is encouraging in affirming the potency of antitrust to the extent that such restrictions may have inhibited the creation of monopoly power in specific markets.

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[1] For a detailed discussion of the legislation amending the Illinois Bank Holding Company Act to permit acquisitions of additional banks in a holding company's home region or region contiguous thereto, see: Douglas H. Ginsberg, "Interpreting the 1981 Amendments to the Illinois Bank Holding Company Act," *Loyola University of Chicago Law Journal* (Fall 1981). Although the amendments contain other provisions, the significance of the Act for our purposes rests with BHCs' new authority to expand beyond one full-service office.

[2] Sue F. Gregorash, "First Year Experience: Illinois Multibanks Shop Carefully," *Economic Perspectives,* Federal Reserve Bank of Chicago (May/June 1983).

[3] See P.O. Steiner, *Mergers,* Chapter 2 (University of Michigan Press: Ann Arbor 1975).

[4] The Sharpe market model is presented in William F. Sharpe, "A Simplified Model for Portfolio Analysis," *Management Science* (January 1963). A good discussion of the Capital Asset Pricing Model is found in William F. Sharpe, *Portfolio Theory and Capital Markets,* NY: McGraw-Hill, Inc. (1970).

[5] See: Stephen J. Brown and Jerold B. Warner, "Measuring Security Price Performance," *Journal of Financial Economics* (September 1980) and G. William Schwert, "Using Financial Data to Measure the Effect of Regulation," *Journal of Law and Economics* (1981).

## "A sea of change"

*For 13 years, George W. Cloos, Vice President and Economic Adviser at the Federal Reserve Bank of Chicago, has been logging the economic events of the year for* Economic Perspectives *and its predecessor publication,* Business Conditions. *In that time, he has seen a great cumulation of rapid economic change. His 13th chronology, and a few general words of analysis, follow.*

Nineteen Eighty-Five was the third consecutive year of expansion, a duration rarely exceeded in peacetime in the past. However, there was no evidence that the economy was winded by the three-year climb. Employment, retail sales, construction, and factory ouptut all ended the year on the upbeat, and all closed at record highs. Inflation remained moderate. Inventories were generally low and well controlled. Most forecasts called for further growth and continued restrained inflation in 1986.

But all sectors of the economy operated last year in an atmosphere of rapid change unprecedented in history, except in wartime. All evidence suggests that this era of unrest will continue into the twenty-first century. Among the factors making for rapid change were the following:

● Adjustments required by the flood of imported goods, now over 20 percent of all goods purchased.
● Efforts to contain and manage the federal government's $2 trillion debt.
● Deregulation of financial institutions, communications, and transportation, as required by law and litigation. Although causing painful adjust-ments for some, deregulation probably has contributed, on balance, to moderation of the inflation spiral.
● The tide of mergers that moved to a new high in 1985. Mergers have caused far-reaching "re-structurings" involving layoffs, sales of divisions, and realignments of balance sheets.
● Failures of important businesses and financial institutions, caught by huge losses. These have created a new caution on the part of lenders and trade creditors.
● A new insurance crisis, with most types of coverage much more costly—and some even impossible to get. This is partly a fruit of the vast growth of litigation, which intrudes on all decisionmaking—economic, social, and political.
● Late in 1985, a sharp decline in world oil prices, threatening energy producers, lenders, and the welfare of oil exporting nations.

No sector of industry or finance has escaped the need to reevaluate and restructure. Steel, motor vehicles, machinery and equipment, oil, chemicals, textiles, airlines, truckers, railroads, agriculture, banks, S&Ls, and insurance companies—all are reported in their trade press to be "in transition," "in chaos," and "under reorganization."

Nineteen eighty-six will resemble 1985 in that management and workers will be struggling in a sea of change. Long-accepted watchwords, rules-of-thumb, and "standard operating procedures" will pass into limbo. As in natural evolution, survival and profit will reward those best able to meet existing and emerging challenges.

## Economic Events of 1985—A Chronology

**Jan 1** Social Security tax base rises from $37,800 to $39,600. Tax rate rises to 7.05%. (Base rises to $42,000 and rate to 7.15% on Jan 1, 1986.)

**Jan 1** Regulatory minimum deposits for Super NOW accounts, money market deposit accounts, and 7-to-31-day time deposits fall from $2,500 to $1,000. (Minimum eliminated Jan. 1, 1986.)

**Jan 1** Price controls lifted on 60% of natural gas.

**Jan 4** Dow Jones industrial stock average closes at 1185, low for the year. (See Dec 16.)

**Jan 8** Illinois law mandates use of auto seat belts (in front seats).

**Jan 8** Major trading company cancels importation of Argentine wheat after widespread public protest.

**Jan 8** In job switch, James A. Baker becomes Treasury Secretary; Donald Regan becomes White House chief of staff.

**Jan 9** General Motors creates Saturn Corp. to build new small car. (See Jul 27.)

**Jan 15** Prime rate falls from 10.70% to 10.5%. (See May 20, Jun 18.)

**Jan 17** American Airlines cuts fares sharply; other airlines follow suit.

**Jan 20** Freeze hits Florida citrus growers.

**Jan 20** Chicago sets record official low, 27 degrees below zero at O'Hare Field (Exceeds 26 below on Jan 10, 1985.)

**Jan 21** Farmers picket Chicago Board of Trade, protesting low farm prices.

**Jan 25** Major union settlements averaged 2.4% first-year increase in 1984, lowest in series starting in 1968. (In 1985, rise averages 2.3%.)

**Jan 29** Dow Jones Industrial Stock index closes at 1293, tops record 1287 set Nov 29, 1983.

**Jan 29** Air Wisconsin buys Mississippi Airlines.

**Jan 30** Nestle buys Carnation for $2.9 billion.

**Jan 30** Government announces record merchandise trade deficit of $123 billion in 1984; predicts larger deficit in 1985. (Deficit was $148 billion in 1985.)

**Jan 30** OPEC abandons Saudi light crude oil as benchmark; cuts prices.

**Feb 11** Stroh's announces plan to close Detroit brewery.

**Feb 13** Kimberly-Clark announces move of headquarters from Neenah, WI to Texas.

**Feb 20** Rockwell International buys Allen-Bradley for $1.7 billion.

**Feb 20** Sears Roebuck announces "universal" credit card. (Later named "Discover".)

**Feb 20** Federal Reserve announces monetary growth targets for 1985: M1, 4-7%; M2, 6-9%; M3, 6-9.5%. (See Jul 17.)

**Feb 25** Trade-weighted dollar hits record high of 164.7 (Mar 1973=100). (At year-end index was 123.6, down 25%.)

**Feb 28** Textron buys AVCO for $1.4 billion.

**Mar 1** Administration will not request extension of Japanese export quotas on autos past April 1, 1985.

**Mar 4** British coal strike ends after 51 weeks.

**Mar 4** Securities and Exchange Commission selects receiver for E.S.M. Government Securities after E.S.M. ceases operations. (See Mar 9.)

**Mar 6** Reagan vetoes farm aid bill. (See Dec 23.)

**Mar 7** Three-month Treasury bills yield 9.13% (coupon equivalent), high for the year. (See Jun 18.)

**Mar 8** Federal Reserve modifies seasonal borrowing program to ease credit to farm banks.

**Mar 9** Home State Savings in Cincinnati closes after run related to E.S.M. closing. (See Mar 15.)

**Mar 11** Soviet Premier Chernenko dies at 73. Mikhail Gorbachev (54) succeeds, youngest since Stalin.

**Mar 12** International Harvester reports negative net worth after sale of farm equipment lines.

**Mar 14** Marine Corp., Milwaukee, buys Independence Bank Group of suburban Wauwatosa. (On Sep 23, Marine buys Firstar Corp. of Appleton.)

**Mar 15** Bucyrus-Erie sells construction equipment division to Northwest Engineering.

**Mar 15** Phillips Petroleum buys 49.8% of its common stock for $4.6 billion, in debentures and notes.

**March 15** General Motors Acceptance Corp (GMAC) enters mortgage banking, agreeing to acquire mortgage portfolio of Norwest Corp.

**Mar 15** Ohio temporarily closes 71 state-chartered, privately-insured S&Ls due to runs related to E.S.M. failure.

**Mar 18** Yield on 20-year Treasury bonds (constant maturity index) rises to 12.21%, high for the year. (See Dec 27.)

**Mar 21** GMAC offers 8.8% loans on small cars.

**Mar 28** Chesebrough-Ponds buys Stauffer Chemical for $1.3 billion.

**Mar 29** Allis-Chalmers agrees to sell farm equipment lines to German firm. (West Allis, WI, plant to close.)

**Apr 1** Japan raises quota on car exports to U.S. from 1.84 million to 2.3 million units.

**Apr 1** Teamsters and big truckers agree on 30% lower starting salary. (One of many "two-tier" wage agreements.)

**Apr 4** General Dynamics, largest defense contractor, charged with hiding cost overruns.

**Apr 9** Bevill, Bresler & Schulman, collapsed government securities firm, goes under control of receiver.

**Apr 14** Inland Steel will cut capacity 30% and reduce white collar staff by 20%. (Many other firms made similar decisions in 1985.)

**Apr 17** Wheeling-Pittsburgh Steel files for bankruptcy under Chapter 11. (See Jul 21.)

**Apr 18** Indiana law provides for regional reciprocal interstate banking, effective Jan 1, 1986. (See Nov 25, Dec 5.)

**Apr 23** Regulators close Beverly Hills S&L (CA), biggest thrift failure ever.

**May 3** E.F. Hutton pleads guilty on check overdraft charges.

**May 4** Big steel companies agree to end coordinated bargaining with United Steelworkers.

**May 6** Mobil will sell Montgomery Ward, part of restructure plan.

**May 8** Federal Reserve Board approves daylight overdraft rules for reducing risk on wire transfer systems, effective Mar 27, 1986.

**May 14** Maryland imposes $1,000 withdrawal limit on privately-insured thrifts to counter run.

**May 15** Coastal Corp. buys American Natural Resources for $2.5 billion.

**May 15** Government announces $2 billion subsidy program to boost sagging agricultural exports.

**May 16** International Harvester produces last tractor at huge plant in Rock Island, IL.

**May 16** United Air Lines pilots strike over two-tier pay plan. (Settled Jun 12.)

**May 17** Unocal buys 33.3% of its common stock for $4.3 billion, in exchange for notes.

**May 20** Federal Reserve discount rate falls from 8 to 7.5%, lowest since Aug 1978. Prime rate falls from 10.5 to 10%. (See Jan 15, Jun 18.)

**May 28** Administration offers detailed tax reform plan, "Treasury II", to lower income tax rates, while limiting credits and deductions. (See Dec 18.)

**May 31** Cooper Industries buys McGraw Edison for $1.1 billion.

**Jun 7** Royal Dutch Shell buys 30.5% of American Shell Oil for $5.7 billion.

**Jun 11** Litton Industries buys 35.8% of its own common stock with exchange of $1.3 billion in debentures and notes.

**June 16** Supreme Court upholds state laws allowing interstate bank purchases on reciprocal basis.

**Jun 18** Prime rate falls from 10 to 9.5%, low for year, and lowest since Sep 1978. (See Jan 15, May 20.)

**Jun 18** Three-month Treasury bills yield 6.87% (coupon equivalent), low for the year. (See Mar 7.)

**Jun 26** Lyle E. Gramley resigns from Federal Reserve Board, effective Sep 1.

**Jul 1** Indiana permits multi-bank holding companies on a statewide basis.

**Jul 2** Judgment orders Exxon to pay federal government $2 billion fine for over-pricing oil in the 1970s.

**Jul 9** Marshall & Ilsley Corp, Milwaukee bank holding co., buys Heritage Wisconsin Corp of Wauwatosa.

**Jul 9** David Stockman resigns as OMB director, effective Aug 1, 1985. (James C. Miller succeeds.)

**Jul 10** Atlantic Richfield sells $1.0 billion of bonds and notes.

**Jul 12** Farm Credit Admin. and banks approve $340 million aid to Omaha Federal Intermediate Credit Bank.

**Jul 12** Mexico cuts oil prices, indicating break with OPEC.

**Jul 17** Federal Reserve announces revised M1 growth target of 3-8% for second half of 1985, and retention of targets for M2 and M3. (See Feb 20.)

**Jul 18** Some production unions strike Chicago Tribune, but publication continues. (Strike unsettled at year-end.)

**Jul 21** United Steelworkers strike Wheeling-Pittsburgh, first big steel strike since 1959. (Strike settled Oct 26.)

**Jul 25** Administration revises GNP growth forecast through fourth quarter from 3.9 to 3%. (Actual was 2.5%.)

**Jul 26** Teamster car haulers' strike begins. (Strike ends Aug 18 after buildup of inventories of finished cars near assembly plants.)

**Jul 27** General Motors announces Saturn plant to be located in Spring Hill, TN, after considering bids from 29 states in nationwide competition.

**Jul 31** CBS buys 21.4%, of its own common stock for $940 million in cash and notes.

**Jul 31** Farley Industries buys Northwest Industries for $1.2 billion.

**Aug 2** Ford will buy First Nationwide Financial, large S&L, for $490 million.

**Aug 2** Montgomery Ward announces phaseout of 113-year-old mail order business.

**Aug 6** FNMA announces tighter income and down payment rules for purchased mortgages, to control rising delinquencies.

**Aug 12** Court approves demolition of half of United States Steel's South Works in Chicago.

**Aug 15** Domestic producers offer 7.7% financing on new cars to move inventory buildup from car haulers' strike.

**Aug 19** Maryland halts withdrawals from Community S&L after run caused by disclosure that affiliate Equity Programs Investment Corp (EPIC) had defaulted on mortgages and securities. (See Sep 6.)

**Aug 29** Administration refuses to impose quotas on shoe imports.

**Aug 30** Index of prices received by farmers falls to lowest level since Dec 1978.

**Sep 1** South Africa freezes principal payments on private-sector foreign debt.

**Sep 5** Farm Credit System requests substantial federal aid.

**Sep 6** EPIC files for bankruptcy. Maryland takes over Community S&L. (See Aug 19.)

**Sep 9** Reagan orders limited economic sanctions against South Africa to protest apartheid.

**Sep 10** R.J. Reynolds buys Nabisco for $4.9 billion.

**Sep 11** Government raises strong corn and soybean crop estimates for 1985.

**Sep 17** Government estimates U.S. became debtor nation in second quarter, first time since 1914, as payments deficit soared.

**Sep 19** Allied and Signal, both conglomerates, merge in $4.9 billion deal.

**Sep 19, 20** Major earthquakes hit Mexico City area, with heavy loss of life and damage to property.

**Sep 22** Group of Five nations agree to intervene to reduce value of dollar. (Dollar falls sharply Sep 23.)

**Sep 27** Semiconductor industry estimates 17% decline in sales for 1985.

**Sep 27** Hurricane Gloria hits East Coast, causing flooding and damage. New York Stock Exchange closed.

**Oct 1** Monsanto buys G.D. Searle for $2.7 billion.

**Oct 1** Iowa permits judges to invoke one-year ban on farm mortgage foreclosures.

**Oct 1** National Highway Traffic Safety Admin. reduces Corporate Average Fuel Economy (CAFE) requirements from 27.5 to 26.0 miles per gallon for 1986 passenger cars.

**Oct 6** Diamond-Star (Chrysler Mitsubishi) announces auto assembly plant to be built near Bloomington, IL.

**Oct 7** OPEC fails to agree on production quotas.

**Oct 14** Section of Welland Canal collapses, blocking part of St. Lawrence Seaway. (Reopens Nov 7.)

**Oct 23** American Express sells Fireman's Fund for $906 million.

**Oct 24** Social Security recipients to get 3.1% raise Jan 1, 1986, smallest rise since changes tied to Consumer Price Index.

**Oct 25** Treasury reports $212 billion federal deficit for fiscal 1985, exceeding $185 billion for 1984, and previous record of $208 billion in 1983.

**Oct 25** London Metal Exchange halts tin trading as International Tin Council discontinues support of tin prices.

**Oct 25** R.H. Macy management announces $3.5 billion plan to take the department store chain private.

**Oct 28** Chrysler production workers (70,000 in U.S.) return after 12-day strike.

**Oct 31** U.S. Steel agrees to buy Texas Oil and Gas for $3.5 billion.

**Nov 1** Philip Morris buys General Foods for $5.6 billion, biggest non-oil merger. (See Dec 13.)

**Nov 1** European Economic Community agrees to limit steel exports to U.S. to 5.5% of U.S. market.

**Nov 5** Comerica Inc, Detroit, applies for hostile takeover of Michigan National Corp.

**Nov 6** General Motors ends cost-of-living adjustments (COLA) for salaried workers.

**Nov 8** Heavy rains in East cause worst flooding in 100 years, especially in Washington, D.C. and West Virginia.

**Nov 13** Procter and Gamble buys Richardson-Vicks for $1.2 billion.

**Nov 14** Dormant Colombian volcano erupts, killing 20,000 and damaging coffee crop.

**Nov 14** Jury awards Pennzoil $10.35 billion judgment against Texaco, by far the largest jury award ever. (Upheld by judge Dec 11, under appeal at year-end.

**Nov 15** Chrysler sells $800 million of 12% debentures.

**Nov 20** VA mortgage rate ceiling falls from 11.5 to 11%, lowest since Sep 1979.

**Nov 21** Electronic data problem forces Bank of New York to borrow record $22.6 billion from Federal Reserve Bank.

**Nov 22** Reagan and Gorbachev finish two-day meeting in Geneva, first "summit" since 1980.

**Nov 25** Egyptian commandos storm hijacked jet held by Arab terrorists in Malta; 57 die.

**Nov 25** Baxter Travenol buys American Hospital Supply for $3.7 billion.

**Nov 25** Illinois law provides for regional reciprocal interstate banking, effective Jul 1, 1986. (See Apr 18, Dec 5.)

**Nov 26** National Gypsum's directors offer to take the company private for $1.1 billion.

**Dec 5** Michigan law provides for regional reciprocal interstate banking, effective Jan 1, 1986. (See Apr 18, Nov 25.)

**Dec 6** Last tractor produced at Allis-Chalmers West Allis plant.

**Dec 8** OPEC meeting ends with announcement that member nations will try to expand market share, abandoning 4-year effort to restrict oil output. (Sharp oil price decline follows.)

**Dec 12** Toyota confirms plan to build Kentucky assembly plant.

**Dec 12** Chartered jet crashes in Newfoundland, killing 258 U.S. servicemen.

**Dec 12** Legislation raises federal debt ceiling from $1,823.8 to $2,078.7 billion. Gramm-Rudman Act mandates balancing of the budget by 1991.

**Dec 12** Midcon buys United Energy Resources for $1.3 billion.

**Dec 12** General Electric announces plan to buy RCA for $6.8 billion, largest non-oil merger ever.

**Dec 16** Dow Jones industrial stock average closes at 1553, high for the year. (See Jan 4.)

**Dec 17** Reagan vetoes legislation placing additional restrictions on textile and apparel imports.

**Dec 17** Continental Bank announces it has repaid debt to consortium of banks established in May 1984.

**Dec 18** House passes broad tax reform bill. (See May 28.)

**Dec 20** General Motors buys Hughes Aircraft for $4.7 billion.

**Dec 23** Amendments to Farm Credit Act of 1971 facilitate federal assistance to Farm Credit System. Food Security Act of 1985 significantly alters many farm programs.

**Dec 26** Pantry Pride buys Revlon for $1.8 billion.

**Dec 27** Yield on 20-year Treasury bonds falls to 9.49%, low for the year. (See Mar 18.)

**Dec 31** U.S. imposes restrictions on imports of semi-finished steel from the European Economic Community.

**Dec 31** FDIC reports 120 insured banks failed in 1985, up from 79 in 1984, which was the highest since FDIC began in 1937. (A record 4,000 banks failed in 1933, before FDIC.)

## The 22nd Annual Conference
## on Bank Structure and Competition
### May 14, 15 & 16, 1986

The Conference on Bank Structure and Competition, sponsored by the Federal Reserve Bank of Chicago, provides an opportunity for the financial community to exchange views and research findings on a variety of issues related to the U.S. financial sector. Primary emphasis is placed on issues related to the management and regulation of financial intermediaries. The first day of the conference is devoted to technical papers that are primarily of interest to an academic audience, while the final two days are designed to appeal to a more general audience. Speakers at the conference include prominent academics, regulators, and industry leaders. An outline of the session topics for each day follows:

### Wednesday, May 14, 1986

● **The Encouragement of Market Discipline in Banking**

● **Acquisitions and Competitive Behavior**

● **Corporate Separateness and Bank Holding Companies**

### Thursday, May 15, 1986

● **Risk in Banking: Three Perspectives**

● **Risk-Based Insurance Premiums and Capital Rules**

● **The Measurement of Banking Risk (concurrent sessions)**
   **A. Market Value Accounting**
   **B. Bank Off Balance Sheet Activities**

### Friday, May 16, 1986

● **Panel on the Regulation of Asset Sales, Futures, and Interest Rate Swaps**

● **Bank Management in Today's Environment (concurrent sessions)**
   **A. Alternative Banking Strategies**
   **B. Panel on the Use of Economic Models in Banking**

● **Recent Developments in Banking (concurrent sessions)**
   **A. Interstate Mergers and Acquisitions**
   **B. Economic Conditions and the Performance of Small Banks**

The conference will be held at the Westin Hotel in Chicago. For more information about the conference, please write or call: Betty Hortsman, Public Information Center, Federal Reserve Bank of Chicago, P.O. Box 834, Chicago, Illinois 60690-834, Tel.no.: (312) 322-5114.

# Interstate banking game plans: Implications for the Midwest

*Dave Phillis and Christine Pavel*

Interstate banking is spreading rapidly throughout the country. It is fairly well entrenched in the Southeast and in New England, and in 1985, interstate banking appeared in the Midwest with the passage of Indiana's regional interstate banking bill in April. In November, Illinois passed a similar law. Nevertheless, 26 states still prohibit interstate mergers and acquisitions.[1] Over 9,500 institutions, representing 63 percent of all U.S. banking firms and 46 percent of domestic bank assets, are still forbidden to acquire or be acquired by bank holding companies across state lines.

As of December 1985, at least thirteen state legislatures were grappling with the interstate banking issue. Most of these were considering regional, reciprocal legislation. Such laws allow out-of-state bank holding companies to acquire or merge with in-state institutions on a reciprocal basis. In the other 13 states, some sort of interstate legislation will probably be introduced.

Indeed, interstate banking is a trend that is becoming more and more difficult to ignore. Market forces, especially those fostered by interest rate deregulation, have been encouraging banks to compete for retail deposits on a nationwide basis. Recent advances in data processing and communications technology are facilitating this nationwide competition for retail customers. Also, the proliferation of nonbank banks, the nationwide deployment of nonbank subsidiaries by bank holding companies, and the acquisitions of failing banks and thrifts across state lines have added to the de facto existence of interstate banking organizations in this country.

In August 1981, when Key Banks of Albany, New York took advantage of Maine's reciprocal interstate banking law by agreeing to acquire Depositors Corporation of Augusta, the interstate banking movement began to take a more direct route. Since then, over 50 bank holding companies have proposed to acquire out-of-state organizations. Most of this merger activity has occurred in New England, in the Southeast, and in the Washington, D.C. metropolitan area where regional interstate banking compacts are fairly well developed. Most states in those regions permit interstate banking on a regional, reciprocal basis.

An analysis of the interstate banking experience in these states can help legislators, regulators, bankers and consumers of banking services in other states to understand the market forces that are driving the first round of interstate acquisitions. The experiences of these states can also provide information about the types of institutions that become involved in interstate banking, the attributes that acquirers value, and how consumers will fare as banks compete for their business across state lines.

This article examines interstate merger and acquisition activity since 1981. The first section identifies key characteristics that separate institutions that have not engaged in regional interstate merger activity from those that have. This section also identifies the significant factors that separate target institutions from acquirers. The second section presents two models for predicting whether or not a banking firm will be a target, an acquirer, or a spectator. The next section examines 37 interstate mergers and acquisitions since 1981 and attempts to identify what factors affect the price paid in an interstate deal. The last section draws implications for the Midwest, particularly the Seventh Federal Reserve District. Implications for Seventh District bankers, as well as for consumers, are discussed in the conclusions.

## Who is involved in interstate mergers?

We compared various financial and market variables across banking firms based in established interstate banking regions—the

Southeast, Northeast, and New England states—to identify characteristics that differentiate banking firms that have become involved in the first round of regional interstate merger and acquisition activity from those that have not and to identify characteristics that separate target institutions from acquiring institutions. To make our sample manageable, only the 12 states that had at least one banking firm that was a target or an acquirer in a regional interstate deal as of August 1985 were included.[2] The financial and market share data are from *Reports of Condition* and *Reports of Income* as of December 1981, the last year before any regional interstate deal was proposed. Data for banks that belong to the same holding company organization are grouped together as one observation.

The banking organizations were separated into several groups. First, they were classified as either players or spectators. A player had been involved in a regional interstate bank merger or acquisition, either as an acquirer or as a target as of August 1985.[3] The group of players was further broken down into targets and acquirers. In the 12-state sample, 2 percent of all institutions were players—28 targets and 16 acquirers. The group of 1,786 spectators was reduced to 80 by taking a random sample.

The means of the financial and market variables for the players and spectators and the corresponding T-statistics, which indicate whether the two groups differ significantly with respect to these variables, are shown in Table 1; the means and T-statistics for targets and acquirers are shown in Table 2. As can be seen in these two tables, several factors are significant in separating banking organizations that have not been involved in a regional interstate acquisition from those that have, either as targets or as acquirers. Many of these same factors, in turn, separate target institutions from acquiring institutions. In general, spectator institutions tend to be smaller in asset size and number of offices, have smaller statewide deposit shares, and are less commercial-oriented than player institutions.

Size is the predominant factor that differentiates targets and acquirers from spectators. On average, institutions that have not become involved in interstate deals had total assets of $137 million in 1981, although the largest had $2.5 billion in assets. The average target, with

**Table 1**
**Separating the players from the spectators in the Southeast and Northeast: Mean values & T-statistics**
*($ millions)*

| | Players (n=44) | (T-statistics) | Spectators (n=80) |
|---|---|---|---|
| **SIZE** | | | |
| Total assets | $2,170 | (−8.621)* | $137 |
| Banking offices | 78 | (−10.736)* | 5 |
| **PROFITABILITY** | | | |
| Return on assets | 1.0% | (−0.068) | 1.0% |
| Net spread[1] | 4.9% | (0.283) | 5.0% |
| **FOCUS** | | | |
| Retail deposits/assets | 65.2% | (3.387)* | 75.0% |
| Consumer loans/assets[2] | 15.0% | (−0.431) | 14.3% |
| Commercial loans/assets[3] | 16.7% | (−4.223)* | 10.6% |
| **MARKET** | | | |
| Statewide deposit share | 7.3% | (−9.339)* | 0.3% |
| MSAs | 2 | (−6.125)* | 1 |
| **OTHER** | | | |
| Net charge-offs/assets | 0.4% | (−0.121) | 0.4% |
| Capital/assets | 7.2% | (2.077)* | 11.6% |
| Fee income/income | 7.1% | (−4.870)* | 4.5% |

*Significant at the 1 percent level.

[1] Net income from earning assets as a percent of earning assets.

[2] Loans to individuals divided by domestic assets.

[3] Commercial and industrial loans divided by domestic assets.

$1 billion in assets, was nearly eight times as large and the average acquiring institution, with $4 billion in assets, was more than 30 times as large as the average spectator banking institution.

The average target and acquirer also tended to have more extensive branch networks than institutions that were not involved in interstate deals. The average spectator had only 5 banking offices and a presence in only one metropolitan area in 1981, while the average target had roughly 47 offices and a presence in two metropolitan areas and the average acquirer had 138 offices in three metropolitan areas.

The number of offices that an institution has is indicative of the branching laws in the state in which it operates as well as the size of the organization and its marketing orientation. In the sample, however, all but two states allowed statewide branching in 1981. These two allow limited intrastate branching.

Another significant factor that separates spectator institutions from the players, and targets from acquirers, is statewide presence. The statewide share of total deposits for the average institution that was involved in a regional interstate acquisition was 7.3 percent, nearly 25 times that of the average spectator institution. The average target's state share

was 5.1 percent, about half that of the average acquirer.

Institutions that were involved in interstate deals also tend to be more commercial-, as opposed to consumer-, oriented than their uninvolved counterparts, although they have significant retail banking operations. Retail deposits (deposits less than $100,000) as a percent of assets at player institutions averaged 65 percent in 1981. This compares with 75 percent at spectator institutions. Retail deposits were 69 percent of total assets at the average target, and 59 percent of total assets at the average acquirer. Commercial loans as a percent of assets were also higher at the average acquirer (20 percent) than at the average target (15 percent). And at the average spectator institution, commercial loans accounted for only 11 percent of total assets.

Analysis of the key factors that distinguish players from spectators and acquirers from targets suggests that bank holding companies that are acquiring banks across state lines are doing so to enhance their retail banking operations. These bank holding companies are acquiring institutions that have extensive, albeit smaller, retail networks, slightly more consumer-focused loan portfolios, and strong retail deposit bases. Although the average institution that has been a spectator of interstate banking so far has a strong retail deposit base and a loan portfolio that is weighted heavily with consumer loans, it is relatively small. Most acquirers do not seem willing to expend managerial resources to purchase and integrate a string of small retail banks.

## Predicting targets and acquirers

A banking institution can basically follow one of three interstate strategies. It can become an acquirer, a target, or a spectator. While the means of key variables and their T-statistics indicate how these three types of institutions differ, they cannot be used to predict which strategy an institution is likely to follow. Therefore, we developed a model to predict an institution's probable interstate strategy.

Using a stepwise logit technique, the variables in Tables 1 and 2 were used to develop two models for predicting whether a given institution would become a target, an acquirer, or neither.[4] A logit model, basically, is a choice model that assumes that an individual, in this case a banking institution, is faced with two or more alternatives and that the institution's choice is dependent upon the characteristics of the institution.

Each model begins by predicting whether an institution would become involved in a regional interstate acquisition. Assuming that an institution will become involved in an interstate deal, each model then predicts whether the institution will become a target or an acquirer. (The details of each model are presented in the box entitled "Descriptions of logit and purchase premium models.") As expected, both models suggest that acquiring institutions are using interstate banking as a vehicle to expand their retail banking networks.

The first model indicates that the number of offices (branches plus main offices) is critical in determining whether and how an institution will be involved in a regional interstate acquisition. In general, the more banking offices an institution has, the more likely it is to become a player in interstate banking. Assuming that an institution will become a player, it is more likely to become an acquirer, the greater its asset size. According to this "office" model, an institution that operates more than 26 banking offices has a greater than 50 percent probability of becoming a player, and a player with more than $3.3 billion in assets at year-end 1984 has

**Table 2**
**Separating the acquirers from the targets in the Southeast and Northeast**
**Mean values & T-statistics**
*($ millions)*

|  | Acquirers (n=16) | (T-statistics) | Targets (n=28) |
|---|---|---|---|
| **SIZE** |  |  |  |
| Total assets | $4,141 | (6.290)* | $1,044 |
| Banking offices | 138 | (6.120) | 47 |
| **PROFITABILITY** |  |  |  |
| Return on assets | 0.9% | (−0.554) | 1.0% |
| Net spread[1] | 4.7% | (−0.668) | 5.0% |
| **FOCUS** |  |  |  |
| Retail deposits/assets | 58.8% | (−2.914)* | 68.8% |
| Consumer loans/assets[2] | 13.6% | (1.126) | 15.8% |
| Commercial loans/assets[3] | 20.2% | (2.758)* | 14.7% |
| **MARKET** |  |  |  |
| Statewide deposit share | 11.1% | (3.024)* | 5.1% |
| MSAs | 3 | (0.869) | 2 |
| **OTHER** |  |  |  |
| Net Charge-offs/assets | 0.3% | (−1.464) | 0.4% |
| Capital/assets | 6.7% | (−1.078) | 7.4% |
| Fee income/income | 6.6% | (−0.909)* | 7.4% |

*Significant at the 1 percent level.
[1] Net income from earning assets as a percent of earning assets.
[2] Loans to individuals divided by domestic assets.
[3] Commercial and industrial loans divided by domestic assets.

## The logit and purchase premium models

Two hierarchical logit models and a purchase premium model were developed from various financial, market, demographic and structural variables. (See Tables 1, 2, and 3 for a description of these variables). The logit models predict whether an institution would become a target, an acquirer, or a spectator in regional interstate banking. The purchase premium model identifies which characteristics acquirers tend to pay premiums for and which they tend to discount.

### The logit models

Two logit models were developed from a set of 17 financial, market, and structural variables to predict regional, interstate acquisition activity (see Tables 1 and 2). The models are estimated from a sample of 16 acquirers, 28 targets, and 80 randomly selected spectator institutions from 12 states in the Southeast, Northeast, and New England. The second model differs from the first in that number of offices was excluded from the set of variables for the second model. This variable was excluded in order to develop a model that may be more applicable to a region that contains unit banking and limited branching states.

Each model contains two equations. The first predicts whether an institution will be a spectator or a player. Given that an institution will be a player, the second equation predicts whether an institution will be a target or an acquirer.

A stepwise procedure yielded the following "best" model with offices:

$$\text{Probability(Player)} = 1/(1 + e^{-a})$$
$$\text{Probability(Target|Player)} = 1/(1 + e^{-b})$$

where $a = -2.66 + .104(\text{number of offices})$

$b = 3.86 - .001(\text{assets})$

$e$ is the base of natural logarithms

Assets are in millions of dollars and are deflated by the growth in total bank assets since year-end 1981.

The first equation of this model, when tested against the sample on which it was estimated, was correct 89.5 percent of the time and had a false-positive rate of 8.1 percent and a false-negative rate of 11.5 percent. The second equation, when tested against the sample, correctly distinguished between targets and acquirers 84.1 percent of the time and had a false-positive rate of 13.8 percent and a false-negative rate of 20.0 percent. The variables in each equation are significant at the 1 percent level using a two-tailed test.

A second model, which excluded number of offices from the set of possible variables, was also developed. A stepwise procedure yielded the following "best" model without offices:

$$\text{Probability(Player)} = 1/(1 + e^{-c})$$
$$\text{Probability(Target|Player)} = 1/(1 + e^{-b})$$

where $c = -2.84 + 2.128 (\text{state share of deposits})$

$b = 3.86 - .001(\text{assets})$

The only difference between the two models is the first equation, which predicts which institutions will be players and which will be spectators. In the first model, whether an institution becomes a player depends on the number of offices that it operates, whereas in the second model, state share of deposits is the critical factor.

The first equation of the second model, when tested against the sample, was correct 91.1 percent of the time. The false-positive rate was 5.4 percent and the false-negative rate was 10.3 percent. The variable state share is significant at the 5 percent level using a two-tailed test.

### The purchase premium model

The purchase premium model was estimated from a sample of 37 interstate acquisitions in 17 states that had been proposed or completed by the end of Au-

gust 1985. Five interstate acquisitions were excluded from the sample because of inaccurate or incomplete data. Twenty-six financial, structural, and demographic variables were initially identified. A stepwise regression procedure was used to select the best measure of certain variables and to screen out variables which had little relationship to purchase premiums.

As shown below, five of the ten variables are statistically significant at the 10 percent level. The model explains 56 percent of the variability in premiums.

Since a target banking institution's net spread position is very important in determining the premium an acquiring banking institution is willing to pay, a regression model was developed to identify the factors that influence a target's net spread position. As shown in the table, the net spread model contains ten variables and explains 78 percent of the variability in net spread. Four of the ten variables in the net spread model are statistically significant at the 10 percent level using a two-tailed test.

**Results of purchase premium regression**

| Variable | Coefficient (T value) |
|---|---|
| Net spread | 3.1818*** (2.77) |
| Consumer mortgages | −.4878* (−1.97) |
| Fee income | −.5519* (−1.71) |
| Net charge-offs | −8.5070* (−1.93) |
| Share of statewide Deposits | −.0032** (−2.19) |
| Retail deposit growth | −.0232 (−1.09) |
| Population | .0000 (.01) |
| Population growth | .0111 (.28) |
| Per capita money Income | −.000005 (−.29) |
| Per capita money Income growth | −.0372 (−.38) |
| $R^2$ | 55.7 |
| Adjusted $R^2$ | 38.7 |

**Results of net spread regression**

| Variable | Coefficient (T value) |
|---|---|
| Retail deposits | .0543*** (3.00) |
| Retail deposit growth | −.0018 (−.73) |
| Consumer mortgages | −.1395*** (−4.50) |
| Consumer loans | .0450** (2.12) |
| Commercial mortgages | .0110 (.37) |
| Commercial loans | −.0242 (−1.43) |
| Population | .0000 (.43) |
| Population growth | −.0031 (−.65) |
| Per capita money Income | .000003** (5.57) |
| Per capita money Income growth | .0052 (.41) |
| $R^2$ | 77.8 |
| Adjusted $R^2$ | 69.3 |

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 1 percent level.

a greater than 50 percent chance of becoming an acquirer.

The "office" model performed fairly well when tested against the 12-state sample of 124 institutions. It correctly distinguished between players and spectators 90 percent of the time and between targets and acquirers, 84 percent.

The second model was developed from the same set of variables as the first with the exception of the variable for number of offices. This variable was dropped because the number of offices that an institution operates is influenced by its home state's branching law. Most of the states in our sample allow branching statewide, but in the Seventh District, Illinois severely restricts branching, and Indiana, Iowa, Michigan, and Wisconsin permit only limited branching.[5] In addition, until only recently Indiana did not permit the formation of multibank holding companies; Illinois limits the geographic spread of multibank holding companies. (On July 1, 1986 the limitations on intrastate acquisitions will be eliminated, but Illinois' highly restrictive branching laws will remain intact.) Therefore, to make our model more applicable to the Seventh District, we estimated a second model without the variable for number of offices.

This second model indicates that size and statewide deposit share are most significant in predicting interstate acquisition activity among institutions. In general, the larger an institution's share of statewide deposits, the more likely it is to become involved in a regional interstate acquisition. An institution with at least 1.3 percent of statewide deposits has a greater than 50 percent probability of becoming a player. Given that an institution will become a player, the greater its size, based on total assets, the more likely it is to become an acquirer. This "deposit share" model, when tested against the sample of 124 institutions, correctly distinguished players from spectators 91 percent of the time and targets from acquirers, 84 percent.

Both models perform fairly well; however, because retail banking seems to be a key force driving interstate consolidation, the "office" model may be better for predicting interstate acquisition activity. Large banks (banks that generally have been acquirers) in unit banking and limited branching states tend to concentrate on commercial/merchant banking activities. In the sample of 28 regional interstate

deals, only one involved an acquirer and a target that are essentially "merchant" banks, i.e., banks that primarily serve business customers and wealthy individuals. The acquiring institution, a small bank holding company located in Washington, D.C., has proposed to acquire a small Maryland bank in a Washington, D.C. suburb.

Banks have engaged in "merchant" banking activities on a nationwide basis for some time now through loan production offices and Edge Act offices, and through nonbank subsidiaries of bank holding companies. If these "merchant" banks want to continue to concentrate primarily on commercial customers, then they probably will not initiate any interstate acquisitions. If, however, they view interstate banking as a vehicle to establish a significant presence in retail banking, then they will probably become acquirers.

The two models, therefore, implicitly contain opposite assumptions. The first model assumes that geographic presence is not important for "merchant" banks. The second assumes that "merchant" banks want to expand into retail banking or that geographic presence is important in its own right.

## What are acquirers buying?

Another way to identify merger and acquisition strategies is to analyze the deals that have been proposed so far. Analysis of what acquirers are willing to pay a premium for and what they tend to discount also indicates that interstate banking is consumer-driven.

No merger or acquisition will occur unless the merging firms are perceived to be worth more together than apart. The more the combined firm is worth relative to the value of the independent organizations, the more the acquiring firm is willing to pay above the market value of the target; i.e., the acquirer will pay a purchase premium.

To gain further insight into what is driving interstate mergers and acquisitions, we attempted to identify variables that are significant in determining the price paid for interstate bank acquisitions.[6] Various financial, structural, and demographic variables were regressed on the ratio of price paid for a target to the target's total domestic assets (purchase premium) of 37 interstate bank mergers and acquisitions—28 in the Southeast, Northeast,

and New England and nine in developing interstate regions (Table 3). The value of transactions reported in the trade press ( *American Banker* and *Wall Street Journal*) were used as the purchase price. Total assets and other financial variables were obtained from the financial statements periodically filed with federal bank regulators.[7]

The definition of purchase premium used in this model is not the conventional definition. The purchase price divided by the book value of assets rather than equity was used because equity for a bank is largely determined by regulatory policy. Book values rather than market values were used because many of the targets' stocks are not widely traded, and therefore market values were difficult to obtain. Book value of a bank is a good substitute for market value, however, because at least 70 percent of a typical bank's assets are short-term or are repriced frequently.

The financial variables used in this study measure the target institutions' profitability and the composition of its assets and liabilities. Five-year averages of the profitability measures were used in order to mitigate the effects of any unusually profitable or unprofitable years. Loan-to-asset ratios for consumer and commercial loans measure the focus of the target institutions' lending activities. The levels and five-year growth rates of deposits under $100,000 capture the extent of the targets' retail deposit-gathering activities. The capital-to-asset ratios and the five-year average net charge-off rates measure target firms' capital positions and lending records. Other financial variables that were tested in this study include the ratio of each target's total assets to its acquirer's total assets, the percent of each target's operating income derived from fees, and the percent of each target's assets involved in nonbank activities.

Structural variables were included to capture the varied legal environments in which the target banks operate. Branching laws are classified as either statewide, limited, or unit

**Table 3**
**Variables used to develop the purchase premium model**

**Financial variables**

| Profitability: | Net income/total assets (ROA)* |
| | Net income/total equity (ROE)* |
| | Net spread/average earning assets* |
| | Operating income/total assets* |

| Lending: | Consumer loans/total assets |
| | Consumer mortgages/total assets |
| | Commercial mortgages/total assets |
| | Commercial loans/total assets |
| | Consumer loans and mortgages of target/consumer loans and mortgages of acquirer |
| | Commercial loans and mortgages of target/commercial loans and mortgages of acquirer |

| Deposit taking | Deposits less than $100,000/total assets |
| | Growth in deposits less than $100,000* |

| Miscellaneous | Investment in nonbank subsidiaries/total equity |
| | Net loan charge-offs/total loans |
| | Total equity/total assets |
| | Total assets of target/total assets of acquirer |

**Structural variables**

| Market share | State rank and share of statewide deposits |
| | Rank and share of deposits in lead bank's local market |

| Legal restrictions | State branching status (statewide, limited, or unit) |
| | Type of interstate law (regional or national) |
| | Number of interstate law (regional or national) |
| | Number of domestic branches operated by target |
| Miscellaneous | Region (New England, Southeast, or neither) |
| | Type of consideration (cash, stock, both) |

**Demographic variables****

| | Population (1980) |
| | Population growth (1970-80) |
| | Per capita money income (1980) |
| | Per capita money income growth (1970-80) |
| | Households earning more than $30,000/year (1980) |

*Averaged over five years preceding announcement of acquisition.

**All demographic variables are for the county in which the target's lead bank operates its main office.

banking. Interstate banking laws are classified as either regional or national. Other structural variables include each target's share of statewide deposits and rank in its home state, as well as the rank and share of each target's lead bank in its primary local banking market, the number of domestic branches operated by each target, the interstate compact region (Southeast, New England, or neither), and the type of consideration provided.

The demographic variables regressed on the purchase premium control for the varying characteristics of the primary local market in which each target's lead bank operates. The level and growth of population and income are used as proxies for the level of demand and growth in demand for banking services.

In some instances there are several alternative measures of important financial, structural, and demographic variables. For example, profitability can be measured by return on assets, return on equity, the ratio of operating earnings to assets, or the net spread on average earning assets. A stepwise regression procedure was used to select the best of these alternative variables. The stepwise regression was also used to screen out variables that have little relationship to the purchase premium.

This information was used to develop the final purchase premium model. The final model, which includes ten variables, accounts for 56 percent of the variability in purchase premiums. (See the box for a detailed discussion of this regression.) Five of these variables play a statistically significant role in explaining purchase premiums: net spread, consumer mortgage loans, fee income, net charge-offs, and statewide deposit share (see Figure 1). The other five variables were included in the model as controls.

A target institution's net spread position is by far the most important determinant of its purchase price. Net spread is the total income earned from loans and securities less the interest paid on deposits as a percent of average earning assets. The target firms in this study, on average, earned a net spread of 4.88 percentage points over the five-year period before they agreed to be acquired. The regression results indicate that if a target firm earned a net spread of 5.37 percent, 10 percent above the average, an acquirer would pay 10.2 percent more than the average purchase premium to

acquire that firm, all else equal. Acquirers, therefore, seem to be looking for target institutions that are very effective in the basic businesses of both lending and deposit taking. This seems reasonable since banking firms could already offer either, but not both, of these services at the same location on an interstate basis.

Four other variables are statistically significant but inversely related to the purchase premium. Generally, a target institution with few consumer mortgages, low fee income, and low net charge-offs would receive a relatively large purchase premium. The inverse relationship between net charge-offs and purchase premiums indicates that banks with highly skilled lending departments attract relatively large purchase premiums.

Since only 55 percent of fee income is derived from deposit-taking and lending activities, the inverse relationship between fee income and purchase premiums may mean that, although targets are profitable, core services are not priced correctly.[8] Such banks may provide an acquirer with an opportunity to generate additional fee income and, therefore, additional profits after the merger by instituting better pricing policies and by introducing or expanding fee-generating services such as trust services.

The relationship between purchase premium and consumer mortgages is understandable because mortgage loans are generally long-term and fixed-rate. Also, interest rates during the last five years have been quite volatile, making mortgages highly vulnerable to interest-rate risk, and often unprofitable.

The purchase premium equation also indicates that there is an inverse relationship between purchase premium and a target's share of statewide deposits. This relationship is difficult to explain. The sample on which the equation was estimated had an average share of statewide deposits of 7.1 percent, which indicates that targets generally hold strong positions in their home states and acquirers look for relatively large target organizations. The average target is about one-quarter of the size of the average acquirer. The inverse relationship between state share and purchase premium, therefore, may indicate that targets with large state shares gained market share by paying above average interest rates for deposits or, more likely, overexpanding their branching networks. This would adversely affect profits

and reduce purchase premiums. The variable for number of offices, however, was not statistically significant in the purchase premium model.

Another possible explanation for the inverse relationship between purchase premium and state share is that banks with very large shares are more vulnerable in a market that is becoming increasingly competitive due to interstate banking. Also, the largest banking organizations in a state may insist upon a merger of equals, making it difficult to structure a deal.

Since a target's net spread is paramount in determining the premium an acquirer is willing to pay, a regression model was developed to determine what factors influence a target's net spread position. The net spread model contains ten variables, which account for 78 percent of the variability in the net spread of the target firms in the sample (see box on the logit and purchase premium models).

One demographic and three financial variables exhibit a statistically significant relationship with net spread (see Figure 2). The level of retail deposits held by the target is an important determinant of the firm's net spread position. The typical (average) target firm in this study funded 71.8 percent of its assets with deposits of less than $100,000. The net spread equation indicates that a typical target firm with retail deposits 10 percent above average

would earn an 8 percent higher net spread. Similarly, the income level of the population served by a target's lead bank is also important in determining the target's net spread position. If the income of the county served by a typical target's lead bank were 10 percent above average, the target's net spread would be 7.4 percent above average. The net spread equation also indicates that a high level of consumer loans tends to raise a target's net spread while a high level of consumer mortgages tends to lower a target's net spread position.

The information contained in the net spread equation corroborates the conclusions drawn from the comparisons of targets and acquirers, the choice models, and the purchase premium model. Acquirers are looking for institutions that have profitable retail banking operations. Target institutions that operate their lead banks in affluent areas and have established sizable consumer loan and retail deposit bases will attract relatively high purchase premiums. Institutions with high ratios of consumer mortgages to total assets, however, will receive relatively low premiums.

## Implications for the Midwest

We applied both choice models and the purchase premium model to the five states of the Seventh Federal Reserve District to see what to expect in the District after the first

Figure 1
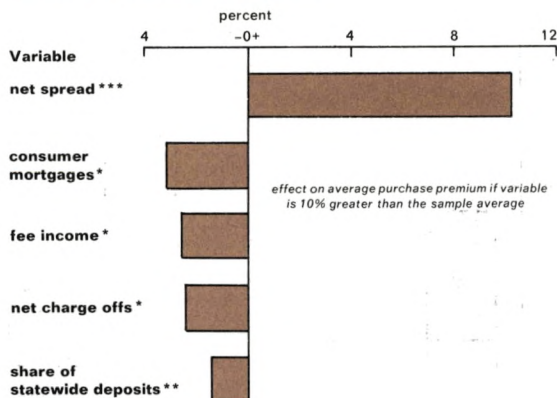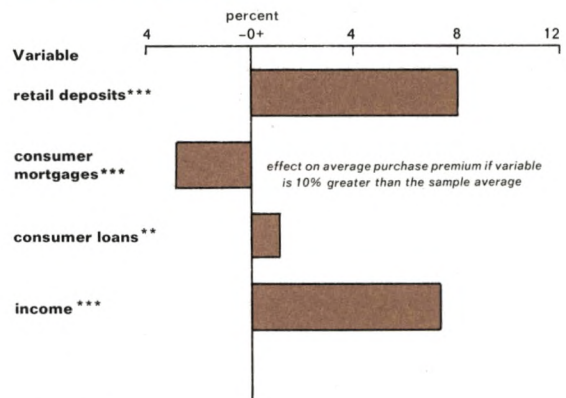**Relative importance of variables in purchase premium regression**



NOTE:  $R^2$--55.7, adjusted $R^2$--38.7.
  *Significant at the 10 percent level.
 **Significant at the 5 percent level.
***Significant at the 1 percent level.

Figure 2
**Relative importance of variables in net spread regression**



NOTE:  $R^2$--77.8, adjusted $R^2$--69.3.
  *Significant at the 10 percent level.
 **Significant at the 5 percent level.
***Significant at the 1 percent level.

phase of regional interstate banking in the Midwest. Year-end 1984 data were used; 1984 assets were deflated by the average growth in bank assets over the 1981-84 period. We assume that the Midwest interstate banking region comprises Illinois, Indiana, Iowa, Michigan, and Wisconsin, although not exclusively. For example, an acquirer in Michigan does not have to acquire a target in one of the other four District states; it could acquire a bank in, say, Ohio. Similarly, a target in the District could be acquired by a bank holding company outside the District.

The "office" model predicted that 215 institutions from the Seventh District, or 8 percent, would be involved in an interstate acquisition (see Table 4). Nineteen institutions have an average probability to become players of 94 percent; 11 have an average probability of 63 percent; 11 have an average probability of 36 percent; and 2,348 have an average probability of 7 percent.

Predictions of which institutions would be targets and which would be acquirers, however, were based on the 30 institutions that have greater than 50 percent probabilities of becoming players. From these 30 institutions, the "office" model predicts that 10 firms would be acquirers, and 20, targets (see Figure 3). The average institution with a greater than 50 percent probability of being an acquirer has nearly five times the assets and four times the number of offices of the average institution with more than a 50 percent probability of becoming a target.

The ratios of retail deposits to assets and commercial loans to assets were not significant in the choice model. However, these ratios for the average predicted acquirer and target in the Seventh District are consistent with those of the average acquirer and target in the 12-state sample. The average predicted acquirer in the District has a lower retail deposits-to-assets ratio and a higher commercial loans-to-assets ratio than the average target institution.

If a region is not strictly defined, the 10 acquirers do not necessarily have to acquire banks within the Seventh District, and the 20 targets do not have to be purchased by an acquirer in the District. The fact that the model predicts more targets than acquirers may suggest that the prices paid for targets will be bid down. This contrasts with the 12-state

## Table 4
### Predicting the players in interstate banking

| | Office model | | | |
| | Probability of becoming a player | | | |
| | 0-25% | 25-50% | 50-75% | 75-100% |
|---|---|---|---|---|
| Total in group | 2,522 | 11 | 11 | 19 |
| Average probability | 7.4% | 36.4% | 62.8% | 93.5% |

| | Deposit share model | | | |
| | Probability of becoming a player | | | |
| | 0-25% | 25-50% | 50-75% | 75-100% |
|---|---|---|---|---|
| Total in group | 2,499 | 15 | 15 | 34 |
| Average probability | 6.9% | 32.5% | 61.9% | 94.0% |

sample, in which the number of targets exceeded the number of acquirers.

Based on the predictions of the "office" model, the average interstate deal within the Seventh District will consist of an acquirer purchasing a $1.2 billion institution to create a new $7 billion institution. The average price paid for the target will be $164 million, representing a purchase premium of 13.7% over book value.

The "deposit share" model predicted that 219 firms in the District will be involved in an interstate acquisition (see Table 4). According to this model, 34 firms have average probabilities of 94 percent of being involved in interstate

Figure 3
**Locations of predicted players in the Seventh District**
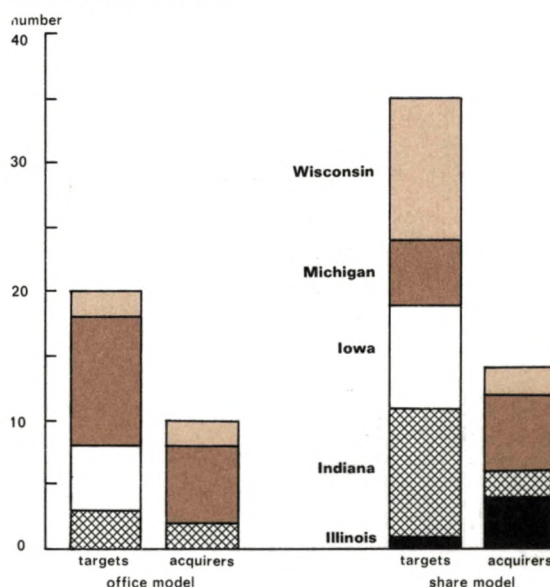
banking; 15 firms have average probabilities of 62 percent; 15 firms, 33 percent; and 2,499, 7 percent.

The 49 institutions with greater than 50 percent probability of being players were used to predict which firms would be targets and which would be acquirers. Fifteen institutions are expected to be acquirers, and the other 34 are expected to be targets (see Figure 3). According to the "deposit share" model, the average acquirer accounts for 9.5 percent of the deposits in its home state, about 3 1/2 times the average target's share of state deposits. This model's predictions are consistent with the 12-state sample: the average acquirer will have more commercial loans as a percent of assets than the average target, but the average target will have a stronger retail deposit base.

Based on the prediction of the "deposit share" model, the average interstate deal in the Seventh District will cost $146.3 million, rep-

resenting a purchase premium of 13.3 percent over asset value. The average acquirer will have about $8.4 billion in assets, and the average target will have $1.1 billion in assets.

As shown in Table 5, both the "office" model and the "deposit share" model are fairly consistent. In differentiating between players and spectators, the only significant differences are in the average player's retail deposits-to-assets ratio and in the average spectator's size based on total domestic assets. The "office" model predicts that the average player will have a higher ratio of retail deposits to assets than the average player predicted by the "deposit share" model. Also, the "office" model predicts that the average spectator will be larger than predicted by the "deposit share" model.

In distinguishing targets from acquirers, the two models differ only in their prediction of the average target. According to the

**Table 5**
**Separating the players from the spectators and the acquirers**
**from the targets in the 7th District:**
**Office models vs. deposit share model**

| | Players | | Spectators | |
|---|---|---|---|---|
| | Office | Deposit share | Office | Deposit share |
| Expected number of firms | 215 | 219 | 2,348 | 2,344 |
| Average values | | | | |
| Domestic assets *(millions)* | $2,773 | $3,164 | $89** | $60** |
| Offices | 74 | 47 | 1 | 1 |
| Statewide share of deposits | 5.4% | 4.6% | 0.1% | 0.1% |
| Retail deposits/assets | 74.5%* | 67.7%* | 82.1% | 82.2% |
| Commercial loans/assets | 14.2% | 17.2% | 1.9% | 1.7% |

| | Acquirers | | Targets | |
|---|---|---|---|---|
| | Office | Deposit share | Office | Deposit share |
| Number of firms | 10 | 15 | 20 | 34 |
| Average values | | | | |
| Domestic assets *(millions)* | $5,841 | $8,440 | $1,238 | $1,053 |
| Offices | 143 | 105 | 39*** | 24*** |
| Statewide share of deposits | 9.9% | 9.3% | 3.1% | 2.7% |
| Retail deposits/assets | 68.4% | 60.8% | 77.6% | 73.2% |
| Commercial loans/assets | 19.3% | 22.7% | 11.6%* | 14.9%* |
| Acquisition price *(millions)* | | | $164.0 | $146.3 |
| Premium | | | 13.7% | 13.3% |

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

"office" model, the average target will operate fewer offices, have more commercial loans as a percent of assets, and have a smaller retail deposit base than the average target predicted by the "deposit share" model.

## Winners and "losers" by state

As shown in Figure 3, the "deposit share" model predicts that nearly three-quarters of all players in the Seventh District will be from Indiana, Michigan, and Wisconsin—limited branching states. Only five institutions that will be involved in interstate merger activity will be from Illinois, a unit banking state. Four of these should be acquirers.

The "office" model, however, predicts that most institutions that will be involved in interstate merger activity are based in Michigan, and most would-be-acquirers are based in that state as well. This is particularly interesting because Illinois has four of the ten largest institutions in the region. The "office" model excluded all Illinois banks from the set of player institutions because number of offices is a key determinant in this model.

Both models imply that current intrastate branching restrictions will have profound implications for a state's role in interstate banking. If either model is applicable to a region that contains unit banking states, highly restrictive branching laws could mean that banks in unit banking states like Illinois will sit on the sidelines while interstate banking allows banks in less restrictive neighboring states to combine and grow around them.[9]

The application of the choice models and the purchase premium model to the Seventh District may have limitations because the models were estimated on data from regions that are different from the Seventh District. Perhaps most important is that states that have interstate banking laws tend to have more liberal intrastate branching laws than do Seventh District states. Thus, a highly restrictive branching law, such as Illinois', limits the number and geographic spread of banking offices that an in-state bank operates and, therefore, limits its statewide share of deposits as well.

There is some evidence, however, that Illinois banking organizations will be sitting on the sidelines. As shown in Table 6, eight of the

District's 15 largest bank holding companies increased their deposits more than 10 percent through acquisitions in the last three years. Four of these institutions are in Michigan and only two are in Illinois. Furthermore, three of the District's 15 largest banking firms increased their deposits by more than 20 percent through acquisitions. Not one of these is in Illinois.

Analysis of the intrastate acquisition activity in Illinois and Indiana also indicates that Illinois institutions do not tend to be aggressive acquirers. Since January 1, 1982, Illinois has permitted the formation of multibank holding companies. From January 1 to December 31, 1982, 47 banks had been acquired by 24 of the state's 1,200 holding companies; however, only 15 of the 47 targets did not have a previous relationship with their acquirers.[10] Since July 1, 1985, Indiana has permitted multibank holding companies. In the subsequent three months, more than 24 of the state's 400 banks had agreed to be acquired.

The applications for nonbank banks by District banking organizations also indicate that bank holding companies in Illinois and Iowa are less expansion-minded than holding companies in Michigan, Indiana, and Wisconsin. Of the five applications for nonbank banks by District organizations, four are from a Michigan bank holding company and one is from an Indiana institution. Of the four applications to convert limited power trust companies into nonbank banks, three are from Michigan bank holding companies and one is

### Table 6
### 15 largest 7th District bank holding companies: 1984

| | Total deposits (in billions) | Percent of deposits acquired in last 3 years | Banking offices |
|---|---|---|---|
| First Chicago Corp. (IL) | $14.6 | 17% | 17 |
| NBD Bancorp Inc. (MI) | 9.9 | 15 | 271 |
| Continental Illinois Corp. (IL) | 7.8 | 2 | 6 |
| Comerica Inc. (MI) | 7.3 | 17 | 238 |
| Michigan National Corp. (MI) | 5.9 | 0 | 342 |
| Bank of Montreal (Harris Bank, IL) | 4.8 | 15 | 16 |
| Manufacturers Nat'l Corp. (MI) | 4.7 | 0 | 136 |
| First of America Bank Corp (MI) | 4.2 | 14 | 216 |
| First Wisconsin Corp. (WI) | 4.1 | 3 | 73 |
| Northern Trust Corp. (IL) | 3.9 | 8 | 9 |
| Marshall & Ilsley Corp. (WI) | 3.4 | 23 | 78 |
| Old Kent Financial Corp. (MI) | 3.3 | 35 | 170 |
| Marine Corp. (WI) | 2.7 | 33 | 75 |
| Indiana National Corp. (IN) | 2.4 | 0 | 55 |
| American Fletcher Corp. (IN) | 2.4 | 0 | 69 |

SOURCE: Board of Governors of the Federal Reserve System.

from a Wisconsin holding company. Each of these applications is for an institution that accepts demand deposits but does not make commercial loans.

## Conclusions

Serving the retail banking customer seems to be the driving force behind the first phase of interstate consolidation. Acquiring institutions are purchasing profitable banks that have strong consumer banking operations and fairly extensive retail distribution networks. Furthermore, they are paying a premium for these targets, which suggests that acquiring institutions are committed to serving consumers.

The models developed in this article indicate that the number of offices that an institution operates, which is indicative of its retail banking operation, is crucial in determining whether an institution will become involved in a regional interstate acquisition. Large banks with very few offices, e.g., large Illinois banks, tend to concentrate on serving commercial customers and have very little experience operating retail banking networks. They would not, therefore, be expected to become active in the retail market when interstate banking is permitted throughout the Midwest. This is as much a result of branching restrictions as it is of the marketing orientations of these institutions. Most medium-sized Illinois institutions, which do have experience serving consumers, also have limited experience operating retail networks. They too would not be expected to become involved in an interstate merger or acquisition.

The models developed in this article also indicate that the largest institutions in a region would become acquirers, provided that they have a significant number of banking offices. A player institution with more than $3.3 billion in domestic assets at year-end 1984 has a greater than 50 percent probability of becoming an acquirer. The average acquirer's domestic assets would be between five and eight times greater than those of the average target.

The smallest predicted target had over $400 million in domestic assets at year-end 1984; thus, the fear that interstate banking will cause small banks to be "gobbled up" by large banks seems unwarranted. The first phase of interstate consolidation will occur among the largest institutions. Furthermore, in the first phase, targets will command attractive purchase premiums (about 13.5 percent in the District). Over time, however, premiums will decline as the most attractive banking institutions are acquired and as competition erodes profit margins.[11]

Regardless of which banks are acquirers and which are targets, consumers of banking services should not be harmed by interstate banking and many consumers could benefit. Retail banking seems to be the driving force behind interstate banking, and acquirers are willing to pay a premium for relatively large, profitable, consumer-oriented banks. An acquiring institution, therefore, would not be expected to adopt policies that would dissipate its customer base. In addition, economic theory holds that the removal of geographic barriers to entry increases competition and, therefore, reduces price and/or increases quality, thus benefitting consumers. If, however, number of offices is the key determinant in who becomes a player and who becomes a spectator in interstate banking, consumers in unit banking or highly restrictive branching states will be sitting on the sidelines with the bankers unless restrictions on branching and intrastate acquisitions are relaxed.

Relaxation of these restrictions would benefit both bankers and consumers of banking services. More liberal branching and multibank holding company laws would allow banking organizations in highly restrictive branching states to grow through branching or through intrastate mergers and acquisitions. And, if they so choose, these banks could assemble intrastate retail banking networks, thus preparing them to operate regional networks across state lines, and making them more attractive to out-of-state bidders. Consumers would benefit from the increased competition that would ensue, and to the extent that the current banking laws support a greater number of banks than market forces would permit, more liberal banking laws would lead to a more efficient banking system.

Our analysis suggests that unit banking states may be at a disadvantage when interstate banking arrives. Legislatures in these states can either forego passage of an interstate banking bill or begin to liberalize restrictive branching legislation. The first solution has the merit of preserving the status quo. But this status quo can only be preserved by sacrificing

## Lessons from nonbank subsidiaries and nonbank banks

Despite prohibitions against interstate banking, bank holding companies have separately offered deposit-taking and lending services across state lines for nearly 30 years through nonbank subsidiaries, loan production offices, and nonbank banks. A careful examination of the types and locations of nonbank subsidiaries and offices that bank holding companies have established and the types and locations of nonbank banks that they are seeking to establish, indicates that interstate banking is consumer-driven and that bank holding companies are establishing presences in areas that have been experiencing rapid growth.

### Nonbank subs and LPOs

The 4(c)8 provisions of the Bank Holding Company Act allow banks to provide services such as consumer and commercial finance, mortgage banking, lease financing and credit insurance underwriting on an interstate basis through nonbank subsidiaries. The map shows the ten states that house the most 4(c)8 offices. These ten states account for a combined 3,052 4(c)8 offices, 55.5 percent of the U.S. total. California accounts for the most 4(c)8 offices and nearly five times as many as the average state. Five of the top ten states are in the Southeast,

an area that has been experiencing rapid economic growth recently.

Most nonbank subsidiaries are directed at consumers rather than businesses. Over 65 percent of all nonbank subsidiaries are consumer finance companies, trust companies, or industrial banks. This is the case among the top ten states, where 86 percent of all 4(c)8 offices are consumer-oriented. Furthermore, most of these consumer nonbank subsidiaries are lending offices. Only Florida has a significant number of trust companies, and Colorado—not among the top ten—has the most industrial banks (40).

In the case of the industrial bank subsidiaries, a prime determinant of a state's magnetism is legislative. Many states forbid industrial banking activity. In fact, all 105 industrial banks in the United States are located in 11 states, and over half are located in Arizona, California, Colorado, and Kansas.

Business-oriented 4(c)8 offices—e.g., commercial finance companies and lease financing operations—account for a very small proportion of all nonbank subsidiaries. Among the top ten states, they account for only 14 percent. Texas, California, and Ohio house the most business 4(c)8 offices, with 11, 10, and 10, respectively.

**Nonbank banks—Top 10 states**

| | Nonbank banks applications | Will accept demand deposits | Will make commercial loans |
|---|---|---|---|
| Florida* | 44 | 29 | 15 |
| Texas* | 33 | 18 | 15 |
| Georgia* | 22 | 13 | 9 |
| Virginia* | 19 | 15 | 4 |
| Pennsylvania* | 17 | 9 | 8 |
| California* | 15 | 9 | 6 |
| Arizona | 14 | 8 | 6 |
| Maryland | 14 | 11 | 3 |
| Massachusetts | 12 | 8 | 4 |
| New Jersey | 12 | 8 | 4 |

*Also rank among the top ten states for nonbank subsidiaries.

Nonbank subsidiaries of bank holding companies: 1983
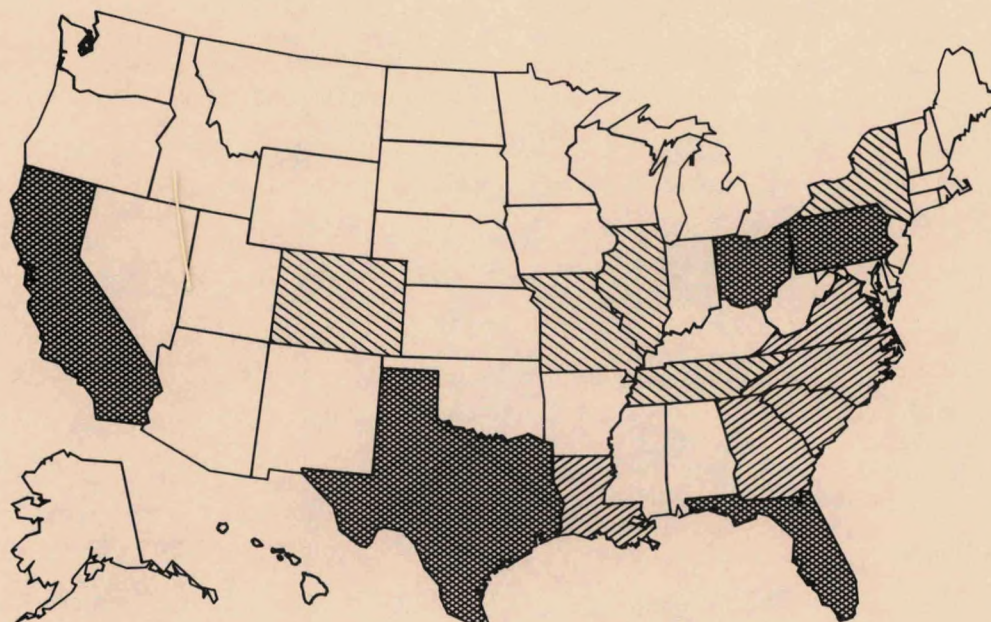
▓ Rank among top 10 states for total 4(c)8 offices, total consumer 4(c)8 offices, and total commercial 4(c)8 offices plus LPOs

▨ Rank among top 10 states for total 4(c)8 offices and total consumer 4(c)8 offices

▧ Rank among top 10 states for total commercial 4(c)8 offices plus LPOs

SOURCE: David D. Whitehead, **A Guide to Interstate Banking: 1983**, Federal Reserve Bank of Atlanta.

As shown in the map, five states rank among the top ten states for both consumer and commercial nonbank subsidiaries. These states include California, Florida, Ohio, Pennsylvania, and Texas. Together these five states account for 33 percent of all 4(c)8 offices.

Loan production offices are another means for bank holding companies to provide services to customers across state lines. Loan production offices serve as calling offices for a bank's commercial lending department and are operated on an interstate basis. Forty-four organizations in 19 states maintain interstate LPOs in 34 states. Six states house more than 10 LPOs each. These states include California (22), Illinois (21), Texas (19),

New York (16), Colorado (14) and Tennessee (14). The first four of these states also rank among the states with the most business-oriented 4(c)8 offices.

**Nonbank banks**

Nonbank subsidiaries of bank holding companies and LPOs have been permitted for nearly 30 years, but nonbank banks are a fairly recent phenomenon. In March 1984, U.S. Trust Company of New York received permission from the Federal Reserve Board to convert its Florida trust company into an institution that accepts demand deposits but does not make commercial loans—not a commercial bank as

defined in the Bank Holding Company Act. Since then, over 300 nonbank bank applications to charter such nonbank banks have been filed with the Office of the Comptroller of the Currency (although less than one-tenth have been approved). Most of these applications are for institutions that will accept demand deposits and make consumer loans, although 151 will make commercial loans but not accept demand deposits. In May 1985, the 11th U.S. Circuit Court of Appeals overturned the Fed's U.S. Trust decision, thus putting nonbank banks on hold; nevertheless, we can gain some insight into what is driving interstate banking by examining the locations for nonbank bank charters.

As shown in the table opposite, eight states are particularly attractive for the establishment of nonbank banks. Not surprisingly, Florida, Texas, and Georgia head the list; these states rank among the top ten states for nonbank subsidiaries of bank holding companies. Collectively, these ten states account for over 25 percent of all proposed nonbank banks in the United States.

To better understand what is attracting nonbank banks to these states, various population, income and market variables at the MSA level (metropolitan statistical area) were regressed on the number of nonbank bank applications in an MSA filed by bank holding companies. The MSA level was used because state-wide statistics tend to mask important variations within states. Using a stepwise linear regression procedure, we found that the number of nonbank banks in an MSA increases with per capita income, income growth, population, population growth, and number of banking offices. The number of nonbank banks decreases with population density. Each of these variables are significant at the 10 percent level, and these six variables explain 44 percent of the variability in the number of proposed nonbank banks in an MSA.

At first glance, the inverse relationship between the number of nonbank banks and population density may seem a bit surprising. Careful analysis of the data, however, indicates that most nonbank bank applications have been for institutions in growing metropolitan areas, which as yet are not very densely populated. As shown in the table below, banking firms seeking to establish an interstate presence are attracted to metropolitan areas that have been experiencing rapid population and income growth. These areas are primarily in the Southeast and in the West. The few exceptions are Philadelphia, Chicago, Boston, and New York. These cities, however, have very high population and income levels, which account for their attractiveness and compensate for their low population and income growth rates.

### Nonbank banks: population and income for top 10 MSAs

| | Nonbank banks applications | Population | | Per capita income | |
|---|---|---|---|---|---|
| | | 1980 Level | 1970-80 Growth | 1980 Level | 1970-80 Growth |
| | | (millions) | | (thousands) | |
| Washington, D.C. | 33 | 3.3 | 69.0% | $9.4 | 1.6% |
| Atlanta | 22 | 2.1 | 27.0 | 6.8 | 2.3 |
| Dallas | 16 | 2.0 | 25.8 | 8.0 | 2.2 |
| Phoenix | 14 | 1.5 | 55.4 | 7.7 | 1.8 |
| Houston | 13 | 2.7 | 44.7 | 7.8 | 2.7 |
| Philadelphia | 13 | 4.7 | −2.2 | 7.8 | 1.6 |
| Tampa-St. Pete | 12 | 1.6 | 46.0 | 6.6 | 2.2 |
| Boston | 11 | 3.7 | −1.3 | 7.7 | 1.6 |
| Chicago | 11 | 6.1 | −0.5 | 9.1 | 1.5 |
| New York | 9 | 8.3 | −8.8 | 8.1 | 1.4 |

Six states rank among the top ten in both the number of nonbank subsidiaries and the number of nonbank banks. These states include California, Florida, Georgia, Pennsylvania, Texas, and Virginia. Most nonbank banks and nonbank subsidiaries of bank holding companies in these states, as well as in the others, are consumer-oriented. That is, most of the nonbank subsidiaries are consumer finance and trust companies, and most of the nonbank banks will not make commercial loans. The flood of nonbank bank applications since March 1984 seems to indicate that bank holding companies are seeking to expand into areas that have been developing. Cities with high income and population levels, however, are also attractive even if they have not been growing rapidly in recent years.

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any role as a leader in retail banking. It would also deny consumers in these states the potential benefits available to consumers in most of the country. The second solution would permit the development of a more sophisticated banking industry capable of competing with the retail banking organizations that are emerging in other parts of the country. It is also likely to benefit consumers.

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[1] Four states have grandfather laws and six allow out-of-state bank holding companies to establish in-state limited service banks.

[2] The 12-state sample includes: Connecticut, District of Columbia, Florida, Georgia, Maine, Maryland, Massachusetts, New York, North Carolina, Rhode Island, South Carolina, and Virginia.

[3] The term "acquisitions" will be used throughout this article to refer to mergers and acquisitions. There are two mergers in our sample. The smaller institution in each case was designated as the target institution.

[4] Three additional variables were also included: 1) the number of states in our subset of 12 states that are included in the interstate law of an organization's home state; 2) the number of states included in our subset of 12 states that an organization can enter; and 3) branching status of an organization's home state (0 if statewide, 1 if limited). None of these additional variables proved significant.

[5] Iowa allows limited branching. A bank can branch within its home county and in contiguous counties in communities that do not have state or national banks. Illinois law allows a bank to establish five "facilities" within its home county or within 25 miles of its main office.

[6] For a discussion of what factors affect purchase premiums of intrastate acquisitions, see Randolph P. Beatty, John F. Reim and Robert F. Schapperle, "The Effects of Barriers to Entry on Shareholder Wealth: Implications for Interstate Banking," *Journal of Bank Research* (Spring 1985), pp. 8-15.

[7] Board of Governors of the Federal Reserve System, *Reports of Condition, Reports of Income, Annual Report of Domestic Bank Holding Companies, Bank Holding Company Financial Supplement,* various issues.

[8] Board of Governors of the Federal Reserve System, *Functional Cost Analysis: 1984 Average Banks.*

[9] Interstate banking may provide a means by which holding companies in unit banking states can escape outmoded intrastate branching restrictions. However, if the nonbank bank experience is any indication, Illinois bank holding companies do not seem anxious to take advantage of this opportunity to expand across state lines. As of November 1985, no Illinois holding company had an application pending to establish a nonbank bank.

[10] Sue F. Gregorash, "First year experience: Illinois multibanks shop carefully," *Economic Perspectives* (May/June 1983) p.15.

[11] See Joel A. Bleeke, "Banking or Brewing? A Fresh Look at Acquisition Patterns," *Proceedings of a Conference on Bank Structure and Competition,* Federal Reserve Bank of Chicago, 1984, pp. 249-63.

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