Preliminary
Not for Quotation

Price Stickiness in Bank Deposit Rates: An Analysis of Intra-Market Relationships

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August 2006

Abstract

Deposit rate rigidity has been previously examined primarily across markets and primarily in the context of the role played by market structure and concentration, e.g., Hannan and Berger (1989) and Newmark and Sharpe (1992). This study focuses on intra-market rate rigidity. Using weekly data on individual financial institutions from 1986 to 2004, I find rate rigidity in all deposit rates with rate rigidity increasing over time. In addition, the results indicate that within an MSA many institutions have statistically significant differences in the probability of a rate change and in the average size of a rate change. These by-institution differences, however, are not consistently related to institution size, although there is some evidence that market concentration plays a role at least for one type of deposit.

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General concern about price rigidity dates back at least to the 1800s, as documented by Laidler (1992). Carlton's (1986) empirical analyses of price stickiness, finding slow price adjustment by large firms, prompted a spate of more recent work in price rigidity. Hannan and Berger (1991) and Neumark and Sharpe (1992) were among the first to examine deposit rate stickiness. Both found evidence of slow adjustment, and both also examined the causes for the slow adjustment, albeit without reaching any firm conclusion. Subsequently, Hannan (1994), Scholnick (1996) and Jackson (1997) among others have further examined deposit rate stickiness, with emphasis on the role of market structure and concentration.

This paper makes two contributions to this extensive literature. First, I consider the issue of deposit rate stickiness using weekly data from April 1986 through August 2004. Prior studies typically employ monthly data obtained from a Federal Reserve survey of deposit rates. However, bank asset-liability-management (ALM) committees typically meet once a week for rate setting purposes.[1] Thus, weekly data corresponds to the period of re-examination typically employed by financial institutions. Using monthly data potentially understates the degree of price rigidity. For example, if an institution alters its CD rate on average once every four weeks, a study employing monthly data may not find price rigidity while a study using weekly data likely would.

[1] *Bank Rate Monitor,* "Savings: Usually on Wednesdays," (March, 1996), page 12. Based on a Bank Rate Monitor survey, seventy percent of all institutions adjust their rates - or consider adjusting their rates - once per week, with Wednesday representing the most common effective date for new deposit rates and Tuesday the second most common. Financial institutions are most likely to hold their ALM meeting after Tuesday's weekly auction of Treasury bills.

The 18 year period of analysis is also substantially longer than previously employed. Prior work generally focuses on a three year period, again based on a Federal Reserve survey. The Fed survey has the advantage of using a broad selection of institutions, but at the cost of a relatively short time period. If interest rates are relatively stable over a three year period, the power of any test for stickiness may be relatively low. While I have over 18 years of data, data limitations require the use of subperiods of approximately 6 year length. Using subperiods allows me to examine the extent to which rate rigidity has changed over time, potentially in response to financial deregulation and innovation.[2] For example, one hypothesis why deposit rates are sticky focuses on bank regulations and contends that rates adjusted slowly in the 1980's since banks were accustomed to a regulated environment and it took time to learn to compete. If that were the case, one should expect more price stickiness at the beginning of the sample. Alternately, since bank mergers have increased concentration ratios, if increased concentration leads to greater deposit rate stickiness as Hannan and Berger (1991) hypothesize, one should expect greater stickiness at the end of the period.

The second contribution of this paper is to conduct the analysis at an institution level. Since the focus is on individual institutions rather than market averages, I can determine not only whether deposit rates adjust slowly but also whether different institutions in a single market have the same degree of price stickiness. While studies including Jackson and Eisenbeis (1997) and Heitfield (1999) examine relationships across markets, typically viewed as metropolitan statistical areas (MSAs), it is appropriate to first consider relationships within a market. If rates

[2]Using the Bank Rate Monitor (BRM) data is not without cost since it covers many fewer institutions than the Fed survey. However, as of January 1, 2000, institutions in the BRM survey hold over twenty percent of U.S. deposits. Thus, the sample of institutions represent a substantial proportion of the underlying population.

within a market exhibit different degrees of stickiness for a given deposit type, there is a question of whether cross-market comparisons are appropriate. Alternately, one can ask if there are different degrees of rate stickiness within an MSA, is the MSA the appropriate definition of a market or is an even narrower definition appropriate. If rate stickiness does differ across institutions within an MSA, one could conclude either that the rates are determined in different markets, that they are influenced by difference shocks, or that institutions have different objective functions or different strategies.[3]

For example, if the concentration ratio differs between two MSAs, one would not be surprised to find differing deposit rate stickiness across those markets. Within an MSA, however, the standard measures of market concentration are the same across institutions. Thus, rate stickiness due to market concentration would suggest the same degree of price stickiness across all institutions. However, different institutions may have different amounts of market power or may face different demand curves. Either factor could cause different financial institutions within a market to have different degrees of rate rigidity. To my knowledge, no one has examined intra-MSA differences in rate stickiness.

Alternately, one could argue that different MSAs may be subject to different shocks. Los Angeles could be in a slump while New York was strong. In this case, it would not be surprising to find financial institutions in the two markets facing different supplies of funds and thus repricing deposits differently. However, if New York financial institutions different among

[3]That rates move together need not indicate that they are determined in the same market. They may move in response to similar factors. Thus, a change in the federal funds rate may impact both the deposit rate and the loan rate and those markets could be otherwise independent.

themselves, it would suggest different shocks or different supplies for different institutions within an MSA.

The outline of the paper is as follows. Section I presents the conceptual framework employed to analyze deposit rate rigidity, and Section II describes the statistical tests employed. Section III describes the data and presents summary statistics on the deposit rate data that indicate financial institutions adjust deposit rates slowly. Section IV examines whether there are differences in rate rigidity over time, across rates, and - most importantly - across institutions. Section V then tests potential causes for differences in rate rigidity while Section VI concludes.

I. Conceptual Framework

Financial institutions have the ability to change rates daily or even intra-day if they wish. In practice, even the largest institutions typically have ALM committees that meet once per week to formally discuss the possibility of rate changes. Recent models of the deposit rate setting process include Hannan (1994), Hutchison (1995) and Sharpe (1997) and can be interpreted as analyses of weekly rate setting. Rigidity then implies rates being adjusted less frequently than once per week or an ALM committee choosing not to change rates at its weekly meeting. One could argue that there was no change in market conditions warranting a change. From the perspective of the ALM committee, that statement would be tautological. However, market rates change weekly and even daily with rates only infrequently NOT changing from one week to the next. Thus, the decision not to change deposit rates from one week to the next would appear difficult to reconcile with the typical behavior of market rates.

The theoretical literature on reasons for price rigidity ranges from Rotemberg's (1982) emphasis on the potential to alienate customers to Klemperer (1995) review of consumer's cost

of changing suppliers to Dixit's (1991) emphasis on the fixed costs of changing prices. The focus of this paper is why rate rigidity varies. Differences in the type of product potentially play a major role. For example, NOW accounts potentially pay interest but much of their value to deposit suppliers lies in the non-interest services they provide, in particular the checking-cashing privileges. In contrast, the services associated with CDs are primarily interest related. Thus, it should not be surprising to find greater rate rigidity for NOWs than for CDs.[4]

The size of the customer base has been identified by Rotemberg and Saloner (1987) in general and Hannan and Berger (1991) for deposits as a potential reason for price rigidity. Specifically, the larger the customer base, the less price stickiness is expected. For example, an institution with a larger deposit base gains more with a rate cut than an institution with a small deposit base. Thus, one would expect institutions with large deposit bases to initiate any rate reductions.

Price stickiness has commonly been related to the market structure, for example Diebold and Sharpe (1990), Hannan and Berger (1991) and Rhoades (1995). Greater market concentration is hypothesized to allow firms to reprice less frequently as well as allowing firms to set higher prices. Prior results generally are consistent with those hypotheses.

Price stickiness also may change over time. If market concentration or firm size or product definitions change, the degree of rate rigidity also would be expected to change. There is a long list of other factors that could also change and potentially alter the degree of rate rigidity. Changes in the regulatory of interest rates have had a dramatic impact, as the deregulation of

[4]When CD rates change, typically the change influences only new deposits. In contrast, when NOW rates change, all deposits are affected. That difference also may make institutions less willing to change NOW rates.

interest rates from the 1960s to the 1980s suggests. Other changes in the regulatory environment may have a substantial change with the removal of limitations on branching and mergers have had significantly increased the number of financial institutions operating in multiple markets. Changes in the cost structure, the increased reliance of computers for processing transactions, and the advent of internet banking all potentially change the costs and benefits of repricing more frequently. In sum, it may be more surprising to find that rate rigidity did not change over time than that it has changed given the scope of factors potentially influencing deposit rate pricing.

The list of reasons why rate rigidity has changed is hardly exhaustive. For example, rate stickiness may be related to the sensitivity of consumer response with deposit rates changing more slowly when there is a high price elasticity, or rate stickiness may be related to how competitors are assumed to react and those reactions may be determined based on game theoretic consideration. However, the list of factors above lend themselves to analysis with currently available deposit rate data and will be the focus of the analysis here.

Unlike some prior studies that have used market averages, I focus exclusively on individual financial institutions. To the extent that institutions within an MSA have the same deposit supply curve and face the same constraints, then using market averages to consider rate repricing would be appropriate. However, if institutions have different deposit bases, provide a different mix of depositor services, or face different deposit supply functions, then one should not expect to observe the same rate setting process or the same rate stickiness. Thus, it is appropriate to first examine intra-MSA relationships and then later consider the relationships across MSAs. That approach is adopted here.

Price stickiness or price rigidity must be considered as a relative rather than absolute matter. Apart from auction markets, there appear to be few markets without some degree of price rigidity. For example, wholesale gasoline prices changed frequently yet Davis and Hamilton (2004) find evidence of price rigidity. In contrast, the federal funds rate potentially changes from transaction to transaction within a day, and there appears to be no rigidity in the funds rate.

Deposit rate rigidity may take either one of two forms. Rates could be rigid if they change slowly. That is, if a financial institution were pegging a deposit rate to the funds rate but were changing it only with a lag, e.g. were changing it only after the next weekly meeting of the ALM committee, then that deposit rate would be sticky or slow to adjust. That type of stickiness is not considered here. Rates also could be rigid if they were changed less frequently than they would be in an auction market. That is, if a financial institution were pegging a deposit rate to the funds rate but would only change the deposit rate when the indicated change was, say, greater than 25 basis points, then that deposit rate also would be sticky. In this case, the stickiness would be reflected in fewer rate changes and in larger rate changes when those changes did occur. It is this question that I address below.

III. Statistical Methodology

Three types of tests are employed to examine deposit rate stickiness: tests of differences in rate change probabilities, tests of differences in average rate change sizes, and tests of differences in the distribution of rate changes. The first set of tests examines the number of observed rate changes or the probability of a rate change. If prices are sticky, one would expect less frequent rate changes. Do banks change deposit rates less frequently than market rates change or do banks even within the same market change rates with the same frequency? Two

tests address these questions. The first considers differences in the probabilities of a rate change and is a standard z test, since the binomial can be approximated by the normal distribution for the sample sizes available here. The test statistic is:

$$Z = \frac{p_1 - p_2}{P(1-P)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)^2}$$

where

$$P \equiv \frac{p_1 n_1 + p_2 n_2}{n_1 + n_2}$$

and where p_i is probability of a rate change for institution i and n_i is number of weeks in sample for institution i.[5] The null and alternate hypotheses are:

H_0: $p_1 = p_2$

H_a: $p_1 \neq p_2$

The second test is an F test for a difference between two counts based on a Poisson distribution. The underlying assumption is that rates change only once per week, an assumption consistent with the typical financial institution's rate adjustment process. The test statistic is:

$$F = \frac{N_1}{N_2 + 1}$$

where N_i is number of rate changes for institution i, the degrees of freedom are $2(N_2 + 1)$ and $2N_1$ respectively, and N_1 refers to the institution that more frequently changes its rate. The null and alternate hypotheses are:

[5]When comparing a bank's rate change and a market rate change, the market rate corresponds to institution 1.

H_0: $N_1 = N_2$

H_a: $N_1 > N_2$.

The second set of tests examines the size of the average rate change. If rates are sticky, one should expect a larger rate change when rates finally are changed. For example, the federal funds rate is viewed as completely flexible, changing even within a day. If a financial institution is slow to adjust its rate but desires to keep its rate set relative to the funds rate, when it does change its rate, the change must be larger than the funds rate change.[6] Three tests are employed here for differences in means or medians. The first is the t test. Since the variances are unknown and not necessarily equal, the appropriate specification of the t test is:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

where $\bar{x}_i$ is mean rate change at institution i and $s_i \equiv$ standard error the rate change at institution i. In this case, the degrees of freedom must be approximated by the value:

$$v = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{s_1^4}{n_1^2(n_1+1)} + \frac{s_2^4}{n_2^2(n_2+1)}} - 2$$

[6]This statement assumes that the funds rate is moving in a consistent direction rather than following a random walk. Over each period considered here, there are many subperiods where market rates moved for prolonged periods in a consistent direction.

In addition to this parametric test, there are two nonparametric tests; the first is the median test. For each of the two institutions, calculate the number of observations to the left and to the right of the median of the combined samples. The test statistic is:

$$\chi^2 = \frac{\left(\left|a_1 b_2 - a_2 b_1\right| - .5N\right)^2 N}{(a_1 + a_2)(a_1 + b_1)(a_2 + b_2)(b_1 + b_2)}$$

where a_i is number of observations above the overall median for institution i, $b_i \equiv$ number of observations below the overall median for institution i, and $N \equiv n_1 + n_2$. This statistic is distributed χ^2 with one degree of freedom, and the null and alternate hypotheses are:

H_0: $\text{median}_i = \text{median}_j$

H_a: $\text{median}_i \neq \text{median}_j$

The second nonparametric test is the Mann-Whitney test and has the same null and alternate hypotheses as the median test. It is a test based on rankings. All values for both institutions are ranked from low to high. Ranks are then assigned from left to right with ties receiving the value of the average ranking. The sum of the ranks are calculated for each institution and the following statistics are calculated:

$$U_1 = n_1 n_2 + \frac{n_1(n_1 + 1)}{2} - R_1$$
$$U_2 = n_1 n_2 + \frac{n_2(n_2 + 1)}{2} - R_2$$

where $R_i \equiv$ sum of the ranks for institution i. The test statistic is $U = \min(U_1, U_2)$. For large samples, the critical values follow the normal approximation given by:

$$Z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1 n_2 + 1)}{12}}}$$

The first two sets of tests consider parts of the distribution of rate changes, i.e. the probability of a rate change and the average change in rates. The third test examines whether the entire distribution of rate changes is the same. Price stickiness suggests fewer but bigger changes and thus a fundamentally different distribution than would be obtained in the absence of stickiness. Rate stickiness suggests a fat-tailed distribution of rate changes.

The standard χ^2 test for consistency is employed to compare two distributions. The data must be arranged based on a histogram with n groups of rate change sizes, and the test statistic is:

$$\chi^2 = \sum_{i=1}^{n} \sum_{j=1}^{2} \frac{\left(X_{ij} - E_{ij}\right)^2}{E_{ij}}$$

where X_{ij} is the observed number of changes at institution j falling into histogram group i, and E_{ij} is the expected value for group i and institution j under the null hypothesis that the distributions are the same, and

$$E_{ij} = \frac{\sum_{i=1}^{n} X_{ij} \sum_{j=1}^{2} X_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{2} X_{ij}}$$

The test statistic is χ^2 with (n-1) degrees of freedom. The result is potentially sensitive to the choice of the intervals for the underlying histogram and different histograms are employed below to ensure that the results are robust to that selection.

III. Data and Summary Statistics

The data source for bank deposit rates is *Bank Rate Monitor* (BRM). BRM has surveyed deposit rates weekly at ten financial institutions in each of ten major markets, Boston, Chicago, Dallas, Detroit, Houston, Los Angeles, New York, Philadelphia, San Francisco and Washington D.C., since April 7, 1986. The sample employed here runs from April 7, 1986 through August 23, 2004. BRM generally surveys the largest five banks and the largest five thrifts in each market. The institutions generally remain the same from week-to-week, although there have been changes over the period due to bank mergers and bank closures.

The variability of the institutions in BRM's sample poses a potential problem. Only 23 of the 100 institutions included in the survey at the beginning of the period remain in the sample at the end. The results here consider only institutions with complete data.[7] To increase the number of available institutions, the sample is divided into thirds, each having 320 observations. The periods run from April 7, 1986 through May 18, 1992, from May 25, 1992 through July 6, 1998, and from July 13, 1998 through August 23, 2004.[8] Not only do subperiods allow the inclusion of many more institutions, they also allow analysis of whether and how rate rigidity may have changed over time.

That an institution is included in the sample does not guarantee that it will be included when considering rate stickiness for a particular deposit rate since not all institutions have quotes for all types of deposits. BRM data include both rates for NOW accounts, money market

[7]The analysis has also been undertaken including all institutions with over 95 and over 90 percent coverage and the results are unchanged.

[8]The results are not sensitive to the break points between the subperiods. Changing the dates of the break points between the subperiods by 26 weeks or breaking the sample into quarters rather than thirds leave the results unaffected.

accounts (MMKT), and different maturities of CD's.[9] Since 1 year CD's are the most common, the analysis presented below is limited to the 1 year CD rate although the results are robust for other CD maturities.

Given that rate rigidity is relative, a comparison rate is needed to determine whether a financial institution's deposit rate is rigid. Three rates are employed here, the federal funds rate and the one-year and ten-year Treasury rates. All are set in auction markets with potentially substantial intra-day rate fluctuations; thus they would appear to be a reasonable baseline for the behavior of a non-rigid interest rate. Table 1 presents summary information on these market rates over the three periods defined above. The last two columns in Table 1 indicate that short-term rates declines in the first and third periods and increased in the second while long-term rates were approximately constant during the first period and declined during the second and third. In each period, however, rates were changed at roughly the same rate with about 95 percent of all weeks having a rate change from the rate a week earlier. Weeks when market rates do not change are rare and perhaps random events.[10]

Tables 2 to 4 present similar summary statistics for the three deposit rate series, NOWs, MMKTs, and CDs, by city and by subperiod. In the context of rate rigidity, perhaps the most noteworthy feature of these tables is the dramatically lower number of rate changes compared

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[9]BRM includes both the rate and the yield. Yields are used in this analysis.

[10]This percentage if anything understates the variability of these rates since the funds rate and the Treasury rates virtually always also had some intra-week variability even when the rates seven days apart were identical. There also is the question of what constitutes an interest rate change, or whether a one or two basis point change is simply noise in the series. Thus, I also consider two alternate definitions of a rate change based on a minimum change of 5 basis points (BP) and of 10 BP. Approximately 70 percent of weeks have market rate changes of 5BP or more and 35 percent have rate changes of 10BP or more.

Kahn, Pennacchi and Sopranzetti (2000) have documented that bank rates are more likely to cluster on "even" values and integers. While they use the stated rate and I focus on the yield, their results do suggest that when an institution deliberately changes its rates, they do so in particular sizes. These alternate definitions of what constitutes a change are unimportant when comparing rates across financial institutions but potentially are important when comparing rates for a financial institution with market rates. However, using the 5BP or 10BP definition of a rate change leaves the results below unaffected.

with Table 1. While the funds and Treasury rates change virtually every week, on average across the institutions within a city, deposit rates appear to change relatively infrequently. For example, for NOW rates during the first period, only 7.1 percent of institutions changed their rates in any given week, implying on average a change in NOW rates once every 14.1 weeks. Even in Los Angeles, the market with the most rate changes, only 9.3 percent of institutions changed rates in any given week for a rate change every 10.8 weeks. In the second period, the number of rate changes declines with only 4.1 percent of rates changing or a rate change on average every 24.4 weeks. And in the third period, there appears to be even greater rigidity with a rate change only 2.6 percent of the time or a rate change every 38.5 weeks. Compared with market rates, NOW rates appear to be very sticky and the degree of price rigidity appears to have increased from the late 1980's to the early 2000's. While there is some variability across markets, the decline in the number of rate changes is near universal.

The results for MMKT rates are similar. Only 17.9 percent of institutions changed rates in any given week during the first subperiod or one change every 5.6 weeks. That percentage falls to 7.5 percent in the second period and falls further in the third period to 5.1 percent, or a rate change every 19.6 weeks. As with NOW rates, there are some differences across markets. For example, in the second period the percentage of rate changes runs from New York at 16.3 percent to Dallas at 4.5 percent. However, the increase in rate rigidity again is nearly uniform. Comparing the results in Tables 2 and 3 also suggest that there is less rate rigidity in MMKT accounts than there is in NOW accounts.

Table 4 for CD rates suggests rate rigidity compared to market rates but less rigidity than with other deposit rates. During the first period rates were changed 38.6 percent of the time or

once every 2.6 weeks. In the second and third periods this percentage drops to about 23 percent or a change every 4 weeks. Once again, there appear to be substantial difference across markets although the directions of movements from one period to another are similar.[11]

Tables 2 to 4 carry strong implications for results using monthly data to analyze rate rigidity. For the typical institution, using monthly data may not be a problem for the most recent period for NOW and MMKT accounts, with the average weeks between changes at 38.5 and 19.6 respectively. Even looking at the markets with the highest rate of change, average weeks between changes would be 13.9 and 7.3 respectively, although in all cases actual rate changes could cluster within a month. However, for CDs, in the most recent period rates are changed at the average institution every 4.3 weeks and the most aggressive repricing occurs every 2.3 weeks. Thus, using monthly data to analyze CD repricing is inappropriate. In addition, considering the two earlier periods, the case for using monthly data is more problematic. For CDs many institutions reprice more than once per month and MMKT accounts also frequently repriced more than once per month. Only for NOW accounts can one make a case that monthly data would not pose a potential problem.[12]

IV. Results

A. Differences in Rate Change Distributions

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[11]The results from Tables 2 through 4 also suggest potential asymmetry in rate changes when compared to the results from Table 1. In virtually every case there appear to be substantially more rate decreases than rate increases even when market rates are increasing. In contrast, for Table 1 there is statistically significant asymmetry only for the ten-year Treasury rate for the last two periods. The results in Tables 2 through 4 also suggest that deposit rates have fallen substantially relative to market rates. Pursuing these results, however, would lead far afield and are left to another paper.

[12]Note, for example, that repricing MMKT accounts in the first period every 5.6 weeks on average does not imply that monthly data is appropriate for two reasons. First, some institutions will reprice more frequently. Second, even if none repriced more frequently, the 5.6 weeks refers to the average period between repricing. That average could reflect long periods of rate stability followed by periods of multiple rate changes within a month, again making the use of monthly data problematic.

Are deposit rates are rigid relative to, say, the federal funds rate? For all institutions, all rates and all periods, the binomial test indicates that in virtually 100 percent of the comparisons the null hypothesis of no rate rigidity can be rejected at the 95 percent confidence level. That conclusion has been documented in prior studies, is suggested in Tables 1 through 4, and is not the focus of this paper.

The question of interest here is how deposit rate rigidity varies. The results in Tables 2 through 4 suggest differences over time and across rates. Since rate rigidity is a relative concept, have rates become more rigid over time? And are NOW rates more rigid than MMKT rates or CD rates? One might expect increased rate rigidity over time given the observed consolidation in the financial services sector and given prior results indicating that increased concentration leads to increased rate rigidity, e.g. Hannan and Berger (1991) and Neumark and Sharpe (1992). To test for differences over time, only a limited sample of institutions are available since the institution would need to have complete data on the indicated rate for the two consecutive periods. There are a maximum of 34 institutions with data across the first two periods and 37 across the second two. Thus, the results need to be considered suggestive given the small sample sizes. The results are summarized in Table 5.[13] If there was no change over time in the degree of rigidity, one would expect 5 percent of the comparisons to be significant and one would expect 50 percent of the changes to be negative. Table 5 indicates that about 25 percent of NOWs are significant, with almost all indicating an increase in rigidity, and far less than half the changes are negative. These results suggest that NOW rates have become more rigid. The evidence is more dramatic for MMKT rates, especially from the first to the second period with over 80 percent

[13]Given the limited number of institutions by market, it does not make sense to break down the results by market.

significant and positive (indicating greater rigidity) and no negatives. The CD results from the first to second period also suggest an increase in rigidity with about 80 percent significant and very few negatives in the sample. However, for CDs in the third period there is no evidence to suggest further increased rate rigidity. Roughly 50 percent of the changes are decreases rather than increases, and while there are many more significant changes than one would expect by chance, those changes are equally split between positives and negatives. The results in Table 5 suggest increased rate rigidity for all rates and all time periods, except the most recent period for CDs.

Differences in rate rigidity across rate categories should not be surprising. NOW accounts offer greater implicit services than CDs, for example. Table 6 compares rigidity across rates. Equal rate rigidity implies 50 percent of the comparisons would be negative and 5 percent would be significant. In contrast, comparing NOWs and MMKTs, there are few negatives, about 10 percent or less, and over 35 percent significant. Thus, NOW rates appear to be more rigid than MMKT rates. Similarly MMKT rates appear to be more rigid than CD rates, with very few negatives and over 90 percent of the comparisons significant. Simply stated, there appear to be major differences in rate rigidity moving from NOW to MMKT to CD rates. This result should not be surprising given differences in presumed services associated with the different types of accounts.[14]

There is also a third and more subtle potential rigidity differential suggested by the results in Tables 2 though 4. Consider that during the second period New York's MMKT rate changed 16.3 percent of the time while Dallas's rate changed only 4.5 percent of the time. Thus, the

[14]Given the results in Tables 5 and 6 and the consistency with prior results and intuition, similar results on differences in mean changes and the distribution of changes are not presented here but are consistent with the findings reported.

tables suggest not only cross-market rate rigidity differences but also potential rigidity differences among financial institutions within a market. The latter is the focus here. Within a market, do different institutions have different amounts of rate rigidity? Are some slower to reprice than others? If there are differences across institutions within a market, one should expect that there would also be differences across institutions in different markets.[15]

Table 7 presents results that examine whether there are differences in rate rigidity across institutions within a market. Table 7 presents not only the summary results but also the by-market results for cross-institution comparisons.[16] The table includes the number of potential comparisons, given the available number of financial institutions, as well as the percentage of those comparisons that are statistically significant at the 5 percent level.[17] As discussed in the section on methodology, there are two sets of results, the standard binomial and a Poisson-based F test. The results of the two tests are broadly consistent.

If the probabilities of a rate change are the same across institutions, and the degree of rate rigidity is the same, then one should expect to find 5 percent of the cross-institution comparisons significant. For each rate and for every period the actual percentage of significant comparisons is substantially higher. For example, in the first period Boston has 4 financial institutions with complete data for a total of 6 different comparisons across institutions. For NOW rates, 50

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[15]Prior studies of rate rigidity or linkages among rates sometimes use market averages, e.g. Cooperman, Lee and Lesage (1991) and Neumark and Sharpe (1992). However, if there are differences in rate rigidity across institutions within a market, this approach would be problematic. Neuberger and Zimmerman's (1990) finding that California deposit rates differ from those in the rest of the country would be one example of the phenomenon examined here.

[16]If there are differences across institutions, then it is also likely that there are differences across markets. However, the meaning of market averages under these circumstances is unclear and it would not appear reasonable to examine differences across markets once differences within a market have been identified.

[17]With k institutions, there are k(k-1)/2 comparisons.

percent of those comparisons were significantly different than zero at the 5 percent significance level, thus rejecting the null hypothesis that the probabilities of a rate change are the same across a pair of institutions. The results vary across markets. For example, in the first period only 20 percent of Washington's NOW rates differ across institutions while 57 percent of San Francisco's NOW rates differ. Nonetheless, across cities and across time periods the results consistently indicate that there are many more rejections than expected of the null hypothesis of equal probabilities of rate changes across institutions.

One potentially surprising feature of the results in Table 7 is that NOW accounts appear to be the least likely to have cross-institution differences in rate rigidity while CDs appear to be the most likely. If NOWs have greater non-interest returns than other account types, *ceteris paribus* one might expect to find more rejections of equal rate rigidity for NOWs. Financial institutions could differ in NOW rate levels and in frequency of change because non-price differences would be more important. The NOW results in the last subperiod, however, must be interpreted with care since there are relatively few NOW rate changes. Thus, finding fewer differences across institutions may be the result of the tests having relatively low power to distinguish between institutions' relative rate rigidity because all institution's NOW rates are so rigid. For example, during the third period, 320 weeks, the mean number of NOW rate changes was 10 while the maximum was 23 and the minimum 2.

Table 8 presents similar results for differences in the average rate change across institutions. If financial institutions have the same degree of rate rigidity, one should expect to find similar probabilities of rate change and similar average rate changes. The results of Table 8 are broadly consistent with the results of Table 7. The results of the three tests, the t test for

differences in means, the median test, and the Mann-Whitney test are generally consistent. For each test, for each rate and for each period (with one exception) there are substantially more rejections than expected of the null hypothesis that the mean or median rate change differs across institutions. Only for NOW rates in the third period are the results potentially consistent with the null hypothesis of no difference in average rate changes. Once again, however, this result needs to be interpreted very carefully since there were relatively few NOW rate changes at most institutions during this period and the power of the test during this period may be low.

Table 9 presents the results of testing whether the entire distribution of rate changes differs across institutions. The χ^2 test is run twice, once including only non-zero rate changes and once including all week-to-week differences even zeros. The two tests are based on different perspectives on the rate change structure. Excluding weeks without rate changes asks: given that a rate change occurred, did two banks have differing patterns of repricing? In contrast, including weeks without rate changes potentially allows two banks to have different distributions based solely on differences in the probability of a rate change. Given that many institutions have significantly different probabilities of a rate change, one should expect the second test to yield more rejections of the null hypothesis of the same distribution.[18]

The results in Table 9 are again broadly consistent with those from Tables 7 and 8. In general, there are more rejections of the null hypothesis than expected by chance for all rates and periods except for NOW accounts in the third period, and the CD results are the strongest in rejecting the null hypothesis of no difference between the distributions. There also are more significant differences when zeros are included, as expected.

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[18]The results are potentially sensitive to the choice of widths for the histogram intervals. The results were rerun using a number of different sets of intervals with no appreciable change in the results.

What do the results in Tables 7 to 9 in sum imply? At a minimum, they suggest that different institutions have different degrees of price stickiness.[19] Furthermore, they suggest that these differential rigidities hold not only for NOW and MMKT rates, where one might expect them given the service features of those accounts, but also for CD rates. The results in Tables 7 to 9 also confirm that the differences between the maximum and minimum rate changes presented in Tables 2 to 4 represent statistically significant differences. For example, during the second period institutions in New York changed MMKT rates between 18 and 100 times. During the third period, institutions in Detroit changed CD rates between 20 and 134 times. However, not all cities and rates varied so dramatically. Washington D.C. in the second period, has a range of rate changes running only from 45 to 49. Thus, rate rigidity appears to differ dramatically across some institutions in some markets but these differences are not uniform.

B. Reasons for Differences in Rate Change Distributions

To date, I have documented that there are significant differences within a market between many pairs of institutions both in the frequency of deposit rate repricing and in the average deposit rate change. These results suggest that financial institutions pursue different strategies in terms of changing deposit rates. Two general reasons have been advanced for possible differential rate pricing either across markets or across institutions. The first focuses on market-related factors. Berger and Hannan (1989) and Neumark and Sharpe (1992) among others relate rate stickiness to market concentration. These studies generally find higher concentration associated with less frequent rate changes. The second focuses on institution-related factors. Rotemberg and Saloner (1987) present a model where large institutions are more willing to

[19] Davis and Hamilton (2004) find "surprising heterogeneity" across firms in a study of price differences in the wholesale gasoline market. They did not attempt to determine the source of that variation.

change rates since they will have more to gain from lowering their rates when rates decline. Thus, market concentration and institution size are hypothesized to influence the distribution of rate changes.

Two equations are employed to consider what factors influence the distribution of rate changes. One considers the probability of a rate change and the other considers the mean rate change.

$$p_i = \alpha_0 + \alpha_1 \text{ share}_i + \alpha_2 \text{ conc}_k + \alpha_3 W_i + \alpha_4 Z_k \quad \text{and}$$

$$\bar{x}_i = \beta_0 + \beta_1 \text{ share}_i + \beta_2 \text{ conc}_k + \beta_3 W_i + \beta_4 Z_k$$

where p_i is the probability of a rate change at institution i during a particular time interval, $\bar{x}_i$ is the mean rate change at institution i, share_i is a measure of the market share or size of institution i, conc_k is a measure of the market concentration of institution i in market k, W_i is a vector of other institution-specific variables potentially influencing the distribution of rate changes and Z_k is a vector of other market-specific variables potentially influencing the distribution of rate changes.

Two measures of share_i are employed, the market share of institution i and the log of total deposits in institution i in market k. Given that there is no difference between the results using these two measures, only results using the former are reported below. Three measure of conc_k are employed, the Herschel-Herfindahl Index (HHI), the three firm concentration ratio, and the number of banks in the market. All have been previously employed to measure market concentration. The discussion above suggests that $\alpha_1 > 0$ and $\beta_1 < 0$ (positive for the number of banks). That is, larger institutions are expected to have more frequent but smaller rate changes. In addition, one should expect $\alpha_2 < 0$ and $\beta_2 > 0$ (negative for the number of banks) or higher market concentration to lead to fewer rate changes and larger rate changes.

It is important to control for differences across markets and financial institutions with the latter potentially being particularly important given the finding of cross-institution differences within a market. The former may be important to explain cross-city differences in the results. A number of cross-institution controls were included in the equations including a dummy variable for whether an institution was a bank or a thrift, a series of dummy variables for different sources of bank charters, a dummy for whether an institution is headquartered in the market, the percentage of the institution's total deposits that come from that market, and the number of branches that it has in that market. Market related variables include average income in the market, population and population density. However, none of the institutional or market factors are consistently significant, and none are included in the following regression results.

Table 10 presents the importance of market share and concentration measures as determinants of differences in probabilities while Table 11 presents these factors role in determining differences in mean changes. The results are, at best, mixed. The first period had the least price rigidity but still had substantial differences in both measures of rigidity across institutions, i.e. 40 to 50 percent of comparisons significantly different across institutions. However, neither market share nor any measure of concentration plays a significant role in explaining these differences.[20]

In the second period, there is some evidence that market concentration plays a role, at least for MMKT rates. Increased market concentration measure leads to fewer rate changes and larger changes, as hypothesized. In addition, when the number of banks is used as the measure of

[20]For this period it is necessary to use the 1994 values for the concentration and market share values since the data is only available beginning in 1994. However, the high correlations between the values from one year to the next, or from the 1994 to 2004 values suggest that using the beginning of period values from 1986 would have made a difference were they available.

concentration, there is evidence that concentration also influences CD rate changes. However, this evidence cannot be considered robust. For all three rates, market share again plays no role in influencing rate change probabilities or the size of a rate change.

During the third period, concentration again appears to play a role for MMKT rates as well as for NOW rates, although not for CDs. Higher concentration decreases the probability of a rate change and increases the average size of a rate change for both MMKT and NOW rates. The evidence for NOWs, however, should be interpreted carefully since in this period there were relatively few significant cross-institutional differences. During this period, market share also is significant for the size of rate change for NOW accounts. Institutions with larger market share have larger rate changes when they do change their NOW rates. Again, this result should be interpreted cautiously given the limited number of significant cross-institutional differences.

The results in Tables 10 and 11 are disappointing in the sense that differences in market concentration and institution size generally do a poor job in explaining differences in cross-institution rate rigidity. MMKT rate changes appear to be influenced by market concentration, at least during the last two periods, but NOW and CD rate changes generally are not. There is no strong evidence that market size influences any rate change.

V. Conclusions and Implications

This study confirms that deposit rates at large financial institutions are more rigid than market-determined rates. This rigidity, not surprisingly, differs across rates, with NOW accounts having the most rigid and CD accounts having the least rigid rates. This result is expected since NOW accounts offer non-rate services while competition among financial institution for CDs focuses on rate competition. More surprising is the finding that rate rigidity appears to have

increased from the late 1980's to the 2000's across all rates. While market concentration generally increased over the period of analysis, this increase in rate rigidity does not appear to be consistently related to market concentration. Most surprising is the result that rate rigidity differs significantly not only between markets but also between institutions within a market. From April 1986 through August 2004 there appear to be significant differences between the largest institutions in the largest financial markets in terms of how deposit rates are changed. While Hannan and Prager (2004) among others have found differences in mean rate between large and small institutions, I find no evidence of differences in the probability of a rate change based on size.

Differences in the level of rates across institutions are not unexpected due to differences in services or fees, for example. However, Stigler and Sherwin (1985) show that prices within a market will move together, even if their equilibrium values differ, in response to stochastic shocks. Nevertheless, the results here indicate that the distributions of price changes differ, a result at odds with Stigler and Sherwin's model.

Previous studies have hypothesized that concentration and size may influence deposit rate setting. Greater market concentration has been hypothesized to result in greater price rigidity, and that larger institutions have been hypothesized to reprice more quickly than smaller. Concentration does impact MMKT rates, although likely not NOW or CD rates. However, neither concentration nor size can explain the intra-market differences in the distributions of rate changes, measured either by the probability of a change or the mean change.

Given the lack of explanatory power of size and concentration, the question remains why do rate-repricing differences exist across institutions. At this point there appear to be two potential explanations. First, assuming that these financial institutions are attempting to maximize profits, it

is possible that they have adopted different maximizing strategies. That is, in the face of uncertain deposit supplies and uncertain reaction by competitors, there may not be a clear strategy on when it is optimal to reprice deposits. Different institutions may reach different conclusions about how quickly or how frequently a rate change is warranted.

Second, different institutions may face different deposit supply functions. Two institutions may compete in the same geographic market but their customer base may differ substantially or their customers may have different rate elasticities. With this perspective, institutions in the same geographic area may actually operate in different markets. While a number of studies have attempted to determine the appropriate scope and definition of a market, typically comparing a MSA with a state or even a national market, for example Jackson (1992), Calem and Nakamura (1998), Biehl (2002) and Heitfield and Prager (2004), no one has examined whether a metropolitan area may consist of "fractured" markets, perhaps depending on services provided or distribution of branch offices.

The banking industry has changed substantially over the past twenty years. The recent advent of internet banking has hastened that change. Three of the largest so-called internet banks (E*Trade, Capital One and ING) have increased their deposit base from $3 billion in 1999 to almost $60 billion by 2005. However, the changes in rigidity documented here appear to predate this recent development. While the growing importance of internet banking suggests possibly less deposit rate stickiness as depositors have easier access to a wider range of financial institutions, the data suggest that rate stickiness has increased rather than decreased, especially for NOW and MMKT accounts. Thus, the importance of rate rigidity appears to be increasing even in the face of developments that might be expected to reduce it.

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Table 1
Summary Statistics - Market Rates

Rate	Period	Mean	Std. Dev.	Max.	Min.	# Rate Increases	# Rate Decreases	Pct. Rate Changes	Mean Change	First Observation	Last Observation
Funds	4/7/1986-5/18/1992	7.10	1.51	11.77	3.47	153	153	95.6	0.148	6.97	3.89
	5/25/1992-7/6/1998	4.68	1.12	6.20	2.86	162	142	95.0	0.127	3.85	5.47
	7/13/1998-8/23/2004	3.46	2.06	6.58	0.97	143	150	91.6	0.095	5.50	1.51
Treas1	4/7/1986-5/18/1992	7.00	1.31	9.78	4.06	143	166	96.6	0.106	6.21	4.12
	5/25/1992-7/6/1998	5.03	1.06	7.24	3.02	147	154	94.1	0.070	4.27	5.34
	7/13/1998-8/23/2004	3.46	1.85	6.40	0.95	139	165	94.1	0.070	5.36	2.03
Treas10	4/7/1986-5/18/1992	8.24	0.69	10.11	6.78	147	161	96.3	0.103	7.10	7.29
	5/25/1992-7/6/1998	6.42	0.64	8.00	4.41	137	172	96.6	0.084	7.35	5.41
	7/13/1998-8/23/2004	4.97	0.80	6.77	3.20	134	170	95.0	0.093	5.46	4.25

Funds refers to the federal funds rate while Treas1 and Treas10 refer to the 1 year and 10 year constant maturity Treasury rates respectively. Max. and Min. are the maximum and minimum values of the corresponding interest rate during the specified period. The number of rate increases and decreases indicates how many weeks had a rate change in the indicated direction, and the percentage of rate changes is defined as the percentage of weeks where the rate changed from one week to the next. The mean change refers to the absolute value of the rate change in those weeks when a change occurred. First observation and last observation are the interest rate on the first week and last week of the sample and give a perspective on whether rates rose or fell over a particular period.

Table 2
NOW Account Rates

Period	City	# institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rate Δ's	Mean Change	First Observation	Last Observation
4/7/1986 -	Boston	4	5.49	0.75	5.2	22.0	8.5	43	15	0.235	6.27	2.94
5/18/1992	Chicago	2	5.24	0.49	3.0	12.5	4.8	23	8	0.305	5.70	3.20
	Dallas	1	5.08	0.52	3.0	9.0	3.8	NA	NA	0.331	5.90	3.05
	Detroit	9	4.93	0.49	3.3	15.8	6.0	33	11	0.235	5.86	3.34
	Houston	2	5.29	0.62	6.0	14.0	6.3	21	18	0.302	6.30	3.04
	Los Angeles	7	4.57	0.68	5.7	24.1	9.3	57	16	0.171	5.94	2.43
	New York	7	5.13	0.72	3.1	15.7	5.9	37	11	0.257	5.69	2.51
	Philadelphia	5	4.87	0.47	2.6	18.0	6.4	33	16	0.195	5.77	3.02
	San Francisco	7	4.49	0.74	2.7	25.7	8.9	57	14	0.194	6.01	2.17
	Washington	5	5.43	0.53	4.6	17.0	6.8	26	13	0.231	6.01	3.61
	Total/Average	49	4.97	0.61	3.8	18.9	7.1			0.226		
5/22/1992-	Boston	2	1.27	0.43	2.5	13.0	4.8	16	15	0.137	2.73	0.87
7/6/1998	Chicago	4	1.79	0.26	8.0	14.0	6.9	46	6	0.262	2.67	1.30
	Dallas	5	1.52	0.40	0.4	7.0	2.3	12	5	0.270	2.78	1.06
	Detroit	7	1.80	0.51	2.7	13.0	4.9	20	7	0.193	3.30	1.00
	Houston	5	1.58	0.41	0.6	6.6	3.2	14	6	0.228	3.02	1.08
	Los Angeles	7	1.15	0.29	1.1	11.6	4.0	24	6	0.137	2.25	1.01
	New York	4	1.29	0.29	1.2	8.0	2.9	15	5	0.189	2.32	0.98
	Philadelphia	4	1.34	0.49	3.2	12.8	5.0	26	9	0.212	2.82	1.00
	San Francisco	4	1.11	0.24	1.8	5.8	2.4	9	6	0.148	2.04	1.01
	Washington	4	2.04	0.35	2.8	13.2	5.0	24	9	0.197	3.15	1.46
	Total/Average	46	1.50	0.37	2.3	10.5	4.1			0.198		

Table 2 continued

Period	City	# institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rate Δ's	Mean Change	First Observation	Last Observation
7/13/1998-	Boston	6	0.47	0.27	1.0	6.8	2.4	10	6	0.157	1.05	0.13
8/23/2004	Chicago	6	0.71	0.37	1.0	10.2	3.5	14	9	0.118	1.37	0.23
	Dallas	5	0.39	0.24	0.2	5.0	1.6	8	3	0.198	1.01	0.15
	Detroit	6	0.76	0.31	2.5	6.7	2.9	23	2	0.252	1.30	0.54
	Houston	5	0.45	0.32	1.2	6.6	2.4	13	5	0.180	1.14	0.15
	Los Angeles	6	0.41	0.29	0.5	6.8	2.3	9	6	0.133	1.00	0.11
	New York	7	0.66	0.30	2.3	8.9	3.5	19	4	0.156	1.15	0.19
	Philadelphia	4	0.67	0.32	0.2	5.2	1.7	10	2	0.098	1.07	0.23
	San Francisco	5	0.40	0.28	0.4	6.2	2.1	8	5	0.148	1.01	0.12
	Washington	5	0.43	0.33	0.8	9.4	3.2	20	6	0.154	1.48	0.13
	Total/Average	55	0.54	0.30	1.1	7.3	2.6			0.161		

The number of institutions refers to the number of financial institutions with complete data in *Bank Rate Monitor* for the indicated period and city. The number of rate increases and decreases are the number of weeks when the given rate changed in the indicated direction on average across the financial institutions in a given market, and the percentage of rate changes is defined as the percentage of weeks where the rate changed from one week to the next on average in a given market. The maximum and minimum number of rate changes indicates the maximum and minimum changes at a financial institution in that market. Thus, for Boston during the first period, the most an institution changed it rate was 43 times while the least an institution changed its rate was 15 times. The mean change refers to the absolute value of the rate change in those weeks when a change occurred. First observation and last observation are the average interest rates on the first week and last weeks of the period and give a perspective on whether rates rose or fell over a particular period. The last row, "Total/Average" refers to the total number of institutions with complete data during a subperiod while other values represent the weighted average of the corresponding columns, weighted by the number of institutions with complete data.

Table 3
Money Market Rates

Period	City	# Institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rate Δ's	Mean Change	First Observation	Last Observation
4/7/1986-	Boston	8	6.15	0.94	19.9	56.5	23.9	161	43	0.144	7.23	3.51
5/18/1992	Chicago	8	5.78	0.82	18.1	41.8	18.7	86	33	0.160	6.49	3.47
	Dallas	3	5.55	0.67	6.0	20.7	8.3	37	18	0.224	6.88	3.47
	Detroit	9	5.59	0.74	18.8	38.3	17.8	79	30	0.134	6.35	3.65
	Houston	5	6.05	0.86	9.6	24.4	10.6	45	25	0.263	7.20	3.46
	Los Angeles	8	5.36	0.56	12.5	37.4	15.6	85	35	0.132	6.35	3.49
	New York	7	6.05	0.30	24.6	56.7	25.4	166	44	0.140	6.56	3.27
	Philadelphia	6	5.32	0.53	10.3	42.8	16.6	73	37	0.097	6.48	3.50
	San Francisco	8	5.40	0.63	10.8	38.2	15.3	63	38	0.142	6.44	3.35
	Washington	7	5.80	0.75	16.9	44.4	19.2	100	39	0.125	6.78	3.42
	Total/Average	69	5.70	0.68	15.6	41.8	17.9			0.149		
5/25/1992-	Boston	4	2.58	0.31	9.5	18.5	8.8	32	29	0.186	3.53	2.40
7/6/1998	Chicago	7	2.84	0.33	13.4	18.9	10.1	48	12	0.157	3.42	2.74
	Dallas	5	2.56	0.31	5.2	9.2	4.5	20	4	0.191	3.01	2.31
	Detroit	6	2.68	0.42	3.7	13.2	5.2	26	9	0.273	3.64	2.40
	Houston	6	2.68	0.32	5.8	11.0	5.3	23	4	0.176	3.21	2.43
	Los Angeles	7	2.39	0.29	5.7	18.3	7.5	33	17	0.121	3.48	2.17
	New York	4	2.73	0.48	21.5	30.5	16.3	100	18	0.151	3.12	2.34
	Philadelphia	6	2.33	0.39	5.7	17.8	7.4	35	13	0.185	3.54	1.88
	San Francisco	4	2.37	0.25	6.0	13.5	6.1	22	17	0.119	3.38	2.02
	Washington	4	2.80	0.21	6.8	12.2	5.9	26	15	0.131	3.34	2.79
	Total/Average	53	2.59	0.33	8.0	16.2	7.6			0.171		

Table 3 continued

Period	City	# Institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rate Δ's	Mean Change	First Observation	Last Observation
7/13/1998-	Boston	6	1.50	0.76	3.0	15.5	5.8	25	14	0.276	2.54	0.55
8/23/2004	Chicago	6	1.57	0.85	3.0	19.3	7.0	30	14	0.148	2.59	0.41
	Dallas	5	1.06	0.62	2.0	8.6	3.3	15	5	0.249	2.10	0.33
	Detroit	5	1.79	0.83	1.8	12.2	4.1	18	6	0.225	2.79	0.60
	Houston	5	1.00	0.60	2.8	10.4	2.4	21	5	0.218	2.43	0.32
	Los Angeles	6	1.28	0.68	2.0	12.2	4.5	23	10	0.176	2.15	0.30
	New York	7	1.47	0.51	4.3	18.1	7.0	44	10	0.201	2.50	0.51
	Philadelphia	4	1.36	0.70	2.2	11.2	4.2	21	6	0.181	2.08	0.40
	San Francisco	4	1.20	0.63	2.2	10.5	4.3	15	8	0.185	2.02	0.29
	Washington	6	1.75	1.00	2.5	18.0	6.4	30	11	0.209	2.69	0.31
	Total/Average	54	1.38	0.72	2.7	14.1	5.1			0.207		

The number of institutions refers to the number of financial institutions with complete data in *Bank Rate Monitor* for the indicated period and city. The number of rate increases and decreases are the number of weeks when the given rate changed in the indicated direction on average across the financial institutions in a given market, and the percentage of rate changes is defined as the percentage of weeks where the rate changed from one week to the next on average in a given market. The maximum and minimum number of rate changes indicates the maximum and minimum changes at a financial institution in that market. Thus, for Boston during the first period, the most an institution changed it rate was 43 times while the least an institution changed its rate was 15 times. The mean change refers to the absolute value of the rate change in those weeks when a change occurred. First observation and last observation are the average interest rates on the first week and last weeks of the period and give a perspective on whether rates rose or fell over a particular period. The last row, "Total/Average" refers to the total number of institutions with complete data during a subperiod while other values represent the weighted average of the corresponding columns, weighted by the number of institutions with complete data.

Table 4
1 year CD Rates

Period	City	# Institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rates Δ's	Mean Change	First Observation	Last Observation
4/7/1986-	Boston	8	7.36	1.34	39.4	72.9	35.1	137	49	0.183	7.84	4.27
5/18/1992	Chicago	8	6.91	1.41	50.8	76.6	39.8	179	80	0.137	7.26	4.11
	Dallas	3	7.26	1.25	66.7	93.0	49.9	171	143	0.155	7.34	4.24
	Detroit	8	6.88	1.23	45.0	62.4	33.6	154	57	0.181	6.96	4.12
	Houston	5	7.32	1.24	58.6	83.0	44.3	162	103	0.165	7.68	4.30
	Los Angeles	8	7.04	1.26	45.0	82.1	39.7	144	109	0.129	7.39	4.15
	New York	7	7.06	1.38	43.0	80.3	38.5	136	111	0.166	7.49	3.90
	Philadelphia	6	7.00	1.30	38.3	76.3	33.0	137	63	0.149	7.37	4.00
	San Francisco	8	7.12	1.25	47.6	86.1	41.2	165	109	0.122	7.68	4.03
	Washington	7	7.40	1.26	48.3	76.1	38.9	154	81	0.140	7.58	4.09
	Total/Average	68	7.12	1.30	46.8	77.8	38.6			0.152		
5/25/1992-	Boston	4	4.59	1.02	22.8	34.5	17.9	68	47	0.183	4.15	4.91
7/6/1998	Chicago	7	4.72	1.07	60.7	57.7	37.0	177	50	0.113	4.04	5.23
	Dallas	5	4.36	0.82	32.2	40.8	22.8	85	53	0.145	4.10	4.79
	Detroit	7	4.33	0.98	28.0	35.3	19.8	98	30	0.181	4.04	4.66
	Houston	6	4.36	0.83	36.7	44.0	25.2	106	66	0.140	4.07	4.79
	Los Angeles	7	4.53	0.98	31.1	38.3	21.7	84	57	0.137	4.03	5.07
	New York	4	4.33	0.96	38.2	41.8	25.0	97	67	0.145	3.84	4.69
	Philadelphia	7	3.93	0.82	16.0	25.9	13.1	61	26	0.264	3.91	4.47
	San Francisco	4	4.38	1.08	39.0	38.5	24.2	94	70	0.116	3.75	5.03
	Washington	4	4.44	0.84	22.5	25.0	14.8	49	45	0.135	4.01	4.93
	Total/Average	55	4.39	0.94	33.1	38.7	22.4			0.159		

Table 4 continued

Period	Period	City	# Institutions	Mean	Std. Dev.	# Rate Increases	# Rates Decreases	Pct. Rate Changes	Max. # Rate Δ's	Min. # Rates Δ's	Mean Change	First Observation
7/13/1998-	Boston	6	3.39	1.55	15.0	35.2	12.6	84	24	0.195	5.14	1.75
8/23/2004	Chicago	6	3.23	1.88	39.5	61.2	31.5	137	71	0.120	5.23	1.70
	Dallas	6	3.16	1.75	33.8	51.7	26.7	110	77	0.145	4.68	1.68
	Detroit	6	3.26	1.77	31.0	52.3	26.0	134	20	0.180	5.01	1.72
	Houston	5	3.00	1.78	31.4	51.2	25.8	109	66	0.171	4.66	1.34
	Los Angeles	5	3.13	1.85	26.2	46.6	22.8	86	55	0.141	5.04	1.37
	New York	7	3.08	1.68	25.3	45.4	22.1	108	34	0.156	4.81	1.38
	Philadelphia	4	3.12	1.68	13.0	28.5	13.0	86	20	0.267	4.67	1.50
	San Francisco	5	3.16	1.87	29.6	47.8	24.2	103	66	0.138	5.04	1.40
	Washington	5	3.27	1.71	33.7	54.3	27.5	140	51	0.133	5.07	1.71
	Total/Average	55	3.17	1.75	28.2	47.9	23.4			0.162		

The number of institutions refers to the number of financial institutions with complete data in *Bank Rate Monitor* for the indicated period and city. The number of rate increases and decreases are the number of weeks when the given rate changed in the indicated direction on average across the financial institutions in a given market, and the percentage of rate changes is defined as the percentage of weeks where the rate changed from one week to the next on average in a given market. The maximum and minimum number of rate changes indicates the maximum and minimum changes at a financial institution in that market. Thus, for Boston during the first period, the most an institution changed it rate was 43 times while the least an institution changed its rate was 15 times. The mean change refers to the absolute value of the rate change in those weeks when a change occurred. First observation and last observation are the average interest rates on the first week and last weeks of the period and give a perspective on whether rates rose or fell over a particular period. The last row, "Total/Average" refers to the total number of institutions with complete data during a subperiod while other values represent the weighted average of the corresponding columns, weighted by the number of institutions with complete data.

Table 5
Differences in Probabilities of Rate Changes Over Time

	NOW Accounts		Money Market Accounts		1 year CDs	
	Period 1vs. Period 2	Period 2 vs. Period 3	Period 1 vs. Period 2	Period 2 vs. Period 3	Period 1 vs. Period 2	Period 2 vs. Period 3
Total Comparisons	26	33	33	36	34	37
% Significant	23.1	27.3	81.8	33.3	79.4	48.6
% Positive & Significant	19.2	24.2	81.8	27.8	76.5	21.6
% Negative	19.2	33.3	0	19.4	8.8	51.4

Period 1 runs from 4/7/1986 through 5/18/1992; period 2 runs from 5/25/1992 through 7/6/1998; period 3 runs from 7/13/1998 through 8/23/2004. Total Comparisons refers to the number of institutions with complete data for both periods being compared, e.g. there are 26 institutions with complete rate data on NOW accounts for the first two periods. Comparisons are based on the Z test although similar results are obtained with the F test. Percentages significant refer to the percent of pairwise results that are significant at the 5 percent level, e.g. 23.1 percent of institutions with complete NOW rate data have a significantly different week-to-week probability of a change between the first and second periods; 19.2 percent of the 26 are significant and positive; and 19.2 percent are negative, albeit generally insignificant. If there is no difference in probabilities of rate changes across periods, one should expect the percent significant to be 5 percent, the percent positive and significant to be 2.5 percent, and the percent negative to be 50 percent.

Table 6
Differences in Probabilities of Rate Changes Across Rate Types

	NOW Accounts vs. MMKT Accounts			MMKT Accounts vs. 1 year CDs			NOW Accounts vs. 1 year CDs		
	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3	Period 1	Period 2	Period 3
Total Comparisons	49	45	53	68	51	53	48	46	54
% Significant	83.7	37.8	39.6	95.6	100.0	92.4	100.0	97.8	100.0
% Positive & Significant	83.7	37.8	39.6	92.6	98.0	92.4	100.0	97.8	100.0
% Negative	2.0	11.1	5.7	4.4	2.0	0	0	0	0

Period 1 runs from 4/7/1986 through 5/18/1992; period 2 runs from 5/25/1992 through 7/6/1998; period 3 runs from 7/13/1998 through 8/23/2004. Total Comparisons refers to the number of institutions with complete data for both periods being compared, e.g. there are 49 institutions with complete rate data on NOW and MMKT accounts in the first period. Comparisons are based on the Z test although similar results are obtained with the F test. Percentages significant refer to the percent of pairwise results that are significant at the 5 percent level, e.g. 83.7 percent of institutions with complete NOW and MMKT rate data in the first period have a significantly different week-to-week probabilities of change between the NOW and MMKT rates; 83.7 percent of the 49 are significant and positive; and only 2.0 percent are negative. If there is no difference in probabilities of NOW and MMKT rate changes, one should expect the percent significant to be 5 percent, the percent positive and significant to be 2.5 percent, and the percent negative to be 50 percent.

Table 7
Differences in Probabilities of Rate Changes Across Institutions

		NOW Accounts			Money Market Accounts			1 year CDs		
		#	% Significant		#	% Significant		#	% Significant	
Period	City	comparisons	Z test	F test	comparisons	Z test	F Test	comparisons	Z test	F test
4/7/1986-	Boston	6	50	50	28	71	71	28	39	36
5/18/1992	Chicago	1	100	100	28	64	64	28	61	61
	Dallas	0	NA	NA	3	33	33	3	33	0
	Detroit	36	33	33	36	44	47	28	75	71
	Houston	1	0	0	10	10	10	10	40	40
	Los Angeles	21	48	52	28	43	46	28	32	29
	New York	21	29	29	21	62	62	21	5	0
	Philadelphia	10	30	30	15	47	47	15	67	67
	San Francisco	21	57	57	28	36	39	28	46	39
	Washington	10	20	20	21	62	62	21	52	48
	Total	127	38.6	39.3	218	50.9	52.3	210	46.7	42.9
5/25/1992-	Boston	1	0	0	6	0	0	6	17	17
7/6/1998	Chicago	6	83	83	21	57	57	21	76	76
	Dallas	10	0	0	10	60	60	10	30	30
	Detroit	21	14	14	15	20	20	21	57	57
	Houston	10	0	0	15	33	33	15	27	27
	Los Angeles	21	43	43	21	29	33	21	14	14
	New York	6	17	17	6	83	83	6	67	67
	Philadelphia	6	33	33	15	47	47	15	40	40
	San Francisco	6	0	0	6	0	0	6	33	17
	Washington	6	17	17	6	0	17	6	0	0
	Total	93	22.6	22.6	121	36.4	38.0	127	40.2	39.4

Table 7	continued	NOW Accounts			Money Market Accounts			1 year CDs		
		#	% Significant		#	% Significant		#	% Significant	
Period	City	comparisons	Z test	F test	comparisons	Z test	F Test	comparisons	Z test	F test
7/13/1998-	Boston	15	0	0	15	0	0	15	67	67
8/23/2004	Chicago	15	0	0	15	33	40	15	53	53
	Dallas	10	0	0	10	30	30	15	33	27
	Detroit	15	53	53	10	50	50	15	87	87
	Houston	10	0	10	10	30	40	10	40	40
	Los Angeles	15	0	0	15	13	13	10	30	30
	New York	21	19	19	21	52	52	21	67	67
	Philadelphia	6	17	17	6	50	50	6	50	50
	San Francisco	10	0	0	6	0	0	10	40	40
	Washington	10	30	40	15	27	27	15	73	73
	Total	127	12.6	14.2	123	29.3	30.9	132	56.8	56.1

For each market, the number of comparisons indicates the number of pairwise tests that can be conducted for different probabilities of a rate change across institutions. In general, with k institutions, the number of possible comparisons is k(k-1)/2. The Z is based on the standard test for differences in probabilities, which given the sample size here is approximated by the normal distribution. The F test is based on the Poisson distribution and compares the number of changes across institutions. Percentage significant refer to the percent of pairwise results that are statistically significant at the 5 percent level. For example, in the first period for NOW accounts, Boston has 3 institutions with complete data yielding a total of 6 possible pairwise comparisons. Of those comparisons, both the Z and F tests indicate that 3 are significantly different at the 5 percent level. If there are no differences across institutions in probabilities of rate change, one should expect to find 5 percent of the results in this table to be significant.

Table 8
Differences in Average Changes Across Institutions

		NOW Accounts				Money Market Accounts				1 year CDs			
		#	% Significant			#	% Significant			#	% Significant		
Period	City	comparisons	t test	Median	MW	comparisons	t test	Median	MW	comparisons	t test	Median	MW
4/7/1986-	Boston	6	50	50	67	28	43	54	54	28	57	50	50
5/18/1992	Chicago	1	100	100	0	28	50	54	64	28	68	75	71
	Dallas	0	NA	NA	NA	3	33	0	0	3	0	67	67
	Detroit	36	0	8	47	36	31	42	53	28	46	61	64
	Houston	1	0	0	0	10	0	0	40	10	40	50	70
	Los Angeles	21	33	33	24	28	11	25	25	28	25	14	14
	New York	21	38	24	33	21	43	57	48	21	57	57	52
	Philadelphia	10	30	30	20	15	20	40	33	15	33	33	47
	San Francisco	21	33	19	29	28	32	25	18	28	68	43	46
	Washington	10	30	40	50	21	38	52	62	21	52	52	71
	Total	127	25.2	23.6	36.2	218	32.1	40.4	44.0	210	50.5	49.0	52.9
5/25/1992-	Boston	1	0	0	0	6	67	67	67	6	0	33	50
7/6/1998	Chicago	6	0	17	17	21	48	38	48	21	10	29	24
	Dallas	10	10	20	10	10	0	20	10	10	60	60	60
	Detroit	21	14	43	47	15	7	0	13	21	19	0	10
	Houston	10	0	20	0	15	27	0	33	15	60	73	67
	Los Angeles	21	43	5	33	21	24	10	24	21	14	14	10
	New York	6	17	17	17	6	50	50	67	6	0	67	50
	Philadelphia	6	50	33	50	15	53	53	53	15	60	27	60
	San Francisco	6	0	0	0	6	0	0	0	6	0	0	0
	Washington	6	50	50	50	6	0	0	0	6	0	17	33
	Total	93	21.5	22.6	28.0	121	28.9	22.2	32.2	127	25.9	29.1	33.1

Table 8 continued		NOW Accounts				Money Market Accounts				1 year CDs			
		#	% Significant			#	% Significant			#	% Significant		
Period	City	comparisons	t test	Median	MW	comparisons	t test	Median	MW	comparisons	t test	Median	MW
7/13/1998-	Boston	15	13	0	0	15	13	27	47	15	60	73	67
8/23/2004	Chicago	15	0	0	0	15	7	13	20	15	33	26	33
	Dallas	10	30	0	30	10	30	0	30	15	60	53	53
	Detroit	15	13	7	20	10	30	20	30	15	33	33	27
	Houston	10	30	0	10	10	40	10	50	10	80	70	60
	Los Angeles	15	0	0	0	15	20	13	20	10	0	0	0
	New York	21	48	29	52	21	0	24	24	21	38	52	62
	Philadelphia	6	0	0	17	6	50	50	33	6	50	33	50
	San Francisco	10	0	0	0	6	0	0	0	10	0	10	10
	Washington	10	0	30	0	15	33	33	47	15	53	47	53
	Total	127	15.7	5.5	15.0	123	19.5	19.5	30.9	132	41.7	42.4	43.9

For each market, the number of comparisons indicates the number of pairwise tests that can be conducted for different mean or median rate change across institutions. In general, with k institutions, the number of possible comparisons is k(k-1)/2. The t test is the standard test employed for differences in means when the variances are unknown and potentially unequal. The median test compares the number of changes in two samples above and below the median of the combined sample and follows the χ^2 distribution with one degree of freedom. The Mann-Whitney (MW) test ranks the changes across both institutions and then compares the sum of the ranks. For large samples the critical values follow a normal approximation. Percentage significant refer to the percent of pairwise results that are statistically significant at the 5 percent level. For example, in the first period for NOW accounts, Boston has 3 institutions with complete data yielding a total of 6 possible pairwise comparisons. Of those comparisons, both the t test and the median test indicate that 3 are significantly different at the 5 percent level while the Mann-Whitney test indicates 4 are significant. If there were no differences across institutions in mean or median rate change, one should expect to find 5 percent of the results in this table to be significant.

Table 9
Differences in Distributions Across Institutions

		NOW Accounts			Money Market Accounts			1 year CDs		
		#	% Significant		#	% Significant		#	% Significant	
Period	City	comparisons	w.o. 0's	w. 0's	comparisons	w.o. 0's	w. 0's	comparisons	w.o. 0's	w. 0's
4/7/1986-	Boston	6	0	33	28	64	71	28	46	46
5/18/1992	Chicago	1	0	0	28	54	79	28	75	86
	Dallas	0	NA	NA	3	0	0	3	67	67
	Detroit	36	0	8	36	31	44	28	79	93
	Houston	1	0	0	10	0	20	10	40	40
	Los Angeles	21	33	38	28	25	43	28	39	43
	New York	21	19	24	21	57	71	21	62	57
	Philadelphia	10	0	0	15	0	13	15	33	53
	San Francisco	21	29	29	28	36	46	28	54	57
	Washington	10	60	60	21	48	76	21	48	62
	Total	127	18.1	20.5	218	38.1	54.1	210	55.2	61.9
5/25/1992-	Boston	1	0	0	6	67	67	6	50	50
7/6/1998	Chicago	6	0	50	21	14	52	21	52	91
	Dallas	10	0	0	10	40	20	10	40	70
	Detroit	21	10	38	0	7	7	21	19	67
	Houston	10	0	0	15	20	33	15	40	47
	Los Angeles	21	19	33	21	14	19	21	0	0
	New York	6	0	0	6	67	83	6	67	83
	Philadelphia	6	17	17	15	40	53	60	53	60
	San Francisco	6	0	0	6	0	0	6	0	0
	Washington	6	33	33	6	0	0	6	0	17
	Total	93	9.7	22.6	106	19.8	35.5	172	33.1	51.2

Table 9 continued		NOW Accounts			Money Market Accounts			1 year CDs		
		#	% Significant		#	% Significant		#	% Significant	
Period	City	comparisons	w.o. 0's	w. 0's	comparisons	w.o. 0's	w. 0's	comparisons	w.o. 0's	w. 0's
7/13/1998-	Boston	15	0	0	15	27	27	15	53	67
8/23/2004	Chicago	15	0	0	15	0	13	15	20	67
	Dallas	10	0	0	10	20	40	15	33	33
	Detroit	15	13	40	10	40	20	15	67	93
	Houston	10	0	0	10	40	40	10	60	60
	Los Angeles	15	0	0	15	13	13	10	20	20
	New York	21	14	19	21	10	24	21	57	86
	Philadelphia	6	0	0	6	0	33	6	83	100
	San Francisco	10	0	0	6	0	0	10	20	50
	Washington	10	0	10	15	27	40	15	67	87
	Total	127	3.9	8.7	123	17.1	23.6	132	47.7	67.4

For each market, the number of comparisons indicates the number of pairwise tests that can be distributions across institutions. In general, with k institutions, the number of possible comparisons is k(k-1)/2. The χ^2 test for consistency is employed with m-1 degrees of freedom where m is number of groups in the histogram employed to make the comparisons. The results here the intervals (-∞ to -0.25), (-0.249 to -0.1), (-0.099 to -0.001), (0), (0.001 to 0.099), (0.1 to 0.249), and (0.25 to ∞), which can be viewed intuitively as small, medium and large changes. The results could be sensitive to the choice of histogram, but alternate intervals yield the same results. There are two sets of results presented, one including zeros and the other excluding zeros. Distributions across institutions could vary either because the probability of a rate change differs or because the size of rate changes differs; the exclusion of weeks with zero changes focuses on the latter. Percentage significant refer to the percent of pairwise results that are statistically significant at the 5 percent level. For example, in the first period for NOW accounts, Boston has 3 institutions with complete data yielding a total of 6 possible pairwise comparisons. Of those comparisons, none are significantly different at the 5 percent level when zeros are excluded while 2 are significant when they are included. If there were no differences across institutions in mean or median rate change, one should expect to find 5 percent of the results in this table to be significant.

Table 10
Regression Results: Determinants of Differences in Probabilities

		NOW Accounts			Money Market Accounts			1 year CDs		
Period	City	HHI	3 Firm	# Banks	HHI	3 Firm	# Banks	HHI	3 Firm	# Banks
4/7/1986-	Mkt. Share	-0.076	-0.078	-0.071	0.129	0.126	0.127	0.202	0.205	0.235
5/18/1992		(0.332)	(0.325)	(0.361)	(0.357)	(0.371)	(0.358)	(0.190)	(0.184)	(0.117)
	Concentration	0.001	0.026	-0.002	-0.004	-0.118	0.014	-0.001	-0.047	0.014
		(0.593)	(0.578)	(0.706)	(0.145)	(0.204)	(0.102)	(0.697)	(0.649)	(0.122)
	R^2	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.04
	# observations	43	43	43	56	56	56	55	55	55
5/25/1992-	Mkt. Share	-0.005	-0.003	-0.011	-0.011	-0.011	-0.020	0.043	0.049	0.081
7/6/1998		(0.915)	(0.953)	(0.799)	(0.884)	(0.881)	(0.767)	(0.781)	(0.754)	(0.542)
	Concentration	-0.001	-0.047	0.003	-0.005	-0.138	0.019	-0.003	-0.105	0.037
		(0.191)	(0.119)	(0.393)	(0.007)	(0.010)	(0.000)	(0.384)	(0.317)	(0.000)
	R^2	0.00	0.01	0.00	0.11	0.10	0.24	0.00	0.00	0.24
	# observations	46	46	46	53	53	53	54	54	54
7/13/1998-	Mkt. Share	0.021	0.021	0.017	0.031	0.029	0.011	0.218	0.225	0.245
8/23/2004		(0.353)	(0.347)	(0.446)	(0.416)	(0.442)	(0.766)	(0.223)	(0.207)	(0.153)
	Concentration	-0.001	-0.030	0.003	-0.003	-0.093	0.007	-0.001	-0.052	0.017
		(0.078)	(0.064)	(0.065)	(0.001)	(0.001)	(0.005)	(0.801)	(0.671)	(0.132)
	R^2	0.03	0.03	0.03	0.16	0.16	0.11	0.00	0.00	0.03
	# observations	55	55	55	54	54	54	56	56	56

The dependent variable is the probability of a rate change at a financial institution. The independent variables are market share and a measure of concentration. Market share is the financial institution's share of total deposits in a particular market. Three concentration measures are employed, the Herschel-Herfindahl Index (HHI), the three-firm concentration ratio, and the number of banks in the market. The numbers in parentheses are the probability values of the estimated coefficients. (Note that the number of observations here may be less than the number of observations from Tables 2 through 4 if there is missing data on the independent variables.)

Table 11
Regression Results: Determinants of Differences in Mean Changes

		NOW Accounts			Money Market Accounts			1 year CDs		
Period	City	HHI	3 Firm	# Banks	HHI	3 Firm	# Banks	HHI	3 Firm	# Banks
4/7/1986-	Mkt. Share	0.0022	0.0022	0.0022	-0.0001	-0.0001	-0.0000	0.0009	0.0009	0.0008
5/18/1992		(0.327)	(0.323)	(0.340)	(0.899)	(0.889)	(0.957)	(0.133)	(0.147)	(0.174)
	Concentration	-0.00002	-0.00081	0.00009	-0.00001	-0.00002	0.00002	0.00000	0.00009	-0.00003
		(0.552)	(0.549)	(0.513)	(0.915)	(0.970)	(0.600)	(0.986)	(0.831)	(0.388)
	R^2	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	# observations	43	43	43	56	56	56	55	55	55
5/25/1992-	Mkt. Share	-0.0001	-0.0001	-0.0002	-0.0006	-0.0007	-0.0004	0.0005	0.0005	0.0002
7/6/1998		(0.955)	(0.950)	(0.916)	(0.644)	(0.634)	(0.784)	(0.637)	(0.640)	(0.814)
	Concentration	-0.00002	-0.00039	0.00003	0.00006	0.00188	-0.00017	-0.00001	-0.00014	-0.00011
		(0.666)	(0.714)	(0.762)	(0.053)	(0.055)	(0.068)	(0.815)	(0.839)	(0.064)
	R^2	0.00	0.00	0.00	0.04	0.03	0.03	0.00	0.00	0.03
	# observations	46	46	46	53	53	53	54	54	54
7/13/1998-	Mkt. Share	-0.0048	-0.0048	-0.0042	-0.0020	-0.0021	-0.0019	-0.0018	-0.0019	-0.0020
8/23/2004		(0.002)	(0.002)	(0.006)	(0.149)	(0.131)	(0.159)	(0.081)	(0.077)	(0.055)
	Concentration	0.00011	0.00332	-0.00028	0.00004	0.00160	-0.00016	0.00002	0.00060	-0.00013
		(0.002)	(0.002)	(0.005)	(0.177)	(0.110)	(0.070)	(0.465)	(0.405)	(0.063)
	R^2	0.21	0.21	0.19	0.02	0.03	0.05	0.02	0.03	0.08
	# observations	55	55	55	54	54	54	56	56	56

The dependent variable is the mean rate change at a financial institution. The independent variables are market share and a measure of concentration. Market share is the financial institution's share of total deposits in a particular market. Three concentration measures are employed, the Herschel-Herfindahl Index (HHI), the three-firm concentration ratio, and the number of banks in the market. The numbers in parentheses are the probability values of the estimated coefficients.