Working Paper 8408

HOLDING COMPANY INTEREST-RATE SENSITIVITY:.
BEFORE AND AFTER OCTOBER 1979

by Gary Whalen

December 1984

Federal Reserve Bank of Cleveland

HOLDING COMPANY INTEREST-RATE SENSITIVITY: BEFORE AND AFTER OCTOBER 1979

Abstract

Since October 1979, market interest-rate movements have been frequent and large. Over the same time period, for a variety of reasons, competition has intensified in both bank loan and deposit markets. These developments have changed the benefits and costs of various types of **asset/liability** management strategies or alternatively a financial institution's level of interest-rate risk exposure. In this study, the rate-sensitivity postures of a sample of holding companies are examined over the 1977 to 1983 interval to determine whether and how **asset/liability** management strategies changed after October 1979. In general, the evidence suggests that holding companies reduced their exposure to rate risk in the immediate post-October 1979 period. However, this change does not appear to have been permanent. The data show a reversal of this pattern at a number of companies in 1982 and 1983.

I. Introduction

Changes in market interest rates have been relatively frequent and large recently, particularly since October 1979, when the Federal Reserve adopted a new procedure for monetary control. The new approach placed greater emphasis on the supply of bank reserves and less emphasis on confining short-term fluctuations in the federal funds rate.' As a result, the federal fundsrate

and other market rates became relatively more volatile. For example, the
standard deviation of the quarter-to-quarter change in the commercial paper
rate was 79 basis points over the 11-quarter period before the fourth quarter
of 1979. Over the ensuing 9 quarters it increased to 492 basis points. This
increase in variability has deeply concerned bank managers (and also bank
analysts, investors, and regulators), because sharp, unanticipated changes in
market rates can produce undesirable changes in a banking organization's net
interest margin and, thus, its profitability and market value.[2] Whether
market-rate gyrations adversely affected a particular institutions's
performance after October 1979 depends upon the rate-sensitivity posture
maintained by the organization during this time.

II. The Gap as an Index of Rate Sensitivity

The net interest margin (NIM) impact of a given change in market rates
occurring over some relatively <u>short</u> time period (90 days, for example)
<u>generally</u> depends upon the type and size of any banking organization's
cumulative rate-sensitivity gap relative to its volume of averaging earning
assets.[3] This gap is defined as the difference between the institution's
volume of rate-sensitive assets (RSAs) and its volume of rate-sensitive
liabilities (RSLs). Any asset or liability that can be repriced at some time
in the specified interval is classified as rate-sensitive and is included in
the respective total.[4] Symbolically, this relationship can be expressed as
follows:

$$CHNIM = \frac{\$GAP}{AEA} * CHR,$$

where

$$\text{CHNIM} = \text{NIM}_t - \text{NIM}_{t-1},$$

$$\text{\$GAP} = \text{RSA} - \text{RSL},$$

$$\text{AEA} = \text{total average earning assets, and}$$

$$\text{CHR} = R_T - R_{T-1},$$

where

R is some representative market rate of interest.

Given a relatively short time horizon, if an organization's volume of RSAs exceeds its volume of RSLs, or it has a positive gap, changes in its margin should be positively correlated with changes in market rates over that interval. The reason for this relationship is that more of the institution's assets than liabilities have rates that change as market rates change. So, given rising market rates, interest income should increase more than interest expense, causing the organization's net interest income and NIM to rise as well. The larger the gap relative to an institution's total volume of average earning assets, the larger the NIM impact of a given increase in rates. Obviously, given a positive gap, an organization's NIM falls along with market rates.

Conversely, given a relatively short time period, changes in an institution's NIM are negatively correlated with market-rate changes if it has a negative gap (RSLs > RSAs). Again, the larger the gap relative to total average earning assets, the larger the rate impact. The NIM of organizations that have a zero gap or are balanced (RSAs = RSLs) should not vary markedly in response to changes in market rates.[5]

It should be noted that the so-called typical relationships between bank gap positions, NIMs, and market rates described above may weaken or even

- 4 -

disappear as the hypothesized time horizon is lengthened.[6] That is, the NIM impact of a rate change assumed to occur over a longer time interval (1 year for example) might not be unambiguously related to an institution's 12-month cumulative gap position. One reason these relationships break down is that any given cumulative long-term gap position is consistent with a wide variety of different short-term incremental (that is, non-cumulative) gap positions. The ultimate NIM impact generated by some given change in rates assumed to occur over a 12-month period will depend on the distinctive pattern of short-term gaps at each individual institution. It will also depend on how the rates on the various types of assets and liabilities already on the institution's books respond to the given change in market rates, on how the short-term gap positions are reshaped over the period as various assets and liabilities mature, and on other factors as well.[7]

III. Asset/Liability Management Strategy

The discussion above suggests that bank management could have elected to pursue one of two asset/liability management strategies in the volatile rate environment that prevailed after October 1979. Management could have attempted to pursue an anticipatory gapping strategy (creating positive gaps prior to expected rate increases and negative gaps prior to expected rate declines), or it could have adopted and maintained a zero-gap position during this time.

The first strategy implies that management is willing to assume more risk to earn higher expected returns, because anticipatory gapping is potentially disastrous if rate expectations are not realized. The risks and potential

returns from such a strategy depend on the size of the gap opened. A zero-gap strategy implies a choice of lower expected returns in exchange for lower risk.

Management's choice of a strategy might be influenced by its degree of satisfaction with the organization's NM at the outset of any given period, its appetite for risk, and its ability to forecast interest rates.[8] Another important factor is management's ability to expeditiously alter the organization's gap position, given a particular rate outlook.[9]

If management is dissatisfied with its organization's NM level, if it has an appetite for risk, if it forecasts rates with confidence, and if it can reshape the organization's balance sheet in any desired fashion, then anticipatory gapping strategy becomes attractive and is likely to be pursued. On the other hand, if an institution's management is content with the current margin level, strongly dislikes taking risks, has little confidence in its ability to forecast rates, and is unable to alter the organization's gap position easily, a zero-gap strategy appears more attractive.

The shift by the Federal Reserve to a monetary aggregate targeting procedure in October 1979, in combination with several other forces, radically altered the operating environment of banks (and of all financial institutions). These developments affected the potential risks and returns of both kinds of asset/liability management strategies and so may have caused management to reevaluate, and perhaps alter, the strategy previously pursued.

In particular, the shift to a monetary targeting procedure caused both short-term and long-term interest rates to change more frequently and by much larger amounts than they had in the past. Irregular unprecedented movements in rates make accurate rate forecasting more difficult and anticipatory gapping increasingly risky.

At the same time, intra- and interindustry competition were becoming more intense for all firms supplying financial services. Regulatory barriers to pricing and product competition were being eliminated or circumvented. This increase in competition put pressure on the margins of banks and all other financial institutions. Management might be induced to gap more aggressively under such circumstances in an attempt to delay, or even reduce, margin shrinkage that stemmed from deregulation.

This study represents an attempt to determine whether and how the gap-management strategies pursued by a nonrandom sample of 41 regional bank holding companies located in 11 different states changed after October 1979.

IV. Evidence of Rate Sensitivity

A Direct Measure of the Rate-Sensitivity Gap

From 1979 to 1982, only a limited amount of information on the rate-sensitivity characteristics of holding company assets and liabilities was disclosed in published annual reports. It is possible to construct only 1 gap measure--a year-end, 12-month gap measure--for holding companies from available data. Even this gap measure requires a judgment about the rate-sensitivity characteristics of certain balance-sheet items. Thus, the gap measures used here, like any such measures, are relatively crude indexes of each company's exposure to market-rate changes. Examination of these measures across companies and changes in these measures over time indicate whether and how holding companies altered their rate-sensitivity postures since 1979.

Year-end 1979, 1980, 1981, and 1982 estimated gap figures for the sample companies are reported in appendix A Details concerning the construction of these measures are included in this appendix as well. The data in appendix A

indicate that only 9, or 22.0 percent, of the sample companies had positive 12-month gaps at year-end 1979. The mean 1979 gap ratio for the sample companies was -5.9 percent.

Little evidence of defensive balance-sheet adjustment is apparent from these gap measures through year-end 1980. The number of companies with negative gaps actually increased to 36. The mean gap hit -12.8 percent at year-end. The mean absolute value of the gap rose from 8.3 percent in 1979 to 14.4 percent in 1980, indicating that the companies generally did not reduce the size of their gap position (and so their exposure to rate risk) during 1980.

However, a reversal of the trend toward greater liability sensitivity was evident by the end of 1981. This might reflect an attempt by banks to take advantage of an expected rise in rates. On the other hand, it might indicate a general desire to move in the direction of a zero gap, given the unpredictable rate movements during this period. In this case, the mean 1981 gap position was -8.2 percent. A formal test indicated that the difference between the 1981 and 1980 mean gap ratios was highly significant. The change in the gap was positive at 33 companies.

The data suggest that companies generally reduced their interest-rate risk exposure during 1981. The absolute value of the gap declined at 32 of the sample companies, and the mean absolute value of the 1-year gap measures fell by roughly 5 percentage points to 9.8 percent.

The general movement in the direction of asset sensitivity continued during 1982. Thirty-eight companies exhibited positive gap changes. Twenty-one of the sample companies had positive one-year gaps at the end of this year. The mean 1982 gap position was -0.1 percent. However, the

mediangap was slightly positive at 0.7 percent. The difference between the .
1982 and 1981 mean gap measures is again statistically significant.

The absolute value gap measures indicate that holding companies generally
were unwilling to bear as much rate risk as in the past. The mean absolute
value of the gap again declined to 6.3 percent and was below the 1979 level.
The absolute value of the gaps of 32 companies was lower in 1982 than it had
been in 1981. Twenty-five of the companies reduced the absolute value of
their gaps in both of the two preceding years.

Indirect Rate-Sensitivity Gap Measures

NIM beta. As noted in section II, relatively long-term gap measures (like
12-month measures) provide only limited insight on holding company exposure to
rate changes occurring over shorter intervals, such as a month or a quarter.
Determination of this exposure requires detailed knowledge of each
institution's shorter-term gap positions--its 30- or 90-day gap.

Few holding companies published the data necessary to construct such
short-term gap measures over the 1979 to 1982 interval. However, it is
possible to obtain two types of estimates of holding company short-term gap
positions using non-balance-sheet data that are available.

The correlation between changes in an organization's NIM and changes in
market rates occurring over relatively short time periods generally depends
upon its short-term gap position. A positive correlation indicates it has a
positive short-term gap; a negative correlation, a negative short-term gap; a
zero correlation, a zero short-term gap. This suggests that the regression
coefficient obtained by regressing the short-run change in a holding company's
NIM on the corresponding change in a representative market rate of interest

can be used as an estimate of its short-term gap position.[10] We will refer
to this coefficient here as a company's NIM beta. The sign of the estimated
coefficient indicates the nature of its gap--a positive coefficient, a
positive gap and vice-versa. The statistical significance and absolute value
of the coefficient provide insight to the size of the gap; a significant large
coefficient implies a large-gap position. An insignificant coefficient
suggests that an institution is roughly balanced.

Quarterly net-interest margin data were used to estimate such a regression
for each of the sample companies for several subperiods from the first quarter
of 1977 to the third quarter of 1983. The regression results are detailed in
appendix B.

Although a large proportion of the companies had negative 1-year gaps in
1979, relatively few (16) exhibited negative regression coefficients from the
third quarter of 1977 to the third quarter of 1979. Just two of these
companies had coefficients significant at the 10 percent level (2-tail test).
Twenty-five of the companies had positive coefficients, suggesting positive
short-term gaps. However, only two of these positive coefficients were
significant. The mean coefficient for the companies with negative
coefficients was -0.0678, and for the companies with positive coefficients it
was 0.0757. The mean absolute value of the coefficients for all companies was
0.0726 for the pre-October 1979 period.

Coefficients obtained from regressions estimated over the entire period
from the fourth quarter of 1979 to the third quarter of 1983 suggest that
short-term gap position adjustments were similar to the longer-term gap
changes noted above. In particular, a movement in the direction of asset
sensitivity is evident after 1979. A total of 31 companies exhibit

positivecoefficients for this interval; 13 of these are significant. Only ten companies had negative coefficients, with just one being significant. Further, the regression results suggest that companies generally maintained smaller short-term gap positions in the post-October 1979 interval.

The coefficient for companies with positive coefficients is 0.0353; for the companies with negative coefficients, it is -0.0219. The absolute value of the coefficient declined at 33 of the sample companies, and the mean absolute value of the coefficient is roughly one-half what it was in the pre-October 1979 period: 0.0320 as opposed to 0.0726.

However, if the post-October 1979 period is broken into two subperiods of roughly equal length (from the fourth quarter of 1979 to the fourth quarter of 1981 and from the first quarter of 1982 to the third quarter of 1983), the regression results suggest short-term rate-sensitivity adjustments not apparent when the entire period is examined.

The results indicate that most companies (36) had positive short-term gaps in the first post-October 1979 subperiod. Eighteen of the 36 regression coefficients are significant. This presumably reflects the expectation that short-term rates would rise over this interval. Just one of the five negative coefficients is significant. The mean coefficient for the companies with positive coefficients was 0.0396, as opposed to -0.0382 for the companies with negative coefficients. The mean absolute value of all coefficients was 0.0394.

Estimated coefficients for the second subperiod suggest the short-term gaps of most companies turned negative toward the end of 1981. This may reflect deliberate adjustments to take advantage of an expected decline in short-term rates or an inability to offset liability composition changes dueto the introduction of money market deposit accounts (MMDAs).[11] Thirty-six of

the estimated coefficients are negative for this interval; thirteen of these are significant. The mean of the negative coefficients was -0.0813. The mean of the positive coefficient was 0.0551. The mean absolute value of all coefficients was 0.0782. The latter is well above the corresponding value for the 1979 to 1981 period, indicating that companies were generally willing to assume more interest-rate risk after 1981.

Debt index beta. It is possible to derive another measure of interest-rate sensitivity for publicly traded bank holding companies from stock market data. Essentially this is accomplished by regressing the periodic rate of return on a holding company's stock on some type of interest-rate index and some broad stock-market index (which has been orthogonalized with respect to the interest-rate index to eliminate correlation between the two independent variables).[12]

A variety of interest-rate indexes have been employed in previous research. In most studies, the rate of return on a debt instrument or bond index has been used; this is the approach taken in this study.[13] Although several alternatives were employed, the results reported are from regressions where the rate of return on an index of high-grade corporate bonds was used as the interest-rate index.[14]

The estimated coefficient on the bond index return variable in the regression equation is an estimate of the market's view of the rate-sensitivity posture of a holding company. It is termed the debt index beta in this study. Since bond returns move inversely with interest rates, a positive significant coefficient on the bond return variable indicates that the company's market value declines when market rates rise. This suggests that the market considers the company to be liability-sensitive (RSL > RSA).

Larger positive coefficients suggest larger negative gaps. The market value of companies with relatively large positive gaps should not decline significantly as rates rise, because their profitability should move in tandem with market rates. Thus, such companies should exhibit negative or insignificant positive debt index return coefficients.[15]

The regression results for the sample companies appear in appendix C. Monthly rate-of-return data were used. Again, the regressions are estimated for a variety of subperiods from January 1977 to September 1983.

The mean bond index return coefficient, or mean debt index beta, was 0.0085 for the sample companies in the pre-October 1979 period. Ten of these coefficients are significant at the 10 percent level if a 2-tailed hypothesis test is conducted. The mean coefficient for these 10 companies was 0.0147.

The mean debt index beta coefficient was 0.0053 for the sample companies when the regressions were estimated for the entire post-October 1979 period. The coefficients of 18 companies were lower for this interval than they were in the preceding period. However, 34 of the coefficients are significant in the latter period. Thus, the debt index beta results for the entire post-October 1979 interval seem to conflict with the NM beta results for the same period.

Regression results for October 1979 to December 1981 yield a mean debt index beta coefficient of 0.0055 for all sample companies. The mean coefficient is 0.0064 for the 29 companies with significant coefficients. These findings suggest that many companies were viewed by the market as liability-sensitive over this period, although the NM beta findings, and to a lesser extent the long-term gap measures, suggest a general movement in the direction of asset sensitivity. The coefficients of 27 sample companies

were lower in this period than they had been before October 1979, confirming the decreased willingness to bear rate risk revealed by the other 2 measures for this time period.

Results for the January 1982 to September 1983 period reveal that the mean coefficient for all sample companies declined slightly to 0.0053. However, the mean debt index beta coefficient for 19 companies with significant coefficients was 0.0086--above the value for similar companies in the preceding time period. Thus, the debt index beta results do not reflect the marked shift to short-term liability sensitivity after 1981 that is indicated by the NIM beta measures.

The 1982 to 1983 coefficients of only 18 companies were smaller than in the previous period. The 1982-83 coefficients of 27, or roughly two-thirds, of the sample companies were below the value for the pre-October 1979 interval. However, only ten companies showed consistent period-to-period declines over the entire 1977-83 interval. These results confirm the bounce-back (suggested by the NIM beta measures) in the willingness of holding companies to bear rate risk.

V. A Comparison of the Findings Obtained Using the Alternative Rate-Sensitivity Measures

The different measures of rate sensitivity produce slightly different pictures of changes in holding company gap-management strategy from 1977 to 1983. This point becomes more clear if the three different rate-sensitivity measures derived for each company are correlated with one another across companies for each of the three sub-intervals examined (see table 1).

Table 1   Correlation Coefficients

Rate-sensitivity measures	NIM beta	Debt index beta
12-month gap[a]		
Jan. 1977–Sept. 1979	-.047	.051
Oct. 1979–Dec. 1981	.271[b]	-.294[b]
Jan. 1982–Sept. 1983	-.131	-.045
NIM beta		
Jan. 1977–Sept. 1979	---	-.133
Oct. 1979–Dec. 1981	---	-.069
Jan. 1982–Sept. 1983	---	.032

a. The gap measure used for the October 1979 to December 1981 period was an average of the 1979, 1980, and 1981 year-end gap figures.   For the January 1982 to September 1983 interval, the gap measure was the 1982 year-end figure.

b. Significant at the 10 percent level, 2-tailed test.

As noted in section II, any long-term gap position can be consistent with a wide variety of shorter-term gap positions. Thus, the relationship between a company's 12-month gap measure and the other rate-sensitivity measures is not clear, a priori. However, since the 12-month gap is determined by a company's sequence of shorter-term gaps, it seems reasonable to expect to find a positive correlation between the company's 12-month gap and NIM beta, although the correlation might be weak. A significant positive correlation was discovered, but only for the October 1979 to December 1981 interval. The correlations for the other intervals were negative and weak.

Similarly, the relationship between a company's 12-month gap measure and its debt index beta could be loose. However, a negative correlation between such measures appears more likely than a positive one. A significant negative relationship was detected but, as was the case above, only for the October 1979 to December 1981 period.

The relationship between the NIM beta and debt index beta measures also is not determinate, but a negative relationship appears likely. A negative correlation was found in only two of the three periods examined, and none of the correlations is significant.

Each measure does paint a slightly different picture of the rate-sensitivity posture of the sample companies over this time period. However, the three sets of measures taken together indicate that holding companies generally changed their rate-sensitivity postures. Prior to October 1979, the typical holding company had a negative long-term gap. However, the NIM beta and debt index beta measure results suggest that they did not typically have large negative short-term gaps during this time period as well. Changes in the sample companies' 12-month gap and NIM beta measures in

the immediate post-October 1979 period suggest that companies reacted to the rate volatility in this interval by moving toward asset sensitivity. The NIM beta results seem to indicate that most companies managed to adjust their short-term gap positions quickly in this manner. However, the debt index beta results suggest that the market discounted short-term gap adjustments and penalized companies with longer-term negative gaps. The general decline in the size of all of the rate-sensitivity measures indicates that most companies maintained smaller gap positions during this interval.

Results for the final subperiod reveal that the rate-sensitivity trends first evidenced after October 1979 generally did not continue. The NIM beta results indicate that the short-term gaps of many companies turned from positive to negative. Further, two of the three measures suggest either that holding companies became more willing to assume interest-rate risk in the 1982 to 1983 period, or that they were forced to do so because of an inability to offset changes in liability composition that were due to deposit-rate deregulation.

VI. Summary and Conclusions

The results suggest that holding companies did alter their rate-sensitivity postures after October 1979. In the 1980 to 1981 period, holding companies generally moved toward asset sensitivity and reduced the size of their gap positions. However, the changes varied across companies and do not appear to have been permanent. This behavior is not surprising in view of the factors influencing management's choice of an appropriate asset/liability management strategy as identified above. For example, gapping might have

appeared less risky (and so more attractive) as rate volatility declined in 1981, and the Federal Reserve announced that it would abandon its strict monetary targeting strategy. On the other hand, margin pressures may have forced management to take on more risk to boost expected returns. It is also possible that holding company management became more willing to assume rate risk in 1982 and 1983, because it had finally detected and corrected perceived deficiencies or improved the asset/liability management practices used before October 1979.

Given that a company's optimal rate-sensitivity posture is a function of several factors that typically change over time, it is not possible to unambiguously determine a single correct posture for all companies for all times. Thus, it is not possible to conclude that the adjustments evident in the most recent period are inappropriate. This implies that it would be difficult to implement a system of deposit insurance pricing that ties an institution's premium to a measure of its interest-rate risk without generating a variety of unintended, perhaps undesirable, changes in bank behavior. Until more is known about how banks determine their overall risk exposure and exposure to the various kinds of risk, the benefits and costs produced by changing the incentives for banks to take particular types of risks will remain uncertain. Given this uncertainty, regulatory changes that affect the willingness of banks to take risks should be carefully considered.

Appendix A

The 12-month gaps listed in table 2 were derived by subtracting each
institution's estimated total volume of rate-sensitive liabilities (that is,
those subject to repricing over the ensuing 12-month interval) from its
estimated volume of rate-sensitive assets. This total was then divided by the
institution's average earning assets. All data were drawn from bank holding
company annual reports. Total estimated rate-sensitive liabilities were
assumed to be the sum of large-denomination ($100,000) certificates of deposit
(CDs), deposits in foreign offices, federal funds purchased, securities sold
under agreement to repurchase, other debt with an original maturity of one
year or less, and long-term debt with a remaining maturity of one year. In
addition, the mean ratio of money market certificates to total deposits (less
large CDs) for all banks in each holding company's state for each year in the
period was used as an estimate of the percentage of its small-denomination
time deposits that were rate-sensitive. This percentage times its volume of
total deposits (less large CDs) produced an estimate of rate-sensitive
small-denomination time deposits and was included in the liability total.
Total rate-sensitive assets were the sum of federal funds sold, securities
purchased under agreements to resell, investment securities with remaining
maturity of one year or less, trading account securities, floating-rate loans,
and fixed- rate loans with remaining maturities of one year or less.

Table 2   Holding Company 12-Month Gaps

Company	Gap 1979	Gap 1980	Gap 1981	Gap 1982
AL-1	-.004	-.151	-.030	.012
AL-2	-.156	-.248	-.126	-.093
AL-3	.025	-.081	-.028	.073
AL-4	-.046	-.142	-.108	.017
AL-5	-.085	-.180	-.082	-.128
CO-1	-.067	-.058	.014	.077
CO-2	-.104	-.158	-.222	-.097
FL-1	-.061	-.167	-.096	.088
FL-2	-.150	-.278	-.164	-.014
FL-3	-.111	-.253	-.227	-.103
FL-4	-.123	-.101	-.080	-.018
FL-5	-.008	-.174	-.153	-.042
MA-1	.022	.093	.115	.219
MI-1	-.059	-.189	-.072	-.053
MO-1	.099	-.053	-.075	.017
MO-2	-.107	-.190	-.130	-.056
MO-3	.103	.158	.051	.327
MO-4	.044	.054	-.009	.029
NJ-1	.038	-.081	-.067	.037
NJ-2	-.123	-.125	-.043	-.017
NJ-3	.003	-.043	-.023	.015
NJ-4	-.053	-.107	-.060	.038
NJ-5	-.052	-.152	-.064	.028
OH-1	-.152	-.144	-.082	.007
OH-2	-.198	-.311	-.198	-.067
OH-3	-.143	-.249	-.122	.030
OH-4	-.067	-.150	-.110	-.022
TN-1	-.112	-.124	.028	.022
TN-2	-.178	-.185	-.143	-.057
TN-3	-.030	-.225	-.155	-.110
TX-1	.136	.036	.134	.058
TX-2	-.233	-.291	-.262	-.154
TX-3	.031	-.089	-.057	.062
TX-4	.006	.002	-.037	.060

- 20 -

Table 2 Holding Company 12-Month Gaps (Continued)

Company	Gap 1979	Gap 1980	Gap 1981	Gap 1982
VA-1	-.096	-.127	-.106	.014
VA-2	-.080	-.173	-.039	.044
VA-3	-.040	-.147	-.177	-.117
VA-4	-.065	-.147	-.157	-.101
VA-5	-.068	-.117	-.059	-.024
WI-1	-.025	-.080	-.084	-.048
WI-2	-.111	-.090	-.043	-.010

Appendix B Regression Results: NIM Betas

Company	77:3Q-79:3Q		79:4Q-83:3Q		79:4Q-81:4Q		82:1Q-83:3Q	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
AL-1	.0699	1.38	.0143	0.81	.0241	1.22	-.0862	-2.20*
AL-2	.2314	4.70*	.0372	1.72	.0547	2.93*	-.1379	-2.73*
AL-3	.0327	0.55	.0107	0.40	.0163	0.57	-.0817	-2.50*
AL-4	,0307	0.70	.0530	2.29*	.0637	2.23*	-.0727	-4.25*
AL-5	-.0548	-0.82	0255	1.56	.0376	2.44*	-.0983	-2.35*
CO-1	-.1128	-3.22*	.0616	3.57*	.0694	3.82*	-.0252	-0.47
CO-2	.0316	0.43	.0287	1.23	.0412	2.06*	-.0885	-1.03
FL-1	-.1139	-1.84	.0388	1.29	.0345	1.07	.0392	0.52
FL-2	.0214	0.38	.0387	1.86*	.0462	3.00*	-.0317	-0.33
FL-3	-.0267	-0.47	.0257	1.37	.0359	2.04*	-.0595	-1.72
FL-4	-.0614	-1.60	-.0010	-0.05	.0097	0.40	-.1193	-2.21*
FL-5	-.1219	-3.36*	.0407	1.89*	.0571	3.30*	-.1268	-1.93
MA-1	.0596	1.62	.0150	0.84	.0298	1.92*	-.1053	-2.20*
MI-1	.0338	0.62	.0154	0.87	.0304	2.02*	-.1291	-5.37*
MO-1	.1292	0.98	.0802	1.70	.1092	2.50*	-.2276	-1.55
MO-2	-.0104	-0.25	-.0170	-0.75	-.0343	-3.82*	.1671	1.90
MO-3	.0901	1.02	-.0108	-0.20	.0015	0.05	-.1820	-0.69
MO-4	-.0300	-0.66	.0152	0.90	.0195	0.86	-.0138	-0.33
NJ-1	-.0310	-0.32	.0641	1.87*	.0615	1.16	-.0037	-0.43
NJ-2	-.0401	-1.55	-.0253	-0.88	-.0271	-0.86	-.0319	-0.33
NJ-3	-.1099	-1.19	-.0006	-0.05	.0033	0.33	-.0690	-2.65*
NJ-4	-.1211	-0.80	.0381	1.49	.0382	0.53	.0285	0.28
NJ-5	.1314	0.51	.0101	0.50	.0153	0.60	-.0460	-0.85
OH-1	-.0397	-0.44	.0024	0.10	.0147	0.48	-.1269	-4.89*
OH-2	.1969	1.41	-.0924	-1.12	-.0902	-0.28	-.0637	-0.56
OH-3	.0907	1.13	.0243	0.12	.0221	0.63	-.1572	-1.28
OH-4	-.1769	-1.55	-.0404	-2.04*	-.0266	-1.59	-.1751	-2.72*
TN-1	.0144	0.28	.0473	1.87*	.0662	5.70*	-.0366	-0.30
TN-2	.0460	0.43	-.0027	-0.21	.0093	0.76	-.0196	-0.53
TN-3	.0613	0.79	.0292	2.01*	.0471	3.09*	-.0442	-1.04
TX-1	.1106	0.58	.0645	2.72*	.0728	3.42*	-.0514	-0.76
TX-2	.0492	0.82	.0276	1.20	.0459	2.97*	-.1238	-1.84
TX-3	.0094	0.14	.0645	4.11*	.0680	4.21*	-.0092	-0.29
TX-4	-.0126	-0.16	.0568	2.34*	.0875	4.17*	-.0566	-0.65*

- 22 -

Appendix B Regression Results: NIM Betas (Continued)

Company	77:3Q-79:3Q Coeff.	t-stat.	79:4Q-83:3Q Coeff.	t-stat.	79:4Q-81:4Q Coeff.	t-stat.	82:1Q-83:3Q Coeff.	t-stat.
VA-1	.0869	1.55	-.0072	- 0.41	.0032	0.25	-.0513	- 0.71
VA-2	.0035	0.05	.0345	1.84*	.0413	0.76	-.0412	- 0.81
VA-3	-.0222	0.51	.0444	2.38*	.0461	2.53*	.0303	0.38
VA-4	.0942	2.10"	.0048	0.27	.0035	0.17	.0136	0.23
VA-5	.1011	1.53	.0550	2.06*	.0641	1.82	-.0426	-1.30
WI-1	.1247	1.53	-.0211	1.03	-.0130	-0.70	-.1238	-1.82
WI-2	.0419	0.53	.0258	1.33	.0342	1.32	-.0683	-5.78

* Significant at the 10 percent level, 2-tail test.

Appendix C Regression Results: Debt Index Betas

Company	77:2 - 79:9 Coeff.	77:2 - 79:9 t-stat.	79:10 - 83:9 Coeff.	79:10 - 83:9 t-stat.	79:10 - 81:12 Coeff.	79:10 - 81:12 t-stat.	82:1 - 83:9 Coeff.	82:1 - 83:9 t-stat.
AL-1	.0125	1.51	.0055	4.59*	.0051	3.57*	.0053	2.07*
AL-2	.0053	0.62	.0080	3.66*	.0075	3.27*	.0068	1.29
AL-3	.0173	1.97*	.0041	2.64*	.0039	2.11*	.0057	1.74"
AL-4	.0198	2.54*	.0038	1.97*	.0030	1.24	.0077	1.96*
AL-5	.0079	0.90	.0078	4.50*	.0061	3.12*	.0108	2.78*
CO-1	.0136	1.40	.0050	2.70*	.0049	2.09*	.0080	2.36*
CO-2	.0148	2.20*	.0071	3.56*	.0072	3.88*	.0095	1.82*
FL-1	.0057	0.97	.0053	2.77*	.0038	1.76*	.0100	2.45*
FL-2	.0171	2.12*	.0025	1.17	.0038	1.42	-.0010	-0.26
FL-3	.0024	0.33	.0046	1.15	.0055	0.92	.0041	1.09
FL-4	.0238	3.35*	.0050	2.92*	.0038	1.67	.0092	2.88*
FL-5	.0090	1.10	.0077	4.26*	.0078	3.40*	.0080	2.25*
MA-1	.0126	1.87*	.0063	3.27*	.0056	3.08*	.0099	1.93*
MI-1	.0039	0.87	.0057	3.43*	.0049	2.69*	.0063	2.11"
MO-1	.0013	0.20	.0003	0.46	-.0002	-0.29	.0003	0.34
MO-2	.0078	2.05*	.0061	5.52*	.0057	3.98*	.0069	3.18*
MO-3	.0044	0.48	.0001	0.05	.0009	0.38	.0030	0.68
MO-4	.0011	0.30	.0017	0.97	.0030	1.65	-.0042	-1.03
NJ-1	.0052	1.13	.0075	3.08*	.0057	3.72*	.0139	1.87*
NJ-2	.0068	0.96	.0055	3.06*	.0049	2.64*	.0063	1.48
NJ-3	.0061	0.88	.0068	3.37*	.0061	2.40*	.0079	1.91*
NJ-4	.0095	1.04	.0093	4.54*	.0101	3.74*	.0070	1.92*
NJ-5	.0087	1.31	.0074	4.50*	.0064	3.24*	.0103	2.82*
OH-1	.0016	0.21	.0049	2.17*	.0039	1.27	.0061	1.52
OH-2	.0080	1.76*	.0053	2.01*	.0055	1.67	.0046	0.85
OH-3	.0064	0.83	.0041	2.01*	.0053	2.29*	.0010	0.21
OH-4	.0104	1.95*	.0081	5.39*	.0076	4.15	.0092	3.02*
TN-1	.0025	0.28	.0065	3.69*	.0076	3.95*	.0033	0.83
TN-2	.0045	0.51	.0062	2.97*	.0059	2.59*	.0054	1.09
TN-3	.0113	1.32	.0040	1.78*	.0059	2.29*	.0039	0.86
TX-1	.0155	1.67	.0046	2.02*	.0068	2.97*	.0008	0.15
TX-2	.0060	1.24	.0061	3.12*	.0073	4.13*	.0071	1.54
TX-3	.0058	0.86	.0021	1.27	.0036	1.56	.0020	0.41
TX-4	.0094	1.30	.0009	0.43	.0037	1.54	.0067	1.54

Appendix C Regression Results: Debt Index Betas (Continued)

Company	77:2 - 79:9		79:10 - 83:9		79:10 - 81:12		82:1 - 83:9	
	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.	Coeff.	t-stat.
VA-1	.0062	1.06	.0076	4.56*	.0063	3.11*	.0107	2.98*
VA-2	.0089	1.53	.0078	3.99*	.0085	4.37*	.0071	1.43
VA-3	.0149	2.29*	.0069	3.51*	.0066	3.12*	.0068	1.42
VA-4	.0047	0.74	.0040	2.16*	.0041	1.90*	.0037	0.86
VA-5	.0089	0.76	.0049	2.23*	.0049	1.65	.0048	1.36
I-1	.0034	0.40	.0069	3.64*	.0061	2.53*	.0064	1.85*
WI-2	.0019	0.29	.0073	2.70*	.0105	3.15*	-.0044	-0.93

*Significant at the 10 percent level, 2-tail test.

Footnotes

1.   Although the procedure was changed again in August 1982, the emphasis on reserve supply remains relatively greater than before 1979.

2.   Bank non-interest income is relatively stable and less than operating expense.   Thus, net interest earnings are the key determinant of overall profitability.

3.   A number of authors have made a strong case in favor of using the concept of duration analysis to create an alternative index measure of rate sensitivity--the so-called duration gap.   For a discussion of duration-gap models, see Toevs and Haney (1984).   While duration-gap measures have a number of attractive properties relative to periodic gap models, they do have one particularly nettlesome drawback--1arge amounts of very detailed asset/liability characteristic information are required to construct them. This is why such measures are not used in this study.

4.   Actually, precise measurement of rate-sensitive assets and liability totals is quite complicated.   For example, interest-rate and principal payments received must be considered, prepayments and defaults should be estimated, and estimates of the rate-sensitive portions of liabilities without explicit maturities must be obtained.   For a discussion of these issues, see the studies in footnote 6.

5.   This discussion and all that follows presume that banks do not hedge exposed gap positions with off-balance-sheet devices such as interest-rate futures or other techniques such as interest-rate swaps.   Available evidence suggests that most banks did not actively hedge their gap positions in this way from 1979 to 1982.

6.   For an extensive discussion of problems and complications involved in gap models, see Binder and Lindquist (1982), Kaufman (1984), and especially Toevs (1983) and Toevs and Haney (1984).

7.   Again, off-balance hedging could alter these relationships and is assumed to be immaterial.

8.   Management's choice of interest-rate risk exposure has a direct and indirect impact on the organization's total risk exposure, because it influences other dimensions of risk.   For example, interest-rate risk exposure affects an institution's credit risk and liquidity risk.

9.   Both strategies presume that bank management is able to exercise a considerable amount of control over its organization's rate-sensitivity posture.   Realistically, desired balance-sheet adjustments take time and can be costly.   Desired gap adjustments may be constrained by conflicting customer preferences and competitive pressures.

10. Such a technique was used in Olson and Simonson (1982). Here, the 90-day negotiable CD rate was used as the representative market rate.

11. The MMDA was essentially the first retail deposit product without a rate ceiling. Financial institutions could thus attempt to bid funds away from competitors. However, since this was not possible in the past, customer and competitor reaction to MMDA pricing differentials were unknown. As a result, prediction of inflows into MMDAs was subject to error, and inflows probably surprised asset/liability managers at most institutions. MMDAs at commercial banks went from zero in November 1982 to over $185 billion by the end of the first quarter of 1983. Because the maximum nominal maturity on MMDAs is one month (and the effective maturity could be less), these funds constitute relatively short-term liabilities. Large inflows may have resulted in undesired increases in liability sensitivity.

12. See Chance and Lane (1980), Lloyd and Shick (1977), Lynge and Zumwalt (1980), and Flannery and James (1984b).

13. Actually, the interest-rate index should be a measure of unanticipated rate movements--that is, a white-noise process. Formal statistical tests indicated that the index used in this study could be treated as a white-noise process and so the rate series was not transformed in any way. Flannery and James (1984b) found that their results were not affected when they used various original rate series instead of a pre-whitened series.

14. Specifically, the Salomon Brothers rate of return index for a portfolio of high-grade corporate bonds was used in the regressions reported.

15. It is uncertain whether asset-sensitive companies will exhibit negative significant coefficients. Some observers have argued that the market values of asset-sensitive companies will not change significantly as market rates change, because the net income of such companies will rise and fall in tandem with market rates and, presumably, the rates investors use to discount their cash flow streams of banking organizations.

References

Aspinwell, Richard C. "Managing Interest Rate Risk: The Basic Concepts," Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, April 12-14, 1982, pp. 463-70.

Biderman, Mark. "Monitoring and Measuring Interest Rate Risks," Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, April 12-14, 1982, pp. 471-83.

Binder, Barrett F., and Thomas W.F. Lindquist. Asset/Liability and Funds Management at U.S. Commercial Banks, A Research Report Prepared for Bank Administration Institute's Accounting and Finance Commission, Rolling Meadows, IL: Bank Administration Institute, 1982.

Chance, Don M., and William R. Lane. "A Re-examination of Interest Rate Sensitivity in the Common Stock of Financial Institutions," Journal of Financial Research, vol. 3, no. 1 (Spring 1980), pp. 49-55.

Dew, James Kurt. "Interest Rate Risk Management: Maximizing Earnings at Minimum Risk," Proceedings of a Conference on Bank structure and Competition, Federal Reserve Bank of Chicago, April 12-14, 1982, pp. 492-503.

Flannery, Mark J., and Christopher M. James. "Market Evidence on the Maturity of Bank Assets and Liabilities," Journal of Money, Credit and Banking, vol. 16, no. 4 (November 1984a), pp. 435-45.

_____. "The Effect of Interest Rate Changes on the Common Stock Returns of Financial Institutions," Journal of Finance, vol. 39, no. 4 (September 1984b), pp. 1141-53.

Graddy, Duane B., and Adi S. Karna. "Net Interest Margin Sensitivity among Banks of Different Sizes," Journal of Bank Research, Winter 1984, pp. 283-90.

Hanweck, Gerald A., and Thomas E. Kilcollin. "Bank Profitability and Interest Rate Risk," Research Papers in Banking and Financial Economics, Division of Research and Statistics, Board of Governors of the Federal Reserve System, July 1981.

Kaufman, George G. "Measuring and Managing Interest Rate Risk: A Primer," Economic Perspectives, Federal Reserve Bank of Chicago, January/February 1984, pp. 16-29.

Lindhart, Ronald A., and Robert R. Klinzing. "Measuring and Monitoring Interest Rate Risk: A Regulator's Viewpoint," Proceedings of a Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago, April 12-14, 1982, pp. 484-91.

Lloyd, William P., and Richard A. Shick. "A Test of Stone's Two-Index Model of Returns," Journal of Financial and Quantitative Analysis, September 1977, pp. 363-76.

Lynge, Morgan J., Jr., and J. Kenton Zumwalt. "An Empirical Study of the Interest Rate Sensitivity of Commercial Bank Returns: A Multi-Index Approach," Journal of Financial and Quantitative Analysis, vol. 15, no. 3 (September 1980), pp. 731-42.

Martin, John D., and Arthur J. Keown. "Interest Rate Sensitivity and Portfolio Risk," Journal of Financial and Quantitative Analysis, June 1977, pp. 181-95.

Olson, Ronald L., and Donald G. Simonson. "Gap Management and Market Rate Sensitivity in Banks," Journal of Bank Research, Spring 1982, pp. 53-8.

Toevs, Alden L. "Gap Management: Managing Interest Rate Risk in Banks and Thrifts," Economic Review. Federal Reserve Bank of San Francisco, no. 2 (Spring 1983), pp. 20-35.

_____, and William C. Haney. Measuring and Managing Interest Rate Risk: A Guide to Asset/Liability Models Used in Banks and Thrifts. New York: Morgan Stanley, October 1984.