A Statistical Analysis of the Factors Affecting S&Ls' Net Interest Margins

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Introduction and Summary

After an extended period of declining interest rates in the early 1990s, rates began to increase in February 1994. By year end, the one-year Treasury yield had increased more than 350 basis points and the ten-year Treasury yield had increased nearly 200 basis points.

Because most S&Ls have asset durations that are greater than their liability durations, their income is typically expected to decline when interest rates increase. What we observed during the 1994 rate run-up, however, was that net interest margin (NIM) for the industry as a whole remained relatively stable compared to its 1993 level. During 1994, the NIM of the median institution declined only 7 basis points and NIM actually increased for 41 percent of institutions.

In this Risk Management Release we examine the factors that con-

tributed to changes in NIM, both negative and positive, during 1994. Our analysis indicates that although interest rate exposure contributed to a decline in NIM for many institutions, there were a number of other factors that had a significant <u>positive</u> effect on NIMs and resulted in the relative stability of NIM for the industry as a whole. The most important of these factors were:

- The ability of institutions to retain nonmaturity deposits as rates rose even though increases in the offered rates on their deposits lagged behind increases in market rates.[1]

- A shift toward assets with higher credit risk, and presumably higher yields. A number of institutions also increased their relative holdings of fixed-rate mortgages (FRMs). FRMs typically have higher coupons than adjustable-rate mortgages (ARMs) but increase most S&Ls' interest rate exposure.

- An increase in interest-earning assets relative to interest-bearing liabilities.

- The rolloff of older, high-rate CDs issued in the early 1990s.

In the next section, we examine how interest income and interest expense for the thrift industry changed in 1994 relative to 1993. In Section III, we describe in more detail the factors that significantly affected the change in NIM.

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[1]   Nonmaturity deposits include transactions accounts, MMDAs, and passbook accounts.

Changes in Interest Income and Expense in 1994

When interest rates increase, we expect thrift interest income and interest expense to increase. For thrifts whose asset duration is longer than that of liabilities, we expect interest expense to increase faster than interest income, resulting in a decline in net interest income. The opposite would be true for thrifts with a longer liability duration than asset duration. That is, income should increase faster than expense, resulting in an increase in net interest income.

Surprisingly, instead of interest income and interest expense both increasing in 1994, interest income, as a percent of assets, declined for 53 percent (684/1294) of institutions analyzed, and interest expense fell for 42 percent (547/1294) of institutions (see Table 1).[2]

Median NIM for the industry declined only 7 basis points during 1994 as interest rates rose significantly. The cause of this modest decline was unexpected. While median interest expense increased by 4 basis points, median interest income unexpectedly declined 2 basis points.

Of the 534 institutions with an increased NIM in 1994, more institutions actually saw interest expense decline (332 thrifts) than increase (202 thrifts). For these institutions, the median increase in NIM was 21 basis points, with median interest income increas-

Table 1. Direction of Change in Interest Income and Expense in 1994 Relative to 1993
(Number of Institutions in Each Category)

Interest Expense/ Assets	Interest Income/Assets		
	Increased	**Decreased**	**Total**
(All Thrifts)			
Increased	378	369	747
Decreased	232	315	547
Total	610	684	1294
(Thrifts w/Increased NIM)			
Increased	202	0	202
Decreased	232	100	332
Total	434	100	534
(Thrifts w/Decreased NIM)			
Increased	176	369	545
Decreased	0	215	215
Total	176	584	760

ing 19 basis points, and median interest expense declining 4 basis points.

Of the 760 institutions with a decline in NIM, only 215 experienced declining interest expense. The median decrease in NIM was 27 basis points, with median interest income decreasing 17 basis points, and median interest expense increasing 10 basis points.

The large number of institutions experiencing declining interest income and expense as market rates increased in 1994, suggests there were other factors that accounted for the changes in NIMs. In the next section we describe those factors.

Factors Affecting Changes in NIM

To determine what factors influenced changes in NIMs, we performed a cross-sectional regression analysis using as the dependent variable the average NIM in 1994 minus the average NIM in 1993 for each institution. The factors that had a significant influence on NIM are discussed in this section. The first three factors have an inverse relationship to NIM. That is, the higher their value, the bigger the decline (or smaller the increase) in NIM. The remaining seven factors have a positive relationship to NIM.

Table 2 provides statistics on each variable for the group of 534 institutions for which NIM increased in 1994, and the 760 institutions for which NIM

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[2] The data set for this study consisted of 1,294 institutions for which OTS NPV Model Exposure Report results were available for all eight quarters of the 1993 through 1994 period.

decreased. The value of each variable is listed at the 10th, 50th, and 90th percentiles for each income group.[3] All variables that represent the change in some financial ratio (such as the change in the ratio of nonmaturity deposits to liabilities) are calculated as the average ratio in 1994 less the average ratio in 1993, and thus are positive if that ratio increased.

Table 3 lists the results of the regression analysis including the regression coefficients, the standardized regression coefficients, and the significance level of the associated t-statistics.[4]

Duration Mismatch (Variable 1)

The more an institution's asset duration exceeds its liability duration, the more its net portfolio value (NPV) is expected to decline in a rising rate environment. For most S&Ls, the duration of assets is greater than that of liabilities. The median asset duration for the industry was estimated by the OTS Net Portfolio Value Model to be 1.78 percent as of March 1994, while that of liabilities was 1.61 percent.[5]

Variable 1 is the duration of assets as of March 1994 minus that of liabilities, or the "duration mismatch." The median duration mismatch for the industry is 0.15, but ranges from a high of 2.89 percent to a low of -2.84 percent. The median duration mismatch is 0.04 for institutions for which NIM increased in 1994 but is much higher, 0.34, for institutions for which NIM declined (see Table 2).

The negative regression coefficient indicates that institutions with larger mismatches experienced greater declines in NIM (or smaller increases) during 1994. Along with changes in credit risk and changes in the amount of nonmaturity deposits, this variable is one of the three most important factors explaining changes in NIM during this period.

Table 2. Financial Measures by Income Group

| | Measures for Thrifts with | | | | | |
| | Rising NIM | | | Falling NIM | | |
	10th	50th	90th	10th	50th	90th
Change in NIM (basis points)	*3*	*22*	*59*	*-5*	*-27*	*-66*
1. Duration Mismatch	-.62	.04	.95	-.40	.34	1.19
2. % Liabs Repricing During 1994	23.2	36.4	53.5	24.3	37.7	55.6
3. Change in Ratio of Nonaccrual Assets to Total Assets	-.93	-.08	.22	-.62	-.07	.28
4. WAC on Repricing CDs	2.77	3.19	3.72	2.74	3.19	3.62
5. Nonmaturity Deposits as % of Liabilities	18.8	33.4	54.1	18.0	31.8	51.3
6. Change in Ratio of Nonmaturity Deposits to Total Liabilities	-5.0	-1.3	1.6	-6.9	-2.5	.68
7. Change in Ratio of FRMs to Assets	-5.9	-.08	6.2	-7.5	-1.3	4.5
8. Change in Risk-Based Capital Ratio	-.18	.08	.41	-.28	.01	.29
9. Change in WAC on Teaser ARMs (basis points)	-18	0	63	-39	0	54
10. Change in Ratio of Interest Earning Assets to Interest Bearing Liabilities	-.6	1.4	4.2	-1.7	.8	3.0

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[3] The 50th percentile, also known as the median, is the value in the middle of a set of numbers that have been ranked from high to low. Similarly, the 90th percentile is the number that is greater than 90 percent of the other numbers in the set.

[4] Standardized regression coefficients can be used to evaluate the relative importance of the independent variables in explaining the variation in the dependent variable. They indicate by how many standard deviations the dependent variables is expected to change as a result of a one standard deviation change in the independent variable. Variables with large standardized regression coefficients can be said to have had a greater influence on changes in NIM than those with small ones.

t-statistics are used to test if the coefficient estimates are significantly different from zero; that is, if there really is a relationship between the dependent and independent variable. Generally, if the significance level is .1 or less, researchers will accept the hypothesis that such a relationship exists.

[5] The OTS NPV Model produces estimates of the market value of several categories of assets, liabilities, and off-balance sheet contracts under a range of interest rate scenarios. The effective duration of each category of assets and liabilities is estimated by calculating the percent change in value that results from a 100 basis point shock.

Table 3. Regression Results

	Regression Coefficient	Standardized Regression Coefficient	Significance Level
Intercept	*-26.24*	*0.0*	*.0067*
1. Duration Mismatch	-13.26	-.222	.0001
2. % Liabs Repricing During 1994	-.193	-.057	.0810
3. Change in Ratio of Nonaccrual Assets to Total Assets	-5.68	-.084	.0008
4. WAC on Repricing CDs	.078	.075	.0035
5. Nonmaturity Deposits as % of Liabilities	.199	.066	.0405
6. Change in Ratio of Nonmaturity Deposits to Total Liabilities	2.60	.230	.0001
7. Change in Ratio of FRMs to Assets	1.18	.162	.0001
8. Change in Risk-Based Capital Ratio	31.24	.222	.0001
9. Change in WAC on Teaser ARMs (basis points)	.072	.098	.0001
10. Change in Ratio of Interest Earning Assets to Interest Bearing Liabilities	1.61	.144	.0001

ties repricing during 1994 was not dramatically different between institutions with increasing and decreasing NIM.

As Table 2 shows, institutions for which NIM declined in 1994 had a larger percentage of liabilities scheduled for repricing in the next year (median of 37.7 percent) than institutions for which NIM increased (median of 36.4 percent). The difference is somewhat greater at the 90th percentiles (55.6 versus 53.5).

Change in Ratio of Nonaccrual Assets to Total Assets (Variable 3)

If nonaccrual assets relative to total assets decline, we would expect to see interest income, and NIM increase. The numbers in Table 2 show that institutions for which NIM increased during 1994 experienced larger declines or smaller increases in nonaccrual assets than institutions for which NIM decreased. The regression results confirm the influence of nonaccrual assets on NIM during this period.

Percent of Liabilities Repricing During 1994 (Variable 2)

The duration mismatch tells us the expected direction of change in NPV and long-term NII.[6] It does not necessarily indicate how NII will change in the near-term. Two institutions with the same duration mismatch could experience substantially different changes in their short-term NII depending on when their liabilities reprice.

For example, two institutions could both have a duration mismatch of 1.0, but very different asset and liability durations. Say one institutions has an asset duration of 2.5 and a liability duration of 1.5, while the other has an asset duration of 1.5 and a

liability duration of 0.5. Because the second institution has a larger percent of liabilities repricing in the near future, it will experience a decline in NIM sooner than the other institution in a rising rate environment, even though their losses over the remaining life of the portfolio would be very similar.

The regression results indicate that institutions with a larger percent of liabilities scheduled for repricing during 1994 experienced greater declines (or small increases) in NIM. This variable, however, was not a very important one in explaining changes in NIM. Statistically, the relationship was barely significant. Moreover, the percent of liabili-

Weighted Average Coupon on Repricing CDs (Variable 4)

Surprisingly, the rates paid on CDs by some institutions actually declined during 1994 even though market rates increased. A number of institutions had older, high-rate CDs, that matured during 1994 and reset to significantly lower rates. The median rate on new CDs issued by thrifts in March 1990, with maturities of three years or more, was 8.1%.

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[6]   For more information on this topic, see "NII and NPV Simulation: Are the Two Methods for Measuring IRR Consistent?" by Elizabeth Mays, published by OTS in August 1995.
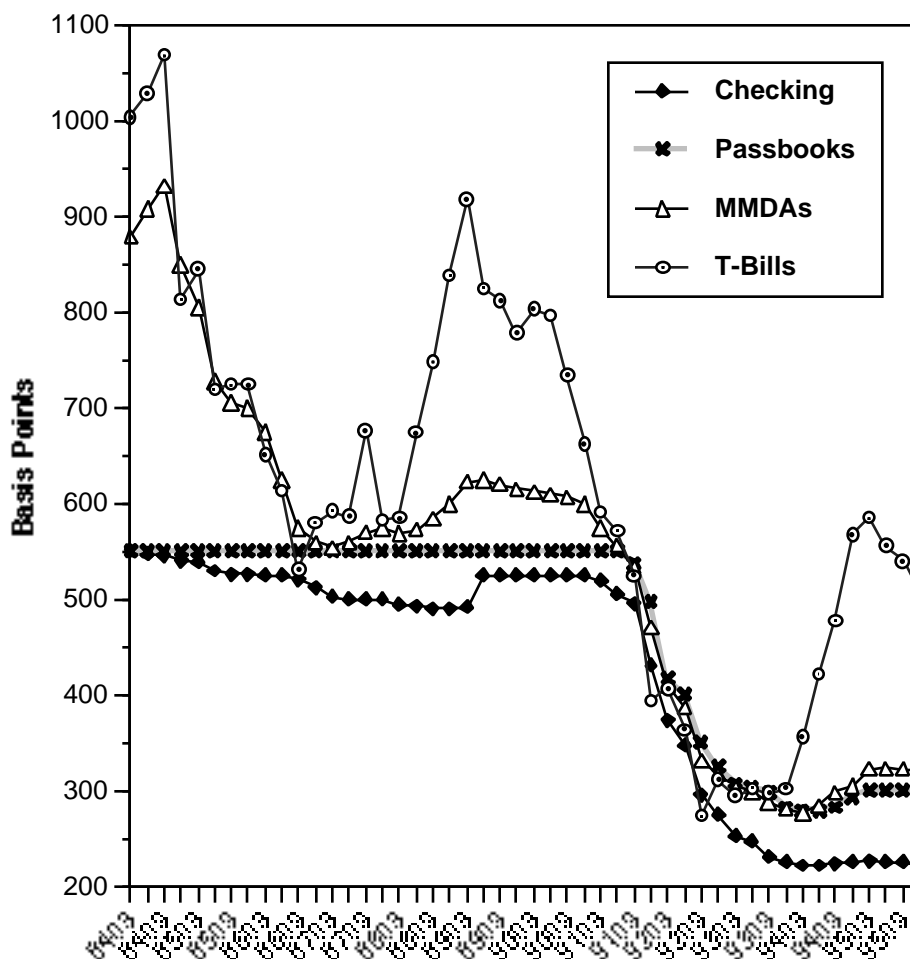
Rates declined substantially in the early 1990s before beginning to once again trend upward in 1994. Despite the rate run-up, the median rate on newly issued three-year CDs was significantly lower, at 6.80%, than in the early 1990s.

The higher the weighted average coupon (WAC) on CDs scheduled to reprice during 1994, the less interest expense would increase (and thus, NIM decline) when rates rise. The WAC on CDs scheduled for repricing during 1994 is higher at the 90th percentile for the group for which NIM increased (3.72%) than the group for which NIM decreased (3.62%). Thus, it appears there was a small, but significant group of institutions for which NIM was bolstered by the repricing of older, high-rate CDs. This is confirmed by a positive and significant regression coefficient.

Nonmaturity Deposits as Percent of Liabilities (Variable 5)

In general, thrifts were slow to raise offered rates on nonmaturity deposits in 1994 even though short-term Treasury yields increased by more than 300 basis points between December 1993 and December 1994.[7] Figure 1 compares the median rate offered by S&Ls on interest-bearing transactions accounts, MMDAs, and passbook accounts to the 3-month Treasury yield. As Treasury rates rose during 1994, there was only a minimal increase in the median offered rates on passbook accounts (10

Figure 1. Quarter-end Median Interest Rates on S&Ls' Nonmaturity Deposits and on 3-month T-bills

basis points) and MMDAs (24 basis points), and no change in the median offered rate on interest-bearing checking accounts.

Because institutions were able to hold down offered rates, an institution with a large volume of nonmaturity deposits would be expected to show a smaller increase in interest expense, and as a result, a smaller decline, or even an increase in NIM. Indeed,

institutions for which NIM increased in 1994 generally had more nonmaturity deposits as a percent of liabilities (median of 33.4 percent) than institutions for which NIM decreased (median of 31.8 percent). The regression results indicate that large holdings of nonmaturity deposits was a significant factor explaining increases in NIM during 1994.

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[7] Rates on retail CDs, on the other hand, increased by at least as much as Treasury yields. The median rate offered by thrifts on new CDs with maturities between six months and one year increased from 3.55% to 6.15% (258bp), exceeding the 228 bp increase in the 6-month bill rate during that period. Similarly, the median rate on new CDs with maturities between one and two years increased from 4.06% to 6.40% (234bp), exceeding the 205bp increase in the 1-year bill rate.

Change in Ratio of Nonmaturity Deposits to Total Liabilities (Variable 6)

When offered rates on deposits lag increases in market rates, there is an incentive for customers to withdrawal their deposits. The numbers in Table 2 show there was some loss of nonmaturity deposits during 1994 for both income groups at the median. Institutions with declining NIM had a larger decline in nonmaturity deposits (decline of 2.5 percent of liabilities at the median) than institution with increasing NIM (decline of 1.3 percent of liabilities).

The regression results show a positive relationship between the change in nonmaturity deposits and the change NIM in 1994.[8] That is, institutions with declines in the ratio of nonmaturity deposits to liabilities experienced larger declines in NIM. On average, a 1.0 percent decline in the ratio of nonmaturity deposits to total liabilities produced a drop of 2.6 basis points in institutions' NIMs during this period.

Change in Ratio of FRMs to Assets (Variable 7)

In periods of rising rates and declining interest margins, institutions may be tempted to invest in assets with higher yields (and greater risk). In the case of mortgages, for example, this may involve a switch from adjustable-rate mortgages to fixed-rate mortgages. Such a switch would also increase the interest rate risk of most institutions.[9]

Although the median institution in both income groups decreased their holdings of FRMs as a percent of assets in 1994 relative to 1993, the holdings of FRMs increased for 49 percent of institutions for which NIM increased, but for only 36 percent of institutions for which NIM declined. At the 90th percentile, the change in FRMs as a percent of assets was notably larger for institutions for which NIM increased (increase of 6.2 percent) than for the other group (increase of 4.5 percent).

The regression results confirm that an increase in FRMs was a significant factor leading to increases in NIM during 1994.

On average, a 1.0 percent increase in the FRMs' share of total assets would increase institutions' NIMs by 1.2 basis points during this period.

Change in Risk-Based Capital Ratio (Variable 8)

In the same manner that an institution may increase interest rate risk to attain higher yields, so too may an institution take on additional credit risk. To determine whether this was a significant factor in 1994, we used risk-based capital requirements as a proxy for credit risk.

The capital requirement increased for 67 percent of institutions for which NIM increased while it rose for only 53 percent of institutions in the other group. At the 90th percentile, the capital requirement as a percent of assets increased 0.41 basis points for the first group, but only 0.29 basis point for the other group. The regression results indicate this shift toward assets with greater credit risk was one of the most significant factors contributing to rising NIMs.[10]

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8   There were 266 institutions that increased their holdings of nonmaturity deposits as a percent of total liabilities in 1994. The increases were fairly small, however, with only 5 percent of the institutions increasing nonmaturity deposits by more than 5 percent of liabilities. Sixty percent of the 266 institutions increased offered rates on core deposits at least slightly, but only ten percent of them increased rates by more than 65 basis points. Thus, some institutions appear to have been able to attract new nonmaturity deposits by increasing offered rates but by less than they would have had to for other types of funds.

9   Ideally, one would include the change in measured interest rate risk as an independent variable in the regression to determine if the institution took some action to increase yield at the expense of increased risk. Because duration changes with the level of interest rates, however, changes in measured IRR include both changes in interest rate exposure that result from actions of institutions as well as those that occur as a result of changing market rates.

10   Analysis of the change in the asset composition of the two income groups indicated that institutions with increasing NIMs had a larger increase in construction loans, commercial loans, and consumer loans than the other income group.

Change in WAC on Teaser ARMs (Variable 9)

Many institutions lowered the initial coupon ("teaser rate") on ARMs in 1994 compared to 1993. In fact, the reported weighted average coupon (WAC) on teaser ARMs fell for 224 out of 560 institutions reporting teaser ARM balances even as interest rates increased. This would result in lower net income in 1994, all else equal. The percentile measures show that institutions for which NIM declined showed larger decreases or smaller increases in the WAC on teaser ARMs than those for which NIM increased. The regression results confirm that an increase in ARM teaser rates was a significant factor contributing to increases in NIM.

Change in Ratio of Interest Earning Assets to Interest Bearing Liabilities (Variable 10)

An increase in the amount of interest-earning assets relative to interest-bearing liabilities should, of course, lead to a larger NIM. This could result from a decrease in non-interest bearing assets such as from the liquidation of REO, or an increase in equity capital. The median increase in this ratio in 1994 relative to 1993 for the industry was one percent. Institutions for which NIM increased showed larger increases in this ratio (or smaller declines) than institutions for which NIM decreased. The regression results confirmed the significance of this variable in explaining changes in NIM during 1994.

Conclusion

NIM for the thrift industry remained relatively stable during 1994 even as interest rates rose. Rising rates generally had a negative effect on the NIMs of S&Ls as a result of their assets/liability mismatches. There were a number of other factors, however, that contributed positively to net interest income. The result was fairly stable NIMs for the industry during this period.

First, institutions were able to hold down interest rates on non-maturity deposits with only moderate deposit run-off. It is likely that the pace of run-off would have accelerated during 1995 if the large spread between deposit offered rates and market rates had persisted. As it happened, market rates declined throughout most of 1995, and nonmaturity deposit levels stabilized.[11]

Second, institutions appear to have increased income by shifting into assets with greater credit risk and interest rate risk. The increase in risk-based capital requirements during 1994 and the increase in fixed-rate mortgages as a percent of assets are examples of such shifts.

Other factors that helped to bolster NIM include an increase in the ratio of interest-earning assets to interest costing liabilities, and a decline in interest expense for a number of thrifts whose older high-rate CDs rolled over to lower market rates ■

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[11] The industry average ratio of nonmaturity deposits to total liabilities was 32 percent in June 1994 and declined to 28 percent at year-end. It declined further, to 26.7 percent, at March 1995 then leveled off at about 25 to 26 percent in the remaining quarters of 1995.