How Do Changes in Market Interest Rates Affect Bank Profits?

By Mark J. Flannery*

In the past year, interest rates in the United States have been both unusually high and unusually variable. The prime loan rate, for example, stood at 15 percent in early 1980, increased to a peak of 20 percent in April, then plummeted to 11 percent by August. Other short-term rates exhibited a similar pattern. As is often the case, however, bank loan rates have received more popular attention than other rates, and many people believe that the banking sector was making unreasonably high profits from these higher loan rates.

For many bankers and bank regulators, though, high and rising market rates do not necessarily imply record profits. These observers recognize that greater bank interest revenues are at least partly offset by the higher interest costs banks must pay for their deposits and other liabilities. If market rates drive up bank costs more rapidly than loan revenues, bank profits will fall. In the extreme, widespread bank losses could destabilize the financial sector, or so the story goes.

With bank costs and revenues both responding to increases in market rates, the net effect on bank profits is hard to predict. A recent Philadelphia Fed study concludes, however, that most banks employ portfolio management techniques that insulate their earnings from the effects of high and volatile market rates. Banks do not reap windfalls, nor are they in danger of failing, when market rates change.

INTEREST RATES AND PROFITS: A DUAL IMPACT

When interest rates rise, because of Fed policy actions or other forces, bank portfolio

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managers can expect changes on both the asset and liability sides of their balance sheets.[1] Bank revenues and costs will adjust to reflect the new level of market rates at different speeds, depending on each bank's collection of assets and liabilities. Rearranging the portfolio to make the most of new market circumstances also may take longer at one bank than at another.

The Asset Side. Market rates affect bank revenues in two distinct ways. First, an increase in market rates raises the amount of income a bank can earn on new assets it acquires. If a bank were 100-percent invested in overnight loans and securities, for example, its average revenues would change every day to reflect current market interest rates. Of course, no bank holds such an asset portfolio. Assets mature over time and are liquidated, with the proceeds only gradually being reinvested at the new higher interest rates. All earning assets eventually will roll over into securities bearing the new higher rate, but the time involved will vary across banks.

For each bank, the speed with which revenues adjust to new market conditions depends on how long it takes for the average asset's interest rate to adjust to current market rates. The adjustment may occur either when the asset matures (an old loan is repaid and a new one bearing the current market rate is issued) or when a variable-rate clause causes the contract rate to change.[2] Many bank loans, especially loans to business, carry an interest rate that can change before the loan must be fully repaid. Some banks also issue variable-rate mortgages, for example. The mortgage loan may run 30 years before it is fully repaid, but the interest rate is adjusted, say, every six months to bring it more nearly into line with current market rates. For purposes of judging its impact on revenues, this mortgage should be considered a six-month asset.

The second way market rates affect bank revenues is through their impact on the bank's decisions about which loans and securities to purchase and how much to hold in cash reserves. Some loan customers may find it more difficult to borrow in the open market when rates are high. This difficulty might cause them to bid up bank loan rates even more than, say, the Treasury bill rate increases. If so, banks could earn more profit from making loans than from buying marketable securities, and revenues would fluctuate as the asset portfolio is reshuffled. Likewise, a bank's holdings of cash reserves and other nonearning assets should decrease when the return on earning assets rises. Total bank revenue therefore will rise more than in proportion to the market rate if nonearning assets come to occupy a smaller percentage of the portfolio.

Thus after a permanent increase in market rates, a bank's average return on assets rises. The extent of the adjustment and the time period involved depend on the portfolio's structure at the time and the behavior of loan customers in response to higher rates.

The Liability Side. In a similar way, the impact of market rate changes on bank costs depends on the average maturity and composition of the liability portfolio. Negotiable certificates of deposit, Federal funds borrowed, and subordinated debentures (long-term borrowings secured by a bank's general credit and subordinated to deposits) all have well defined interest costs and maturities. For other (primarily retail) deposit types, the picture is more complicated.

Some liability maturities are poorly defined. What is the maturity of a demand deposit

[1] Exactly the same principles apply to rate decreases.

[2] Strictly speaking, the asset's maturity is an inappropriate measure since it ignores cash flows prior to the repayment of principal. G. O. Bierwag, "Immunization, Duration, and the Term Structure of Interest Rates," *Journal of Financial and Quantitative Analysis* 12 (1977), pp. 725-742, explains why duration is a better measure of a security's response to interest rate changes. Maturity is used here for simplicity.

(checking) account? Of a passbook savings account? Some would argue that these are very short-term liabilities: demand deposit balances can be withdrawn without notice, and savings account balances are de facto (if not de jure) payable on demand. But every banker is familiar with the notion of core deposits—balances that will remain with the bank for long periods of time almost irrespective of market conditions. Are demand and passbook balances zero-maturity or infinite-maturity liabilities? This issue is extremely important in assessing a bank's exposure to interest rate risk. (Account balances with ill defined maturities made up 59 percent of all insured commercial bank deposits and 45 percent of total assets in May 1980.)[3]

Another complication arises because a bank's true cost for some deposit types exceeds the explicit interest payments made to depositors. Federal bank regulators have prohibited the payment of any interest on demand deposits since 1933. In addition, Regulation Q limits the maximum rate payable on time and savings accounts,[4] and these rates have been below their competitive level for a number of years. This situation creates an incentive for banks and thrift institutions to compete with one another by offering implicit interest payments (free checking, for example, or toasters, or Snoopy dolls) to attract and keep deposits. Bankers also try to attract funds by making it cheaper for people to do business with them—building new branches, extending business hours, and paying bank-by-mail postage—so that it becomes easier to hold savings in the form of bank deposits than in other available instruments. When market rates rise, bankers heat up their implicit interest competition for these regulated accounts, incurring additional expenses in the process. The true cost of funding a bank's asset portfolio therefore includes both interest and noninterest expenses.[5]

Aside from these complications, the response of bank costs to a market rate change is analogous to developments on the asset side of the balance sheet. Liability costs eventually will follow market rates with the speed of adjustment depending on the bank's initial liability portfolio composition and the nature of its depositors.

The Net Effect. A stylized example can best describe the net effect of market rate changes on bank costs versus revenues. Suppose that the market rate of interest has been fixed at 9 percent for as long as anyone can remember, then suddenly and permanently rises to 10 percent.[6] Bank costs and revenues both begin to rise almost immediately, with their relative responses determining the impact on bank profits (Figure 1 overleaf). Whether profits go up or down depends largely on the average maturity of bank liabilities and assets.[7]

A perfectly balanced asset/liability position would leave the intermediary's profit

[3]Note that the effective maturity of demand or savings balances need not be constant across individual banks.

[4]The Monetary Control Act of 1980 requires that Regulation Q ceilings be phased out by 1986. As this occurs, bankers will most likely reduce their noninterest expenses and compensate depositors more directly via explicit interest.

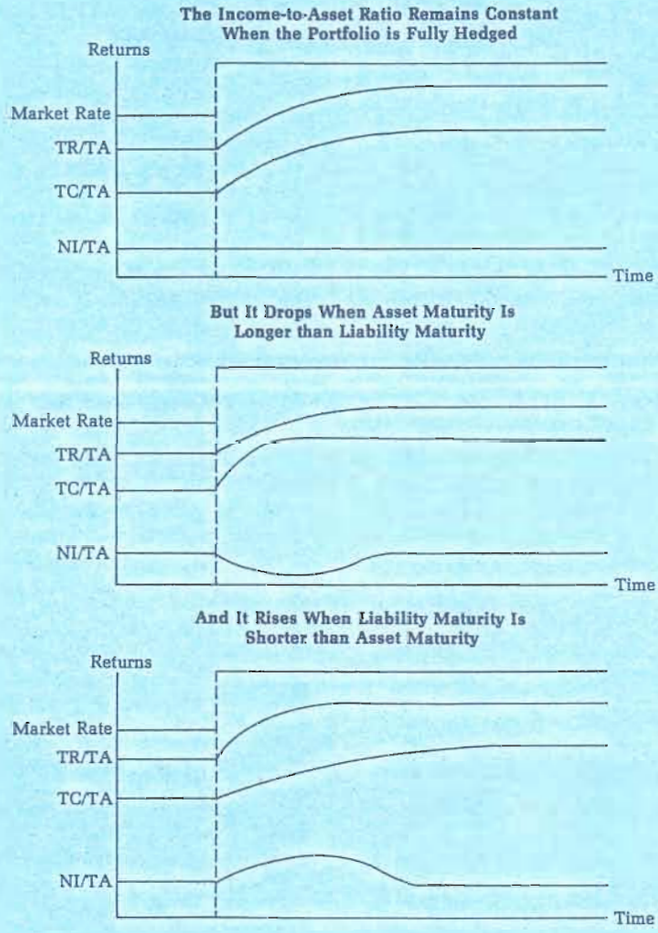
[5]For more detailed discussion of this phenomenon as it has applied to Massachusetts and Connecticut, see Robert A. Taggart and Geoffrey Woglom, "Savings Bank Reactions to Rate Ceilings and Rising Market Rates," *New England Economic Review*, September/October 1978, pp. 17-31; and Michael A. Klein, "The Implicit Deposit Rate Concept: Issues and Applications," *Economic Review*, Federal Reserve Bank of Richmond, September/October 1978, pp. 3-12.

[6]It is unlikely, of course, that the market rate will remain unchanged for very long. One should think of this example as describing a permanent change in *average* rates: instead of fluctuating around an average level of 9 percent, they fluctuate around an average of 10 percent.

[7]Bankers sometimes refer to a funding gap, by which they mean the difference between average asset and liability maturities.

FIGURE 1

THE EFFECT OF A MARKET INTEREST RATE INCREASE ON BANK PORTFOLIO PERFORMANCE DEPENDS ON THE ASSET/LIABILITY BALANCE*



*TR/TA is the ratio of total revenues to total assets; TC/TA is the ratio of total costs to total assets; NI/TA is the ratio of net income to total assets.

stream unaffected by market interest rate changes. This balance can be achieved only if each asset is financed by a liability of similar maturity. Market rate changes then affect revenues and costs equally promptly or slowly.

Whether a bank finds this so-called hedged position desirable depends on its expectations about future interest rate movements and the shareholders' willingness to accept risk. Suppose a bank portfolio manager expects interest rates to rise and wishes to profit to the fullest possible extent based on that development. Then the bank should issue liabilities with an average maturity exceeding its average asset maturity. If rates do rise, interest costs will rise more slowly than revenues (because liability rates are locked in) and the bank will earn a handsome profit until its cheap liabilities must be rolled over. Of course, if interest rates fall (contrary to expectation), asset returns would decline more promptly than liability costs and the bank would show poor earnings. This is the risk of an unbalanced asset/liability position. An unbalanced portfolio offers more opportunity for profit, but, like a wager, also offers the prospect of loss.

Many people (including many bank regulators) feel that the nature of banking in the real world requires these institutions to borrow short and lend long—to structure their portfolios so that the average maturity of their assets exceeds the average maturity of their liabilities. But such an asset/liability imbalance is most appropriate for a bank that expects market rates to *fall*. If banks cannot avoid holding this sort of unbalanced portfolio, a sharp market rate increase may threaten their viability.

Market rate changes, then, can have two separate effects on bank profits. The immediate or short-run effect reflects primarily the relative maturities of the asset and liability portfolios. After all assets and liabilities have matured, a second effect may emerge: the higher market rate may induce permanent portfolio revisions that can raise or lower bank income.

THE EMPIRICAL EVIDENCE

Some evidence on how banks have been structuring their asset and liability portfolios can be obtained by examining the past relation of bank profits to market rates. Individual banks regularly report their revenues, costs, and profits to the Federal banking agencies. Their records provide annual information on a sample of 75 United States banks (in six size categories) for the period 1961-78.

Interest rate data also are readily available, but accurately summarizing the historical pattern of market rates can be difficult. Consider the first half of 1980: the average Treasury bill rate was 11.5 percent for the period as a whole, but it varied from 11.7 percent in early January to 15.5 percent in late March, finally falling to 7.4 percent at the end of June. This was surely an unusual period for interest rates, but it serves to illustrate two distinct components of market rate behavior—the *average level* over a time period (for example, the six-month average for January through June 1980) and the *variability* of rates within each time period.[8] These two components cannot perfectly capture the full richness of each period's market rate environment, but they go a long way toward that goal.

Analyzing the historical experience of 75 banks yields several important conclusions. One may come as a surprise to many bankers and regulators: the variability of market interest rates within a year has virtually no impact on commercial bank profits. While the market rate's average *level* prominently influences bank revenues and costs, fluctuations around that average are unimportant.

[8]Variability can be measured by the range of rates observed (highest minus lowest) or the standard deviation of weekly rates around the period's average.

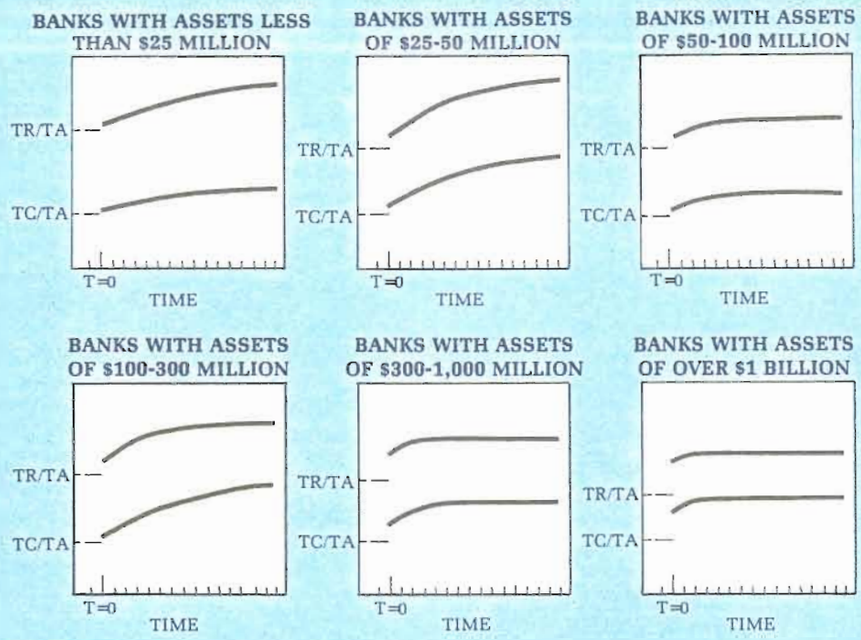
The Short Run: Are Banks Well Balanced? A market rate change endangers bank profitability only if asset and liability returns adjust at significantly different speeds. Then an interest rate change can cause sharp profit fluctuations and, if rates change contrary to the bank's expectations, perhaps even insolvency.

The historical relations between market interest rates and each bank's revenue, costs, and profits were determined statistically. Using these estimated relations, the impact of a hypothetical permanent 100-basis-point increase in all market rates was calculated for each bank.[9] (A *permanent* rate change of this magnitude would be large by historical standards, though temporary interest rate fluctuations within a year routinely exceed 100 basis points.) Bank responses in each size class were then averaged (Figure 2). The

[9]A basis point is one-hundredth of a percentage point. Reactions to larger or smaller market rate changes would be proportional to those in Figures 2, 3, and 4.

FIGURE 2

AT MOST BANKS, ASSET RETURNS AND LIABILITY COSTS RESPOND ABOUT EQUALLY QUICKLY TO MARKET RATE CHANGES*



*Bank classification based on 1978 asset position.

evidence shows that different sized banks respond at different speeds to market rate changes. In particular, larger banks' revenue and costs adjust more quickly than smaller banks', because larger banks tend to deal with larger, more interest-sensitive customers.

Within each individual bank, of course, the relative adjustments of revenues and costs determine the net impact on profitability. Judging from the ratios of total revenues to total assets and total costs to total assets, asset returns respond more promptly than liability costs to market rate changes at smaller banks, suggesting that asset maturities are shorter on average than liability maturities. The same is true at larger banks, though the difference between average asset and liability maturities is not so great. Banks with assets above $300 million appear to have balanced their effective asset and liability maturities quite closely so that revenues and costs are about equally affected by a rate increase. The smaller banks (those below $100 million) seem to enjoy significantly increased profitability following a market rate increase, while larger banks' revenues and costs adjust at approximately equal speed—leaving no great effect on profit even in the short run. At least over the first 15 years following a market rate increase, no class of banks is in danger of failing from adverse market effects.

The Long Run: Are High Rates Good for Banks? Figure 3 provides information on the cumulative effect of all these adjustments: what is the final impact on revenues, costs, and profits when the market rate of interest rises permanently by 100 basis points? From the first two columns of Figure 3 it is clear

FIGURE 3

THE LONG-RUN IMPACT ON BANK REVENUES AND COSTS OF A ONE-PERCENTAGE-POINT INCREASE IN MARKET RATES IS GREATER AT SMALLER BANKS

Bank Size Class (millions of dollars)	TR/TA	TC/TA	Difference
< 25	1.36	.558	.802
25 - 50	1.35	.812	.538
50 - 100	1.64	1.217	.423
100 - 300	1.26	1.229	.031
300 - 1,000	.938	1.013	-.075
> 1,000	.852	.900	-.048

that banks below $300 million (approximately 97 percent of all banks in the United States, holding 33 percent of all bank assets) enjoy a permanent increase in their pretax interest income when market rates rise. Equally clearly, the magnitude of this effect is smaller the larger the bank: banks under $25 million enjoy a .802-percentage point increase (1.36 - .558) in their net earnings margin while banks between $100 million and $300 million gain only .031 of a percentage point. For banks with assets above $300 million, market rate increases induce a slight decline in operating margin because costs eventually rise by more than revenues. Differences in the largest three bank classes are small (in a statistical sense), however, and should not be accorded great significance.

Figure 4 shows the change in net income associated with a permanent 100-basis-point increase in market rates. (Net income is revenues less costs, adjusted for taxes, capital gains or losses on securities sold, and other extraordinary income items.) As an example of how to read this Figure, consider the banks smaller than $25 million. The permanent market rate increase ultimately raises net income as a percentage of total assets by a tenth of a percent. The size of this effect should be judged by comparing the tenth of a percent with the actual ratio of net income to total assets, which in this case is

FIGURE 4

A ONE-PERCENTAGE-POINT INCREASE IN MARKET RATES SLIGHTLY RAISES LONG-RUN BANK PROFITS*

Bank Size Class (millions of dollars)	1978 Value of NI/TA	Change in NI/TA
< 25	1.264	.1005
25 - 50	.983	.120
50 - 100	1.042	.0781
100 - 300	.972	.0238
300 - 1,000	.870	.0724
> 1,000	.572	.0330

*The change in NI/TA (the ratio of net income to total assets) indicated for each size class is the average value from a number of banks in the sample. For each individual bank a test can be performed to determine whether the indicated change in NI/TA is statistically important. Among the 75 sample banks, 24 showed significant (at the five-percent level) permanent changes in NI/TA when market rates changed. Of these 24 banks, only two manifest lower earnings at higher market rates. In the total sample of 75 commercial banks, therefore, only two have been shown to suffer significant declines in NI/TA when market rates increase.

1.264 percent. All six bank classes enjoy greater net income at higher market rates, though the increases are not particularly large.[10] Overall, the available evidence indicates that changes in market interest rates have a relatively small impact on the average bank's reported profits.[11]

The historical period covered by this study ended with 1978. Since then, retail banking has changed drastically on account of money market certificates, and even more regulatory changes are pending in the wake of the Monetary Control Act of 1980. Policy recommendations therefore follow from this study only if its historical results can be expected to persist into the future. Lacking a crystal ball, no definitive response can be given to this concern, but some evidence is available from evaluating the impact of a large previous change in banking practices.

Observers often argue that institutional changes in the early 1970s changed the nature of banking, at least among large money market institutions. In mid-1970, interest rate ceilings were eliminated for large certificates of deposit ($100,000 or more) with a maturity less than 90 days. Shortly after that, large money center banks introduced a floating prime rate tied to market interest rates. These two developments potentially set the stage for much quicker bank responses to market rate fluctuations than had occurred during the 1960s.

Statistical tests were conducted to determine if the 15 largest sample banks exhibited significantly different interest rate effects during the latter half of the period (1970-78) than they had during the former half (1961-69).[12] The answer is No. While market rate fluctuations were larger during the 1970s, large banks responded to rate changes with about the same speed as they had in the 1960s. Floating prime loans and unregulated deposit rates undoubtedly induced important portfolio adjustments at large banks, but these insured that bank profits remained relatively insensitive to market rate fluctuations. It can be expected that corresponding adjustments will occur in retail banking practices in response to the regulatory developments of the 1980s.

CONCLUSION

The historical experience of 75 United States commercial banks indicates that, on the whole, bank profits are not very responsive to the level of market interest rates. When market rates change, the responses of bank revenues and costs approximately cancel one another, leaving the level of commercial bank profits only slightly sensitive to market rates in most cases. The popular conception that the banking industry reaps unreasonably large profits during tight money times thus is not supported by the evidence.

For identical reasons, the regulatory fear that sharp rate increases threaten the commercial banking system's viability also should

[10] In the fourth quarter of 1979 and the first quarter of 1980, some large United States banks reported sharp profit increases, attributing them to the effects of high market rates on asset/liability balances. Upon closer inspection of balance sheets and income statements, however, the bank profit *margins* emerged as approximately unchanged from periods of lower interest rates. (Salomon Brothers' "Quarterly Banking Review" reports the average net interest margin for 37 large U.S. banks declined only 25 basis points—less than 10 percent—between the first quarter of 1979 and the first quarter of 1980.) The reported large changes in net profits derived more from overall asset growth than from changing profit margins.

[11] This evidence implies nothing categorical about the impact of higher market rates on the market value of bank stock. As a technical matter, however, bank stock prices must *decline* when rates rise *unless* net income also rises. The evidence in Figure 4 thus allows for the possibility that bank stock values rise, fall, or remain unchanged when market rates rise.

[12] Specifically, a Chow test was performed for the revenue, cost, and income equations of each bank. Only one of the 15 banks manifested significant structural shifts between the two historical periods.

be questioned. Seriously unbalanced asset/liability portfolios are not a pandemic feature of commercial banking in the United States. Thus relatively large market rate fluctuations can be tolerated if these prove necessary to attaining monetary policy goals such as full employment and price stability. (Another way to say this is that the banks' ability to weather the past year's market gyrations reflects their well-hedged balance sheets.)

This conclusion does not imply that regulators should ignore individual bank exposure to interest rate risks. An excessively unbalanced asset/liability portfolio threatens bank stability just as much as undue loan concentration, excessive reliance on bought money, or low capitalization. Individual banks certainly can choose asset/liability portfolios that leave them exposed to interest rate risks; several recent examples come readily to mind. But most banks can avoid such risks if they choose. While selected banks may be threatened by sharp market rate changes, the banking industry as a whole is not.

SUGGESTED READINGS

G. O. Bierwag, "Immunization, Duration, and the Term Structure of Interest Rates," *Journal of Financial and Quantitative Analysis* 12 (December 1977), pp. 725-742.

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