FRBSF WEEKLY LETTER

Number 92-39, November 6, 1992

Interest Rate Risk and Bank Capital Standards

Considerable attention recently has focused on the interest rate risk exposure of U.S. banks. This new-found attention is due in part to a provision in the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) that requires federal banking regulators to incorporate interest rate risk into bank capital standards by the middle of 1993. In their current form the risk-based capital requirements focus on the credit risk of bank assets, requiring banks to hold more capital against assets assumed to pose a greater risk of default. Although most observers believe that interest rate risk is less important for banks than credit risk, this omission may mean that bank capital levels do not accurately reflect the true risk of bank portfolios.

The Federal Reserve Board has responded to the requirements of FDICIA by proposing a framework for addressing interest risk in bank capital standards. In this *Letter,* I provide some background on the notion of interest rate risk, and describe the general features of the Fed's proposal. I also compare this proposal to an alternative methodology proposed by thrift regulators.

What is interest rate risk?

Interest rate risk refers to the (possibly adverse) effect that changes in interest rates can have on the values of bank assets and liabilities. Financial instruments typically provide a stream of payments that is fixed in nominal terms for a period of time. The fixed-payment period may be relatively short, such as for a Treasury bill or an adjustable-rate mortgage loan, or long, as with a long-term bond or a fixed-rate mortgage loan. When market interest rates change, the value of financial instruments changes as well. An increase in market rates during the fixed-payment period diminishes the value of the fixed stream of payments and thus reduces the market value of the instrument. A decline in rates, in contrast, raises the value of the fixed payment stream.

In general, the longer the period during which the payments are fixed, the greater the relative change in value from a given change in both short- and long-term interest rates. Thus, the market value of a long-term bond or a 30-year fixed-rate mortgage is more sensitive to a parallel shift in interest rates than a short-term debt security or an adjustable-rate mortgage.

The impact of a change in interest rates on the value of a bank depends on the maturity structure of both its assets and its liabilities. If the fixed payments the bank receives from its assets take longer to respond to interest rate changes than the fixed payments it makes on its liabilities, then a rise in interest rates would reduce the value of assets more than the value of liabilities, and the bank's net worth would fall. In practice, most banks have a liability side of the balance sheet that carries a shorter repricing period than the asset side. That is, they typically borrow short and lend long. Thus, a certain amount of interest rate risk appears to be a normal part of the business of banking.

If exposure to interest rate risk is high, then an unfavorable move in interest rates could significantly reduce an institution's net worth and eat into its capital cushion. In extreme cases, an adverse move in interest rates could reduce an institution's capital below the level required by regulators. This is what happened to many thrifts in the late 1970s and early 1980s. Concerns about a repeat of this episode have prompted efforts to identify banks facing significant interest rate risk, and to require them to hold more capital against the possibility of large interest rate-induced declines in value.

How do you measure it?

As the preceding discussion suggests, the interest rate risk associated with any financial instrument is directly related to the length of time over which the instrument makes fixed payments. One commonly used measure of the "length" or effective maturity of a financial instrument is its duration. The duration of a financial asset is the weighted average maturity of its cash flows,

where the present values of the cash flows (as a percent of total present value) serve as the weights. For example, a financial asset that makes a fixed nominal payment every year for ten years has a duration somewhat less than five years. This is because the asset pays more of its present value in the first five years than it does in the second five years; the present discounted value of the fixed payments received far in the future is less than the present value of payments received earlier. In contrast, the duration of a ten-year zero-coupon bond (which makes no payments until maturity) is equal to ten years since 100 percent of the present value of its cash flows are received at maturity. In practice, it is typical to adjust an instrument's duration for noncontinuous compounding of interest, yielding the more commonly used measure known as modified duration.

The duration measure is particularly useful as a gauge of interest rate risk. The longer the duration of an asset or liability, the more its value will change in response to a given percentage point change in both short- and long-term market interest rates. A 30-year fixed-rate mortgage, for example, has a relatively long duration. The value of this asset fluctuates more from a parallel shift in the yield curve than a shorter duration asset, such as a short-term consumer loan. The concept of duration can be applied to both the assets and liabilities of a bank's balance sheet; a weighted average of these individual durations yields a single measure of the exposure of the bank's net worth to changes in interest rates. The measurement system proposed by the Federal Reserve uses this method to assess interest rate risk.

The Fed's proposal

Any system intended to measure the interest rate risk of bank portfolios requires information on the maturity structure of bank assets and liabilities. Thus, the Fed's proposal requires banks to assign their on- and off-balance sheet assets and their liabilities to one of six time bands based either on the maturity of the instrument or (for floating rate instruments) on the length of time until its interest rate adjusts.

In addition to the maturity information, the Fed's proposed system also requires banks to assign their assets to one of three categories: amortizing, nonamortizing, and deep discount. Amortizing assets make periodic payments of both principal and interest, while nonamortizing assets pay interest only, delaying principal repayment until maturity. Deep discount assets make neither interest nor principal payments but instead are sold at a discount from face value and then repay principal at maturity. These differences in cash flow characteristics affect the duration of the different types of assets. For a given maturity, an amortizing asset has a shorter duration than a nonamortizing one, which in turn has a shorter duration than a deep discount asset.

Each bank reports to the regulators its dollar positions in each of the time bands for the three different types of assets and for liabilities. These reported positions are then multiplied by "risk weights" that are derived from the durations of the corresponding assets and liabilities. The risk weights are expressed in percent terms and represent the change in the value of an instrument resulting from a 100 basis point (one percentage point) change in all interest rates. The result of this multiplication is a series of risk-weighted positions that measure the change in the value of the bank's reported holdings that would follow a 100 basis point change in interest rates. For example, multiplying the bank's holdings of long-term fixed rate mortgage loans by the appropriate amortizing risk weight yields a number that represents the change in the value of the bank's mortgage holdings resulting from a 100 basis point change in all rates.

Finally, total risk-weighted liabilities are subtracted from total risk-weighted assets to arrive at the net risk-weighted position of the bank. This number, expressed in dollars, is the change in the net worth of the bank that would occur as a result of a 100 basis point shift in interest rates. Alternatively, this net risk-weighted position can be expressed as a percent of total assets. In this way, the interest rate risk of different banks can be compared easily, just as bank capital ratios are compared.

Normal vs. excessive interest rate risk

One guiding principle of the Fed's proposal is that a certain amount of interest rate risk is inherent in banking. Moreover, credit risk is considered to be significantly more important than interest rate risk in terms of the threat it poses to bank solvency. The Fed's proposal suggests that existing risk-based capital requirements are sufficient to cover "normal" levels of interest rate risk. Banks that have "normal" interest rate risk will not be required under the proposed system

to hold additional capital. Only those institutions that are exposed to "excessive" risk would be required to hold more capital.

The obvious next question is what constitutes excessive risk. To answer this question, Fed researchers look to the historical distribution of banking industry risk exposures. Applying the proposed measurement system to the recent experience of U.S. banks suggests that a net risk-weighted position equal to 1 percent of a bank's assets may be considered "normal." That is, the "normal" change in the net worth of a bank arising from a 100 basis point change in all interest rates is 1 percent of assets. Drawing on this result, the Fed proposal suggests that any bank with a net risk-weighted position equal to 1 percent of assets or less would not be required to hold additional capital over and above the existing risk-based capital requirements. Only exposures in excess of 1 percent would require additional capital, which would be equal to the amount in excess of the 1 percent risk exposure.

Some pros and cons

The Fed's proposal is a relatively streamlined system for measuring interest rate risk. The system balances the need to obtain information to measure interest rate exposures with a desire to minimize the additional reporting burden for banks. While the proposal calls for expanded reporting of asset types and maturity structures, banks are not required to report detailed yield information on individual assets. Ideally, asset-specific yield and coupon information would be required to obtain more accurate duration-based risk factors. Instead, the Fed's proposal uses representative bank assets to derive the risk weights. This approach also neglects asset-specific information like prepayment options and may fail to capture unusual characteristics of new financial instruments. This compromise reduces the accuracy of the final risk measure but also reduces the bank's reporting burden.

The Fed's approach differs somewhat from one proposed last year for thrifts by the Office of Thrift Supervision (OTS). The OTS would require thrifts to report maturity information and cash flow characteristics of assets and liabilities, as well as instrument-specific information on yield, coupon, prepayment options, and so on. This more detailed method would then simulate the impact of a 200 basis point shift in all interest rates, requiring thrifts to hold additional capital equal to a portion of the simulated change in net worth.

How different are these two approaches? The OTS method provides a more accurate measure of the interest rate sensitivity of net worth, and thus of interest rate risk. However, it also imposes a considerable reporting burden on thrifts. Since little work has been done to assess the differences between the two approaches, it is unclear whether the additional reporting requirements of the OTS proposal are worth the cost. Some preliminary work comparing the two methods on a sample of thrifts suggests that the two methodologies largely agree on identifying high interest rate risk institutions. Differences arise between the two approaches when considering institutions with more moderate levels of interest rate risk.

Conclusion

Some measure of interest rate risk will become a reality for the nation's financial intermediaries in the next year, though the exact form of this measure is not yet known. Moreover, this measure will be linked to risk-based capital standards. Some have argued that the failure of the current system to address interest rate risk creates an incentive for banks and thrifts to substitute interest rate risk for credit risk by altering the composition of their portfolios. Recent large increases in bank holdings of Treasury securities, it is claimed, are consistent with this incentive.

Of course, the rather simple systems proposed by regulators should not preclude the use by bank management of more sophisticated interest rate risk monitoring mechanisms. Institutions that take big interest rate risk exposures should already be aware of the nature of their positions and the risks they pose to net worth.

Jonathan A. Neuberger
Economist

Research Department
Federal Reserve
Bank of
San Francisco

P.O. Box 7702
San Francisco, CA 94120

Index to Recent Issues of *FRBSF Weekly Letter*

DATE	NUMBER	TITLE	AUTHOR
4/17	92-16	Causes and Effects of Consumer Sentiment	Throop
4/24	92-17	California Banks' Problems Continue	Zimmerman
5/1	92-18	Is a Bad Bank Always Bad?	Neuberger
5/8	92-19	An Unprecedented Slowdown?	Trehan
5/15	92-20	Agricultural Production's Share of the Western Economy	Schmidt/Dean
5/22	92-21	Can Paradise Be Affordable?	Cromwell/Schmidt
5/29	92-22	The Silicon Valley Economy	Sherwood-Call
6/5	92-23	EMU and the ECB	Walsh
6/19	92-24	Perspective on California	Sherwood-Call
7/3	92-25	Commercial Aerospace: Risks and Prospects	Cromwell
7/17	92-26	Low Inflation and Central Bank Independence	Parry
7/24	92-27	First Quarter Results: Good News, Bad News	Trenholme/Neuberger
8/7	92-28	Are Big U.S. Banks Big Enough?	Furlong
8/21	92-29	What's Happening to Southern California?	Sherwood-Call
9/4	92-30	Money, Credit, and M2	Judd/Trehan
9/11	92-31	Pegging, Floating, and Price Stability: Lessons from Taiwan	Moreno
9/18	92-32	Budget Rules and Monetary Union in Europe	Glick/Hutchison
9/25	92-33	The Slow Recovery	Throop
10/2	92-34	Ejido Reform and the NAFTA	Schmidt/Gruben
10/9	92-35	The Dollar: Short-Run Volatility and Long-Run Adjustment	Throop
10/16	92-36	The European Currency Crisis	Glick/Hutchison
10/23	92-37	Southern California Banking Blues	Zimmerman
10/30	92-38	Would a New Monetary Aggregate Improve Policy?	Motley

The *FRBSF Weekly Letter* appears on an abbreviated schedule in June, July, August, and December.