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Supervising Interest Rate Risk Management

Over the past 20 years, financial institutions have made significant efforts to establish and improve their procedures for interest rate risk management, including using economic models of interest rates and related models of credit risk (Lopez 2001a, b). At the same time, bank supervisors worldwide, including the Federal Reserve, have been expanding their knowledge and oversight of interest rate risk management techniques. For example, U.S. bank supervisors recently issued supervisory guidance on sound risk management practices regarding the valuation of mortgage servicing rights (Board of Governors 2003).

The centerpiece of these international supervisory efforts is the revised Basel Capital Accord, which was released in June 2004 and is to be fully implemented by year-end 2007. This *Economic Letter* reviews the Accord's stated principles on interest rate risk. In brief, the principles strongly support the idea that banks' internal risk assessments should, whenever possible, form the basis for supervisory oversight of their interest rate risk profiles. The principles suggest supervisory guidelines for assessing the adequacy of interest rate risk management systems, such as focusing on banks' internal control functions and stress-testing results.

Components of interest rate risk

Interest rate risk (IRR) is defined as the change in a bank's portfolio value due to interest rate fluctuations. Taking on IRR is a key part of what banks do; but taking on excessive IRR could threaten a bank's earnings and its capital base, raising concerns for bank supervisors. In practice, IRR management systems have been developed to measure and control such risk exposures, both in the trading book (i.e., assets that are relatively liquid and regularly traded) and in the banking book (i.e., assets, such as loans, that are much less actively traded).

IRR can be roughly decomposed into four categories: repricing risk, yield curve risk, basis risk, and optionality (see Basel Committee on Banking Supervision (BCBS) 2003). Repricing risk refers to fluctuations in interest rate levels that have differing impacts on bank assets and liabilities; for example, a portfolio of long-term, fixed-rate loans funded with short-term deposits (i.e., a case of duration mismatch) could significantly decrease in value when rates increase, since the loan payments are fixed (and funding costs have increased). Yield curve risk refers to changes in portfolio values caused by unanticipated shifts in the slope and shape of the yield curve; for example, short-term rates might rise faster than long-term rates, clearly affecting the profitability of funding long-term loans with short-term deposits. Basis risk refers to the imperfect correlation between index rates across different interest rate markets for similar maturities; for example, a bank funding loans whose payments are based on U.S. Treasury rates with deposits based on Libor rates is exposed to the risk of unexpected changes in the spread between these index rates. Finally, optionality refers to risks arising from interest rate options embedded in a bank assets, liabilities, and off-balance-sheet positions. Such options can be explicitly purchased from established markets for interest rate derivatives or included as a term within a loan contract, such as the prepayment option included in residential mortgages.

IRR management

Banks have access to a wide array of financial tools for managing their IRR, such as standard asset-liability management procedures and interest rate derivatives. Banks commonly use one of two approaches when assessing aggregate IRR exposures across their various business lines and portfolios—the traditional earnings approach and the more challenging economic value approach. The earnings approach focuses on how interest rate changes affect a bank's overall earnings, which are typically measured as net interest income (the difference between total interest income and total interest expenses). Broader measures that include non-interest income, such as revenue from mortgage servicing activities, and expenses have become common, however. The main point of this approach is to examine earnings sensitivity to interest rate fluctuations of different sizes.

The economic value approach takes a broader perspective on IRR management by focusing on how interest rate changes affect total expected net cash flows from all of a bank's operations. Thus, this approach examines expected cash flows from assets minus expected payments on liabilities plus the expected net

cash flows from off-balance-sheet positions, such as fees charged for borrower credit lines. This approach is more challenging to conduct since, at a minimum, it requires collecting and aggregating more data; at the same time, it provides greater insight into a bank's aggregate IRR exposure.

In addition to such aggregate IRR management approaches, banks use more focused IRR measurement techniques for derivatives and other instruments with especially complex risk profiles, such as mortgage-backed securities. While the aggregate approaches typically involve making judgmental adjustments to interest rates and tracking their impact across the bank, the focused techniques explicitly use mathematical models of interest rate dynamics for various index rates and their yield curves. For example, many possible future interest rate paths are generated and used to examine the potential effects of interest rate changes on portfolio values, investment returns, and cash flows from different assets. Since the models can examine the components of interest rate risk separately, risk managers use them to gauge and control their portfolios' exposures to a broader range of interest rate fluctuations. In theory, the more sophisticated IRR management techniques could be applied to the bank as a whole. Important developments in this direction have been made, but several important challenges still remain, especially in aggregating IRR exposures across business lines.

A key advantage of these mathematical IRR management techniques is that they provide a consistent framework for analyzing a wide variety of possible interest rate scenarios. For example, banks can consider multiple scenarios accounting for changes in the general level of interest rates and changes in the relationships among interest rates. However, since models are just simplifications of actual phenomena, prudent IRR management requires considering extreme scenarios that might not be within a given model's structure. This practice is commonly called stress-testing, since the underlying model and IRR management system are "stressed" by examining uncommon, although not implausible, scenarios. Common stress scenarios include abrupt changes in the general level of interest rates (i.e., repricing risk), changes in the relationships among key market rates (i.e., basis risk), changes in the slope and shape of the yield curve (i.e., yield curve risk), changes in the liquidity of key financial markets, and changes in the volatility of market rates. Optionality risks typically are affected by all of these scenarios.

Supervisory guidelines

As part of its ongoing efforts to address international bank supervisory issues and to support the revised Basel Capital Accord, the BCBS recently issued a summary paper regarding general principles on IRR management. The principles were intended to be used in the supervisory evaluation of the adequacy and effectiveness of bank IRR management systems and in developing supervisory responses to these systems. The principles are based on the current IRR management practices of large international banks and are intended for IRR exposures arising from trading and book activities.

The principles advocate that banks have in place comprehensive management systems that measure and control IRR exposures effectively. The systems must be subject to appropriate board of directors and senior management oversight. Specifically with respect to supervisors, the principles advocate that banks' own IRR management systems should, whenever possible, form the basis of supervisors' measurement of and response to their interest rate sensitivity. The BCBS principles can be grouped into four categories: IRR management oversight issues, issues related to adequate bank policies and procedures, issues specific to IRR monitoring and control, and specific supervisory issues.

With respect to management oversight issues, the principles state that a bank's board of directors should approve IRR strategies and policies and ensure that senior management effectively monitors, communicates, and controls these risks. Furthermore, risk managers within the IRR management system must be independent from the risk-taking functions of the bank in order to avoid potential conflicts of interest. Risk managers also should be able to report IRR exposures directly to senior management and the board of directors.

Senior management must ensure that a bank's IRR policies and procedures are clearly defined and consistent with the nature and complexity of the bank's activities. For example, senior management could articulate its risk tolerance, both for the bank as a whole and for the disaggregated business units, by crafting policy statements identifying specific interest rate instruments and activities that are permissible. When proposing new interest rate products or activities, management should work to identify the inherent risks clearly and ensure that adequate procedures and controls are in place before introducing them.

With respect to IRR monitoring and control issues, banks must capture all material IRR exposures, whether in their trading or banking books, within their management systems. Operating limits and related practices for keeping IRR exposures within levels consistent with internal policies must be clearly estab-

lished and enforced. Furthermore, all IRR modeling assumptions and parameters must be well documented and updated with reasonable frequency. Stress-testing should be regularly used to assess the bank's interest rate sensitivity and examine the appropriateness of key modeling assumptions. Stress-test results must be considered when establishing and reviewing IRR policies and procedures. A bank must have adequate information systems for reporting accurate IRR exposure information on a timely basis to its board of directors and senior management. Finally, effective IRR management systems require regular evaluations by independent auditors, whether internal or external.

With respect to supervisory issues, the BCBS principles address four main concerns. First, since banks' own systems are to form the basis of supervisory oversight of IRR management, supervisors should receive sufficient and timely information with which to evaluate bank's IRR systems. For example, supervisors should have ready access to information on the range of maturities and currencies in bank portfolios, including off-balance-sheet items. Information contained in internal management reports, such as earnings and economic value estimates, and the results of stress tests would also be useful. Second, banks should disclose publicly information on their aggregate IRR exposures and their policies for managing them. The BCBS has issued recommendations for the public disclosure of information on IRR as part of the overall review of the Basel Accord (Lopez 2003).

Third, to facilitate supervisory monitoring of IRR exposures across institutions, banks should try to use standardized rate changes to provide the results of their internal measurement systems, expressed in terms of changes to economic value. According to the BCBS guidelines, these rate changes should in principle be determined by banks but based on the recommended criteria. For example, for IRR exposures in G-10 currencies, banks should consider either a parallel rate change of ±200 basis points or the changes implied by the 1st and 99th percentiles of historically observed interest rate changes over at least five years. Fourth, senior management and boards of directors should periodically review both the design and the results of their stress tests. Supervisors will continue to expect institutions to examine multiple scenarios in evaluating the appropriate level of their IRR exposures.

If supervisors determine that a bank's management system does not capture its IRR exposures fully, the bank would be required to bring its system up to the appropriate supervisory standards. If supervisors determine that a bank is not holding sufficient capital for its level of IRR exposure, especially in the banking book, remedial action should be considered, requiring the bank to reduce its risk or to set aside additional capital or a combination of the two, depending on the situation.

Conclusion

In support of the revised Basel Accord, the BCBS has issued several guidelines regarding IRR management for both bankers and bank supervisors. The BCBS is aware that banks' IRR management techniques continue to evolve, so certain details of their guidelines will need to be updated. However, the principle that banks' own assessments of their IRR exposures should form the basis of supervisory oversight is a defining characteristic of future supervisory efforts.

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