

United States General Accounting Office

GAO

Report to the Chairman, Committee on
Banking, Finance and Urban Affairs,
House of Representatives

December 1993

BANK INSURANCE FUND

Review of Loss Estimation Methodologies



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United States
General Accounting Office
Washington, D.C. 20548

Accounting and Information
Management Division

B-255616

December 9, 1993

The Honorable Henry B. Gonzalez
Chairman, Committee on Banking,
Finance and Urban Affairs
House of Representatives

Dear Mr. Chairman:

This report responds to your January 5, 1993, letter asking us to compare certain public and private sector estimates of bank failures and related losses incurred by the Bank Insurance Fund (BIF). As agreed by your office, we have reviewed the loss estimation methodologies of the Congressional Budget Office (CBO), the Federal Deposit Insurance Corporation (FDIC), the Office of Management and Budget (OMB), Ely and Company, and Roger J. Vaughan and Edward W. Hill (Vaughan and Hill).¹

This report (1) contrasts the various approaches used by these forecasters in estimating bank failures and losses and (2) discusses the major similarities and differences between them, the key assumptions used, and the timing and frequency of their preparation.

Results in Brief

The forecasters' methodologies have some similar characteristics, but, in application, there are significant differences in how estimates of the Bank Insurance Fund's losses from future resolution activity are made. Common characteristics included reliance on professional judgment and the unaudited quarterly reports of financial condition and income that banks submit to regulatory agencies (call reports). However, there were major differences in the data that were used in addition to call reports, in assumptions used, and, ultimately, in how losses were estimated. Also, the time period covered by the underlying data on which these projections were based as well as the time periods covered by the projections varied widely, resulting in estimates that would be difficult to compare even if they had been developed in the same manner.

Long-range estimates of bank failures and their impact on the insurance fund are problematic because of their dependence on uncertain future events, such as interest rate movement and changes in real estate market conditions. This uncertainty, coupled with the lack of clear and complete

¹Ely and Company is a private financial institutions consultant. Roger J. Vaughan and Edward W. Hill are the authors of *Banking on the Brink: The Troubled Future of American Finance* (Washington Post Company Briefing Books, October 1992).

disclosure regarding the bases for the estimates and the key assumptions used in each of the estimation methodologies, add to the difficulty that users of the estimates may have in making direct comparisons and drawing firm conclusions about their reasonableness. This uncertainty also underscores the importance of having a well-capitalized Bank Insurance Fund to absorb losses from failed banks which are inherently difficult to estimate over a long-term period.

Among the five forecasters whose loss estimation methodologies we reviewed, we believe that FDIC should be in the best position to provide meaningful loss estimates. As a bank regulator and as the administrator of the Bank Insurance Fund, FDIC has access to key information, such as confidential supervisory data on open banks and data on the actual cost of resolutions, that is critical to making reasonable projections of future bank failures and their potential cost to the insurance fund.

Background

During the 7-year period ended December 31, 1992, the Bank Insurance Fund incurred estimated losses totaling over \$31 billion from resolving 1,194 failed banks with total assets of over \$222 billion. As a result, the Fund balance, which had reached a high of \$18.3 billion at the end of 1987, was reduced to a deficit of about \$7 billion at the end of 1991. The escalating rate of bank failures and resulting losses during this period raised concern by the Congress and the public that, if this trend continued, taxpayer assistance might become necessary. The Congress took action to help minimize losses to BIF and rebuild the Fund's reserves by enacting the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA). The act (1) required prompt corrective regulatory action to minimize losses to BIF, (2) strengthened corporate governance and accounting requirements for insured financial institutions, (3) increased FDIC's authority to borrow for BIF's losses from resolution activity, and (4) established a maximum time period for FDIC to rebuild BIF's reserves to achieve the designated ratio of reserves to insured deposits of 1.25 percent contained in the Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA).

As the pace of bank failures and their associated costs continued at historically high levels, a number of public and private sector entities and individuals published estimates of future bank failures and their expected costs to BIF. At the time we initiated our review, the most current loss estimates prepared by the forecasters whose methodologies we reviewed, and the time periods covered by their estimates, were as follows:

Forecaster	Estimated loss (in billions)	Date of estimate	Period covered
CBO	29.0	January 1993	1993-1996
FDIC	39.6	October 1992	1992-1995
OMB	45.2	January 1993	1993-1998
Ely and Co.	11.1	November 1992	1992-1995
Vaughan and Hill	31.3 to 95.5	October 1992	as of 12/91 ^a

^aUnlike the other loss forecasters, Vaughan and Hill's methodology focused on measuring bank failure costs based on losses already embedded in banks at the end of 1991. Consequently, Vaughan and Hill's estimates represent the cost BIF would already have incurred had banking regulators closed all institutions Vaughan and Hill estimated as insolvent at year-end 1991.

With the exception of Vaughan and Hill, each of these forecasters has subsequently revised its estimates to account for the effects that significant changes in interest rate and market conditions have had on the financial condition of the banking industry. The most recent estimates of these forecasters, which reflect the significant improvement that has occurred in the condition of the banking industry during the past year, are as follows:

Forecaster	Estimated loss (in billions)	Date of estimate	Period covered
CBO	9.0	September 1993	1993-1996
FDIC	7.2 ^a	July 1993	1993-1995
OMB	18.2	August 1993	1993-1998
Ely and Co.	6.5	May 1993	1993-1995

^aOf this amount, \$6.2 billion has been recognized as estimated liabilities for unresolved cases on the financial statements of BIF as of June 30, 1993.

These more recent BIF loss projections, which are based on year-end 1992 and first quarter 1993 bank data, are substantially lower. The magnitude of the change in loss estimates illustrates the sensitivity of forecasts to changing economic conditions. If the banking industry's condition and performance continues to improve, we anticipate that loss estimates prepared in the foreseeable future will continue to be lower than previous estimates.

Objective, Scope, and Methodology

Our objective in this review was to describe, compare, and contrast the methods, including key assumptions, that the CBO, FDIC, OMB, Ely and

Company, and Vaughan and Hill used to develop BIF loss estimates. To accomplish this objective, we reviewed and analyzed documentation provided by each of the five forecasters that describes how they estimated potential BIF losses. We also interviewed individual forecasters responsible for preparing the estimates to obtain additional information and clarification regarding the methods and assumptions used. In addition, we incorporated into our report any recent significant revisions to the methods and assumptions used by the five forecasters.

We conducted our study in Washington, D.C., from March through September 1993, in accordance with generally accepted government auditing standards.

Significant Differences in Methods and Assumptions Produced Widely Disparate Results

The loss projections developed by the five forecasters whose loss estimation methodologies we reviewed varied widely. The primary reason is that the forecasters employed different approaches and techniques in estimating future BIF losses from resolution activity. Each forecaster's methodology is summarized below and discussed in detail in appendix I.

- CBO used an approach designed to estimate total industry losses that BIF would incur from bank failures rather than the losses from individual bank failures. CBO used historical failure rates to project failures in terms of total assets of failed banks and used FDIC historical loss rates to project losses to be incurred on the expected failed bank assets. CBO then calculated net outlays for BIF by taking into account both projected losses and estimated premium and other income.
- FDIC used a variety of approaches, including (1) bank income and financial condition projections based on call report data, (2) bank probability of failure projections based on past experience and bank-reported financial characteristics, and (3) individual bank-by-bank analyses. The results of these approaches were compared and reconciled to arrive at estimates of BIF's losses.
- OMB employed a two-stage process that had as its primary goal the estimation of government outlays arising from bank failures. OMB first used a mathematical model to project losses by estimating the current market value of each bank's assets and changes in this value over time. OMB incorporated the results of the model with BIF income and disbursement data obtained from FDIC to project BIF's net outlays for several years.
- Ely and Company employed two basic approaches intended to develop loss estimates for individual banks as well as in total: (1) reducing bank asset values down to their estimated market value and calculating the

effect on bank equity levels and (2) estimating banks' future earnings ability and the related effect on banks' equity levels. Ely and Company developed a failure probability factor based on past experience and applied it to the lower of the two equity levels calculated for each bank to arrive at an estimated loss for each bank. Ely and Company then combined these individual loss estimates to arrive at the total estimate of losses to BIF.

- Vaughan and Hill estimated the levels of banks' capitalization by reducing their asset values to estimated market value using various discount rates for different categories of assets. They then placed the banks in one of seven categories by capital level and applied varying loss rates to their total assets based on their classification to derive the estimated losses.

We found substantial differences in the assumptions used by these forecasters and the manner in which they considered certain factors such as asset valuation, interest rates, and assessment rates. In most instances, it was not clear from available documentation and discussions with the forecasters how the various assumptions they used affected their ultimate loss estimates. However, in view of the importance of some of the factors involved in estimating the amount of losses to BIF from bank failures and the differing degrees to which they were considered, we believe that the differences in the assumptions used significantly contributed to the variation in results.

Asset Valuation Was a Major Consideration in Most Loss Methodologies

One of the most significant variables considered in estimating losses to BIF from bank failures is the valuation of bank assets. This is important because the value of a bank's assets is a strong indicator of its viability at a point in time. The approach forecasters take to establishing these values is also important because experience has shown that call reports cannot always be depended on to provide an accurate picture of the value of banks' assets.²

With the exception of CBO, which did not discount reported asset values in its estimation approach, the methodologies we reviewed all considered the shortcomings of call reports in estimating bank asset values. OMB estimated asset values for banks using a mathematical model adapted from the securities industry, which attempts to approximate the current economic value of a bank's assets by capitalizing its gross earnings. FDIC, Ely and Company, and Vaughan and Hill all discounted asset values.

²Bank Insurance Fund: Additional Reserves and Reforms Needed to Strengthen the Fund (GAO/AFMD-90-100, September 11, 1990) and Failed Banks: Accounting and Auditing Reforms Urgently Needed (GAO/AFMD-91-43, April 22, 1991).

However, the discount rates these forecasters used were not comparable. For example, FDIC estimated asset values based on both an analysis of historical data it maintains and its more recent experience. Ely and Company and Vaughan and Hill each developed different asset discount rates for different classifications of assets based largely on professional judgment.

Interest Rates Were Considered by Several Loss Methodologies

Interest rates are an important component of the loss estimation process because of their major impact on the condition of banks. However, they are also a difficult variable to accurately predict.

The forecasters' methodologies took a variety of approaches in considering interest rates and their impact on the loss estimation process. CBO and OMB employed models which factored in interest rate assumptions, although the impact of these assumptions on the resulting loss estimates was unclear. Ely and Company factored interest rate assumptions into its projections of banks' future earnings ability. FDIC did not consider interest rates in preparing its estimates because FDIC officials felt such consideration was too problematic and unlikely to yield a meaningful result. Vaughan and Hill also did not consider interest rates but focused exclusively on asset valuations.

Assessment Rate Pass-through Assumptions Differed Significantly

Premium assessments for insured deposits are a potentially significant cost to thinly capitalized institutions. Any assessment increases could therefore have a direct and substantial impact on the financial condition and viability of these institutions. For this reason, the manner in which assessment rate increases are considered in a loss estimation process can have a substantial effect on the ultimate loss estimates.

In measuring the impact of assessment rate increases on banks, the forecasters' assumptions varied widely as to how much of the increases would be passed on to customers and how much would be absorbed by banks. CBO assumed banks would pass 50 percent of any assessment increase on to customers. In comparison, FDIC and OMB assumed no pass through to customers, while Ely and Company assumed 100 percent of any assessment increase would be passed on to customers. As with other assumptions made by the forecasters, it was not clear from available documentation how these assumptions impacted the final resulting loss estimates. Vaughan and Hill made no pass-through assumptions regarding assessment rate increases because their methodology resulted in a

projection of the loss BIF had already incurred as of December 1991, not a projection of future BIF losses.

Certain Limitations Affect Precision of Long-range Forecasts

Although the methodologies used by the forecasters varied widely, some common characteristics limited their ability to estimate BIF's long-range resolution costs with a high degree of precision. For example, all of the forecasters' methodologies used call reports as the initial source data in their loss estimation process. These call reports, as well as data on bank failure rates and loss rates, are historical in nature. Therefore, there is a delay between any significant changes in the condition of the banking industry and the impact of these changes on the reasonableness of loss estimates prepared by these forecasters. The impact of this time lag on the estimates depends to a great extent on the significance that the factors influencing such changes in the banking industry's condition, such as interest rates, have in the various loss estimation methodologies. As discussed previously, most of the forecasters whose methodologies we reviewed have already significantly reduced their estimates of BIF losses from future bank failures to reflect the improving conditions in the banking industry brought about to a large extent by the favorable interest rate environment.

Another characteristic common to all of the methodologies is the extensive reliance the forecasters placed on their own professional judgment. The forecasters used a variety of discount factors and often complicated mathematical and statistical techniques and approaches to determine banks' market values and, ultimately, to quantify their loss estimates. The appearance of exactness these techniques and approaches lend to the estimates, however, often masks the subjective nature of many of the factors used in the estimation process. All of the forecasters relied to a large extent on their professional judgment in making certain critical assumptions that have a significant impact on the final estimates. For example, the discounting of bank asset values was a critical component in several of the loss methodologies. In determining the discounted value of assets, the forecasters relied to a great extent on their professional judgment as to appropriate discount rates.

Insufficient Disclosures Hinder Ability to Assess the Basis of Loss Estimates

None of the forecasters whose loss estimation methodologies we reviewed provided sufficient disclosures about their approach to enable users to independently arrive at conclusions as to the merits of the methodologies and the resulting loss estimates. The lack of sufficient disclosure has made it difficult to explain the wide disparity in the loss estimates derived from the five forecasters' methodologies.

While the disclosures currently provided by the forecasters contain some details on the estimation approach they used, they do not explain the rationale for certain critical assumptions made and the impact these assumptions have on the loss estimates. For example, several forecasters discounted banks' reported asset values to estimate their market values. While they disclosed the discount factors they used in this valuation process, they did not disclose the bases for these discount factors. Through our discussions with these forecasters, we found that these discounts were based on discussions with other industry experts and the forecasters' professional judgment. The asset discounting process was a key determinant in estimating losses under these methodologies. Consequently, insufficient disclosures regarding the highly subjective nature of this factor impacts both an understanding of the bases for the discounts and an assessment as to their reasonableness.

FDIC's Role Requires Ability to Determine Meaningful Loss Estimates

The FDIC Improvement Act required FDIC to establish a recapitalization schedule specifying semiannual assessment rates for BIF member institutions sufficient for BIF to achieve the designated reserve ratio of 1.25 percent no later than 15 years after the date on which the schedule became effective. The BIF recapitalization schedule established by FDIC takes into consideration FDIC's estimates of the number and size of future bank failures, the costs of resolving these failures, and the amount of expected assessment and other income. In developing and updating the recapitalization schedule, FDIC examines a range of values for failed bank assets, resolution costs, and industry growth. FDIC monitors relevant developments that might affect its estimates and as circumstances warrant, revises the recapitalization schedule taking into consideration projected losses from resolution activity.

As a federal banking regulator and as the administrator of the insurance fund for federally insured commercial and savings banks, FDIC has at its disposal extensive information on the condition of the banking industry that is not readily available to other forecasters. This includes supervisory information on individual banks' management and internal controls, which

have been shown to be major factors in the future prospects and viability of financial institutions.³ FDIC personnel also have the benefit of extensive experience in evaluating and applying this information in the course of fulfilling their supervisory responsibilities. Given its access to key data, FDIC should be in the best position of any forecaster to develop realistic and meaningful loss estimates, subject to the uncertainties and limitations inherent in any long-range projection, and to know what critical factors should be considered in assessing the health and viability of financial institutions.

Observations

Attempting to predict the future prospects of the banking industry and to estimate future losses that will be incurred by BIF from bank failures is a highly subjective process. Preparing such estimates is essentially an attempt to predict the future, which is an intrinsically uncertain proposition. The health of the banking industry is subject to many variables which are extremely difficult to predict, such as changes in interest rates and fluctuations in real estate markets. There is no empirical formula for forecasters to follow in preparing loss estimates which would enable them to know with certainty what approach and assumptions can most accurately reflect both present and future conditions and events that can play a significant role in the final outcome. Consequently, loss forecasters will, by necessity, continue to rely on their own judgment. As a result, differences in approaches followed, assumptions used, and results obtained most likely will continue.

Despite these limitations, the presence of forecasters engaged in estimating future loss exposure to BIF from its resolution activities can provide the Congress and the public with useful views on the health of the industry and its insurance fund. In this regard, the usefulness of these various loss estimates and their underlying processes can be enhanced through more informative disclosure concerning the bases for the estimates. The forecasters should give particular attention to disclosing how the approach they use results in the projected losses, how and why they selected the various assumptions used in the loss estimation process, and how these assumptions affected the resulting estimates.

As a bank regulator and as the administrator of the Bank Insurance Fund, FDIC should be in the best position to develop sound, reliable BIF loss estimates, subject to the uncertainties and limitations inherent in any

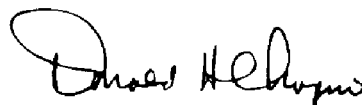
³Bank Failures: Independent Audits Needed to Strengthen Internal Control and Bank Management (GAO/AFMD-89-25, May 31, 1989) and Failed Banks: Accounting and Auditing Reforms Urgently Needed (GAO/AFMD-91-43, April 22, 1991).

long-range loss estimation process. Also, these uncertainties and limitations underscore the need to have a well-capitalized insurance fund to absorb losses from failed banks which are inherently difficult to estimate over a long-term period.

As agreed with your office, unless you publicly announce the contents of this report earlier, we will not distribute it until 30 days from the date of this letter. At that time, we will send copies to the Acting Chairman of the Board of Directors, Federal Deposit Insurance Corporation; the Director, Office of Management and Budget; the Secretary of the Treasury; the Comptroller of the Currency; the Chairman of the Board of Governors of the Federal Reserve System; the Ranking Minority Member of your Committee, and other interested parties. Copies will be made available to others on request.

This report was prepared under the direction of Robert W. Gramling, Director, Corporate Financial Audits, who may be reached on (202) 512-9406 if you or your staff have any questions. Other major contributors are listed in appendix II.

Sincerely yours,



Donald H. Chapin
Assistant Comptroller General

Estimation Methodologies for Forecasting Bank Insurance Fund Losses

The methodologies we reviewed that were used by the five public and private sector entities and individuals to forecast potential losses to the Bank Insurance Fund from bank failures—the Congressional Budget Office (CBO), the Federal Deposit Insurance Corporation (FDIC), the Office of Management and Budget (OMB), Ely and Company, and Roger J. Vaughan and Edward W. Hill (Vaughan and Hill)—differ significantly in the approaches and assumptions they involve regarding BIF's exposure to losses from future resolution activity. The following sections discuss the approaches used for the various loss estimation methodologies we reviewed and their key assumptions.

Congressional Budget Office

Overview

As part of its budget analysis responsibilities, CBO prepares BIF loss projections at least semiannually. We reviewed the estimates prepared in January 1993, in which CBO projected that the BIF would incur losses totaling \$29 billion between 1993 and 1996. CBO projects total losses, not individual bank failures.

In making its projections, CBO uses an actuarial/simulation model. The actuarial component of the model uses historical failure rates as the basis for estimating future failures in terms of total assets. The simulation component quantifies the potential effects of recessions, premium increases, and other factors on BIF losses. The figures derived from the actuarial/simulation model are incorporated into a cash flow analysis that attempts to estimate future total outlays for BIF. As a check on the validity of the results from the actuarial/simulation model and cash flow analysis, CBO reviews FDIC-supplied data that denote trends in the financial condition of banks.

Actuarial/Simulation Model

Under the actuarial component of CBO's loss projection model, CBO first obtains the most recent bank call report data from FDIC to break out the universe of banks into 15 groups. These groups are determined based on equity/asset ratios and asset size. CBO then uses historical bank failure data going back to 1986 to determine the incidence of failure of banks in each group. CBO uses this historical incidence of failure for each bank grouping

to project the number of banks that will fail in each group over a 4-year period and the value of associated assets.

In the simulation component of its model, CBO attempts to quantify the impact various factors and assumptions will have on the number of failed banks and value of failed bank assets that were identified under the actuarial approach. The factors CBO attempts to consider include national recessions, particularly with respect to the impact on real estate markets; the effects of legislation, such as the imposition of risk-based premiums; and regulatory behavior, including how strictly institutions are supervised, how quickly failed banks are closed, the form of resolutions, and the methods used to dispose of acquired assets. CBO acknowledges that the effects of these factors are often difficult to measure, thus making their value when used to forecast potential bank losses uncertain.

Cash Flow Analysis

CBO incorporates the estimated losses from the actuarial/simulation model with anticipated revenue streams in a cash flow analysis to project total BIF outlays for a 5-year period. In performing the cash flow analysis, CBO makes certain assumptions regarding the growth rate of insured deposits and premium income. For example, CBO assumes that the growth rate in insured deposits will be 3 percent in 1994 and gradually increase to 4.5 percent in 1998. In projecting net cash outlays, CBO also makes assumptions about the interest rates that would impact BIF's potential costs of borrowing from the Federal Financing Bank. In this regard, CBO assumes the 90-day Treasury Bill rate will average 3.53 percent in 1994 and gradually increase to 4.90 percent in 1998.

Transition Matrix Approach

As a cross-check on the validity of its loss estimation approach, CBO reviews information provided by FDIC that shows the number of banks and their associated assets that have recently changed supervisory classifications to project bank mergers, survivals, and failures. This "transition matrix" approach provides a basis for examining trends, such as the extent to which sound banks have been deteriorating and weak banks have been improving. CBO uses the information generated from the transition matrix to check the reasonableness of its bank groupings and failure projections.

Federal Deposit Insurance Corporation

Overview

FDIC prepares quarterly loss estimates for the purpose of updating both BIF's recapitalization schedule and its financial statements. We reviewed the estimates prepared as of July 1, 1993, in which FDIC estimated losses to be incurred by BIF totaling \$7.2 billion through the end of 1995. Of this amount, FDIC has recognized \$6.2 billion as estimated liabilities for unresolved cases on BIF's June 30, 1993, financial statements.

FDIC uses several different approaches to project BIF's estimated losses from future bank failures. Once projected, FDIC then reconciles the results of each approach to arrive at a single set of projected losses. While different methods are used, FDIC's principal approach estimates the total amount of failed bank assets using a methodology that reconciles the results from an actuarial model with an analysis of individual banks. Like CBO's model, FDIC's actuarial model uses historical bank failure experience as a basis for predicting future failures. The model assumes that failure rates over a recent time period will continue over the next several years. FDIC's approach does not consider interest rates but does consider certain assumptions regarding assessment rates and asset quality. The analysis of individual banks is performed using call report data and other information from FDIC examination and supervision activity.

Call Report Screening

One approach FDIC uses in its loss estimation methodology is a call report screening process to analyze certain call report information and use this information to determine an estimated "life expectancy" of banks. Under this approach, FDIC uses a computer program to perform a series of analyses on FDIC's data base of call report data submitted by insured banks. The objective of this analysis is to examine each bank's net worth and underlying profitability and to adjust each for identified asset quality problems.

The analysis first measures each bank's net operating cash flow (interest and noninterest income, minus interest and noninterest expense), less uncollected loan income. It then adjusts this amount by subtracting out expected future losses on identified delinquent and nonaccrual loans, plus other real estate owned. These expected future losses are calculated using

loss rates that are determined for various classifications of assets based on historical experience. If the resulting cash flow is negative, it is divided into tangible capital and reserves to estimate the number of quarters that remain until a bank falls below the 2 percent Tier 1 capital standard that would trigger closure or other supervisory action on the part of the regulators. The resulting value is the estimated "life expectancy" of the bank. FDIC compares the results of this screening program with the list of projected failures prepared regularly by FDIC's Division of Supervision (DOS) to identify and investigate instances where banks with apparent short life expectancies per the call report screening process do not appear on the DOS list.

Pro Forma Projection Analysis

FDIC also uses call report data to project banks' income and capital under a separate "pro forma" analysis. This analysis assumes that banks' only source of funds is earnings. Asset sales and new capital issues are not considered in this analysis. Bank earnings projections are based on returns on earning assets. In order to allow for changes in asset quality, bank loan loss provisions are projected separately. Assessment costs are also projected separately to reflect changes in BIF assessment rates.

This analysis assumes that semiannual loan loss provisions are necessary if an institution's loan loss allowance falls below 50 percent of its nonperforming assets. Loan charge-offs are projected using a statistical model which relates several categories of nonperforming loans to loan charge-offs. Projected net income is defined as the return on earning assets, minus increments in deposit insurance premiums and loan loss provisions, plus the tax benefit of new loss provisions. Under this analysis, FDIC assumes that a bank's earnings retention rate will be consistent with the most recently reported year-end rate. FDIC then calculates bank capital as the sum of the last reported quarter-end capital plus projected cumulative retained earnings. Institutions whose projected Tier 1 capital levels fall below the 2-percent limit are assumed to require FDIC assistance.

Actuarial Model

FDIC also employs an actuarial model to estimate future BIF losses from bank failures. The actuarial model does not attempt to predict specific bank failures but focuses instead on estimating the total amount of failed bank assets. FDIC uses its most recent call report data to group banks according to their adjusted capital and net operating income. Adjusted capital is defined as equity capital plus reserves, minus nonperforming

assets. Net operating income is income before taxes and extraordinary items, less securities gains.

FDIC projects the number of bank failures and value of associated assets for a 3-year period by multiplying the number and assets of banks in each capital/income group by a probability of failure percentage for that group. For the estimates we reviewed, FDIC calculated failure probability percentages using historical information it maintains on commercial banks with assets of less than \$1 billion which failed or required assistance between January 1, 1985 and December 31, 1992. FDIC computed failure probabilities using failure information for smaller banks because of the relative infrequency of large bank failures (assets in excess of \$1 billion) between 1985 and 1992, and because using the limited failure information for large banks in the analysis would result in unrealistically low failure rates.

Contingent Loss Analysis

FDIC analyzes recent call report data and the results of recent or ongoing regulatory examinations, including planned supervisory actions, to identify banks with a high probability of failure. Focusing specifically on those institutions with assets over \$100 million that the regulators have identified as problem banks, FDIC analyzes their conditions to identify those banks whose equity capital is expected to fall below 2 percent of total assets within 18 months based upon current equity capital levels, levels and trends of nonperforming assets, and current income trends. FDIC applies various historical loss rates based on banks' total assets to those banks identified through this process as likely to fail to derive an estimate of losses to be incurred by BIF. FDIC includes in this estimate a general reserve for banks with assets under \$100 million based upon its historical loss experience for smaller bank failures. The estimate of losses derived from this analysis is the basis for the estimated liability for unresolved cases that FDIC records in BIF's financial statements.

"Econometric Survival" Model

FDIC uses one other approach, which it calls an "econometric survival" model, to estimate the probability of a bank's future failure, based on reported financial characteristics of the bank. These characteristics include measures of a bank's capital, loan portfolio risk, asset quality, and earnings. All of these characteristics are considered to be statistically significant determinants in estimating the probability of bank failures. With this approach, each financial institution is assigned an estimated probability of failure over a relevant time horizon based on its financial

characteristics. These probabilities are used to calculate the total amount of failed bank assets over the time horizon.

Committee Process

After FDIC completes its estimating process under each of the approaches described above, a committee meets to discuss the results, reconcile the various analyses, and prepare a single set of projections. The committee is comprised of officials from FDIC's Divisions of Research and Statistics, Finance, Resolutions, and Supervision. Such factors as supervisory knowledge of individual bank conditions are incorporated into the estimates. The BIF loss estimates resulting from the committee discussions are subject to the review and approval of the FDIC Board of Directors. They are then incorporated in BIF's financial statement footnotes and in developing or revising BIF's recapitalization schedule.

It should be noted, however, that the losses FDIC estimates BIF has incurred from banks that were identified in the contingent loss analysis as likely to fail over the next 18 months are the losses recorded in BIF's financial statements.

Office of Management and Budget

Overview

OMB, working with FDIC and the U.S. Treasury, estimates bank failure costs semiannually for the President's budget and midsession review update. As of August 1993, OMB estimated BIF would incur losses totaling \$18.2 billion from bank failures for 1993 to 1998.

OMB uses a two-stage process to estimate government outlays arising from FDIC-insured bank failures. The first stage uses a sophisticated mathematical model, options pricing, to estimate the total assets of banks that are expected to be closed by the banking agencies. The second stage estimates the losses and budgetary cash flows associated with the resolution of these failed banks. Finally, OMB's loss estimation process includes consulting with bank regulatory agencies and reviewing current FDIC data to check the reasonableness of the loss estimates and to refine these estimates if deemed necessary.

Options Pricing

OMB uses options pricing to estimate the total amount of failed bank assets. Under options pricing, deposit insurance is treated as giving the owners of a bank the option to transfer the bank's liabilities to the government. The option would be exercised only when the value of a bank's assets drops below that of its liabilities, leaving it insolvent. OMB uses standard options pricing modeling techniques to calculate the expected flow of costs once an adequate measure has been made of each depository institution's current net worth.

OMB begins its calculation of deposit insurance costs by estimating the actual financial condition of every bank with liabilities over \$100 million. The current value of a bank's assets is estimated by capitalizing its gross earnings, net of taxes and interest accrued but not collected. OMB makes two additional adjustments to a bank's reported earnings before capitalization. First, OMB estimates an expected loss provision for each bank based on the loss experience of similar institutions. Second, bank earnings are adjusted to account for the tendency of very high or low reported earnings to revert toward the industry's long-term mean rate of return. The resulting estimate of a bank's current asset value, less the face value of the bank's deposits and other liabilities, provides a measure of its estimated net worth.

To develop multiyear cost projections, the performance of the banking industry is projected forward using a random element to reflect the volatility of individual banks' earnings over time. OMB does not project individual banks but starts with its projections by grouping banks by their estimated net worth. OMB uses other factors in its multiyear cost projections, including the expected variance in earnings, the expected trend in average industry earnings, and the closure rule followed by regulators. Alternative assumptions for each of these factors are used to test the sensitivity of the cost projections.

Cash Flow Analysis

OMB incorporates its estimate of the cost of failed bank assets derived from its options pricing approach with certain data provided by FDIC to project BIF net outlays for the next 6 years. OMB uses FDIC supplied information on both BIF receipts and disbursements in its cash flow analysis. With respect to receipts, OMB uses the latest FDIC data on premium revenues, proceeds from sales of failed bank assets, and interest earnings. For disbursements, OMB uses FDIC-supplied information on loss payments (the difference between the amount of funds FDIC disburses to cover a failed institution's insured deposits and certain other liabilities and the estimated market

value of its assets) and working capital payments used to fund the acquisition of failed institutions' assets or to advance funds to failed institutions prior to resolution. Disbursements also include interest paid by FDIC on working capital borrowings from the Federal Financing Bank and administrative expenses for supervision, legal work, and accounting activity. OMB subtracts receipts from disbursements to produce projected BIF net outlays.

Consultation

After OMB has developed a preliminary estimate of losses from failed banks, it consults with FDIC, Treasury, and the Federal Reserve to discuss both the near-term banking industry outlook and long-term projections. Since FDIC retains the most comprehensive information about institutions likely to fail in the near term, OMB gives a great deal of weight to FDIC's projections. FDIC provides OMB its outlook on projected losses for various classes of assets and information on the mix of resolution strategies it will likely employ. FDIC also provides OMB detailed information on projected revenues and overhead expenses. After OMB has held discussions with FDIC, Treasury, and the Federal Reserve, and has reviewed the FDIC data, it refines its preliminary BIF loss estimates as necessary.

Ely and Company

Overview

Ely and Company produces estimates of future BIF losses from bank failures on an intermittent basis in its capacity as a consultant to financial institutions and related trade groups. We reviewed the estimates Ely and Company prepared in May 1993 which estimated future BIF losses of \$6.5 billion between 1993 and 1995.

Ely and Company's approach focuses on valuing individual banks to derive estimates of BIF losses. Using call report data, Ely and Company calculates net worth values for every BIF-insured institution under two distinct methods, then uses the lower net worth value calculated for each institution to estimate BIF's prospective losses. Under the "asset haircut" method, the on-balance sheet assets of each bank are divided into various categories; each category is then reduced, or discounted, by certain percentages. Under the "capitalized income stream" method, Ely and Company capitalizes an adjusted, going-forward earnings amount to arrive at a second net worth value for each bank. Ely and Company then applies

probability of failure percentages to the lower of the equity levels yielded by the two net worth estimation methods to derive the estimated losses. The loss estimates resulting from this approach are largely dependent on the assumptions used to value assets and capitalize income.

“Asset Haircut”

Under the asset haircut approach, Ely and Company attempts to determine an institution's adjusted capital ratio by considering the effects of asset deflation on a bank's capital position. Ely and Company begins by grouping each bank's real estate or real estate-related assets into 13 categories. These asset categories include nonperforming real estate loans, real estate investments, restructured real estate loans, other real estate owned (OREO), and real estate loan commitments.

Ely and Company divided the 50 states, the District of Columbia, Puerto Rico, and Guam into four groups based on the relative degree of real estate deflation experienced by each in recent years. Based on professional judgment, Ely and Company developed discount rates, or “haircuts,” to be applied to the 13 real estate asset categories of each bank for each of the four geographical groupings. The lowest discount rates were applied to the real estate or real estate-related assets of banks headquartered in the geographical group (Group 1) that has not experienced significant real estate deflation in recent years. Conversely, the highest discount rates were applied to the real estate or real estate-related assets of banks headquartered in the geographical group (Group 4) that has recently experienced severe real estate problems. For example, the discounts applied to construction and land development OREO ranged from 25 percent for banks in Group 1 to 70 percent for banks in Group 4. The discounts applied to nonperforming construction and land development loans ranged from 40 percent for banks in Group 1 to 80 percent for banks in Group 4. For banks owned by multi-bank holding companies, the discounts were applied to each bank before the banks were combined for purposes of further analysis.

Ely and Company also applied various nongeographically related discounts to other assets and commitments of each bank. For example, nonperforming commercial loans were discounted by 50 percent. Performing loans were discounted by between 0.67 percent and 1.67 percent, depending on each bank's ratio of OREO and nonperforming loans to performing loans. These discount percentages, like those derived for real estate assets, were derived based on professional judgment.

Once all discounting was applied, Ely and Company subtracted the effects of the discounting from each bank's gross capital and total assets to derive both adjusted capital and adjusted assets. Adjusted capital was then divided by adjusted assets to derive an adjusted capital ratio.

Capitalized Income Stream

Ely and Company believes that a critical deficiency in any approach that relies solely or primarily on asset discounting techniques is that it fails to consider the added value to banks from their off-balance sheet assets. To ensure consideration of such added value, Ely and Company developed a second approach to determine banks' adjusted capital ratios. This approach attempts to derive another net worth value for each bank by capitalizing a "normalized" income stream which Ely and Company believes more accurately values banks by considering the value of their off-balance sheet assets.

Under this approach, Ely and Company calculates a going-forward, pre-tax income by adjusting the bank's net interest margin. Ely and Company increases each bank's net interest margin by several factors, including (1) the total amount of fees and other income a bank earns, (2) income from reinvesting at a 5.5 percent interest rate the proceeds from liquidating a bank's OREO and nonperforming loans, and (3) estimated operating expense savings achieved by liquidating OREO.

Using professional judgment, Ely and Company then reduces a bank's income to account for several factors. For example, interest earned on longer term loans and investments is reduced to eliminate the potential excess income earned from significant maturity mismatching. The level of this reduction is determined by the time to maturity or repricing of net assets and the type of institution (commercial versus savings bank). Ely and Company also reduced banks' income by discounting their various sources of fee income. For example, a bank's foreign exchange trading gains were discounted by 30 percent, gains from trading accounts were discounted by 20 percent, and other fee income, other than from fiduciary activities and service charges on deposit accounts, was discounted by 10 percent.

Ely and Company also reduced income by a bank's operating expenses in determining its going-forward, pre-tax income. However, Ely and Company only reduced income by half of a bank's operating expenses to recognize the value an acquirer of a bank could obtain by eliminating excess operating expenses. Finally, income was reduced by a

going-forward loan loss allowance used in lieu of a bank's actual provision for loan losses. This loan loss allowance was then adjusted using the same ratio of nonperforming assets to performing loans that was used in the asset haircut method.

All of these factors culminated in a going-forward, pre-tax income amount calculated for each bank. Ely and Company reduced this amount by 38 percent to arrive at each bank's going-forward, after-tax income. Ely and Company then multiplied the after-tax income by ten to capitalize the income.¹

Ely and Company calculated a second adjusted capital ratio for each bank by dividing the capitalized income calculated under this method by the bank's adjusted assets as determined under the asset haircut method. If this adjusted capital ratio was less than 9 percent, the income to be capitalized was first reduced by the amount of equity capital that would have to be invested in the bank to bring it to a 9 percent adjusted capital ratio.

Estimates of Failure Probabilities and Losses

Ely and Company used the lower of the two adjusted capital ratios derived under the asset haircut and capitalized income stream methods to determine the probability that a bank might fail. Based on both past experience and professional judgment, Ely and Company determined probabilities of failure applicable to certain levels of adjusted capital ratios. For example, Ely and Company assigned a 5-percent failure probability to banks with adjusted capital ratios between 2 percent and 3 percent. Banks with adjusted capital ratios between negative 5 percent and negative 8 percent were assigned an 80-percent probability that they would fail.

Ely and Company multiplied the probability of failure associated with each bank based on its adjusted capital ratio by the sum of the lower of the two adjusted capital ratios derived for the bank and an amount for additional losses should failure occur, to determine the probable loss for each bank. The amount Ely and Company added for additional losses equaled 3 percent of adjusted assets if the bank had an adjusted capital ratio of 0 percent to 3 percent. If a commercial bank had a negative adjusted capital ratio, the amount added for additional losses equaled 2 percent of

¹Ely and Company determined that ten would be the price multiple the average bank would sell at, assuming an annual industry earnings growth of 7.5 percent and an after-tax return on capital of 14 to 15 percent.

adjusted assets. If a savings bank had a negative adjusted capital ratio, no additional losses were added.

Roger J. Vaughan and Edward W. Hill

Overview

Roger J. Vaughan and Edward W. Hill's study of the future of the nation's banking industry was essentially a onetime study, although a follow-up study is now in preparation and is expected to be released later this fall. In their study, Vaughan and Hill estimated that as of December 1991, BIF faced losses ranging from \$31.3 billion to \$95.5 billion based on the existing condition of the banking industry. Vaughan and Hill's banking study was not intended to project BIF losses for future years, but rather to assess the level of industry losses based on the financial condition of banks as of December 1991. Thus, the study did not consider the potential effects of future interest rate fluctuations and other factors.

To evaluate the condition of banks, Vaughan and Hill calculated the estimated current market values of bank assets by discounting asset book values by various discount rates. The resulting values derived from this discounting were used to compute adjusted equity-to-asset ratios. Vaughan and Hill classified banks into seven groups, from very well-capitalized to insolvent, based on the adjusted ratios. The classification for each bank reflected the probability of its failure. Vaughan and Hill used the failure probabilities for all banks in combination with FDIC historical and projected loss rates to calculate the total estimated loss to BIF. Vaughan and Hill's estimates are primarily the result of assumptions they made regarding discounting of various categories of bank assets. Separate loss scenarios, one more optimistic, the other more pessimistic, were determined based on different assumptions regarding asset discounting, failure probabilities, and loss rates.

Adjustments to Bank Asset Values

Vaughan and Hill obtained bank asset values as reported in December 1991 banking industry call reports or other financial reports prepared by banks and bank holding companies. Based on discussions with bankers and industry experts and review of banking publications, Vaughan and Hill developed discount rates to be applied to various asset categories and types to arrive at their estimated current market value.

Specifically, Vaughan and Hill discounted the book value of banks' OREO by 80 percent, loans at least 90 days late in their payment schedule by 60 percent, and restructured real estate loans by 60 percent. Vaughan and Hill subtracted the projected losses resulting from this discounting process from each bank's reported capital and assets to determine each bank's adjusted capital ratio.

Under a more pessimistic scenario, Vaughan and Hill applied additional discounts to the book value of assets not identified as troubled in bank financial reports. In addition to the discounting noted above, Vaughan and Hill discounted the book values of all construction and development loans by 40 percent, mortgages for multifamily structures by 30 percent, and all loans for commercial real estate by 20 percent. Each bank's capital and assets were further adjusted for these additional writedowns and a second, more pessimistic, adjusted capital ratio was determined.

After deriving the two adjusted capital ratios, Vaughan and Hill divided all banks into one of seven groups based on the adjusted capital ratios under the two scenarios. These groups are as follows:

- very well-capitalized—equity-to-asset ratio of 8 percent or more, with no chance of failing;
- well-capitalized—equity-to-asset ratio of 6 to 8 percent, with a low chance of failing;
- moderately capitalized—equity-to-asset ratio of 3 to 6 percent, and unlikely to encounter problems;
- weakly capitalized—equity-to-asset ratio of 1 to 3 percent, and more prone to failure, but with reversible portfolio damage;
- vulnerable—equity-to-asset ratio of 0 to 1 percent, urgently needing additional capital and close regulatory scrutiny;
- problem—adjusted equity-to-asset ratio is negative despite a positive book equity to asset ratio, possibly insolvent in terms of true asset values; and
- insolvent—negative book equity-to-asset ratio.

After grouping the institutions into seven capital groupings developed under the two separate scenarios based on their adjusted capital ratios, Vaughan and Hill developed a range of estimates using various FDIC failure rates and loss rates. Vaughan and Hill used three probability of failure rates—23 percent, 25 percent, and 39 percent—to determine the likelihood that institutions in each capital grouping would fail. The reported assets in these capital groupings were multiplied by these probability of failure rates to arrive at the assets associated with probable bank failures.

Appendix I
Estimation Methodologies for Forecasting
Bank Insurance Fund Losses

Vaughan and Hill then multiplied these amounts by two loss rates—17 percent and 25 percent—to arrive at their various ranges of BIF estimated losses.

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