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Abstract

Does growing commercial-bank reliance on Federal Home Loan Bank (FHLBank) advances increase expected losses to the Bank Insurance Fund (BIF)? Our approach to this question begins by modeling the link between advances and expected losses. We then quantify the effect of advances on default probability with a CAMELS-downgrade model. Finally, we assess the impact on loss-given-default by estimating resolution costs in two scenarios: the liquidation of all banks with failure probabilities above two percent and the liquidation of all banks with advance-to-asset ratios above 15 percent. The evidence points to non-trivial increases in expected losses. The policy implication is that the FDIC should price FHLBank-related exposures.

Keywords: **Deposit-insurance pricing, Federal Deposit Insurance Corporation (FDIC), Federal Home Loan Bank (FHLB), moral hazard, secured funding**

JEL codes: **G21, G28, K23**

CFR Research Programs: deposit insurance; banking performance & the economy

1. Introduction

Does growing commercial-bank reliance on Federal Home Loan Bank (FHLBank) advances increase expected losses to the Bank Insurance Fund (BIF)?[1] The answer is important to academic studies of deposit-insurance pricing and policy debates over deposit-insurance reform. Since the early 1990s, banks of all shapes and sizes have come to view the FHLBanks as a critical source of funding. At year-end 2003, the FHLBank System boasted nearly 6,000 commercial-bank members with advances topping $240 billion. By way of comparison, jumbo CDs at all 7,770 U.S. commercial banks totaled $597.3 billion. Broadly speaking, BIF faces potential exposure through two channels. Advances could increase default probability by subsidizing risk-taking or losses-given-default by subordinating the Federal Deposit Insurance Corporation's (FDIC) position at resolution.[2]

Recent discussion of the housing GSEs (government-sponsored enterprises) has ignored BIF exposure to FHLBank funding. The policy debate has instead centered on Freddie Mac and Fannie Mae. Poole (2003), for example, has warned of the systemic risk arising from their rapid growth while Passmore (2003) has argued that implicit government subsidies benefit shareholders of the two GSEs more than homeowners. Emmons and Sierra (2004) have also noted that performance incentives for Freddie and Fannie executives exacerbate moral-hazard problems. To date, scientific study of the FHLBanks has focused on the wisdom of the mortgage-partnership program (Bair, 2003; Frame, 2003) and implicit subsidy of community-bank lending (Craig and Thomson, 2003). Some attempt has also been made to model the decision of community banks to join the System (Collender and Frizzell, 2002), quantify the influence of advances on the behavior of troubled thrifts (Ashley, Brewer, and Vincent, 1998), assess the impact of the Gramm-Leach-Bliley Act of 1999 on System solvency (Nickerson and Phillips, 2002), and measure the effect of FHLBank membership on community-bank risk (Stojanovic,

1. The Federal Deposit Insurance Corporation (FDIC) administers two funds—one for banks (the Bank Insurance Fund, or BIF) and one for thrifts (the Savings Association Insurance Fund, or SAIF).
2. Throughout the paper, we define "default" as liquidation of a bank by the FDIC.

Vaughan, and Yeager, 2001). We are aware of no GSE studies that explore the link between advances and BIF solvency.

Theory and practice of deposit-insurance pricing have also neglected the impact of FHLBank funding on BIF. Under the current pricing structure, banks with different advance levels but similar supervisory ratings and capital protection pay the same premiums (Murton, 2004). Prior to 1989, when the Financial Institutions Reform, Recover, and Enforcement Act of 1989 (FIRREA) opened FHLBank membership to commercial banks, this assumption was reasonable.[3] It may no longer be. Recent scientific work has also sidestepped the issue. Fair-pricing models have been calibrated with average long-term FDIC losses or auditing expenses—an approach that extrapolates from an era when FDIC-insured institutions could not borrow from FHLBanks (Duffie et al., 2003; Falkenheim and Pennacchi, 2003). Moreover, ex post (James, 1991) as well as ex ante (Cooperstein, Pennacchi, and Redburn, 1995) estimates of the aggregate cost of deposit insurance have abstracted from FHLBank borrowings. We are the first to ask whether such abstraction is appropriate. Recent evidence that the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) has not deterred banks from shifting risk to BIF makes our analysis all the more timely (Hovakimian and Kane, 2000).

We model and quantify BIF exposure to FHLBank funding. The overarching goal is to determine whether past disregard of this exposure was justified. We begin by conducting comparative-static exercises to "sign" the relationship between advances and expected losses. We then turn to empirical tests, looking at the effect of advances on default probability and loss-given-default. To get at default probability, we examine the contribution of the advances-to-assets ratio to a CAMELS-downgrade model.[4] To get at loss-given-default, we estimate incremental resolution costs in two scenarios: the

3. Before FIRREA, membership was open only to thrift institutions and insurance companies.

4. "CAMELS" is an acronym representing six dimensions of bank safety and soundness: capital protection (C), asset quality (A), management competence (M), earnings strength (E), liquidity-risk exposure (L), and market-risk sensitivity (S). Once per year, examiners review these dimensions on site and assign a composite rating, which takes an integer value ranging from 1 (best) to 5 (worst). Composite ratings of 1 or 2 denote satisfactory condition while ratings of 3, 4, or 5 denote unsatisfactory condition. We define a CAMELS downgrade as migration from a satisfactory to an unsatisfactory rating. Note: "S" ratings were added to the framework in 1997; tests on pre-1997 data use composite CAMEL ratings.

liquidation of all banks with failure probabilities above two percent and the liquidation of all banks with advance-to-asset ratios above 15 percent. The evidence indicates that access to advances has increased default probabilities and losses-given-default. The magnitudes imply the FDIC should price expected losses arising from FHLBank funding.

The remainder of the paper is organized as follows. Section two provides additional institutional details to frame the research question. Section three provides comparative-static analysis of the impact of FHLBank funding on expected BIF losses. Section four estimates the impact of advances on CAMELS downgrade probability, and section five quantifies the impact of advances on resolution costs. Section six concludes with policy implications.

2. FHLBank Funding and Expected BIF Losses: A Closer Look at the Issues

In recent years, numerous proposals have been put forward to reform the U.S. deposit-insurance system. (For example, see Bloecher, Seale, and Vilim, 2003; Blinder and Wescott, 2001; FDIC, 2000; and Hanc, 1999.) A key assumption behind these proposals is that design of the system has not kept pace with financial innovation. The FDIC has itself recognized the need for extensive reform and has recommended merging the Bank-Insurance Fund (BIF) and the Savings Association Insurance Fund (SAIF), loosening the link between assessment rates and Fund balances, and indexing the deposit-insurance ceiling to inflation (FDIC, 2001).[5]

An important issue overlooked by these reforms is the impact of secured funding—like FHLBank advances—on expected BIF losses (Shibut, 2002). These claims have grown rapidly as Table 1 illustrates; between 1992 and 2003 secured funding at commercial banks grew at an average annual clip of 13.7 percent. Meanwhile, total assets rose at a 6.9 percent annual rate and domestic deposits—the

5. FDICIA requires the FDIC to set premiums so that BIF and SAIF reserves do not fall below 1.25 percent of insured deposits.

assessment base for insurance premiums—rose at a 5.5 percent annual rate. Private insurers price expected losses: the probability of a claim times the magnitude of the claim if filed. In theory, secured funding could affect both failure probability and resolution costs. But the FDIC sets bank premiums based on supervisory ratings and capital ratios—subject to limits based on BIF reserves. Research indicates that supervisory ratings focus more on a bank's current condition than failure probability multiple quarters ahead (Berger, Davies, and Flannery, 2000; Cole and Gunther, 1998). Research also indicates that Prompt Corrective Action capital thresholds—on which premiums depend—are too low to matter (Peek and Rosengren, 1997; Jones and King, 1995).[6] Table 2 contains the pricing matrix at year-end 2004. Nearly 93 percent of U.S. banks will pay no premiums during the first assessment period for 2005. The spread between assessment rates for the riskiest and the safest banks is only 27 basis points, well under recent estimates of actuarially fair spreads. More to the point, these estimates reflect historical FDIC losses and operational expenses. History may not offer a good guide because commercial-bank reliance on FHLBank funding is a post-1989 phenomenon.

FHLBank advances are not the only secured claims on bank balance sheets, to be sure. Others include discount loans, public deposits, and repurchase agreements (repos).[7] But these claims do not pose large risks to BIF. Discount lending has actually declined since the early 1990s—reflecting the effect of bank consolidation (Hakkio and Seldon, 2000), the stigma attached to the Window (Peristiani, 1998), and the sophistication of the overnight-funding market (Furfine, 2001, 1999).[8] Repos do not fund long-term bank growth; such agreements consist largely of overnight inter-bank borrowings to meet reserve requirements and avoid daylight overdrafts. The increase between 1992 and 2003 reflects improvement in bank liquidity management and development of a sophisticated overnight market. Finally, the supply

6. For example, only 78 U.S. banks were less than "well-capitalized" at year-end 2004.

7. "Public deposits" are held by state and local governments; typically, state law requires that the uninsured portion of these deposits be secured by high-quality marketable securities, such as Treasuries or Agencies.

8. In addition, there are two key differences between discount loans and FHLBank advances. First, discount loans are designed to help banks cover payments imbalances that occur late in the business day; FHLBank lending is predominately long-term. Second, FDICIA strictly limited the ability of Federal Reserve Banks to lend to troubled depository institutions.

of uninsured public deposits is limited by the fiscal activity of states or municipalities; growth in the 1990s reflects the impact of robust economic expansion on tax revenues.

FHLBank advances, on the other hand, could materially raise expected BIF losses. Advances accounted for 47 percent of the dollar increase between 1992 and 2003, and they now fund over three percent of bank assets. By way of comparison, at year-end 2003 jumbo CDs funded 7.9 percent of bank assets, and repos—the largest category of secured liabilities—funded 4.3 percent. More important, the supply of advances—unlike other secured funding—is highly elastic. Because of its extraordinary credit-risk record and implicit government guarantee, the FHLBank System can easily place debt in world capital markets. And the Financial Modernization Act of 1999 significantly relaxed membership and collateral requirements, thereby expanding the ability of banks to borrow. Between 1992 and 2003, the number of banks in the System climbed from 1,284 to 5,946. Over the same period, advances outstanding to banks jumped from $6 to $240.8 billion. The FHLBanks impose only two constraints on member borrowing: the borrower must have eligible collateral and an acceptable supervisory rating. Because FHLBanks will advance funds to purchase eligible assets—including assets in abundant supply such as mortgage-backed securities—the collateral constraint is not binding. Moreover, most FHLBanks define an "unacceptable" supervisory rating as a CAMELS 4 or 5 composite. At year-end 2004, only 0.92 percent of U.S. banks posted such a rating, and just 47 of those banks were FHLBank members.[9]

Congress considered two deposit-insurance reform bills in 2004: H.R. 522 and S.229. Although differing in a few details, both bills would have merged BIF and SAIF, increased the coverage ceiling, indexed the new ceiling to inflation, granted the FDIC additional flexibility to set premiums, and mandated rebates when Fund balances exceed a certain level. Neither bill linked premiums to bank funding strategies. So, even if proposed reforms were to pass in the future, FHLBank advances would still constitute a potential risk to BIF.

9. Typically, FHLBanks do not revoke membership or call advances when members encounter financial trouble—a rational policy given safeguards against credit losses. These safeguards are discussed in more detail in section 3.4.

3. FHLBank Funding on Expected BIF Losses: A Simple Model

We now present a simple model of the impact of advances on expected net losses to BIF. The net present value of expected losses at time (NL_t) equals expected gross payouts to insured depositors minus total paid-in deposit-insurance premiums.[10] Expected gross payouts, in turn, equal default probability (p) for bank i times the FDIC's gross losses from liquidating bank i (LS), summed across all banks. Total premiums equal the product of the assessment rate on bank i (r_i) and the assessable deposits in bank i (D_i), again summed over all banks. Assessable deposits at bank i approximately equal the sum of domestic insured and uninsured deposits. Specifically,

$$NL_t = \sum_{t=0}^{T} \sum_{i=1}^{N_t} \left(\frac{1}{1+\delta} \right)^t \left[p_{it} LS_{it} - r_{it} D_{it} \right] \tag{1}$$

where:

NL_t	=	present value of expected net losses
p_{it}	=	probability bank i will default, estimated at time t
LS_{it}	=	gross loss to BIF from liquidation of bank i at time t
r_{it}	=	deposit-insurance assessment rate on bank i at time t
D_{it}	=	assessable deposits of bank i at time t [11]
δ	=	discount rate
T	=	number of periods
N_t	=	number of banks at time t

Each bracketed term in equation (1) is potentially affected by advances. Default probability (p) could depend on advances because FHLBanks do not price failure risk, thereby creating a potential moral hazard. Gross loss-given-default (LS) could depend on advances because FHLBank funding could purchase new assets or replace uninsured deposits—in either case, potentially increasing BIF exposure. Finally, the assessment rate (r) could depend on advances because FHLBank funding might lead banks

10. Throughout the paper, "gross" losses are losses from liquidating a failed bank, without accounting for any premiums paid into BIF. "Net" losses, in contrast, refer to gross losses minus paid-in premiums.

11. Technically, $(r_{it})(D_{it})$ should be multiplied by $(1-p_{it})$. As written, equation (1) implies banks continue paying premiums after default. We assume away the probabilistic nature of premiums to simplify the comparative statics; no results are affected.

into riskier pricing cells, and the assessment base (*D)* could depend on advances because FHLBank funding allows banks to operate with fewer assessable deposits.

Differentiating equation (1) with respect to *A* highlights the impact of advances on BIF losses:

$$\frac{dNL}{dA} = \sum_{t=0}^{T}\sum_{i=0}^{N_t}\left(\frac{1}{1+\delta}\right)^t \left[\left(p_{it}LS_{it}^{'} + p_{it}^{'}LS_{it}\right) - \left(r_{it}^{'}D_{it} + r_{it}D_{it}^{'}\right)\right] \tag{2}$$

where ($p_{it}\ LS'_{it}$) represents the change in net losses traceable to the impact of advances on gross loss-given-default, ($p'_{it}\ LS_{it}$) represents the change in net losses traceable to the impact of advances on default probability, ($r'_{it}\ D_{it}$) represents the change in net losses traceable to the impact of advances on the assessment rate, and ($r_{it}\ D'_{it}$) represents the change in net losses traceable to the impact of advances on assessable deposits. The change in gross losses arising from advances, *LS'*, depends on the quantity of loans (*L*), quantity of insured deposits (*ID*), quantity of uninsured deposits (*UD*), level of equity (*EQ*), and ratio of loan losses (*LR*). The Appendix explores the link between LS' and these variables, assuming equity is endogenous. Substituting equation (A5) from the Appendix into equation (2) yields a framework general enough to analyze the impact of advances on expected losses under a wide set of assumptions. Bank- and time-specific variables are dropped to simplify the exposition.

$$\frac{dNL}{dA} = -\left(\frac{p}{1+\delta}\right)\left(\gamma' EQ + \gamma EQ'\right) + \frac{1}{1+\delta}\left(p' LS - r' D - rD'\right) \tag{3}$$

where:

$$\gamma = \frac{ID}{ID+UD} = \text{insured-depositor share of total deposits}$$

$$EQ = \text{ value of equity (presumed negative for insolvent banks)}$$

Broadly speaking, advances can fund assets or replace deposits. And new assets can be high or low risk. In sections 3.1 through 3.4 below, we use equation (3) to explore the various cases.

3.1 Asset Growth

Banks can use FHLBank funding to book new loans. To focus on the link between asset growth and BIF losses, we assume advances increase loans dollar-for-dollar (L'=1 and $UD'=ID'=D'$=0) but do not affect default probabilities, assessment rates, or loan-loss rates ($p'=r'=LR'$=0)[12] Applying these assumptions—and equations (A6) and (A9) from the Appendix—to equation (3) yields:

$$\frac{dNL}{dA} = \left(\frac{p}{1+\delta}\right)\gamma LR > 0 \tag{4}$$

where γ represents the share of insured deposits in the assessment base. Because default probability (p), the discount rate (δ), insured-deposit share (γ), and the loan-loss ratio (LR) are positive, the derivative is positive. In words, advances increase expected net losses to BIF because dollar loan losses rise with the size of the portfolio, but deposit-insurance premiums do not.

Table 3 illustrates the impact of advance-funded asset growth on BIF losses. Initially, Bank A funds $800 in loans with $700 of insured deposits and $100 of capital [panel (a)]. Now, an economic shock reduces loan value 15 percent and produces insolvency. Upon closure, the FDIC pays insured depositors $700, sells assets for $680, and suffers a loss of $20. Suppose Bank A had used $200 in FHLBank advances to book new loans before the shock occurred [panel (b)]. Once again, let the value of Bank A's loan portfolio decline 15 percent.[13] The FDIC pays depositors $700 at liquidation as before but now must also pay $200 to an FHLBank because advances are fully secured. The $850 recovery from asset sales falls short of the $900 payout. The resulting gross loss ($50) is $30 higher than in the no-advances case. Net BIF losses rise by $30 as well because paid-in premiums do not change; the increase in advances does not affect the assessment base (by construction) or assessment rate (by assumption).

12. These assumptions allow no room for moral hazard. Section 3.4 explores the case when FHLBank advances induce a change in the bank's risk profile.
13. Assuming the economic shock forces Bank A to charge off 15 percent of loans, irrespective of the size of the portfolio, is tantamount to assuming that loans funded with advances are equal in quality to loans already on the books—that is, p'=LR'=0.

3.2 Insured-Deposit Substitution

Banks can also substitute advances for insured deposits. Dollar-for-dollar substitution implies *ID'= D'*= -1, and *L'= UD'*=0. If, as before, *p'=LR'=r'=0*, equation (3) reduces to:

$$\frac{dNL}{dA} = \left[\frac{p}{1+\delta}(1-\gamma)\frac{EQ}{ID+UD}\right] + \frac{r}{1+\delta} \quad \gtreqless \; 0 \tag{5}$$

The bracketed term captures the impact of a change in the insured deposit-assessment base ratio on expected BIF losses —the "insured-share" effect. Again, default probability (*p)*, the discount rate (δ) and insured-deposit share (γ) are positive. To simplify further, assume the insured-deposit share is less than one, and the value of equity (*EQ*) is less than zero.[14] In this case, the bracketed term is negative—net losses fall because the decline in insured deposits increases the share of losses absorbed by uninsured depositors. The unbracketed term represents the change in net losses due to the change in premiums—the "assessment-base" effect. Provided the assessment rate (*r)* is positive, this term is positive: net losses rise because advances reduce the assessment base (and, therewith, premiums paid into BIF).[15] The overall sign of equation (5) is ambiguous, depending on the size of the bracketed term (insured-deposit effect) and unbracketed term (assessment-base effect).

Table 4 illustrates the impact of an advances-for-insured-deposits swap on net BIF losses. Panel (a) shows Bank B's balance sheet before and after an economic shock reduces loan value 15 percent—assuming no advances in the funding mix. Initially, Bank B finances $800 in loans with $600 in insured deposits, $100 in uninsured deposits, and $100 in capital. The assessment base for premiums is $700—the sum of insured and uninsured deposits. The economic shock reduces loan value to $680 and produces insolvency. Upon closure, the FDIC pays $600 to insured depositors. As representative of these depositors, the FDIC receives 85.7 percent ($600 divided by the $700 assessment base) of the $680

14. Again, we assume banks are closed only when liabilities exceeds assets. If the bank holds no uninsured deposits, the bracketed term is zero, and the unbracketed term (the effect of advances on premiums) determines the sign of equation (5).

15. For a bank not paying premiums, the bracketed term determines the sign of equation (5). As noted, this term is negative as long as the funding mix includes uninsured deposits. If the bank does not pay premiums or hold uninsured deposits, advances have no impact on expected net losses.

recovery from asset sales, or $583. The FDIC suffers a gross loss of $17—the $600 paid out minus the $583 received. Panel (b) illustrates the impact of the same shock when FHLBank advances replace insured deposits. The FDIC now pays $450 to insured depositors, sells assets for $680 and disburses $150 to an FHLBank. The FDIC receives 81.8 percent ($450 divided by the $550 assessment base) of the $530 that remains after selling assets and paying the FHLBank, or $434. The gross loss is now $16. The gross loss declines $1 in panel (b) because the insured-deposit share is smaller after advances replace insured deposits. The smaller assessment base, however, implies premiums decline—provided Bank B is paying any. The impact on net BIF losses depends on whether the decline in premiums is greater or less than the $1 decline in gross losses.

3.3 Uninsured-Deposit Substitution

Banks can replace uninsured deposits with advances. To analyze the impact on BIF, we again let $p'=LR'=r'=0$. Dollar for dollar substitution, implies $UD'= D'= -1$, and $L'= UD'=0$. Under these assumptions, equation (3) becomes:

$$\frac{dNL}{dA} = \left[\frac{p}{1+\delta}(-\gamma)\frac{EQ}{ID+UD} \right] + \frac{r}{1+\delta} > 0 \qquad (6)$$

Now, the bracketed term is positive: the default probability (p), discount rate (δ) and insured-deposit share (γ) are positive while the equity level (EQ) is negative. In words, replacing uninsured deposits with advances increases gross resolution costs because the FDIC can shift losses to uninsured depositors but not to FHLBanks. As with insured-deposit substitution, a positive assessment rate makes the unbracketed term positive; premiums fall because the assessment base includes uninsured deposits.

Table 5 provides a clarifying example. Panel (a) shows Bank C's balance sheet before and after an economic shock reduces loan value 15 percent. Initially, the bank finances $800 of loans with $550 of insured deposits, $150 of uninsured deposits, and $100 of capital. The assessment base is again $700.

The shock reduces loan value to $680 and produces insolvency. Upon closure, the FDIC pays $550 to insured depositors. As representative of these depositors, the FDIC receives 78.6 percent ($550/$700) of the proceeds from asset sales, or $534. The gross loss is $16. Panel (b) illustrates the impact of the same shock after advances replace uninsured deposits. The FDIC now must pay $150 to an FHLBank, leaving $530 in assets to cover insured-depositor claims of $550. The gross loss ($20) rises $4 because losses cannot be shared with uninsured depositors as in panel (a). Because the assessment base declines from $700 to $550, the net loss to BIF will rise by more than $4 if Bank C is paying premiums.

3.4 Moral Hazard

Access to advances creates a moral-hazard problem. When a bank assumes more risk, it must pay a higher default premium to uninsured, unsecured creditors. Insured depositors, in contrast, do not demand extra compensation because the FDIC stands ready to make them whole. The resulting moral hazard is well known (Merton, 1977). What is not well known is that FHLBanks, like insured depositors, face no credit risk and, consequently, have no incentive to price failure risk. FHLBanks face no credit risk because of privileges conferred by their GSE status and monopoly position. For example, FHLBanks insist on collateralization far in advance of that demanded by other secured creditors (GAO, 2003). FHLBanks are also privy to confidential commercial-bank examination reports, so they learn about deterioration in a member's loan portfolio before other creditors. Finally, should a member fail and collateral prove insufficient, the exposed FHLBank can assert statutory lien priority on other assets—thereby moving ahead of all unsecured creditors. Because of this protection, no FHLBank has ever lost a penny on an advance. It is rational, therefore, for FHLBanks to ignore failure risk when pricing advances.

A moral hazard arises because the FDIC cannot charge actuarially fair premiums to offset the unpriced failure risk. So banks can take risks with advances, keep the upside, and shift the downside to the FDIC.[16]

Discipline from other funding markets will not reduce the moral hazard. Uninsured, unsecured creditors will still demand higher default premiums as risk increases—even if the bank uses insured deposits and FHLBank advances. (Empirical evidence confirms a link between failure probability and default premiums on uninsured, unsecured bank debt. For example, see Morgan and Stiroh, 2001; Flannery, 1998; Flannery and Sorescu, 1996; and Gilbert, 1990). But, as Billett, Garfinkel and O'Neal (1998) have noted, any discipline is undermined by the availability of funds with no default premium. They noted that risky bank holding companies substituted insured deposits for market-priced debt in the early 1990s to escape market discipline. FHLBank funding provides an easier escape than insured deposits. Insured deposits are expensive to raise. Indeed, the relatively inelastic supply of such deposits in part explains the popularity of FHLBank funding. In contrast, an FHLBank member can borrow as long as eligible collateral is available or can be purchased.[17]

To isolate the impact of moral hazard on BIF, we assume deposit levels and assessment rates remain constant as advances increase, that is $ID'=UD'=D'=r'=0$. We further assume advances fund loan growth exclusively ($L'=1$). Finally, we assume new loans are high risk, that is $p'>0$ and $LR'>0$. Under these assumptions, equation (3) reduces to:

$$\frac{dNL}{dA} = \frac{p}{1+\delta}\left[\gamma\left(LR'L + LR\right)\right] + \frac{p'LS}{1+\delta} > 0 \qquad (7)$$

16. Option-pricing theory provides another way to frame the moral-hazard issue: the value of an FHLBank loan commitment increases in asset risk and leverage, but the option premium does not change. See Thakor (1982) and Thakor, Hong, and Greenbaum (1981) for analysis of loan commitments as options.

17. Some FHLBanks impose total borrowing constraints on members, ranging from 35 to 55 percent of assets (GAO, 2003). Only a handful of commercial banks, however, operate near these constraints. Advances do carry an implicit cost—members hold more pledgeable assets than they otherwise would—but theory and evidence suggest this cost is small. First, pledgeable assets decrease liquidity risk. Second, FHLBank members cite loan growth as the principal justification for borrowing. Funding growth with advances implies the marginal cost—including the opportunity cost of holding more pledgeable assets—is lower the marginal cost of core deposits. Finally, members report that another important motivation for borrowing is purchasing long-term mortgage-backed securities. This strategy has been attractive in recent years because of the large spread between short- and long-term rates. For more discussion of an FDIC survey of motives for FHLBank borrowings, see Stark and Spears-Read (2004).

Every term is positive, so the derivative is positive. In words, expected net losses to BIF rise because default probability and loss given default increase with advances.

Table 6 illustrates the impact of moral hazard on net BIF losses. In panel (a), Bank D funds $1,000 in loans of normal risk with $700 of insured deposits, $200 of advances, and $100 of capital. Suppose, as in the other examples, an economic shock reduces loan value 15 percent and produces insolvency. The FDIC uses $850 in assets to settle FHLBank and insured-depositor claims of $900, resulting in a gross loss of $50. In panel (b) advances fund high-risk loans, thereby increasing the probability of loan loss and decreasing the likely recovery in asset liquidation. So now the same shock produces a 20 percent decline in loan value. The FDIC recovers $800 from asset sales, pays $900 to the FHLBank and insured depositors, and suffers a gross loss of $100. Moral hazard increases gross losses by $50. Net BIF losses also rise by $50 because, by assumption, the assessment rate and base do not change. If the bank migrates into a riskier pricing cell before failure, net losses will be less than $50.[18]

4. FHLBank Funding and Risk-Taking: Evidence from a CAMELS Downgrade Model

The comparative-static exercises in the previous section indicate that advances are likely to increase expected net losses to BIF. But these exercises say nothing about the economic importance of the effect. Gauging this importance involves estimating the impact of advances on default probability and loss-given-default. We now turn to the first of these tasks.

18. Prior research found a positive correlation between FHLBank funding and risk at troubled thrifts in the late 1980s and early 1990s (Ashley, Brewer, and Vincent, 1998) and community banks in the 1990s (Stojanovic, Vaughan, and Yeager 2001). But conceivably advances could reduce bank risk, despite the moral hazard implied by theory and evidence. FHLBanks make advances against a broad range of collateral, thereby reducing liquidity risk for their members. In addition, the flexible terms make advances a potentially effective tool for hedging interest-rate-risk exposures arising elsewhere on the balance sheet. Finally, the FHLBanks provide asset/liability-management (ALM) consulting at minimal cost to help members make the best use of advances. Community financial institutions, which often lack the expertise necessary to employ interest-rate caps or floors, particularly value FHLBank hedging products and ALM consulting. So, ultimately, the net effect of FHLBank advances on bank risk is an empirical issue. Empirically "signing" the net effect, which we do in section 4, is crucial because advances could, in theory, induce a fall in default probability large enough to offset the rise in loss-given-default, thereby leaving expected losses unchanged.

To test for moral hazard, we add the advances-to-assets ratio to a probit model currently used by one Federal Reserve Bank in off-site surveillance (Gilbert, Meyer, Vaughan, 2002). This model estimates the likelihood a healthy bank (CAMELS 1 or 2 composite rating) will encounter financial distress (CAMELS 3, 4, or 5 composite rating) in the coming year. We rely on a downgrade-prediction model because failures have been too infrequent since 1991 to permit re-specification and re-estimation of a failure-prediction model. This approach does not produce an exact estimate of "*p*" (and the relationship between advances and default probability) as defined in the previous section, but it still offers clues about the importance of moral hazard—in large part because the correlation between downgrade and failure probability since 1988 exceeds 90 percent (Hall, King, Meyer, and Vaughan, 2005). Table 7 describes the explanatory variables and the expected relationship between each variable and downgrade risk. Most variables are financial ratios related to leverage, credit, and liquidity risk—three risks consistently found to produce financial distress in commercial banks (Cole, Cornyn, and Gunther, 1995; Putnam, 1983).

We estimate the downgrade-prediction model yearly, beginning in 1992—just after banks started joining the FHLBank System—and ending in 2003. In each equation, downgrade status ("1" = bank examined and downgraded, "0" = bank examined but not downgraded) in year $t+1$ is regressed on accounting and supervisory data for non-*de-novo*, 1- or 2-rated banks in the fourth quarter of year t. In the first regression, for example, downgrade status in 1993 is regressed on year-end 1992 data. We proceed with this convention, estimating equations year by year, through a regression of downgrade status in 2003 on 2002:Q4 data. We run the model year-by-year because pooling constrains coefficients to be equal across years, and previous research has demonstrated considerable time variance. For completeness, however, we also offer evidence from a pooled approach. Table 8 contains the results.[19]

19. The regression analysis was conducted with financial data from the Call Reports and CAMELS data from the National Information Center (a confidential supervisory database). The Federal Housing Finance Board—the safety-and-soundness supervisor of the FHLBanks—supplied bank-level data on advances for 1992-2000. In 2001, commercial banks began reporting advances to their principal supervisors, so the resolution-cost analysis in section 5 draws on Call-Report data. The advances-to-assets ratio was not a candidate variable in the specification search for the CAMELS-downgrade model because the Call Report did not include advances at that time.

The evidence suggests FHLBank advances have a modest impact on bank risk. The advances-to-assets ratio is positive and significant in nine of the eleven year-by-year regressions. And the statistically insignificant regressions, 1993 downgrades on 1992:Q4 financials and 1996 downgrades on 1995:Q4 financials, correspond to early years in the sample when few banks used advances on a large scale. In the pooled regression, the advances-to-assets ratio is positive and significant at the one-percent level. Analysis of standardized coefficients indicates that the impact of advances on downgrade risk is small compared with the credit-risk variables but comparable to the impact of the liquidity-risk variables.

But there are reasons to believe FHLBank funding has increased BIF exposure by more than the coefficients suggest. Banks enjoyed record earnings in the 1990s. And the brief recession of 2001 did not produce a significant uptick in charge offs. As a consequence, capital protection has risen to robust levels unseen since the 1940s—and higher levels of capital put bank owners at greater risk of loss, which in turn impels them to constrain risk-taking. When capital ratios mean revert and bank owners have less money at stake, advances may well have a larger impact on downgrade probability.[20]

20. Adding FHLBank funding to the downgrade model raises a causality issue: risk could be driving advances instead of advances driving risk (as we argue). Put another way, it is possible that banks already dedicated to ramping up risk simply opted to fund with advances. Conceptually, the distinction does not matter for this analysis. Absent the availability of advances, risk-loving banks would have been deterred by the high default premium on market funding or the high marketing costs on insured deposits. Because of the potential for coefficient bias, however, we tested for adverse selection, looking for evidence that risky banks were more likely to join the FHLBank System. Specifically, we regressed membership status in 1992 on risk variables in 1989. We also estimated time-to-FHLB-membership between 1992 and 2000 using a Cox proportional-hazards model. These exercises produced no evidence of adverse selection.

History affords an interesting parallel. Grossman (1992) noted that fixed-rate deposit insurance did not induce significant moral hazard in the thrift industry in the early years of the program. The financial crisis of the 1930s eliminated all but the most well-capitalized and well-managed thrifts. In addition, the Federal Savings and Loan Insurance Corporation (FSLIC) conducted rigorous safety-and-soundness examinations of all applicants for deposit insurance. Finally, the experience of the 1930s convinced owners of all depository institutions to hold more securities (relative to loans) to safeguard against another wave of contagious runs (Friedman and Schwartz, 1963). These factors combined to keep failure risk low. Only after interest-rate shocks (White, 1991) and financial deregulation in the 1970s and 1980s (Keeley, 1990) did capital levels fall low enough to tempt thrift owners to take large risks. Turning to the banking parallels, FIRREA opened FHLBank membership to commercial banks in 1989—but only safe-and-sound institutions were eligible to join. Meanwhile, the banking crisis of the late 1980s and early 1990s weeded out institutions with low capital and poor management. And bad experiences with commercial-real-estate loans during that crisis gave bank owners a more conservative attitude toward credit risk. Finally, unexpectedly robust economic expansion in the 1990s enabled banks to accumulate record levels of capital. These factors have combined to hold risk-taking in check. But a shock to capital could induce bankers to exploit the risk subsidy associated with FHLBank funding just as capital shocks induced excessive risk-taking in the thrift industry.

5. FHLBank Funding and Loss-Given-Default: Evidence from FDIC Resolution Costs

To obtain a range of possible BIF losses, we examine two scenarios:

High-Risk Scenario: The FDIC liquidates all banks with failure probabilities above two percent.

Heavy-User Scenario: The FDIC liquidates all banks with advances-to-asset ratios above 15 percent.

Failure probabilities for the high-risk scenario come from the SEER Risk-Rank model—one of two early warning models used by the Board of Governors of the Federal Reserve for off-site monitoring.[21] The two-percent cutoff reflects the threshold used to compile watch lists of institutions most at risk of failure. At year-end 2003, 334 banks (or 4.33 percent of U.S. banks) qualified as high risk. These banks are likely to be small and unlikely to be FHLBank members, so we also analyze a heavy-user scenario. (Table 9 provides size distributions for all U.S. banks, high-risk banks, and heavy-user banks.) The 15-percent cutoff reflects the results of an informal poll of bank supervisors at the Federal Reserve and FDIC about unsafe-and-unsound dependence on advances. At year-end 2003, 367 institutions (or 4.76 percent of U.S. banks) qualified as heavy users. Examining scenarios with over 300 liquidations might, at first glance, seem extreme. But annual failures reached this level three times during the bank and thrift crisis of the late 1980s and early 1990s. Also, the analysis could be viewed as suggestive of cumulative resolution costs over a longer time span—as implied in equation (1)—given a small discount rate.[22]

We estimate incremental resolution costs using year-end 2003 balance sheets. We start by computing baseline resolution costs for each scenario. The high-risk baseline, for example, is the estimated cost of liquidating all banks with failure probabilities above two percent, given their 2003:Q4 financials. Next, for each scenario, we calculate the cost of liquidating all sample banks at year-end 2003, assuming counterfactually that their balance sheets contained no FHLBank advances. Counterfactual costs for the high-risk scenario, for example, were obtained by removing advances from all 334 banks, making offsetting balance-sheet adjustments, and recalculating resolution costs. The difference between baseline and counterfactual resolution costs is the "increase" in BIF losses from advances. We compute

21. The SEER Risk-Rank model was estimated on 1985-91 data. As noted, the dearth of post-1991 failures precludes re-specification and re-estimation and explains the use of a downgrade probability model in section 4. Every quarter, the Surveillance Section at the Board of Governors feeds the latest Call Report data into the Risk-Rank model to generate failure probabilities for all U.S. banks. All Fed-supervised institutions with failure probabilities above two percent are tagged for on-site or off-site follow up.

22. This approach may seem odd because we assessed the impact of advances on default probability with an econometric model. Indeed, the logical way to proceed would be to estimate a model with loss-given-failure on the left-hand side and advance dependence on the right-hand side. Unfortunately, failures since 1990 have been too rare to permit estimation of such a model. For this reason, we were forced to estimate default probability with a CAMELS-downgrade model.

counterfactual costs by assuming advances could have been used to (1) replace insured deposits, (2) replace uninsured deposits, (3) book real-estate loans, (4) book consumer loans, (5) book commercial loans, or (6) purchase investment securities. Losses differ across the six counterfactuals because liquidation-loss rates vary across asset categories. Also, the FDIC collects premiums from all domestic depositors but protects only insured depositors.[23]

To estimate resolution costs, we use average FDIC loss rates on consumer loans, commercial loans, investment securities, real-estate loans, "other real estate owned" and "other assets" between 1990 and 2002.[24] Table 10 contains these loss rates. For all liquidations, we subtract estimated losses from the book value of assets to obtain the net value available for distribution to the creditors of the receivership. Next, we deduct total claims on the receivership from assets available for distribution to arrive at losses on the receivership. These losses are then distributed across claimants according to priority.[25] We assume secured and preferred claims are paid in full; that is, the value of collateral equals the value of the claim. For advances, the FDIC prepays face value to the FHLBank to get control of pledged assets.

Table 11 presents resolution-cost estimates from the high-risk scenario. In the baseline case—liquidation of all banks with failure probabilities above two percent—gross BIF losses equal $3.66 billion, or 6.11 percent of assets in all 334 institutions. Incremental costs from advances range from $388.9 million in the commercial-loan counterfactual (that is, BIF losses would have been smaller if high-risk banks had not funded commercial loans with advances) to -$34.5 million in the insured-deposit counterfactual (that is, BIF losses would have been larger if high-risk banks had not replaced insured deposits with advances). On average over the six counterfactuals, advances "increase" BIF losses by

23. In theory, banks could use advances to purchase any asset or reduce any liability. We focus on the six most likely strategies—as revealed through a recent FDIC survey (Stark and Spears-Reed, 2004) and an analysis of balance-sheet trends among new FHLBank members (Stojanovic, Vaughan, and Yeager, 2001).

24. Previous studies assumed the historical ratio of fund losses to fund balances will obtain in the future. Our approach is more granular. We apply 1990-2002 loss rates on specific assets to the year-end 2003 asset balances of high-risk and heavy-user banks. See Bennett (2003) for more details on the calculation of loss rates.

25. Since the Omnibus Budget Reconciliation Act in 1993, the FDIC has paid claimants in the following order: administrative costs of the receivership, secured creditors (including FHLBank advances), domestic depositors, general creditors (including foreign depositors), subordinated creditors and stockholders.

$145.9 million—a figure equal to 3.99 percent of the baseline. Insured deposits tend to stay with a bank through different economic and interest-rate environments, so another, perhaps more realistic, way to gauge incremental losses is to focus on the other five counterfactuals.[26] In this case, advances increase average losses by $182.0 million—a figure equal to 4.97 percent of the baseline. Comparing these estimates to BIF offers insight into economic significance. By this metric the impact of FHLBank funding is modest; incremental costs represent well under one percent of year-end 2003 Fund value.

But, as noted, looking only at high-risk banks potentially underestimates BIF exposure. High-risk banks depend less on FHLBank funding than the banking sector as a whole—because these banks tend to be small in operating scale, flush with insured deposits, and short of pledgeable assets. To obtain another perspective, we calculate resolution costs from liquidation of all banks with advance-to-asset ratios above 15 percent. Table 12 presents the results of these calculations. In the baseline case, resolution costs come to $15.36 billion, or 5.92 percent of assets in the 367 heaviest users of FHLBank funding. Incremental costs from advances vary from $8.72 billion under the real-estate-loan counterfactual (that is, BIF losses would have been lower had heavy-user banks not funded real-estate loans with advances) to -$2.07 million under the insured-deposit counterfactual (that is, BIF losses would have been higher had heavy-user banks not replaced insured-deposits with advances). On average across all six counterfactuals, advances increase BIF losses by $3.07 billion—a figure equal to nearly 20 percent of the baseline. If the insured-deposit counterfactual is ignored, advances raise average BIF losses by $4.1 billion—almost 27 percent of the baseline. These estimates imply significant BIF exposure to FHLBank funding; incremental resolution costs from advances represent 9 to 12 percent of year-end 2003 Fund value.

To check robustness, we created "random" samples of banks matched in size to the high-risk and heavy-user banks and then re-calculated incremental resolution costs. As expected, the new estimates fell in the range defined by the two scenarios. The sample of 334 banks comparable in size to the high-risk

26. A recent FDIC survey indicates that only four percent of the sampled banks used advances to replace core deposits. For more details, see Stark and Spears-Reed (2004).

banks, for example, yielded advance-induced increases in average resolution costs equal to 6.99 percent of the baseline, or 0.61 percent of year-end 2003 BIF. Ignoring the insured-deposit counterfactual produced incremental resolution costs equal to 8.82 percent of the baseline, or 0.77 percent of BIF. For 367 randomly selected banks of comparable size to the heavy users, advances raised average resolution costs by 7.11 percent of the baseline, or 2.5 percent of BIF. Averaging over every counterfactual except the insured-deposit counterfactual produced incremental resolutions costs equal to 9 percent of the baseline, or 3.17 percent of year-end 2003 BIF.

We also used a more complicated method of excising advances from sample-bank balance sheets. In prior calculations, we removed advances up to the amount available in an asset category. In some cases, consumer loans, for example, advances remained on the balance sheet because volume was low. In the more complicated method, we continued excising advances after a specific asset category was exhausted by moving to other assets, from highest to lowest loss rate. So, for example, once consumer loans were exhausted, we removed "other real estate owned" (OREO), then commercial loans, and so on until advances equaled zero. We also computed incremental resolution costs when assets were removed in reverse order (that is, lowest-to-highest loss rate). The new approach did not materially change cost estimates for the high-risk sample. For example, under lowest-to-highest-loss removal, advances increased average resolution costs by 5.72 percent of the baseline (0.62 percent of BIF). The highest-to-lowest-loss-rate method raised average costs 6.31 percent from the baseline estimate (0.68 percent of BIF). The new approach did, however, inflate incremental resolution costs for the heavy-user sample. Under lowest-to-highest loss removal, advances increased average resolution costs by 39.57 percent of the baseline (17.99 percent of BIF); removing assets in reverse order produced a jump of 42.08 percent (19.13 percent of BIF). Removing assets from highest-to-lowest loss and ignoring the insured-deposit counterfactual produced staggering estimates of incremental resolution costs—advances increased BIF losses by an average of 55.97 percent, or 25.4 percent of BIF.

Our estimates of resolution costs suggest that FDIC exposure from advances ranges from modest to large, depending on the assumptions. But these figures may still understate potential losses. As noted, U.S. banks currently hold record levels of capital, and capital constitutes the "deductible" for deposit insurance. High levels reduce expected BIF losses by deterring risk-taking and absorbing losses from any given level of risk-taking. Reversion of capital ratios to historical norms would increase both default probability and loss-given default.

A second reason to view the estimates as conservative is our assumption that banks migrate to failure without altering balance-sheet composition. In actuality, banks shrink, often shedding those assets and liabilities most likely to reduce liquidation costs. In the late 1980s and early 1990s, for example, much of the contraction in thrift liabilities prior to failure came from uninsured deposits (Goldberg and Hudgins, 2002); holders of these deposits would be forced to bear a large portion of any resolutions costs. On the asset side, much of the contraction came from loans and securities with deep secondary markets (such as residential mortgages and Treasury or Agency debt), thereby leaving assets likely to lose significant value in liquidation.

A third reason the analysis may understate the problem is our neglect of FHLBank pre-payment penalties. Closing an institution requires pre-payment of outstanding advances, and all FHLBanks assess a penalty based on interest foregone from making new advances at lower rates and the cost of unwinding associated interest-rate hedges. This sum can be large for long-term advances in a falling rate environment. (And nearly 50 percent of advances outstanding to banks at year-end 2003 had maturities over three years.) Moreover, some FHLBanks apply additional charges. The FDIC as receiver must pay these penalties to get control of pledged assets for liquidation. The recent resolution of Bank of Alamo (Alamo, Tennessee) illustrates the potential size of the expense. To assume control of the $69 million-asset bank, which failed in November 2002, the FDIC had to pre-pay $6.4 million of advances from the Federal Home Loan Bank of Cincinnati. The prepayment penalties came to $906,000—14 percent of the advances outstanding (Bair, 2003; Blackwell, 2003).

A final reason the cost estimates may be low is that historical asset-recovery rates could prove weak guides to future resolution costs. The overwhelming majority of banks that fail are small, with simple on- and off-balance-sheet positions. Our estimation of aggregate resolution costs in the high-risk and heavy-user scenarios reflects 1990-2002 loss rates on specific assets. The FDIC has not resolved a large-bank failure since Continental Illinois in the 1980s, and in the interim large banks have grown considerably more complex. Resolution costs could prove to be orders of magnitude higher than application of historical loss rates suggest, particularly if concerns about systemic risk outweigh concerns about FDIC exposure. By volume of advances outstanding, large banks are the FHLBank System's best customers. At year-end 2003, the 424 U.S. banks with more than $1 billion in assets held 78.5 percent of outstanding advances. The position of the FHLBanks as senior secured creditors means the FDIC will absorb the extra costs arising from resolution of a large, complex bank.

In any event, it is important to remember that prior to FIRREA expected BIF losses due to FHLBank advances were zero. Whether incremental losses over time turn out to be nearer the modest numbers suggested by the high-risk scenario or the large numbers suggested by the heavy-user scenario, the increase in exposure is not trivial and has not been priced.

6. Conclusion

Does growing commercial-bank reliance on Federal Home Loan Bank (FHLBank) funding increase risk to BIF? We argued this research question is important because of its implications for academic studies of deposit-insurance premiums and policy debates over deposit-insurance reform. We presented a model showing advances increase expected BIF losses by subsidizing risk-taking and subordinating the FDIC's position in failure resolutions. To quantify the exposure, we examined the effect of advances on default probability using a CAMELS-downgrade model. We then assessed the impact on loss-given-default by calculating incremental resolution costs under two scenarios: liquidation

of all banks with failure probabilities above two percent and liquidation all banks with advance-to-asset ratios above 15 percent. The evidence suggests advances have increased expected losses by a non-trivial magnitude. We noted our research strategy may understate the problem because we estimated downgrade probabilities and resolution costs in a high-capital environment, ignored penalties arising from pre-payment of advances, and overlooked complications associated with the resolution of large-bank failures.

The policy implication is that the FDIC should charge for increases in expected losses arising from advances. Of course, the ideal solution would involve explicitly linking premiums with FHLBank borrowings. A step toward this ideal would be vitiation of pre-payment penalties in failure resolutions. At the margin, this reform would strengthen incentives for FHLBanks to monitor the condition of their members, thereby reducing moral hazard. But these reforms require legislative action. In contrast, supervisors have discretion to levy capital charges to preserve safety and soundness without legislative sanction. A capital charge on heavy use of advances would protect BIF by increasing the deductible for deposit insurance. A higher deductible would curb appetites for risk and trim resolution costs by shifting losses to bank owners. In any event, the first step toward a solution is for scholars and policymakers to recognize that a problem exists. Theory and evidence presented here indicate that failure to price expected losses from FHLBank funding is a problem.

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Table 1
How fast has secured funding grown at U.S. commercial banks?

FHLBank advances accounted for 47 percent of the dollar increase in secured funding at U.S. banks between 1992 and 2003. Unlike other secured liabilities, the supply of advances is highly elastic. Because of its extraordinary credit-risk record and implicit Treasury guarantee, the FHLBank System can easily sell debt in world capital markets. And the Financial Modernization Act of 1999 significantly relaxed membership and collateral requirements, thereby expanding commercial-bank access to advances. Between 1992 and 2003, the number of banks in the FHLBank System climbed from 1,284 to 5,946, and advances outstanding to banks jumped from $6 to $240.8 billion.

Secured Liabilities	1992		2003		Average Annual Growth Rate (percent)
	Billions ($)	Percent of Total Assets	Billions ($)	Percent of Total Assets	
Public deposits	47.1	1.3	73.5	1.0	4.1
FHLBank advances	6.0	0.2	240.8	3.2	33.6
Repurchase agreements	88.2	2.5	322.5	4.3	11.8
Discount window loans	0.2	0.0	0.1	0.0	-4.1
All secured liabilities	***141.5***	***4.0***	***636.9***	***8.5***	***13.7***
Total assets	3,496.2		7,469.5		6.9
Assessable deposits	2,691.4		4,942.2		5.5

Source: Reports of Condition and Income, all U.S. commercial banks, 1992 and 2003
Consolidated Financial Statements of the FHLBanks, Federal Housing Finance Board, 1992 and 2003

Table 2
How does the FDIC price deposit insurance?

This table contains the matrix used to assess Bank Insurance Fund (BIF) premiums for the first semiannual assessment period of 2005. It also shows the number and percentage of banks in each risk cell as of July 1, 2004. Assessment rates are expressed in basis points (i.e., cents per $100 of assessable deposits) per year. Most estimates of actuarially fair premiums imply risk spreads far larger than 27 basis points. Moreover, the pricing matrix does not consider differences in resolution costs arising from differences in bank funding.

	BIF Supervisory Subgroups		
	A	**B**	**C**
	Well Capitalized		
Assessment Rate (basis points)	0	3	17
Number of Institutions	7,343 (92.6%)	421 (5.3%)	84 (1.1%)
	Adequately Capitalized		
Assessment Rate (basis points)	3	10	24
Number of Institutions	60 (0.8%)	4 (0.1%)	10 (0.1%)
	Undercapitalized		
Assessment Rate (basis points)	10	24	27
Number of Institutions	2 (0.0%)	0 (0.0%)	2 (0.0%)
Estimated Annual Assessment Revenue	$84 million		
Assessment Base	$4,334 billion		
Average Annual Assessment Rate (basis points)	0.19		
Source: Murton (2004)			

NOTES:

Capital Group Descriptions:

Group 1 – "Well Capitalized"
- Total Risk-Based Capital Ratio equal to or greater than 10 percent,
- and Tier 1 Risk-Based Capital Ratio equal to or greater than 6 percent,
- and Tier 1 Leverage Capital Ratio equal to or greater than 5 percent.

Group 2 – "Adequately Capitalized"
- Not Well Capitalized and Total Risk-Based Capital Ratio equal to or greater than 8 percent,
- and Tier 1 Risk-Based Capital Ratio equal to or greater than 4 percent,
- and Tier 1 Leverage Capital Ratio equal to or greater than 4 percent.

Group 3 – "Undercapitalized"
- Neither Well Capitalized nor Adequately Capitalized.

Supervisory Group Descriptions:

Subgroup A: This subgroup consists of financially sound institutions with only a few minor weaknesses and generally corresponds to the primary federal regulator's CAMELS composite rating of "1" or "2."

Subgroup B: This subgroup consists of institutions that demonstrate weaknesses that, if not corrected, could result in significant deterioration of the institution and increased risk of loss to the BIF. This subgroup assignment generally corresponds to the primary federal regulator's CAMELS composite rating of "3."

Subgroup C: This subgroup consists of institutions that pose a substantial probability of loss to the BIF unless effective corrective action is taken. This subgroup assignment generally corresponds to the primary federal regulator's CAMELS composite rating of "4" or "5."

Table 3
How does FHLBank funding affect net BIF losses?
Case One: The Bank Uses Advances to Grow

Comparative-static analysis indicates that advance-funded asset growth increases expected net losses to the Bank Insurance Fund (BIF). This table illustrates with a simple numerical example. Initially, Bank A funds $800 in loans with $700 in insured deposits and $100 in capital [panel (a)]. Now, an economic shock reduces loan value by 15 percent and renders the bank insolvent. The FDIC pays insured depositors $700, sells bank assets for $680, and suffers a loss of $20. Suppose Bank A had used $200 in FHLBank advances to book new loans before the shock occurred [panel (b)]. Once again, let loan value decline 15 percent. Supervisors close the insolvent bank, and the FDIC pays depositors $700. The FDIC must now also pay $200 to an FHLBank because advances are fully secured. The $850 recovery from asset sales is insufficient to cover the $900 payout, leaving a gross loss of $50 ($30 higher than in the no-advance case). Net BIF losses also increase by $30 because premiums do not increase with advances.

Panel (a)				**Panel (b)**			
Bank A's Balance Sheet				**Bank A's Balance Sheet**			
Before and After Shock, with No Advances				**Before and After Shock, with Advances**			
Assets		Liabilities		Assets		Liabilities	
Loans	~~$800~~ $680	Insured Deposits	$700	Loans	~~$1000~~ $850	Insured Deposits	$700
		FHLBank Advances	0			FHLBank Advances	$200
		Capital	~~$100~~ $-20			Capital	~~$100~~ $-50
***Gross BIF Loss:* $20**				***Gross BIF Loss:* $50**			
Assessment Base: $700				***Assessment Base: $700***			

Table 4
How does FHLBank funding affect net BIF losses?
Case Two: The Bank Replaces Insured Deposits with Advances

Comparative-static analysis indicates that expected net losses to the Bank Insurance Fund (BIF) could rise or fall when advances replace insured deposits. Panel (a) shows Bank B's balance sheet before and after an economic shock reduces loan value 15 percent—assuming no advances in the funding mix. Initially, the bank finances $800 in loans with $600 in insured deposits, $100 in uninsured deposits, and $100 in capital. The assessment base is $700—the sum of insured and uninsured deposits. The economic shock reduces loan value to $680 and produces insolvency. Upon closure, the FDIC pays $600 to insured depositors. As representative of these depositors, the FDIC receives 85.7 percent ($600 divided by the $700 assessment base) of the $680 recovery from asset sales, or $583 (rounded). The gross BIF loss is $17. Panel (b) illustrates the impact of the same shock when advances replace insured deposits. At liquidation, the FDIC pays $450 to insured depositors, sells assets for $680, and disburses $150 to an FHLBank. The FDIC receives 81.8 percent ($450 divided by the $550 assessment base) of the $530 that remains after selling assets and paying the FHLBank, or $434 (rounded). The gross loss is $16—the $450 paid to insured depositors minus the $434 net proceeds from asset sales. The gross loss falls by $1 because the insured-deposit share is smaller after advances replace insured deposits (81.8 percent versus 85.7 percent). The smaller assessment base, however, implies premiums decline. The impact on net BIF losses will depend on whether the decline in premiums is greater or less than the $1 decline in gross losses.

Panel (a)				**Panel (b)**			
Bank B's Balance Sheet				**Bank B's Balance Sheet**			
Before and After Shock, with No Advances				**Before and After Shock, with Advances**			
Assets		Liabilities		Assets		Liabilities	
Loans	~~$800~~ $680	Insured Deposits	$600	Loans	~~$800~~ $680	Insured Deposits	$450
		Uninsured Deposits	$100			Uninsured Deposits	$100
		FHLBank Advances	$0			FHLBank Advances	$150
		Capital	~~$100~~ $-20			Capital	~~$100~~ $-20
***Gross BIF Loss:* $17**				***Gross BIF Loss:* $16**			
Assessment Base: $700				***Assessment Base: $550***			

Table 5
How does FHLBank funding affect net BIF losses?
Case Three: The Bank Replaces Uninsured Deposits with Advances

Comparative-static analysis indicates that expected net losses to the Bank Insurance Fund (BIF) rise when advances replace uninsured deposits. Panel (a) shows Bank C's balance sheet before and after a shock forces liquidation by reducing loan value 15 percent. Upon closure, the FDIC pays $550 to insured depositors. As representative of these depositors, the FDIC receives 78.6 percent ($550/$700) of the proceeds from asset sales, or $534 (rounded). The gross BIF loss is $16. Panel (b) shows the impact of the same shock when Bank C substitutes FHLBank advances for uninsured deposits. The FDIC must now pay $150 to an FHLBank, leaving $530 in assets to cover depositor claims of $550. The gross loss is now $20—$4 larger because losses cannot be shared with uninsured depositors as in panel (a). Because the assessment base declines, net BIF losses will exceed $4 if Bank C is paying premiums.

Panel (a)				**Panel (b)**			
Bank C's Balance Sheet				**Bank C's Balance Sheet**			
Before and After Shock, with No Advances				**Before and After Shock, with Advances**			
Assets		Liabilities		Assets		Liabilities	
Loans	~~$800~~ $680	Insured Deposits	$550	Loans	~~$800~~ $680	Insured Deposits	$550
		Uninsured Deposits	$150			Uninsured Deposits	$0
		FHLBank Advances	$0			FHLBank Advances	$150
		Capital	~~$100~~ $-20			Capital	~~$100~~ $-20
Gross BIF Loss: $16				***Gross BIF Loss: $20***			
Assessment Base: $700				***Assessment Base: $550***			

Table 6
How does FHLBank funding affect net BIF losses?
Case Four: The Bank Uses Advances to Make High-Risk Loans (Moral Hazard)

Comparative-static analysis indicates that the moral hazard associated with FHLBank funding increases expected net losses to the Bank Insurance Fund (BIF). Panel (a) shows the initial balance sheet for Bank D, assuming $200 in advances funds loans of normal risk. Suppose, as before, an economic shock reduces loan value 15 percent and produces insolvency. The FDIC uses $850 in assets to settle combined FHLBank and insured-depositor claims of $900, resulting in a gross loss of $50. In panel (b) advances fund high-risk loans, thereby increasing the probability of loan loss and decreasing the likely recovery in asset liquidation. So the same shock now produces a 20 percent decline in loan value. The FDIC recovers $800 from asset sales, pays $900 to the FHLBank and insured depositors, and suffers a gross loss of $100. Moral hazard increases the gross BIF loss by $50. Net losses will rise by somewhat less than $50 if Bank D migrates into a riskier pricing cell before failing.

Panel (a)				**Panel (b)**			
Bank D's Balance Sheet				**Bank D's Balance Sheet**			
Before and after Shock, Advances Induce No Moral Hazard				**Before and after Shock, Advances Induce No Moral Hazard**			
Assets		Liabilities		Assets		Liabilities	
Loans	~~$1000~~ $850	Insured Deposits	$700	Loans	~~$1000~~ $800	Insured Deposits	$700
		FHLBank Advances	$200			FHLBank Advances	$200
		Capital	~~$100~~ $-50			Capital	~~$100~~ $-100
***Gross BIF Loss:* $50**				***Gross BIF Loss:* $100**			
Assessment Base: $700				***Assessment Base: $700***			

Table 7
Which factors predict financial distress in commercial banks?

This table lists the independent variables in the CAMELS downgrade-prediction model. Gilbert, Meyer, and Vaughan (2002) developed this model before the Call Report required data on advances, so FHLBank dependence was not a candidate in the specification search. We test for moral hazard by adding the advances-to-assets ratio. Signs note the expected relationship between each variable and the likelihood of a downgrade from satisfactory status (a CAMELS 1 or 2 composite rating) to unsatisfactory status (a CAMELS 3, 4, or 5 rating) in the next year. For example, the negative sign for the net-worth ratio indicates that, other things equal, higher capital reduces downgrade probability. Note: the relationship between asset size and downgrade probability is theoretically ambiguous. Opportunities to reduce risk by diversifying across product lines and geographic regions increase with operating scale. But, as Demsetz and Strahan (1997) have noted, product and geographic diversification relax a constraint, permitting assumption of more risk.

		Independent Variables	Symbol	Expected Impact on Downgrade Probability
Gilbert, Meyer, and Vaughan Variables	Credit Risk Variables	Loans past due 30-89 days as a percentage of total assets	PAST-DUE-30	+
		Loans past due 90+ days as a percentage of total assets	PAST-DUE-90	+
		Non-accrual loans as a percentage of total assets	NONACCRUING	+
		Other real estate owned as a percentage of total assets	OREO	+
		Commercial and industrial loans as a percentage of total assets	COMMERCIAL	+
		Residential real estate loans as a percentage of total assets	RESIDENTIAL	–
	Leverage Risk Variables	Total net worth (equity capital minus goodwill) as a percentage of total assets	NET-WORTH	–
		Net income as a percentage of average assets	ROA	–
	Liquidity Risk Variables	Book value of investment securities as a percentage of total assets	SECURITIES	–
		Deposits > $100M (jumbo CDs) as a percentage of total assets	JUMBO CDs	+
	Control Variables	Natural logarithm of total assets, in thousands of dollars	SIZE	?
		Dummy variable if the bank's CAMELS rating is 2	CAMELS-2	+
		Dummy variable if the bank's management rating is weaker than its composite CAMELS rating	BAD-MANAGE	+
FHLBank Variable		Advances as a percentage of total assets	ADVANCES	+

Table 8
Does dependence on FHLB funding make financial distress more likely?

This table presents the results of probit regressions of downgrade status on financial ratios and control variables. In each equation, downgrade status ("1" = bank examined and downgraded from a CAMELS one or two composite rating to a three, four or five; "0" = bank examined, but not downgraded) in year *t+1* is regressed on accounting and supervisory data for non-*de-novo*, 1- and 2-rated banks at year-end *t*. Standard errors appear in parentheses below the coefficients. One asterisk denotes statistical significance at the 10-percent level, two asterisks at the five-percent level, and three at the one-percent level. FHLBank advances increase downgrade probability—though coefficient magnitudes suggest the impact is modest.

Independent Variable		Pooled 1992-2003	1993 Downgrades (on 1992:Q4 Financials)	1994 Downgrades (on 1993:Q4 Financials)	1995 Downgrades (on 1994:Q4 Financials)	1996 Downgrades (on 1995:Q4 Financials)	1997 Downgrades (on 1996:Q4 Financials)
Intercept		-1.166*** (0.134)	0.270 (0.458)	-1.308*** (0.454)	-0.062 (0.583)	0.306 (0.541)	-0.846 (0.560)
Credit Risk	PAST-DUE-30	0.165*** (0.011)	0.204*** (0.038)	0.129*** (0.039)	0.180*** (0.046)	0.195*** (0.042)	0.084** (0.038)
	PAST-DUE-90	0.233*** (0.020)	0.258*** (0.068)	0.220*** (0.071)	0.259*** (0.081)	0.259*** (0.080)	0.386*** (0.067)
	NONACCRUING	0.235*** (0.015)	0.202*** (0.052)	0.209*** (0.051)	0.214*** (0.061)	0.192*** (0.056)	0.299*** (0.055)
	OREO	0.052** (0.023)	0.129*** (0.047)	0.169*** (0.050)	0.227*** (0.060)	0.069 (0.072)	0.221*** (0.083)
	COMMERCIAL	0.007*** (0.002)	0.008 (0.005)	0.008 (0.006)	0.013* (0.007)	0.012** (0.006)	-0.003 (0.006)
	RESIDENTIAL	-0.004*** (0.001)	-0.005 (0.004)	0.002 (0.004)	-0.017*** (0.005)	-0.011** (0.005)	-0.004 (0.004)
Leverage Risk	NET-WORTH	-0.050*** (0.004)	-0.133*** (0.018)	-0.021 (0.015)	-0.058*** (0.017)	-0.033** (0.017)	-0.078*** (0.022)
	ROA	-0.143*** (0.013)	-0.140*** (0.046)	-0.341*** (0.056)	-0.213*** (0.045)	-0.518*** (0.077)	-0.106* (0.064)
Liquidity Risk	SECURITIES	-0.006*** (0.001)	-0.006* (0.003)	-0.001 (0.003)	-0.005 (0.004)	-0.014*** (0.004)	-0.013*** (0.004)
	JUMBO CDs	0.020*** 0.001	0.009 (0.006)	0.026*** (0.005)	0.016** (0.007)	0.025*** (0.006)	0.021*** (0.006)
Control Variables	SIZE	-0.117*** (0.010)	-0.181*** (0.034)	-0.131*** (0.036)	-0.213*** (0.047)	-0.203*** (0.042)	-0.132*** (0.040)
	CAMELS-2	0.698*** (0.035)	0.604*** (0.146)	0.612*** (0.130)	0.515*** (0.145)	0.458*** (0.137)	0.795*** (0.155)
	BAD-MANAGE	0.460*** (0.028)	0.541*** (0.080)	0.394*** (0.085)	0.554*** (0.101)	0.296*** (0.107)	0.604*** (0.109)
ADVANCES		0.024*** (0.002)	0.033 (0.025)	0.033* (0.017)	0.063*** (0.012)	0.007 (0.021)	0.038*** (0.012)
Pseudo R^2		0.192	0.184	0.164	0.223	0.240	0.250
Observations		81166	8267	8661	8011	7813	6994

Table 8 (Continued)

Independent Variable		1998 Downgrades (on 1997:Q4 Financials)	1999 Downgrades (on 1998:Q4 Financials)	2000 Downgrades (on 1999:Q4 Financials)	2001 Downgrades (on 2000:Q4 Financials)	2002 Downgrades (on 2001:Q4 Financials)	2003 Downgrades (on 2002:Q4 Financials)
Intercept		-1.617*** (0.452)	-1.186*** (0.435)	-1.243*** (0.474)	-1.475*** (0.452)	-2.235*** (0.414)	-1.152** (0.459)
Credit Risk	PAST-DUE-30	0.177*** (0.038)	0.140*** (0.036)	0.233*** (0.042)	0.136*** (0.033)	0.174*** (0.033)	0.178*** (0.038)
	PAST-DUE-90	0.248*** (0.071)	0.118* (0.065)	0.207*** (0.068)	0.380*** (0.072)	0.091 (0.075)	0.234*** (0.068)
	NONACCRUING	0.178*** (0.054)	0.326*** (0.051)	0.177*** (0.054)	0.283*** (0.050)	0.302*** (0.048)	0.268*** (0.046)
	OREO	0.164 (0.112)	0.151* (0.089)	0.037 (0.127)	0.205** (0.104)	0.043 (0.094)	0.227** (0.093)
	COMMERCIAL	0.014*** (0.005)	0.013*** (0.005)	0.007 (0.005)	0.015*** (0.005)	0.007 (0.005)	-0.005 (0.006)
	RESIDENTIAL	-0.002 (0.004)	-0.004 (0.004)	-0.005 (0.004)	0.002 (0.004)	-0.003 (0.004)	-0.006 (0.004)
Leverage Risk	NET-WORTH	-0.023* (0.013)	-0.043*** (0.012)	-0.041*** (0.013)	-0.037** (0.015)	0.003 (0.009)	-0.038** (0.016)
	ROA	-0.067*** (0.022)	-0.157*** (0.036)	-0.290*** (0.053)	-0.204*** (0.049)	-0.233*** (0.048)	-0.405*** (0.061)
Liquidity Risk	SECURITIES	-0.005 (0.004)	-0.004 (0.003)	-0.003 (0.003)	-0.006 (0.004)	-0.008** (0.003)	-0.004 (0.003)
	JUMBO CDs	0.007 (0.006)	0.013** (0.005)	0.016*** (0.005)	0.024*** (0.005)	0.017*** (0.005)	0.006 (0.005)
Control Variables	SIZE	-0.097*** (0.034)	-0.107*** (0.033)	-0.118*** (0.036)	-0.118*** (0.033)	-0.061** (0.031)	-0.063* (0.033)
	CAMELS-2	0.630*** (0.108)	0.732*** (0.104)	0.923*** (0.123)	0.884*** (0.124)	0.952*** (0.128)	0.573*** (0.111)
	BAD-MANAGE	0.514*** (0.099)	0.456*** (0.098)	0.648*** (0.105)	0.439*** (0.113)	0.616*** (0.104)	0.351*** (0.115)
ADVANCES		0.027*** (0.009)	0.009* (0.005)	0.035*** (0.007)	0.017** (0.007)	0.016** (0.007)	0.022*** (0.007)
Pseudo R^2		0.181	0.198	0.235	0.241	0.230	0.207
Observations		6128	6105	5927	5814	5665	5409

PAST-DUE-30	Loans > 30 days past due / total loans	**ROA**	Net income / total assets
PAST-DUE-90	Loans > 90 days past due / total loans	**SECURITIES**	Book value of securities / total assets
NONACCRUING	Loans in non-accrual status / total loans	**JUMBO-CDs**	Jumbo-CDs / total assets
OREO	Other real estate owned / total assets	**SIZE**	Natural logarithm of total assets, in thousands of dollars
COMMERCIAL	Commercial and industrial loans / total assets	**CAMELS-2**	Dummy variable if the bank has a CAMELS rating of 2
RESIDENTIAL	Residential real-estate loans / total assets	**BAD-MANAGE**	Dummy variable if the management rating > CAMELS rating
NET-WORTH	Equity less goodwill / total assets	**ADVANCES**	FHLB advances as a percentage of total assets

Table 9

How does FHLBank dependence at high-risk banks and heavy-user banks compare with all U.S. banks?

This table presents mean and median ratios of FHLBank advances to total assets for all U.S. commercial banks, high failure-risk banks, and heavy-user banks—as of year-end 2003. On average, dependence on advances at high-risk banks is about 74 percent of dependence for the banking sector as a whole. Meanwhile, average dependence on advances at heavy user banks is nearly six times the average for U.S. banks.

	All U.S. Commercial Banks			High-Risk Banks			Heavy-User Banks		
		FHLBank Advances as a Percent of Assets			FHLBank Advances as a Percent of Assets			FHLBank Advances as a Percent of Assets	
Total Assets	**Number**	**Mean**	**Median**	**Number**	**Mean**	**Median**	**Number**	**Mean**	**Median**
<$50 million	1,937	1.76	0.00	118	1.66	0.00	34	19.49	18.64
$50-100 million	1,955	3.17	0.38	106	2.91	0.00	65	19.86	17.89
$100-500 million	3,035	4.41	2.60	99	3.50	1.59	170	20.12	18.35
$500-$1 billion	374	6.36	4.79	6	4.46	3.87	50	19.54	18.04
$1-5 billion	281	6.93	4.77	4	3.82	1.38	39	21.00	18.83
>$5 billion	133	5.86	3.25	1	0.00	0.00	9	36.00	25.68
Total	***7,715***	***3.64***	***0.84***	***334***	***2.68***	***0.00***	***367***	***20.42***	***18.35***

Source: Reports of Condition and Income for all U.S. Commercial Banks, 2003

Table 10
What are the FDIC's historical loss rates on various asset classes?

Previous studies estimated actuarially fair deposit-insurance premiums or aggregate costs of providing deposit insurance by assuming historical ratios of fund losses to fund balances will obtain in the future.. Our approach is more granular. We apply average 1990-2002 loss rates on specific assets—noted below—to year-end 2003 balances of high-risk and heavy-user banks. OREO refers to "other real estate owned," typically collateral seized in foreclosure.

Weighted-Average Losses by Asset Category 1990-2002	
Asset Categories	
Consumer Loans	**25.1**
Commercial Loans	**40.0**
Securities	**1.1**
Real Estate Loans	**22.0**
OREO	**62.1**
Other Assets	**26.4**
Source: Bennett (2003)	

Table 11
How much do FHLBank advances increase losses-given-default?
High-Risk Scenario: Liquidation of All Banks with Failure Probabilities above Two Percent

If all high-risk banks were liquidated, losses to the Bank Insurance Fund (BIF) would equal $3.66 billion, or just over six percent of the assets held by the 334 institutions. To gauge the impact of FHLBank funding, we remove advances from these banks, make offsetting balance-sheet adjustments, recalculate resolution costs, and compare the new estimates with the baseline estimates. The difference is the amount advances "increase" BIF losses. On average, FHLBank funding increases losses by $146 million—a figure equal to four percent of the baseline. If the insured-deposit adjustment is ignored, advances boost average BIF losses by $182 million—a figure equal to five percent of the baseline. Comparing these estimates to BIF offers insight into economic significance. By this metric the impact of FHLBank funding is modest; incremental losses-given-default represent less than one percent of year-end 2003 Fund value.

	Estimated Losses ($000)	**Total Assets ($000)**	**Loss as a Percent of Assets**	**Incremental Resolution Costs ($000)**
Baseline resolution costs	**3,660,268**	**59,934,900**	**6.11**	**--**
Strategies for Using FHLBank Advances (Balance-Sheet Adjustments)				
Replace insured deposits with advances	3,694,776	59,934,900	6.16	(34,508)
Replace uninsured deposits with advances	3,503,993	59,934,900	5.85	156,275
Use FHLBank advances to expand real-estate loan portfolio	3,414,360	58,584,010	5.83	245,908
Use FHLBank advances to expand consumer-loan portfolio	3,551,897	59,421,448	5.98	108,371
Use FHLBank advances to expand commercial-loan portfolio	3,271,366	58,746,112	5.57	388,902
Use FHLBank advances to purchase investment securities	3,649,651	58,765,363	6.21	10,617
Average resolution costs over all strategies	***3,514,341***	***59,231,122***	***5.93***	
Average increase in resolution costs (in $000 from the baseline)	145,928			
Average increase in resolution costs (as a percentage of the baseline)	3.99%			
Average increase in resolution costs (as a percentage of BIF)	0.43%			
Average resolution costs over strategies excluding insured-deposit strategy	***3,478,253***	***59,090,367***	***5.89***	
Average increase in resolution costs (in $000 from the baseline)	182,015			
Average increase in resolution costs (as a percentage of the baseline)	4.97%			
Average increase in resolution costs (as a percentage of BIF)	0.54%			

Table 12
How much would FHLBank advances increase losses-given-default?
Heavy-User Scenario: Liquidation of All Banks with Advance-to-Asset Ratios above 15 percent

If all heavy-user banks were liquidated, losses to the Bank Insurance Fund (BIF) would equal $15.4 billion, or nearly six percent of the assets held by the 367 institutions. To gauge the impact of FHLBank funding, we remove advances from these banks, make offsetting balance-sheet adjustments, recalculate resolution costs, and compare the new estimates with the baseline estimates. The difference is the amount advances "increase" BIF losses. On average, FHLBank funding increases losses by $3.1 billion—a figure equal to 20 percent of the baseline. If the insured-deposit adjustment is ignored, advances boost average losses by $4.1 billion—a figure equaling 27 percent of the baseline. When viewed as a percentage of BIF, incremental resolution costs traceable to advances are large—ranging from 9 to 12 percent of Fund value at year-end 2003.

	Estimated Losses ($000)	**Total Assets ($000)**	**Loss as a Percent of Assets**	**Incremental Resolution Costs ($000)**
Baseline resolution costs	**15,360,264**	**259,400,567**	**5.92**	**--**
Strategies for Using FHLBank Advances (Balance-Sheet Adjustments)				
Replace insured deposits with advances	17,431,584	259,400,567	6.72	(2,071,320)
Replace uninsured deposits with advances	11,207,852	259,400,567	4.32	4,152,412
Use FHLBank advances to expand real-estate loan portfolio	6,642,516	199,429,888	3.33	8,717,748
Use FHLBank advances to expand consumer-loan portfolio	12,414,840	245,020,693	5.07	2,945,424
Use FHLBank advances to expand commercial-loan portfolio	11,066,518	244,870,836	4.52	4,293,746
Use FHLBank advances to purchase marketable securities	14,982,044	214,447,716	6.99	378,220
Average resolution costs over all strategies	***12,290,892***	***237,095,045***	***5.18***	
Average increase in resolution costs (in $000 from the baseline)	3,069,372			
Average increase in resolution costs (as a percentage of the baseline)	19.98%			
Average increase in resolution costs (as a percentage of BIF)	9.09%			
Average resolution costs excluding insured-deposit strategy	***11,262,754***	***232,633,940***	***4.84***	
Average increase in resolution costs (in $000 from the baseline)	4,097,510			
Average increase in resolution costs (as a percentage of the baseline)	26.68%			
Average increase in resolution costs (as a percentage of BIF)	12.13%			

Appendix
A Closer Look at the Impact of FHLBank Advances on Loss-Given-Failure

In a payoff resolution, the FDIC as receiver assumes the assets and liabilities of the failed bank. The FDIC pays insured depositors in full and then takes their place in line to receive proceeds from asset liquidation. Since passage of National Depositor Preference in 1993, claimants have been paid in the following order (Marino and Bennett, 1999):

- Administrative expenses of the receiver
- Secured claims (including FHLBank advances)
- Domestic deposits (insured and uninsured)
- Foreign deposits and other general creditor claims
- Subordinated debt
- Shareholders

Upon resolution, the FDIC pays secured claimants, including an FHLBank, and divides proceeds from the sale of remaining assets with uninsured domestic depositors. Gross BIF losses (*LS*) are insured deposits less the FDIC's share of asset sales after paying secured claimants as shown in equation (A1). We assume administrative expenses are zero, and the only secured claim is FHLBank advances. Each right-hand side variable depends on advances. Bank subscripts are also omitted to simplify the exposition.

$$LS = ID - \gamma\pi \tag{A1}$$

where:

LS = gross BIF losses (i.e., losses before deduction of paid-in premiums)

ID = insured deposits

$\gamma = \dfrac{ID}{ID + UD}$ = insured deposit share of total domestic deposits

and the proceeds from liquidation, after paying the advances, are

$$\pi = (1 - LR)L - A \tag{A2}$$

where:

LR = loan-loss ratio, or the percentage mark down of loans upon resolution

L = book value of loans before resolution

A = amount of FHLBank advances.

By definition, the value of assets equals the value of liabilities and equity:

$$(1 - LR)L = A + ID + UD + EQ \tag{A3}$$

Using equations (A2) and (A3), we can express gross BIF losses as

$$LS = -\gamma EQ \tag{A4}$$

Note that gross losses are positive if and only if the value of equity (EQ) is negative. We will assume $EQ < 0$ throughout this analysis. This assumption is another way of saying that banks are closed and liquidated only when the value of assets falls below the value of liabilities.

To investigate incremental gross losses traceable to FHLBank advances, we differentiate (A4) with respect to *A*, yielding:

$$LS' = \frac{dLS}{dA} = -\gamma' EQ - \gamma EQ' \tag{A5}$$

The marginal change in the insured-deposit share is:

$$\gamma' = \frac{ID'UD - UD'ID}{(ID + UD)^2} \tag{A6}$$

Using equation (A6) we can rewrite the marginal change in gross BIF losses as:

$$LS' = \frac{(ID'UD - UD'ID)EQ}{(ID + UD)^2} - \frac{(ID)(EQ')}{ID + UD} \tag{A7}$$

Following equation (A3), the value of equity can be written as:

$$EQ = (1 - LR)L - A - ID - UD \tag{A8}$$

and the marginal change in equity can be written as:

$$EQ' = L' - (LR')L - (LR)L' - 1 - ID' - UD' \tag{A9}$$

To make equation (A7) more intuitive, we illustrate the influence of different assumptions (Case 1, Case 2, and Case 3) on the link between advances and BIF losses.

<u>Case 1: Advances Fund Loan Growth Exclusively</u>

In this case, each additional dollar of advances is channeled into new loans. This assumption implies *L'=1* and *UD'=ID'*=0. The marginal change in gross BIF losses is given by:

$$LS' = \gamma(LR'L + LR) > 0 \tag{A10}$$

In words, the incremental loss is the insured depositor's share of any increase in loan losses (plus the pre-advance loan-loss ratio). The insured-deposit share and loan-loss ratio are positive, so net losses are increasing in advances—even if advances does not produce a rise in the loan-loss ratio.

Case 2: Advances Substitute for Insured Deposits

Alternatively, we may assume advances substitute for insured deposits, all else equal. This assumption implies *L'=UD'=LR'*=0 and *ID'*=-1. The loan-loss rate does not change because, by assumption, the change in funding mix has no impact on the left side of the balance sheet. In this case, incremental gross losses become:

$$LS' = \left[(1-\gamma)\left(\frac{EQ}{ID+UD} \right) \right] < 0 \tag{A11}$$

By assumption, insured-deposit share is positive (or advances could not substitute for insured deposits). The assumption of negative equity implies equation A11 is negative—an increase in advances reduces gross losses. Gross losses fall because the increase in advances reduces the share of FDIC-insured claims in the bank's funding mix.

Case 3: Advances Substitute for Uninsured Deposits

Finally, we may assume advances replace uninsured deposits, all else equal. This assumption implies *L'=ID'=LR'*=0 and *UD'*=-1. In this case, incremental losses become:

$$LS' = -\gamma \frac{EQ}{ID+UD} > 0 \tag{A12}$$

Assuming the insured-deposit share is initially positive, equation A12 is positive—an increase in advances increases gross losses. Gross losses rise because the increase in advances reduces the FDIC's ability to shift losses to uninsured depositors.