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Should the FDIC Worry about the FHLB?
The Impact of Federal Home Loan Bank Advances on the Bank-Insurance Fund

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Abstract

Does growing bank reliance on Federal Home Loan Bank (FHLBank) funding increase risk to the Bank-Insurance Fund (BIF)? This answer to this research question contributes to both academic studies of deposit-insurance premiums and policy debates over deposit-insurance reform. We attempt to provide an answer by first modeling the impact of FHLBank advances on net FDIC losses. To quantify the exposure implied by the model, we then examine the impact of advances on the probability of loss using a CAMELS-downgrade model. Finally, we assess the impact of advances on loss-given-failure by calculating incremental 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 indicates that access to FHLBank advances has increased both the probability of losses and likely losses-given-default. The policy implication is that the FDIC should consider explicitly or implicitly charging for increases in expected losses arising from FHLBank funding.

Keywords: **Deposit-insurance pricing, Federal Home Loan Bank (FHLB), moral hazard.**
JEL codes: **G21, G28, K23**

1. Introduction

Does growing bank reliance on Federal Home Loan Bank (FHLBank) funding increase risk to the Bank-insurance Fund (BIF)?[1] This answer to this research question contributes to both academic studies of deposit-insurance premiums and policy debates over deposit-insurance reform. Since the early 1990s, commercial banks of all shapes and sizes have come to view FHLBank advances as a critical source of funding. Indeed, at year-end 2003, the System boasted over 8,000 members (including nearly 6,000 commercial banks) and outstanding advances totaling $514.2 billion. Advances potentially expose the deposit-insurance fund through two channels. First, advances could increase the probability of loss by permitting risky banks to escape market discipline. Second, advances could increase resolution costs by subordinating the FDIC's position in failure resolutions. The purpose of this paper is to assess BIF's actual exposure to commercial-bank dependence on FHLBank funding.

Discussion of these potential exposures has been curiously absent in recent policy and scientific work on the housing GSEs. The policy debate has centered Freddie Mac and Fannie Mae. Poole (2003), for example, has voiced concerns about the systemic risk arising from the rapid growth of the two GSEs while Passmore (2003) has adduced evidence that implicit subsidies benefit Freddie and Fannie shareholders more than homeowners. In addition, Emmons and Sierra (2004) have noted that performance incentives for executives at the two GSEs exacerbate moral-hazard problems. To date, scientific study of the FHLBanks has focused on the wisdom of their mortgage-partnership program (Frame, 2003) and their implicit subsidy of community-bank lending (Craig and Thomson, 2003). Some attempt has also been made to model the decisions of community banks to join the FHLBank system (Collender and Frizzell, 2002) and the impact of FHLBank membership on community-bank risk

[1] Throughout this paper, we use the terms "deposit-insurance fund" and "Bank-Insurance Fund" (BIF) interchangeably. The FDIC actually administers two funds—a fund for commercial banks (BIF) and a fund for thrifts (the Savings Association Insurance Fund, or SAIF). The Financial Institutions Reform, Recover, and Enforcement Act of 1989 (FIRREA) dissolved the Federal Savings and Loan Insurance Corporation (FSLIC), vesting the FDIC with responsibility for insuring thrift deposits from a fund (SAIF) completely distinct from BIF.

(Stojanovic, Vaughan, and Yeager, 2001). No work of which we are aware has explicitly addressed the impact of FHLBank funding on expected losses to the deposit-insurance fund.

Theory and practice of deposit-insurance pricing has largely overlooked increases in resolution costs arising from FHLBank funding. Advances must be collateralized. When a bank with outstanding advances is closed, the FDIC first pays off the lending FHLBank to obtain control of pledged assets and resolve the failure. So FHLBank funding effectively subordinates the FDIC's position and, depending on how the borrowing bank actually used advances, could increase resolution costs. But the current premium structure considers only supervisory ratings and capital protection (Merton, 2004). Recent scientific work on fair pricing has relied on average long-term FDIC losses or auditing expenses to calibrate models (Duffie et al., 2003; Falkenheim and Pennacchi, 2003), yet large-scale funding with FHLBank advances is a recent phenomenon for FDIC-insured institutions.[2] Ex post (James, 1991) as well as ex ante (Cooperstein, Pennacchi, and Redburn, 1995) estimates of the aggregate cost of deposit insurance have also abstracted from bank-liability structures. We are the first to ask whether such abstraction is appropriate. Recent evidence from fair-pricing models that the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA) has not deterred banks from shifting risk to the deposit-insurance fund makes our analysis all the more timely (Hovakimian and Kane, 2000).

To pin down the FDIC's exposure, we first conduct simple comparative-static exercises to "sign" the link between advances and net losses to the fund. We then turn to empirical tests, looking at the effect of advances on probability of loss and loss-given-failure. To test the impact on loss probability, we add the ratio of advances to assets to a CAMELS downgrade model—a model that estimates the likelihood supervisors will downgrade a bank from a CAMELS one or two composite to a three, four, or five.[3] To

[2] Originally, only thrift institutions and insurance companies could join the FHLBank System. FIRREA opened membership to commercial banks and credit unions.

[3] CAMELS composites reflect examiner assessments of six components of safety and soundness—capital protection (C), asset quality (A), management competence (M), earnings strength (E), liquidity-risk exposure (L), and market-risk sensitivity (S). Composite ratings represent overall assessments of bank condition and take integer values ranging from one (best) to five (worst). In general, banks with composite ratings of one or two are considered satisfactory while banks with ratings of three,

assess the impact of advances on loss-given-failure, we estimate incremental resolution costs in two different scenarios—the resolution of all banks with failure probabilities above two percent and the resolution of all banks with advance-to-asset ratios above 15 percent. The evidence indicates that access to FHLBank advances has increased both the probability of losses and likely losses-given-failure. The policy implication is that the FDIC should consider explicitly or implicitly charging for increases in expected losses arising from FHLBank funding.

The remainder of the paper is organized in five parts. Section two provides additional institutional details and context so as to bring the importance of the research question into sharper focus. Section three offers a framework for analyzing the impact of FHLBank funding on BIF losses. Section four estimates the impact of the FHLBank funding on the probability of financial distress, and section five quantifies the potential impact of FHLBank funding on resolution costs. Section six offers concluding remarks, including a discussion of the policy implications of our analysis.

2. Motivation

In recent years numerous proposals have been put forward to reform the U.S. deposit-insurance system. (See, for example, Bloecher, Seale, and Vilim, 2003; Blinder and Wescott, 2001; FDIC, 2000; Hanc, 1999.) A central theme motivating these proposals is that the deposit-insurance system has not kept pace with financial innovation. Indeed, the Federal Deposit Insurance Corporation (FDIC) has itself recommended merging the Bank-Insurance Fund (BIF) and the Savings Association Insurance Fund (SAIF), relaxing restrictions on assessment rates that arise when fund balances exceed the designated reserve ratio, and indexing the deposit-insurance ceiling to inflation (FDIC, 2001).[4]

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four, or five are considered unsatisfactory. "S" ratings were added to the CAMELS framework in 1997; tests on pre-1997 data use the composite CAMEL rating.

[4] FDICIA requires the FDIC to set deposit-insurance premiums so that the reserve fund will not fall below 1.25 percent of estimated insured deposits. This threshold is referred to as the designated reserve ratio.

An important topic excluded from proposed reforms is the impact of bank-liability structures on expected losses to the deposit-insurance fund (Shibut, 2002). Private insurers price expected losses—the product of the probability of a claim and the magnitude of the claim if filed. The FDIC, however, sets premiums based on supervisory ratings and capital ratios, subject to the level of the designated reserve ratio for the fund. This approach does not explicitly capture the impact of secured funding on resolution costs, a key omission because secured funding is senior to insured deposits. Table 1 contains the pricing matrix as of December 31, 2004. Nearly 93 percent of U.S. banks are scheduled to pay no premiums during the first assessment period for 2005. More importantly, the spread between the premiums for the riskiest and the safest banks is only 27 basis points, well under the estimates of the actuarially fair spread put forth in recent research. (See Duffie, et al., 2003 and Falkenheim and Pennacchi, 2003, for example.). Even more important, these estimates of the actuarially fair spread were based on average historical losses and operational expenses for the FDIC. Historical averages may not offer a good guide to future resolution costs because heavy bank reliance on secured liabilities is a recent phenomenon.

As noted, FHLBank advances subordinate the FDIC's position at failure and potentially increase resolution costs. But advances are not the only secured claims. Collateralized liabilities include discount-window loans, uninsured public deposits, repurchase agreements, and FHLBank advances. These claims have grown rapidly over the last decade. As Table 2 illustrates, the ratio of secured claims to total assets rose from 4.0 percent in 1992 to 8.5 percent in 2003. During that span, collateralized liabilities grew at an annual average rate of 13.7 percent while total assets grew 6.9 percent and domestic deposits—the base on which insurance premiums are assessed—increased by just 5.5 percent.

Of the four categories of secured lending, only the growth of FHLBank advances poses a potentially large risk 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 reliance on the window (Peristiani, 1998), and the growing sophistication of the overnight-funding market (Furfine, 2001, 1999). Repurchase agreements do not fund 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 management of liquidity and development of a sophisticated market for overnight loans. Finally, the supply of uninsured public deposits is limited by the fiscal activity of the state or municipality. These deposits must, by statute, be secured by high-quality securities in the bank's investment portfolio; growth in the 1990s reflects the impact of the robust economic expansion on municipal revenues. Overall, FHLBank advances account for 47 percent of the dollar increase in collateralized liabilities between 1992 and 2003. Unlike other secured credits, the supply of advances to fund bank growth is highly elastic. Because of its extraordinary credit-risk record and implicit government 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 the ability of commercial banks to borrow from FHLBanks. Between 1992 and 2003, the number of commercial-bank members of the FHLBank System increased from 1,284 to 5,946. Over the same period, advances outstanding to member banks jumped from $6 to $274.0 billion.[5]

Congress considered two deposit-insurance reform bills in 2004, H.R. 522 and S.229. Although the bills differed in a number of details, both would have merged BIF and SAIF, increased coverage levels and indexed the higher levels to inflation, granted the FDIC some flexibility to set premiums, and awarded premium rebates when reserve-fund balances rose above a certain level. Neither bill included a provision to link premiums to bank funding strategies. So, even if current reform proposals were to pass in the future, FHLBank advances would still constitute a potential risk to the deposit-insurance fund.

3. A Model of the Impact of Advances on the Deposit-Insurance Fund

[5] Data on secured claims were taken from Reports on Condition and Income (Call Reports) of U.S. commercial banks, various years. FHLBank data were taken from the consolidated financial statements, Federal Home Loan Bank System, various years.

We now present a simple model to illustrate the impact of FHLBank funding on the FDIC. The net present value of losses at time *t* (*NL)* equals the discounted net payouts from the fund to insured depositors. Net payouts, in turn, equal expected gross payouts—the probability of loss (*p)* at bank *i* times

the FDIC's gross losses from liquidating bank *i* (*LS)*, summed across all banks—minus total paid-in deposit-insurance premiums.[6] Total premiums equal the product of the deposit-insurance assessment rate at bank *i* (r_i) and the quantity of assessable deposits at 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,

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

where:

NL	=	present value of expected net losses
p_{it}	=	probability that bank i will fail, estimated at time *t*
LS_{it}	=	gross loss to the deposit-insurance fund given the failure of bank *i* at time *t*
r_{it}	=	deposit insurance premium assessment rate of bank *i* at time *t*
D_{it}	=	assessable deposits of bank *i* at time *t*
δ	=	discount rate
T	=	number of periods
N_t	=	number of banks at time *t*

Each term inside the brackets in equation (1) is potentially affected by FHLBank advances. Failure probability (*p*) could depend on advances because the "all-in price" of advances does not reflect failure risk, thereby creating a potential moral-hazard problem. Loss given failure (*LS*) could depend on advances because FHLBank funding enables banks to book earning assets or replace uninsured deposits—in either case, potentially exposing the FDIC to a greater loss. Finally, the assessment rate (*r*) could depend on advances because FHLBank funding might lead banks into riskier pricing cells, and the assessment base (*D)* could depend on advances because FHLBank funding allows banks to operate with fewer assessable deposits.

[6] Throughout the paper, we define "gross" losses as FDIC losses from liquidated a failed institution—without accounting for deposit-insurance premiums paid into the fund by that institution. "Net" losses, in contrast, refer to FDIC losses after accounting for paid-in premiums.

The impact of advances on net losses to the deposit-insurance fund may be obtained by differentiating equation (1) with respect to *A*:

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

where ($p_{it}LS'_{it}$) represents the change in losses traceable to the impact of advances on gross losses-given-default, ($p'_{it}LS_{it}$) represents the change in losses arising from the impact of advances on the bank's failure probability, ($r'_{it}D_{it}$) represents the change in losses resulting from the impact of advances on the bank's assessment rate, and ($r_{it}D'_{it}$) represents the change in losses associated with the impact of advances on the level of assessable deposits.

The change in gross losses arising from advances, *LS'*, depends on a number of variables, including the bank's 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 provides the derivation of LS' assuming bank equity is endogenous. Substituting equation (A5) from the Appendix into equation (2) yields a framework general enough to analyze expected net losses to the fund from advances under a wide set of assumptions. We drop bank- and time-specific variables to simplify the exposition.

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

where:

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

$EQ =$ value of equity (presumed negative for insolvent banks)

3.1 Asset Growth

FHLBank advances could increase losses to the deposit-insurance fund by allowing a bank's loan portfolio to grow, thereby increasing losses given failure without a corresponding increase in premiums. We model this scenario by assuming advances are used exclusively to fund new loans, that is, $L'=1$, and $UD'=ID'=D'=0$. For simplicity, we also assume the bank's failure probability, the assessment rate, and the loan write-down given failure do not vary with the level of advances so that $p'=r'=LR'=0$.[7] Applying these assumptions and equations (A6) and (A9) to equation (3) yields:

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

where γ represents the share of insured deposits in the assessment base (i.e., total domestic deposits). Because failure probability (p), the discount rate (δ), insured-deposit share (γ), and the loan-loss ratio (LR) are positive, the derivative is positive. In words, net FDIC losses rise because the dollar value of loan losses rises (with the size of the portfolio) but deposit-insurance premiums do not.

Table 3 offers a simple numerical example. Panel (a) contains hypothetical balance sheets for Bank A. Initially, the bank funds $800 in loans with $700 of insured deposits and $100 of capital. Suppose an economic shock produces insolvency by reducing the value of loans by 15 percent to $680. Upon closure, the FDIC pays insured depositors $700, sells bank assets for $680, and suffers a loss of $20. Now, suppose instead that Bank A had used $200 in FHLBank advances to book new loans before the shock occurred. This scenario is illustrated in panel (b). Once again, an economic shock produces

[7] These assumptions allow no room for moral hazard. Section 3.4 explores the results when FHLBank advances induce banks to increase risk.

insolvency by reducing the value of the bank's loan portfolio by 15 percent to $850.[8] Upon closure, the FDIC pays depositors $700 as before, but now must also pay $200 to an FHLBank because advances are fully secured. The recovery of $850 from the sale of Bank A's assets is insufficient to cover the $900 in payouts, leaving the FDIC with a gross loss of $50—$30 higher than in the no-advance case. Net losses also increase by $30 because premiums paid did not vary with the level of advances. Premiums did not vary because neither the assessment base (by construction) nor assessment rate (by assumption) changed.

3.2 Insured-Deposit Substitution

Banks could substitute FHLBank funding for insured deposits, holding leverage and asset composition constant. If insured deposits decline dollar-for-dollar with increases in advance, then *ID'*= *D'*= -1, and *L'= UD'*=0. Maintaining the assumptions that *p'=LR'=r'=0* reduces equation (3) to:

$$\frac{dNL}{dA} = \left[\frac{p}{1+\delta}(1-\gamma)\frac{EQ}{ID+UD} \right] + \frac{r}{1+\delta} \quad \begin{matrix} > \\ < \end{matrix} \; 0 \qquad (5)$$

The bracketed term represents the impact of a change in the insured-deposit share of the assessment base on net FDIC losses—the "insured-share" effect. Again, failure probability (*p)*, the discount rate (δ) and insured-deposit share (γ) are positive. For simplicity, assume insured-deposit share is less than one, and the value of equity (*EQ*) is less than zero.[9] In this case, the sign of the bracketed term is negative—net FDIC losses decline because advances reduce the volume of claims that can be submitted by insured depositors. The unbracketed term represents the change in losses due to the change in paid-in premiums—the "assessment-base" effect. Provided the bank's assessment rate (*r)* is positive, the term is

[8] 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 new loans funded by advances are equal in quality to loans already on the books—that is, *p'=LR'=0.*

[9] For simplicity, we assume supervisors will not close a bank unless it is insolvent, that is the value of liabilities exceeds the value of assets. Also, if a bank holds no uninsured deposits, the bracketed term goes to zero, and the sign of equation (5) is determined entirely by the unbracketed term—the effect of advances on premiums paid into the fund.

positive—net FDIC losses rise because advances reduce the assessment base (and, therewith, total premiums paid into the fund).[10] The overall sign of equation (5) is ambiguous, depending on the relative sizes of the bracketed term (insured-deposit effect) and unbracketed term (assessment-base effect).

Table 4 contains a simple example that brings equation (5) to life. Panel (a) shows Bank B's balance sheet before and after an economic shock reduces the value of the loan portfolio by 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 Bank B's deposit-insurance premiums is $700—the sum of insured and uninsured domestic deposits. The economic shock produces insolvency by reducing the value of loans to $680. Upon closure, the FDIC immediately pays $600 out of the fund to insured depositors. As representative of these depositors, the FDIC is entitled to receive 85.7 percent ($600 divided by the $700 assessment base) of the $680 recovery from asset sales, or $583 (rounded). The FDIC suffers a gross loss of $17—the $600 paid to insured depositors minus the $583 from asset sales. Panel (b) illustrates the impact of the same economic shock when FHLBank advances replace insured deposits. In this case, the FDIC pays $450 to insured depositors, sells assets for $680 and disburses $150 to an FHLBank (to get control of the collateral). The FDIC is entitled to 81.8 percent ($450 divided by the $550 assessment base) of the $530 that remains after selling assets and paying the FHLBank—$434 (rounded). The FDIC suffers a gross loss of $16—the $450 paid to insured depositors minus the $434 net recovery from asset sales. The gross loss is smaller in panel (b) because insured-deposit share is smaller after the substitution of advances for insured deposits (81.8 percent after versus 85.7 percent before). The smaller assessment base, however, implies that premium payments by the bank to the FDIC fall—provided the bank is paying any premiums. The impact on net FDIC losses depends on whether the decline in premiums is greater or less than the $1 decline in gross losses.

[10] If the bank is not paying premiums, as is the case for nearly 93 percent of U.S. banks, then the sign of equation (5) is determined by the sign of the bracketed term—the impact of advances on the FDIC's exposure. As noted, this term will be negative as long as the bank has uninsured deposits in its funding mix. For a bank paying no premiums and holding no uninsured deposits, an increase in advances would have no impact on net FDIC losses.

3.3 Uninsured-Deposit Substitution

If advances replace uninsured deposits—leverage and asset composition constant—net FDIC losses unambiguously rise. Again, we assume $p' = LR' = r' = 0$. Replacing uninsured deposits dollar for dollar, other things equal implies $UD' = D' = -1$, and $L' = UD' = 0$ so 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 unambiguously positive: failure probability (*p)*, the 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 in insured-deposit substitution, if the assessment rate is positive, the unbracketed term is positive—substitution of advances for uninsured deposits reduces deposit-insurance premiums. Premiums fall because uninsured deposits are part of the assessment base.

Table 5 provides a numerical example of changes in net FDIC losses when a bank substitutes advances for uninsured deposits. Panel (a) shows Bank C's balance sheet before and after an economic shock reduces the value of loans by 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 $700. The economic shock would produce insolvency by reducing the value of the loan portfolio to $680. Upon closure, the FDIC immediately pays $550 to insured depositors. Because the FDIC stands in for insured depositors, it is entitled to receive 78.6 percent (550/700) of the proceeds from asset sales, or $534 (rounded). The gross loss equals $16—the $550 paid to insured depositors minus the $534 received from asset sales. Panel (b) illustrates the impact of the same economic shock when Bank C substitutes FHLBank advances for uninsured deposits. In this case, the FDIC pays $150 to the FHLBank, leaving $530 in assets to cover insured-depositor claims of $550. The FDIC suffers a gross loss of $20. The gross loss is larger in panel (b) because the FDIC cannot share the burden with uninsured depositors as in

panel (a). In addition, the assessment base declines from $700 to $550, so the net loss to the FDIC would rise by more than $4 if Bank C were paying premiums (i.e., $r>0$).

3.4 Moral Hazard

When a bank assumes more risk, it must typically pay a higher interest rate to unsecured, uninsured creditors. This penalty discourages risk taking. When an FHLBank member takes more risk, however, it may avoid paying a higher rate for funding by substituting advances for unsecured, uninsured funding. The FHLBanks have little incentive to adjust terms on advances as the failure probability of a member increases. The monopoly position of the FHLBanks enables them to insist that advances be over-collateralized; with market value of pledged assets typically covering 125 to 170 percent of an advance (Congressional Budget Office, 1993). Moreover, the FHLBanks have the right to call for more collateral should the value of pledged assets decline. Because FHLBanks receive copies of confidential examination reports, they learn about deterioration in a member's loan portfolio—and can demand more collateral—before other creditors become aware of problems. Finally, should a member bank fail and collateral not cover advances, FHLBanks can assert statutory lien priority on that member's other assets. As a result of this protection, no FHLBank has lost a penny on an advance since the creation of the System in 1932. It is rational, therefore, for Home Loan banks to set an "all-in" price on advances—the collateral terms and the interest rate—that is independent of the borrower's failure risk. Member banks intent on pursuing high-risk strategies can, therefore, escape market-imposed checks on risk-taking by substituting FHLBank advances for jumbo certificates of deposit or subordinated debt.[11]

[11] Here are several other ways to consider the moral-hazard issue: (1) the marginal benefit of risk-taking to a bank exceeds the marginal cost because the impact of advances on failure risk is under-priced, (2) FHLBanks can subordinate the FDIC's position without paying an actuarially fair price, or (3) the value of an FHLBank loan commitment is increasing in asset risk and leverage, but the option premium is not adjusted with failure risk. [See Thakor (1982) and Thakor, Hong, and Greenbaum (1981) for analysis of loan commitments as options.]. Moral hazard is traceable to the FHLBanks preferred position as senior secured creditors with special privileges as a housing GSE. This position protects the FHLBanks against losses and enables them to set "all in" prices on borrowings based only on term structure. See Stojanovic, Vaughan, and Yeager (2001) for further discussion.

To see the moral-hazard effect, suppose deposit levels and assessment rates remain unchanged as advances increase—i.e., *ID'=UD'=D'=r'*=0. Suppose further that the bank uses advances to fund growth (L'=1). Finally suppose the bank uses FHLBank funding to make high-risk loans so that both failure probability and the loan-loss ratio increase, that is p'> 0 and LR'> 0. Equation (3) then becomes:

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

Because every term in equation (7) is positive, the derivative is positive. In words, expected net losses to the fund rise because both the likelihood of loss and the loss given failure rise with the level of advances.

Table 6 provides a numerical example of the moral-hazard scenario. Panel (a) shows the initial balance sheet for Bank D, assuming $1000 in loans of normal risk are financed with $700 of insured deposits, $200 of advances, and $100 of capital. Suppose, as in the other examples, an economic shock reduces the value of the loan portfolio by 15 percent and forces Bank D into insolvency. Upon resolution, the FDIC has $850 in assets to settle FHLBank and insured-depositor claims of $900, resulting in a gross loss of $50. In panel (b) the $200 in advances is instead used to book high-risk loans, thereby increasing the probability of loan default and decreasing the likely recovery in liquidation. So the same economic shock now produces a 20 percent decline in loan value instead of 15 percent. 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 losses to the FDIC will also rise by $50 because, by assumption, the assessment rate and base are unchanged. If the bank migrates into a higher pricing cell before failure, net losses will be somewhat less than $50.

4. FHLBank Funding and Risk-Taking: Evidence from a Financial-Distress Model

The comparative-static exercises in the previous section indicate that FHLBank advances are likely to increase net FDIC losses. But these exercises say nothing about the actual economic importance of the link between advances and losses. Gauging the importance of this link involves two empirical tasks: (1) estimation of the impact of advances on failure probability and (2) estimation of the impact of advances on losses given failure. We now turn to the first of these empirical tasks.

As noted, FHLBank advances could raise expected net losses to the FDIC by increasing failure probability. To test for a moral-hazard effect, we employ a probit model that measures the likelihood a bank will encounter financial distress in the next two years. Specifically, we add one FHLBank-related variable—the ratio of advances to total assets—to a CAMELS downgrade model currently used in off-site surveillance at one Federal Reserve Bank (Gilbert, Meyer, Vaughan, 2002). This model estimates the likelihood a healthy bank (CAMELS "one" or "two" composite rating) will encounter financial distress (CAMELS "three," "four," or "five" composite rating) in the coming eight quarters. We use a downgrade-prediction model rather than a failure-prediction model because failures have been rare since the early 1990s. Table 7 describes the explanatory variables and the expected relationship between each variable and downgrade risk. The bulk of the explanatory variables are financial-performance ratios related to leverage risk, credit risk, and liquidity risk—three risks that have consistently produced financial distress in commercial banks (Cole and Gunther, 1998). The only variable with an unclear link to downgrade risk is asset size. Presumably opportunities to reduce risk by diversifying across product lines and geographic regions increase with the scale of operations. As Demsetz and Strahan (1997) have noted, however, that geographic diversification relaxes a constraint, enabling bankers to assume more risk. So, theoretically the relationship between size and downgrade probability is ambiguous.

We estimate the downgrade-prediction model for eight overlapping sample windows, beginning just after FHLBank membership was opened to commercial banks. In each equation, downgrade status

("1" = bank examined and downgraded, "0" = bank examined, but not downgraded) in years *t+1* and *t+2* is regressed on accounting and supervisory data for non-*de-novo* banks rated CAMELS one or two in the fourth quarter of year *t*. In the first regression, for example, downgrade status in 1993 and 1994 is regressed on year-end 1992 data. We continue with this timing convention, estimating equations year by year, through a regression of downgrade status in 2001 and 2000 on 1999: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. Table 8 contains the results of these tests.[12]

Overall, the evidence suggests that access to FHLBank advances has had a modest impact on risk. The advances-to-assets ratio is statistically significant at the one-percent level in six of the eight years. The coefficient is small compared with the credit-risk variables, but in line with the size of the liquidity-risk variables.[13] The economically small magnitude of the advances coefficient suggests, at first glance, that moral-hazard problems have been minor. But there are reasons to believe that access to FHLBank funding has increased the FDIC's exposure by more than the coefficient estimates suggest. Banks enjoyed record earnings in the 1990s. And the brief recession of 2001 did not produce a significant uptick in charge offs. The result has been robust levels of capital protection unseen since the 1940s—and higher levels of capital force bank owners to absorb a larger fraction of any losses, which in turn impels them to reduce risk taking. When capital ratios "mean revert," and bank owners have less money at stake, the link between advances and probability of financial distress may well strengthen considerably.

[12] Financial data for the regression analysis were taken from the call reports. The Federal Housing Finance Board—the safety-and-soundness supervisor of the FHLBanks—supplied historical bank-by-bank data on advances. In 2001, commercial banks were required to start submitting data on advances to their principal supervisors, so numbers for the resolution-cost analysis later in the paper were obtained from the call reports. At the time Gilbert, Meyer and Vaughan estimated their downgrade-prediction model, the advances-to-assets ratio was not available as a candidate variable in the specification search.

[13] For robustness, we estimated the model over non-overlapping one year windows (i.e., downgrade status in 1993 on year-end 1992 financials). Pooled regressions were also estimated first for two-year-ahead downgrades and then for one-year-ahead downgrades. The results from all these robustness checks were consistent with the results presented in table 8.

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 insurance. Finally, the experience of the 1930s convinced owners of all depository institutions to hold more securities (relative to loans) so as to have large stockpiles of ready liquidity in case of another banking crisis (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, the Financial Institution Reform, Recovery, and Enforcement Act of 1989 (FIRREA) opened FHLBank membership to commercial banks—but only safe-and-sound institutions were eligible to take out advances.[14] Meanwhile, the banking crisis of the late 1980s and early 1990s weeded out institutions with low capital levels 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 combined to hold risk taking in check. A severe shock to bank capital levels could induce bankers to exploit the moral hazard associated with FHLBank funding—just as capital shocks led to moral hazard in the thrift industry.

[14] Provisions of the FHLBank Act of 1932 make access to new funding contingent on borrower condition—only safe-and-sound institutions may take down new advances without the permission of the their principal supervisors. But given sufficient eligible collateral, FHLBank members can draw additional advances and make additional risky loans up to the point where critically high leverage or weak asset quality provokes a downgrade to CAMELS 3, 4 or 5. Moreover, FHLBanks are not required to call advances outstanding to troubled member institutions. Indeed, history indicates that advance levels remain steady up to the point of closure—over-collateralization of advances and non-voidable pre-payment penalties protect the FHLBanks from losses. See Ashley, Brewer, and Vincent (1998) for a discussion of FHLBank borrowing by troubled thrifts in the 1980s.

5. FHLBank Funding and Loss-Given-Failure: The Range of Resolution Costs

To gauge the impact of FHLBank funding on losses-given-failure, we calculate incremental resolutions costs traceable to advances under two scenarios:

"High-Risk" Scenario:	The FDIC liquidates all banks with failure probabilities exceeding two percent.
"Heavy-Advance-User" Scenario:	The FDIC liquidates all banks with advances-to-asset ratios above 15 percent.

These scenarios are designed to yield a range of likely incremental resolutions costs. We use a two-percent cutoff for the high-risk scenario because the Federal Reserve relies on this threshold to compile a watch list of institutions most at risk of failure. At year-end 2003, 334 banks (or 4.33 percent of all U.S. banks) posted failure probabilities over two percent. Because banks in the high-risk sample are disproportionately small and less likely to belong to an FHLBank, we also examine incremental losses in a "heavy-advance-user" scenario. Heavy users are banks with an advance-to-asset ratio above 15 percent. (Table 9 provides size distributions for all U.S. banks, for high-risk banks, and for heavy-advance-user banks.) We arrived at the 15 percent cutoff by informally polling bank supervisors about their sense for what constitutes an unsafe-and-unsound level of dependence on advances and then adjusting that threshold to obtain a sample size roughly comparable to the high-risk sample. The heavy-advance-user sample contained 367 banks, or 4.76 percent of all U.S. banks. At first glance, the assumption of over 300 failures might seem extreme. But, failures reached this level three years during the bank and thrift crisis of the later 1980s and early 1990s. Also, the analysis could be viewed as suggestive of the resolution costs of failures over a longer time span, given a small discount rate.[15]

[15] At first glance, our approach to estimating resolution costs may seem odd because we assessed the impact of advances on probability of loss with an econometric model. Indeed, the logical way to proceed with loss-given-failure analysis would be to estimate an econometric model with losses on the left-hand side and advance dependence (and control variables) on the right-hand side. Unfortunately, failures since 1990—particularly failures involving FHLBank advances—have been too rare to admit of econometric estimation of a resolution-cost model. This was the reason we used a CAMELS-downgrade model rather than a failure-prediction model for the first part of the analysis.

For each scenario, we estimate baseline resolutions costs the FDIC would have incurred from the failure of all sample banks at year-end 2003. We then estimate resolution costs under five different assumptions about the impact of FHLBank advances on the sample-bank balance sheets. The difference between estimated costs in the baseline case and estimated costs under the five assumptions captures the incremental impact of advances on resolution costs. We estimate losses on a particular type of asset (consumer loans, commercial loans, marketable securities, real-estate loans, "other real estate owned" and "other assets") using average loss rates suffered by the FDIC when liquidating that asset between 1990 and 2002.[16] (See Bennett, 2003, for more details on the calculation of loss rates.) Table 10 contains the specific loss rates used in our analysis. We then deduct estimated losses from the book value to obtain the net value of assets available for distribution to the creditors of the receivership. Next we deduct total claims on the receivership from the assets available for distribution to arrive at losses on the receivership. These losses are then distributed across claimants according to priority.[17] We assume secured and preferred claims are paid in full, i.e., the value of pledged collateral equals the value of the claim. In the case of advances, the FDIC typically prepays the FHLBank to get control of the assets that were pledged as collateral.[18]

Table 11 contains the analysis for the high-risk scenario. In the baseline case—the FDIC liquidates all 334 banks with failure probabilities above two percent—gross losses to the deposit-insurance fund would be $3.66 billion, or 6.11 percent of total gross assets in those 334 institutions. To gauge the impact of FHLBank funding on BIF, we "strip" advances out of the balance sheets of these banks, recalculate resolutions costs, and compare these new cost estimates with cost estimates from the baseline case. We strip by assuming the banks could have used advances to (1) replace insured deposits,

[16] Previous studies estimated the ex ante or ex post cost of deposit insurance by simply extrapolating average losses as a percentage of the fund. We apply recent loss rates to current balance sheets.

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

[18] As noted later in the paper, pre-payment of advances can result in substantial penalties. Our analysis relies on the conservative assumption that the FDIC pays the FHLBank only the face value of the advance.

(2) replace uninsured deposits, (3) make additional consumer loans, (4) make additional commercial loans, or (5) make additional real-estate loans.[19] Losses to the deposit-insurance fund will differ across advance-deployment strategies because liquidation-loss rates vary across loan categories. Also, the FDIC collects premiums from all domestic depositors but protects only insured depositors. Incremental resolutions costs vary under the various strips from a $389 million decrease under the commercial-loan strip (i.e., losses fall when advances and commercial loans decline together because such loans have a high liquidation-loss rate) to a $35 million increase under the insured-deposit strip (i.e., losses rise when advances replace insured deposits because insured-deposits now represent a smaller portion of the assessment base.) On average over the five strips, losses to the fund would have been $173 million lower absent FHLBank advances—a decrease of 4.73 percent from the baseline estimate. Insured deposits are core deposits—they tend to stay with a bank through different economic and interest-rate environments, so another, perhaps more realistic, approach to gauging losses is to ignore the insured-deposit strip.[20] On average over the other four strips, losses would have been $225 million lower—a decline of 6.14 percent from the baseline. Comparing these estimates to the size of the deposit-insurance fund offers more insight into their economic significance. By this metric FHLBank funding appears to have had only a modest impact on the FDIC's exposure; incremental FDIC losses from advances represent less than one percent of BIF as of year-end 2003.

But, as noted, looking only at the failure of high-risk banks potentially underestimates the FDIC's exposure. On average high-risk banks depend less on FHLBank funding than the banking sector as a whole—mostly because these banks are likely to be small and unlikely to be in business lines that generate pledgeable assets. To get another perspective on potential losses, we calculate resolution costs from failure of all banks with advance-to-asset ratios above 15 percent. Table 12 summarizes the results

[19] In theory, banks can use advances to purchase any asset or reduce any liability. We focus on the five 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).

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

of these calculations. In the baseline case, resolution costs would be $15.36 billion, or 5.92 percent of total assets held by the 367 heaviest users of FHLBank funding. "Stripping" advances out of the balance sheets of these banks, on average, lowers losses by $3.61 billion—a decrease of 23.49 percent from the baseline estimate. Incremental resolutions costs vary from an $8.72 billion decrease under the real-estate-loan strip (i.e., losses fall when advances and real-estate loans decline together because real-estate loans have a high liquidation-loss rate) to a $2.07 million increase under the insured-deposit strip. Omitting the insured-deposit strip reduces average losses by $5.03 billion—a 32.73 percent decline from the baseline. These estimates imply that FHLBank advances increase losses-given-default by an economically significant magnitude; they represent roughly 11 to 15 percent of BIF (as of the year-end 2003).

There are reasons to believe that the range of estimates in the two scenarios understates the FDIC's exposure. First, we assume banks migrate from their current condition to liquidation without altering the composition of their balance sheets. In actuality, banks tend to shrink in the quarters before failure, often shedding those assets and liabilities most likely to reduce the FDIC's liquidation costs. For example, much of the contraction in thrift liabilities in the quarters approaching 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 comes from loans and securities with deep secondary markets (such as residential mortgages and Treasury or Agency debt), thereby leaving the FDIC top heavy with assets likely to lose significant value in liquidation.

A second reason to view the estimates as conservative is our neglect of penalties associated with early liquidation of FHLBank positions. Closure of a failed institution requires pre-payment of outstanding advances, and FHLBanks assesses a penalty based on the cost of replacing the advances or unwinding any associated interest-rate hedges. This sum can be large for long-term advances paying above-market interest rates. (And nearly 50 percent of advances outstanding to banks at year-end 2003 had maturities over three years.) Moreover, some individual FHLBanks apply additional charges. The FDIC as receiver must pay these penalties to get control of the pledged assets for liquidation. The recent

resolution of Bank of Alamo (Alamo, Tennessee) illustrates the potential size of the expense. To assume control over 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 (Blackwell, 2003; Blair, 2003).

A third reason our analysis may understate the problem is the robust level of capital protection as of 2003:Q4—the quarter used in our analysis. As noted, capital constitutes the "deductible" for deposit insurance—high levels reduce FDIC resolution costs by deterring risk-taking behavior (i.e., reducing the probability of loss). But even more important for loss-given-failure analysis, capital absorbs losses arising from any given level of risk taking. So mean reversion of capital ratios would imply concomitant increases in FDIC resolutions costs for institutions with all funding mixes.

A fourth and final reason our cost estimates may be low is that historical asset-recovery rates could prove weak guides to estimating future resolution costs. The overwhelming majority of failed banks are small, with fairly simple on- and off-balance-sheet positions. Our estimation of aggregate resolution costs in the high-risk and heavy-user scenarios reflects historical loss rates. 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 would suggest, particularly if concerns about systemic risk outweigh concerns about the FDIC's loss 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 78.49 percent of outstanding advances. The position of the FHLBanks as senior secured creditors means that unexpected increases in the cost of resolving a large-bank failure will be borne by the FDIC.

In any event, it is important to remember that expected losses to BIF from FHLBank advances were zero prior to FIRREA. Whether incremental losses over time turn out to be nearer the numbers

suggested in the high-risk scenario (an average of $172.9 million, or 0.51 percent of BIF) or the numbers in the heavy-user scenario (an average of $3.61 billion, or 10.68 percent of BIF), the increase in the fund's exposure has not been priced.

6. Conclusion

Does growing bank reliance on Federal Home Loan Bank (FHLBank) funding increase risk to the deposit-insurance fund? We argued that 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 that FHLBank advances could increase probability of loss by permitting risky banks to escape market discipline or increase loss-given-failure by subordinating the FDIC's position in failure resolutions. To quantify the potential exposure, we examined the impact of advances on the probability of financial distress using a CAMELS-downgrade model. We then assessed the impact of advances on loss-given-failure by calculating incremental losses that would arise from liquidation of all banks with failure probabilities above two percent and then from all banks with advance-to-asset ratios above 15 percent.

The evidence indicates that access to FHLBank advances has increased both the probability of losses and likely losses-given-default. We noted that our research strategy may have understated the problem because we estimated financial-distress probabilities and asset-liquidation losses in a high-capital environment, assumed banks migrate to failure without altering balance-sheet composition, ignored penalties arising from pre-payment of FHLBank advances, and overlooked complications associated with resolution of large-bank failures.

The policy implication is that the FDIC should consider explicitly or implicitly charging 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 FHLBank

penalties for prepaying advances 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 both of these reforms would require legislative action. In contrast, supervisors have discretion to levy capital surcharges to preserve safety and soundness without legislative sanction. A capital charge on heavy use of FHLBank advances would protect BIF by increasing the deductible for deposit insurance. And a higher deductible would curb appetites for risk and trim costs of resolution by shifting more of the losses from failure to bank owners. In any event, the first step toward a solution for scholars and policymakers recognition that a problem exists. The theory and evidence presented here strongly suggests that failure to price expected losses from FHLBank advances is a problem.

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Table 1
How does the FDIC price deposit insurance?

This table contains the pricing matrix used to assess deposit-insurance premiums for the Bank Insurance Fund (BIF). It also shows the assessment rates for as well as the number and percentage of institutions in each risk classification in the first semiannual assessment period of 2005. Each institution is categorized based on capitalization and supervisory subgroup rating (as determined in on-site examinations). 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 the 27 basis-point spread that will obtain in the first part of 2005. Moreover, differences in resolution costs that arise from differences in bank liability structures are not explicitly considered in the pricing matrix.

	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)	19		
Source: FDIC (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 2
How fast has collateralized funding grown at U.S. banks?

This table shows the increase in the various categories of collateralized liabilities from 1992 to 2003. Overall, such liabilities grew at an annual average rate of 13.7 percent while domestic deposits—the base from which insurance premiums are assessed—increased by just 5.5 percent. And FHLBank advances account for 47 percent of the dollar increase in collateralized liabilities. Unlike other secured credits, the supply of advances to fund bank growth is highly elastic. Because of its extraordinary credit-risk record and implicit government 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 the ability of commercial banks to use advances to fund growth. Between 1992 and 2003, the number of commercial-bank FHLBank members increased from 1,284 to 5,886. Over the same period, advances outstanding to bank members went from $6 billion to $251.3 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 credits	***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, various years
Consolidated Financial Statements of the FHLBanks, Federal Housing Finance Board, various years

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

Comparative-static analysis indicates that funding growth with advances increases net losses to the deposit-insurance fund. A simple example can bring this relationship to life. Panel (a) contains hypothetical balance sheets for Bank A. Initially, the bank has $800 in loans outstanding, $700 in insured deposits, and $100 in capital. Suppose an economic shock that reduces the value of loans by 15 percent to $680. Supervisors respond by closing Bank A due to insolvency. The FDIC pays insured depositors $700, sells bank assets for $680, and suffers a loss of $20. Now, suppose Bank A had used $200 in FHLBank advances to book new loans before the shock occurred. This scenario is illustrated in panel (b). Once again, an economic shock reduces the value of the bank's loan portfolio by 15 percent to $850. Supervisors close the insolvent bank, and the FDIC pays depositors $700 from the insurance fund. The FDIC must now also pay $200 to the FHLBank because the advances are fully secured. The recovery of $850 from the sale of Bank A's assets is insufficient to cover the $900 in payouts, leaving the FDIC with a gross loss of $50—$30 higher than in the no-advance case. Net losses also increase by $30 because total premiums paid into the fund do not vary with the level of advances. Premiums do not vary because neither the assessment base (by construction) nor assessment rate (by assumption) change.

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 FDIC Losses:* $20**				***Gross FDIC Losses:* $50**			
Assessment Base: $700				***Assessment Base: $700***			

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

Comparative-static analysis indicates that losses to the deposit-insurance fund could rise or fall when a bank uses advances to replace insured deposits. Panel (a) shows Bank B's balance sheet before and after an economic shock reduces the value of the loan portfolio by 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 Bank B's deposit-insurance premiums is $700—the sum of insured and uninsured domestic deposits. The economic shock produces insolvency by reducing the value of loans to $680. Upon closure, $600 is immediately paid out of the fund to insured depositors. As representative of the insured depositors, the FDIC is entitled to receive 85.7 percent ($600 divided by the $700 assessment base) of the $680 recovery from asset sales, or $583 (rounded). The FDIC suffers a gross loss of $17—the $600 paid to insured depositors minus the $583 from asset sales. Panel (b) illustrates the impact of the same economic shock when FHLBank advances replace insured deposits. In this case, the FDIC pays $450 to insured depositors, sells assets for $680 and disburses $150 to an FHLBank (to get control of collateral). The FDIC is entitled to 81.8 percent ($450 divided by the $550 assessment base) of the $530 that remains after selling assets and paying the FHLBank—$434 (rounded). The FDIC suffers a gross loss of $16—the $450 paid to insured depositors minus the $434 net recovery from asset sales. The gross loss is smaller in panel (b) because insured-deposit share is smaller after the substitution of advances for insured deposits (81.8 percent after versus 85.7 percent before). The smaller assessment base, however, implies that premiums paid the FDIC will fall. The impact on net FDIC 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 FDIC Loses:* $17**				***Gross FDIC Losses:* $16**			
Assessment Base: $700				***Assessment Base: $550***			

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

Comparative-static analysis indicates that net FDIC losses unambiguously rise when a bank uses advances to replace uninsured deposits. This table offers a numerical example. Panel (a) shows Bank C's balance sheet before and after an economic shock reduces the value of loans by 15 percent. The economic shock produces insolvency; upon closure the FDIC immediately pays $550 to insured depositors. Because the FDIC stands in for insured depositors, it is entitled to receive 78.6 percent (550/700) of the proceeds from asset sales, or $534 (rounded). The FDIC suffers a loss of $16—the $550 paid to insured depositors minus the $534 received from asset sales. Panel (b) illustrates the impact of the same economic shock when Bank C substitutes FHLBank advances for uninsured deposits. In this case, the FDIC pays $150 to the FHLB, leaving $530 in assets to cover insured-depositor claims of $550. The FDIC suffers a gross loss of $20. The gross loss is larger in panel (b) because the FDIC cannot share the burden with uninsured depositors as in panel (a). In addition, the assessment base declines from $700 to $550, so the net loss to the FDIC will rise by more than $4 if the bank is paying deposit-insurance 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			Insured Deposits	$0
		FHLBank Advances	$0			FHLBank Advances	$150
		Capital	~~$100~~ $-20			Capital	~~$100~~ $-20
Gross FDIC Loses: $16				***Gross FDIC Loses: $20***			
Assessment Base: $700				***Assessment Base: $550***			

Table 6
How does FHLBank funding affect net FDIC 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 borrowing could lead to higher net losses to the FDIC. This table offers a simple numerical example. Panel (a) shows the initial balance sheet for Bank D, assuming the $200 in advances is used to make loans of normal risk. Suppose, as before, that an economic shock reduces the value of the loan portfolio by 15 percent, forcing the bank into insolvency. Upon resolution, the FDIC has $850 in assets to settle combined FHLBank and insured-depositor claims of $900, resulting in a gross loss of $50. In panel (b) the $200 in advances is used to book high-risk loans, thereby increasing the probability of loan default and decreasing the likely recovery in asset liquidation. So the same economic shock now produces a 20 percent decline in loan value instead of a 15 percent. 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 losses also rise by $50 because, by assumption, the assessment rate and base are unchanged.

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 FDIC Losses:* $50**				***Gross FDIC Losses:* $100**			
Assessment Base: $700				***Assessment Base: $700***			

Table 7
Which factors help predict financial distress in commercial banks?

This table lists the independent variables in the downgrade-prediction model developed by Gilbert, Meyer, and Vaughan (2002). The potential impact of FHLBank funding on financial distress is tested by adding the FHLBank advances-to-total-assets ratio to this model. The signs indicate the expected relationship between each variable and the likelihood of a downgrade from satisfactory status (a CAMELS "one" or "two" composite rating) to unsatisfactory status (a CAMELS "three," "four," or "five" rating). For example, the negative sign for the net-worth ratio indicates that, other things equal, higher net worth reduces the likelihood of a downgrade to unsatisfactory status over the next two years. The moral-hazard problem associated with FHLBank funding suggests that advances will have a positive impact on the probability of financial distress.

	Independent Variables	Symbol	Expected Impact on Downgrade Risk
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	+
FHLB Variable	FHLBank advances as a percentage of total assets	FHLBank ADVANCES	+

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

This table presents the results of probit regressions of downgrade status on financial-performance 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 years *t+1* and *t+2* is regressed on accounting and supervisory data for non-*de-novo* one- and two-rated banks in the fourth quarter of year *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. Overall, the downgrade-prediction model fit the data well. Of particular interest, FHLBank advances do appear to increase the likelihood of financial distress—though coefficient magnitudes suggest the impact is modest.

		Period of Downgrade in CAMELS rating			
Independent Variable		**1993-94 (Year-end 1992 Financials)**	**1994-95 (Year-end 1993 Financials)**	**1995-96 (Year-end 1994 Financials)**	**1996-97 (Year-end 1995 Financials)**
Intercept		0.353 (.358)	-0.672* (0.381)	0.333 (0.431)	-0.068 (0.406)
Credit Risk	PAST-DUE-30	0.171*** (0.0320)	0.120*** (0.034)	0.167*** (0.035)	0.186*** (0.032)
	PAST-DUE-90	0.328*** (0.058)	0.282*** (0.063)	0.324*** (0.073)	0.399*** (0.063)
	NONACCRUING	0.147*** (0.046)	0.183*** (0.045)	0.147*** (0.051)	0.160*** (0.046)
	OREO	0..080* (0.041)	0.199*** (0.044)	0.157*** (0.052)	0.090 (0.059)
	COMMERCIAL	0.005 (0.005)	0.006 (0.005)	0.013*** (0.005)	0.010** (0.005)
	RESIDENTIAL	-0.006* (0.003)	-0.004 (0.003)	-0.017*** (0.004)	-0.010*** (0.003)
Leverage Risk	NET-WORTH	-0.093*** (0.014)	-0.024* (0.013)	-0.034*** (0.013)	-0.036*** (0.014)
	ROA	-0.136*** (0.040)	-0.270*** (0.050)	-0.169*** (0.038)	-0.384*** (0.063)
Liquidity Risk	SECURITIES	-0.008*** (0.002)	-0.004 (0.003)	-0.011*** (0.003)	-0.015*** (0.003)
	JUMBO CDs	0.018*** (0.005)	0.024*** (0.005)	0.021*** (0.005)	0.024*** (0.005)
Control Variables	SIZE	-.172*** (0.017)	-0.158*** (0.031)	-0.232*** (0.035)	-0.162*** (0.031)
	CAMELS-2	0.446*** (0.096)	0.614*** (0.103)	0.586*** (0.103)	0.506*** (0.098)
	BAD-MANAGE	0.454*** (0.066)	0.405*** (0.073)	0.538*** (0.078)	0.404*** (0.083)
FHLBank ADVANCES		0.033 (0.021)	0.050*** (0.014)	0.050*** (0.011)	0.018 (0.014)
Number of Observations -2 log likelihood testing whether all coefficients (except the intercept) = 0		8,604 2245.691***	9,193 1906.355***	9,235 1622.902***	9,046 1728.499***

Table 8 (Continued)

Independent Variable		Period of Downgrade in CAMELS rating			
		1997-98 (Year-end 1996 Financials)	1998-99 (Year-end 1997 Financials)	1999-2000 (Year-end 1998 Financials)	2000-01 (Year-end 1999 Financials)
Intercept		-1.064*** (0.373)	-1.252*** (0.330)	-0.922*** (0.339)	-1.007*** (0.344)
Credit Risk	PAST-DUE-30	0.092*** (0.029)	0.186*** (0.029)	0.173*** (0.028)	0.192*** (0.032)
	PAST-DUE-90	0.337*** (0.054)	0.192*** (0.057)	0.229*** (0.054)	0.411*** (0.058)
	NONACCRUING	0.196*** (0.043)	0.184*** (0.043)	0.235*** (0.043)	0.164*** (0.045)
	OREO	0.159** (0.066)	0.125 (0.086)	0.106 (0.075)	0.138 (0.087)
	COMMERCIAL	0.006 (0.004)	0.015*** (0.004)	0.011*** (0.004)	0.012*** (0.004)
	RESIDENTIAL	-0.002 (0.003)	-0.005* (0.003)	-0.003 (0.003)	-0.002 (0.003)
Leverage Risk	NET-WORTH	-0.023** (0.011)	-0.019** (0.009)	-0.050*** (0.010)	-0.026*** (0.009)
	ROA	-0.081*** (0.025)	-0.066*** (0.020)	-0.147*** (0.033)	-0.241*** (0.042)
Liquidity Risk	SECURITIES	-0.010*** (0.003)	-0.006*** (0.003)	-0.003 (0.003)	-0.007*** (0.003)
	JUMBO CDs	0.019*** (0.004)	0.008** (0.004)	0.015*** (0.004)	0.017*** (0.004)
Control Variables	SIZE	-0.130*** (0.029)	-0.107*** (0.025)	-0.114*** (0.026)	-0.118*** (0.027)
	CAMELS-2	0.746*** (0.090)	0.697*** (0.076)	0.751*** (0.077)	0.785*** (0.079)
	BAD-MANAGE	0.546*** (0.080)	0.509*** (0.077)	0.560*** (0.078)	0.525*** (0.084)
FHLBank ADVANCES		0.027*** (0.010)	0.028*** (0.007)	0.015*** (0.004)	0.031*** (0.006)
Number of Observations -2 log likelihood testing whether all coefficients (except the intercept) = 0		8,705 1981.17***	8,226 2343.01***	7,726 2448.36***	7,306 2464.41***

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-CD**	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**	FHLBank advances / total assets

Table 9

How does reliance on FHLBank advances at high-risk banks and heavy-user banks compare with the U.S. banking sector?

This table presents the 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 the U.S. banking sector.

	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?

This table presents the average loss rates experienced by the FDIC in the liquidation of various types of bank assets between 1990 and 2002. OREO refers to "other real estate owned," typically collateral sized by a bank in foreclosure. "Other assets" includes bank structures. FHLBank members are unlikely to deploy advances in either of these asset categories. Of the asset classes covering loans and investments, FDIC losses would be greatest from advances deployed in commercial loans; they would be lowest in marketable securities.

Weighted-Average Losses by Asset Category 1990-2002	
Asset Categories	
Consumer Loans	**18.4**
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 would FHLBank advances increase losses-given-default?
"High-Risk" Scenario: Liquidation of All Banks with Failure Probabilities above Two Percent

This table contains the analysis for the high-risk scenario. In the baseline case—the FDIC liquidates all 334 banks with failure probabilities above two percent—gross losses to the deposit-insurance fund would be $3.66 billion, or 6.11 percent of total gross assets in those banks 334 institutions. To gauge the impact of FHLBank funding on the deposit-insurance fund, we "strip" advances out of the balance sheets of these banks, recalculate resolutions costs, and compare these new cost estimates with cost estimates from the baseline case. We "strip" by assuming the banks could have used advances to (1) replace insured deposits, (2) replace uninsured deposits, (3) make additional consumer loans, (4) make additional commercial loans, or (5) make additional real-estate loans. Losses to the deposit-insurance fund will differ across FHLBank-funding strategies because loss rates vary across loan categories. Also, the FDIC collects premiums from all domestic depositors but protects only insured depositors. Incremental resolutions costs vary under the various strips from a $389 million decrease under the commercial-loan strip (i.e., losses fall when advances and commercial loans decline together because such loans have a high liquidation-loss rate) to a $35 million increase under the insured-deposit strip (i.e., losses rise when advances replace insured deposits because insured-deposits now represent a smaller portion of the assessment base.) On average over the five strips, losses to the fund would have been $173 million lower absent FHLBank advances—a decrease of 4.73 percent from the baseline estimate. Insured deposits are core deposits—they tend to stay with a bank through different economic and interest-rate environments, so another, perhaps more realistic, approach to gauging losses is to ignore the insured-deposit strip. On average over the other four strips, losses to the deposit-insurance fund would have been $225 million lower—a decline of 6.14 percent from the baseline. Taken together, the analysis of scenario one suggests that FHLBank advances increase losses-given-default to the fund by only a modest amount.

	Estimated Losses ($000)	**Total Gross Assets ($000)**	**Loss as a Percent of Assets**
Baseline resolution costs	**3,660,268**	**59,934,900**	**6.11%**
Strategies for Using FHLBank Advances			
Replace insured deposits with FHLBank Advances	3,694,776	59,934,900	6.16%
Replace uninsured deposits with FHLBank Advances	3,503,993	59,934,900	5.85%
Use FHLBank advances to expand real-estate loan portfolio	3,414,360	58,584,010	5.83%
Use FHLBank advances to expand consumer-loan portfolio	3,551,897	59,421,448	5.98%
Use FHLBank advances to expand commercial-loan portfolio	3,271,366	58,746,112	5.57%
Average resolution costs over all FHLBank strategies	***3,487,278***	***59,324,274***	***5.88%***
Average increase in resolution costs (in $000 from the baseline)	172,990		
Average increase in resolution costs (as a percentage of the baseline)	4.73%		
Average increase in resolution costs (as a percentage of BIF)	0.51%		
Average resolution costs over FHLBank strategies excluding insured-deposit strategy	***3,435,404***	***59,171,618***	***5.81%***
Average increase in resolution costs (in $000 from the baseline)	224,864		
Average increase in resolution costs (as a percentage of the baseline)	6.14%		
Average increase in resolution costs (as a percentage of BIF)	0.67%		

Table 12
How much would FHLBank advances increase losses-given-default?
Scenario Two: The Failure of all Heavy-FHLB-User Banks

This table contains estimates of incremental losses to the deposit-insurance fund from FHLBank advances should the FDIC liquidate all banks with advance-to-asset ratios above 15 percent. In the baseline scenario, total resolution costs would be $15.36 billion, or 5.92 percent of total gross assets in the 367 heavy-FHLB-user institutions. "Stripping" advances out of the balance sheets of these banks, recalculating resolutions costs, and comparing these new cost estimates with the baseline estimate provides clues to the impact of advances on the fund. We strip advances by assuming that the banks could have used advances to (1) replace insured deposits, (2) replace uninsured deposits, (3) make additional consumer loans, (4) make additional commercial loans, or (5) make additional real-estate loans. Losses to the deposit-insurance fund will differ across FHLBank strategies because loss rates vary across loan categories. Also, the FDIC collects premiums from and protects insured depositors but not uninsured depositors. Incremental resolutions costs vary under the scenarios from a $8.72 billion decrease under the real-estate-loan strip (i.e., losses fall when advances and real-estate loans decline together because real-estate loans have a high liquidation-loss rate) to a $2.07 million increase under the insured-deposit strip (i.e., losses rise when advances replace insured deposits because the assessment base, and therefore, deposit-insurance premiums, decline.) On average over the five strips, losses to the fund would have been $3.61 billion lower—a decrease of 23.49 percent from the baseline estimate. Insured deposits are core deposits—they tend to stay with a bank through different economic and interest-rate environments, so another, perhaps more realistic, approach to gauging losses is to ignore the insured-deposit strip. On average over the other four strips, losses to the deposit-insurance fund would have been $5.03 billion lower—a decline of 32.73 percent from the baseline. Taken together, the scenario-two analysis suggests that FHLBank advances increase losses-given-default to the fund by an economically significant magnitude.

	Estimated Losses ($000)	**Total Gross Assets ($000)**	**Loss as a Percent of Assets**
Baseline resolution costs	**15,360,264**	**259,400,567**	**5.92%**
Strategies for Using FHLBank Advances			
Replace insured deposits with FHLBank Advances	17,431,584	259,400,567	6.72%
Replace uninsured deposits with FHLBank Advances	11,207,852	259,400,567	4.32%
Use FHLBank advances to expand real-estate loan portfolio	6,642,516	199,429,888	3.33%
Use FHLBank advances to expand consumer-loan portfolio	12,414,840	245,020,693	5.07%
Use FHLBank advances to expand commercial-loan portfolio	11,066,518	244,870,836	4.52%
Average resolution costs over all FHLBank strategies	***11,752,662***	***241,624,510***	***4.86%***
Average increase in resolution costs (in $000 from the baseline)	3,607,602		
Average increase in resolution costs (as a percentage of the baseline)	23.49%		
Average increase in resolution costs (as a percentage of BIF)	10.68%		
Average resolution costs over FHLBank strategies excluding insured-deposit strategy	***10,332,932***	***237,180,496***	***4.36%***
Average increase in resolution costs (in $000 from the baseline)	5,027,333		
Average increase in resolution costs (as a percentage of the baseline)	32.73%		
Average increase in resolution costs (as a percentage of BIF)	14.88%		

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 the 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

National-depositor preference gives domestic depositors priority over all but secured claims and administrative expenses.

Upon resolution, the FDIC pays off secured claimants, including the FHLBank, and divides revenues from the remaining assets with uninsured domestic depositors. The gross losses for the FDIC (*LS*) is the amount of insured deposits less the FDIC's share of the asset sales after paying the secured claimant as shown in equation (A1). For simplicity, we assume the FDIC incurs no administrative expenses, and secured claims comprise FHLBank advances only. Each right-hand side variable is a function of advances. Bank subscripts are omitted for simplicity.

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

where:

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

ID = insured deposits

$\gamma = \dfrac{ID}{ID + UD}$ = insured deposit's 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, and

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 losses to the FDIC as

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

Note that losses to the FDIC 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 supervisors only close and liquidate banks when the value of assets falls below the value of liabilities.

To investigate incremental gross losses traceable to FHLBank advances, we take the derivative of (A4) with respect to A, yielding:

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

More specifically, the marginal change in the insured-deposit share from an increase in advances is:

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

Using equation (A6) we can rewrite the marginal change in gross FDIC losses due to a change in advances 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 due to an increase in advances 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 on the change in losses associated with an increase in advances.

Case 1: Advances Fund Loan Growth Exclusively

In this case, we assume each additional dollar in advances is channeled into a dollar of new loans. This assumption implies *L'=1* and *UD'=ID'*=0.

Under these assumptions, the marginal change in gross FDIC losses from an increase in advances 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 use of advances does not lead to 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:

$$LS' = -\gamma\frac{EQ}{ID+UD} > 0 \tag{A16}$$

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