University of Arkansas, Fayetteville
ScholarWorks@UARK

Graduate Theses and Dissertations

12-2014

Essays on Moral Hazard, Bank Size, Influence, and Risk at the Federal Home Loan Banks

James Cash Acrey
University of Arkansas, Fayetteville

Follow this and additional works at: https://scholarworks.uark.edu/etd

 Part of the Corporate Finance Commons, Finance Commons, and the Finance and Financial Management Commons

Citation

Acrey, J. C. (2014). Essays on Moral Hazard, Bank Size, Influence, and Risk at the Federal Home Loan Banks. *Graduate Theses and Dissertations* Retrieved from https://scholarworks.uark.edu/etd/2018

This Dissertation is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, uarepos@uark.edu.

Essays on Moral Hazard, Bank Size, Influence, and Risk at the Federal Home Loan Banks

Essays on Moral Hazard, Bank Size, Influence, and Risk at the Federal Home Loan Banks

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy of Business Administration in Finance

by

James Cash Acrey
University of Arkansas at Little Rock
Bachelor of Business Administration in Management Information Systems, 2002
University of Arkansas
Master of Business Administration, 2005

December 2014
University of Arkansas

This dissertation is approved for recommendation to the Graduate Council.

_____
Dr. Craig G. Rennie
Dissertation Director

_____
Dr. Timothy J. Yeager
Committee Member

_____
Dr. Wayne Y. Lee
Committee Member

Abstract

Two chapters of research on the Federal Home Loan Bank advances, bank risk, and influence are presented. Federal Home Loan Bank (FHLB) advances are a growing source of debt financing for US banks. FHLB advances are not priced according to bank credit risk, creating potential for moral hazard. FHLB advances are positively related to contemporary bank risk, but the relation between prior advances and subsequent risk varies between large vs. small banks depending upon the risk measure used. The relation between FHLB advances and various measures of bank risk varies between pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) periods differently for large vs. small banks. Thus, FHLB advances are related to bank risk, but the nature of these relations is contingent on bank size and time period. When deciding to lend advances to risky banks and thrifts, the Federal Home Loan Banks (FHLBs) weigh moral hazard incentives against charter value preservation. FHLBs may be more likely to lend to risky large members than risky community banks because large members exert significant influence over the FHLBs through their outsized capital holdings and interest payments on advances, their presence on the Board of Directors, and their ability to obtain advances from multiple FHLB districts. Between 2005 and the financial crisis pinnacle in the third quarter of 2008, the share of advances to large banks surged, even though some of those banks were on the verge of failure. A positive relationship exists among large bank advances, influence metrics, and insolvency risk, consistent with the story that FHLB moral hazard incentives outweigh charter value preservation for their largest members. Regardless of their risk and influence, banks used the advances similarly, primarily as a funding source for new loans.

Table of Contents

Introduction

The following dissertation contains two studies on Federal Home Loan Bank (FHLB) advances and bank risk. In the first chapter, *Federal Home Loan Bank Advances, Bank Size, and Risk,* which was presented at the 2014 SFA meeting in Key West, Florida, presents a difference-in-differences study of FHLB advances across various dimensions of size and at different points in time before, during, and after the financial crisis, using multiple measures of risk. This study examines the impact that FHLB advances have had on bank risk.

The second chapter of this dissertation, *Bank Influence and Moral Hazard at the Federal Home Loan Banks,* continues the study of bank risk and advances, with a novel approach that explores the idea that banks may influence the levels of advances they receive from the FHLBs, due to their size, ownership stakes in the FHLB cooperatives, branches in multiple FHLB districts, and directorship positions on the boards of district FHLBs. This study compliments the first chapter of the dissertation, but adds a unique twist to the moral hazard argument by considering moral hazard at the level of the FHLB lending decision, and identifying channels of influence that a member-bank may use to increase their levels of advances borrowing beyond normal prudent lending standards.

Taken together, the studies document the types of risk posed by FHLB advances, and the pressures that FHLBs are under to continue lending in the face of these increased banking risks.

Chapter 1: Federal Home Loan Bank Advances, Bank Size, and Risk

Abstract

Federal Home Loan Bank (FHLB) advances are a growing source of debt financing for US banks. FHLB advances are not priced according to bank credit risk, creating potential for moral hazard. We find that FHLB advances are positively related to contemporary bank risk, but the relation between prior advances and subsequent risk varies between large vs. small banks depending upon the risk measure used. We also document that the relation between FHLB advances and various measures of bank risk varies between pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) periods differently for large vs. small banks. We conclude that FHLB advances are related to bank risk, but the nature of these relations is contingent on bank size and time period.

JEL Classification: G28, G21, H25

Keywords: Federal Home Loan Bank; debt; banks; risk; financial crisis

I. Introduction

The Federal Home Loan Bank (FHLB) is the third largest borrower in the US, with an estimated $700 billion in debt outstanding as of August 31, 2013. It was created by the 1932 Federal Home Loan Bank Act as a Government Sponsored Entity (GSE) for the purpose of lowering the cost of home ownership. Following the 1980s savings and loan crisis, the 1989 Financial Institutions Reform, Recovery and Enforcement Act allowed federally insured depository institutions like commercial banks and credit unions to join the FHLB system. According to the Federal Housing Agency website, the FHLB system currently consists of 12 regional FHLBs (Atlanta, Boston, Chicago, Cincinnati, Dallas, Des Moines, Indianapolis, New York, Pittsburgh, San Francisco, Seattle, and Topeka) as separate government-chartered member-owned corporations. There are 7,500 members (thrifts, commercial banks, credit unions, insurance companies, and certified community development financial institutions) covering about 80 percent of U.S. lenders. Members must be U.S. organized, be subject to inspection and regulation under U.S. or state banking law, issue long-term residential mortgages, have a minimum of 10% of total assets in residential mortgage loans (except for certified community financial institutions), have sufficient finances for FHLB advances to be safe, and maintain home financing policies consistent with sound finance. Members must maintain minimum investments in FHLB stock set by each bank. FHLB provide member institutions with funding for mortgages and asset-liability management, short-term liquidity, and funding for housing finance and community development. FHLB provide short- and long-term advances (loans) to members, collateralized by residential mortgage loans (including small business, small farm, and small agri-business loans) and government and agency securities. FHLB have boards of directors of 14-19 directors elected by members, including a majority of officers or directors of member institutions and at least 40% who are independent. Interest rates on FHLB advances

are determined by slight spreads over Treasuries and are not adjusted for the credit risk of individual member borrowers. FHLB advances are over-collateralized, and the FHLB system enjoys a "super-lien" that gives it priority over all other claimants, including the Federal Deposit Insurance Corporation (FDIC), in the event of bank default.

The FHLB system underwent a fundamental change during the recent financial crisis (Ashcraft et. al 2008) as it shifted focus away from facilitating low cost home ownership to increasingly include lending to increase liquidity to distressed banks. This led to higher concentrations of advances: by 2013, the 10 largest FHLB borrowers accounted for 42% of advances (Office of Finance 2013), compared to only 23% in 2003 (Bair, 2003). This concentration was also disproportionately among large banks: for example, as of June 30, 2013, J.P. MorganChase accounted for almost 14% of all FHLB advances - about $61.8 billion, or nearly twice the size of FDIC Fund. Large banks now tend to treat the FHLB as a wholesale provider of fungible capital at favorable rates, taking advantage of the super-lien and implicit GSE government guarantee, whereas small banks tend to increase mortgage lending when they get FHLB advances (Frame, Hancock, and Passmore, 2007; Davidson, 2012; and Durunger, 2012).

Prior literature associates FHLB advances with moral hazard risk in lending owing to the lack of risk-pricing in advances (Ashley, Brewer, & Vincent, 1993; Stojanovic, Vaughan, & Yeager, 2008; Frame and White, 2010; and Martinez and Li, 2011) rather than differences between FHLB advances to large vs. small banks over time. However, FHLB advances have recently tended to increase to large risky banks in quarters preceding increased risk of bank failure, whereas advances tended to decrease to small risky banks in similar circumstances, as shown in Figure 1.

[Insert Figure 1 here.]

This paper investigates whether FHLB advances are positively related to bank risk, whether prior advances are related to subsequent risk differently for large vs. small banks, and whether the nature of these relationships changes for large vs. small banks over time. We do so using a three part study design. First, we examine the effect of FHLB advances on bank risk, where bank risk is defined in ten dimensions inspired by the CAMELS rating system. Second, we explore how FHLB advances affect bank risk differently for large vs. small banks, where we define large banks as banks having $10 billion or more in total assets, and small banks as those with less. Third, we provide exploratory evidence how the relation between FHLB advances and bank risk changes between pre-crisis (2005-07), crisis (2008-09), and post-crisis (2009-12) periods.

We find that FHLB advances are positively related to bank risk in eight out of ten different measures of bank risk, including failure probability, risk-based capital ratio, non-core funding/total assets, CRE loans/total assets, loan losses/total assets, non-performing loans/loans, loans/core deposits, and leverage (or, equivalently, negatively related to the equity ratio). FHLB advances are negatively related to 1-year GAP and 12 month asset growth, but the interpretation of whether these two variables capture bank risk or safety is somewhat unclear. We document that lagged FHLB advances are related to subsequent measures of bank risk, in some cases positively and others negatively, and that these relations differ widely between large vs. small banks. Finally, we show that the relation between prior FHLB advances and subsequent failure probability is negative for large bank pre-crisis, less so during crisis, and not significant post-crisis. The relation differs for large vs. small banks, and is mixed for various other bank risk measures. Size and period matter when assessing the effects of FHLB advances on subsequent

bank risk. These results are robust to a variety of alternate specifications and sensitivity analyses.

This paper makes three contributions to the empirical finance literature. First, we show FHLB advances are positively related to bank risk. Second, our finding that prior FHLB advances are related to subsequent bank risk contingent on bank size, we demonstrate that size matters when assessing effects of FHLB advances on bank risk. Third, to our knowledge we are the first to illustrate that the nature of the relations between FHLB advances changes before, during, and after financial crisis.

The rest of the paper proceeds as follows. Section 2 summarizes relevant literature and develops testable hypotheses. Section 3 describes sample selection and variable definitions. Section 4 reports empirical findings. Section 5 reports results of robustness tests and alternate test specifications. Section 6 discusses and concludes.

II. Literature Review and Testable Hypotheses

Literature Review

The three branches of literature most relevant to this paper are those that deal with: (1) FHLB advances and moral hazard; (2) FHLB advances and bank size; and (3) FHLB advances and bank risk.

FHLB Advances and Moral Hazard

The FHLB is a government sponsored entity comprised of 12 regional member-owned banking cooperatives. The FHLB is chartered by the US government, ostensibly for the purpose of increasing member-owned community development lending. FHLB advances are

collateralized loans made to members secured by members' existing mortgages and other securities. As the FHLB system is a combination of cooperatives, banks must contribute equity to their regional FHLB cooperatives to become owners before they can borrow from the FHLB. Once the bank has an ownership stake, it can borrow advances from the FHLB by collateralizing discounted portfolios of mortgages or other securities such that the collateralized amount is substantially higher than 100% of the advance. These advances are available in a variety of maturities, including "plain vanilla" classic advances, amortizing advances, option-embedded advances, rate sensitive advances, and other offerings. FHLB advances are priced according to market rates based on macroeconomic variables, and are set across each FHLB district. Importantly, interest rates are not adjusted for the risk of individual banks. In the event a member bank defaults, FDIC has to resolve FHLB advances and any prepayment penalties owed to the FHLB first. The FHLB thus enjoys super-lien GSE status that gives it priority in claims over all other claimants, including FDIC. Prior literature reviews the cooperative structure and incentives of the FHLB system, and associates advances with moral hazard risks in banking owing to this lack of risk-pricing in advances lending (Ashley et al., 1993; Flannery and Frame, 2006; Stojanovic et al, 2008; Frame and White, 2010; and Martinez and Li, 2011). It does not focus on differences between large vs. small banks, or how the relation between FHLB advances and bank size and risk change over time.

Monitoring incentives of FHLBs are skewed by their GSE status and their joint and several liability (Nickerson and Phillips 1999). Lack of risk pricing in FHLB advances creates a classic moral hazard incentive in the risk-taking decisions of the banks (Stojanovic et al. 2008). The FHLB's super-lien GSE status insulates its decisions from market discipline, and reduces FHLB district incentives to monitor and restrict member credit. It also removes incentives for

holders of FHLB debt to monitor advances lending (Bennett, Vaughan, & Yeager, 2005; Frame and White 2010). Increasing advances to large member borrowers by FHLB districts may also lead to higher advances lending than would otherwise occur.

Substantial losses have already occurred as a consequence of large FHLB advances to big banks. In the case of the IndyMac bank failure, the FDIC Deposit Insurance Fund lost an estimated $9 billion, $5 billion of which was associated with the bank's use of FHLB advances before failure. Papagianis (2010) notes "…FHLB didn't care what kind of mortgage loans IndyMac was originating because their performance had no impact on whether the FHLB would get paid back." The FHLB has little incentive to constrain risky member borrowing, even if member banks seek FHLB advances to "gamble for resurrection" (Ashley et al. 1993). Costs associated with bank failure are borne by taxpayers rather than remaining member banks. Even though the FHLB system has access to privileged information about bank examinations, giving it superior information on bank difficulties before other lenders, FHLB incentives, subsidies, and legal protections appear to override any concerns that they may have about the creditworthiness or underlying collateral of member banks. This characteristic of FHLB advances helps motivate discussion of moral hazard in the literature.

FHLB Advances and Bank Size

Large banks tend to receive disproportionately large FHLB advances. As previously noted, J.P. Morgan Chase accounted for about 14% of FHLB advances, or $61.84 billion, as of June 30, 2013. This was almost twice the dollar value of FDIC's Fund. Similarly, the largest 10 FHLB advance borrowers accounted for 41.4% of all advances (Office of Finance, 2013). Large banks tend to treat the FHLB as a wholesale provider of fungible capital at favorable rates owing

to implicit government guarantees (Frame et al., 2007; Davidson, 2012). Small banks tend to increase mortgage lending when they get FHLB advances (Davidson, 1012; Durunger, 2012). FHLB advances also tend to increase for large banks in periods preceding bank failure (or assisted buyout transactions, as in the case of IndyMac and Countrywide), whereas FHLB advances appear to decrease for small banks in similarly distressed circumstances. Moral hazard incentives and lending associated with FHLB advances appear to be fundamentally different for large banks compared to small, also helping motivate our study.

Some published evidence links FHLB advances to bank size. For example, Ashcraft et al. (2010) show FHLB lending in crisis year 2008 was over $1 trillion, and that some of the largest banks were financed in part with FHLB advances. FHLB advances to large banks helped precipitate the breakdown of the originate-to-distribute pipeline of risky mortgages, fuelling the recent financial crisis. Ashcraft et al. (2010) found large banks use advances to fund increases in federal funds and repurchase lending, their trading book, and non-mortgage lending. Increases in the trading books of large banks are troubling from the standpoint of bank risk, given recent revelations about London Whale trading loss affecting J.P. Morgan Chase. FHFA-OIG (2012) also reports moral hazard concerns in FHLB lending to large troubled banks, including Countrywide (with $51 billion in outstanding advances when it failed), IndyMac, Washington Mutual, and others.

Corporate governance policies at FHLB districts may also help explain differences in moral hazard incentives from advances borrowing by large member banks. The FHLBs were established as regional cooperatives in which FHLB shareholders are also FHLB borrowers. The FHLB corporate structure resembles that of credit unions more than those of commercial banks because the cooperative structure with restricted eligibility provides FHLB members access to

loans at below-market rates. Members are required to purchase equity capital in their respective regional FHLB as a condition of membership. As a member's borrowing level increases, it must acquire higher levels of activity-based FHLB equity capital. Equity infusions during periods of rising demand for advances provide a self-capitalizing wholesale source of liquidity for FHLBs that scales readily with market conditions (Jetter, 2013). FHLB equity is not traded in the market, nor is it held by non-members. It can only be purchased or redeemed (with restrictions and lock-out periods) at par value, removing share price incentives for risk-taking by FHLB members.

As a consequence of this cooperative structure, the largest FHLB district borrowers are the largest shareholders in the FHLB district. A large bank's ability to dominate an FHLB district's board of directors is attenuated by regulatory constraints on the voting privileges of members, including a limit on any one member's voting shares. For example, FHLB Atlanta's 10-K filing shows the highest percentage of capital stock held by any one director of the FHLB was 0.3%. However, it also shows Countrywide Bank held 21.4% of FHLB Atlanta's total capital stock, SunTrust Bank held 5.8%, and BB&T NC held 5.7%, effective January 31, 2007. At the system level, the FHLB Combined Financial Report for the third quarter of 2013 shows only 10.2% of outstanding advances were held by members whose officers were FHLB directors (Office of Finance 2013). Statutes appear effective in preventing the self-dealing through FHLB district directorships.

However, large banks still possess indirect influence on FHLB districts through the size of their businesses. Each regional FHLB competes for business with the other regional FHLBs, the Federal Reserve, commercial banks, and other wholesale funding providers. Bank holding companies often have subsidiary banks in two or more FHLB districts, strengthening their ability

to negotiate loans based on their ability to divert business to other FHLB districts. For example, J.P. Morgan Chase accesses FHLB advances in Pittsburgh, Cincinnati, San Francisco, and Seattle regions, and Bank of America borrows from FHLB districts based in Boston, New York, Atlanta, San Francisco, and Seattle. Large bank advances motivate bigger FHLB debt issuances, adding depth and liquidity to FHLB debt. Banking industry consolidation is also a potential threat to FHLB districts, as large banks in other districts acquire small banks and taking acquired bank business back to the parent's FHLB district. Consequently, even though large banks may not be able to directly influence FHLB boards based on their directorships, their share of stock and outstanding advances in a competitive environment may still influence FHLB districts toward disproportionate lending favoring large bank members.

Countrywide's capital shares made it FHLB Atlanta's largest shareholder and borrower, with $28.2 billion in advances outstanding, as reported in FHLB Atlanta's 2006 10-K report. As Countrywide's financial position deteriorated with the onset of financial crisis, and it struggled to raise additional funds in capital markets, FHLB Atlanta approved an increase in Countrywide's advances of $20 billion to $51.1 billion in the third quarter of 2007, pledging $62.4 billion of rapidly deteriorating mortgages as collateral against the advances (Shumer 2007). Such an extraordinary exception to prudent lending standards could either be considered assistance to the largest shareholder and most prominent customer of the business, or a gamble for the resurrection of a critical investment. However, FHLB's super-lien GSE status, prepayment penalties for unwinding failed bank advances that increase the cost of failed bank resolution, and FHLB's overcollateralization policies ultimately protect FHLB Atlanta from losses associated with its lending decision.

Each FHLB is responsible for establishing policies on member credit limits based on creditworthiness and collateral quality. FHLB credit personnel use internally-developed credit ratings models to evaluate routine advances lending decisions, and higher levels can be approved by FHLB board committees at each of the FHLBs, such as FHLB Atlanta's Credit and Member Services Committee. Further, the Federal Housing Finance Agency (FHFA), charged with regulating the FHLB system, recently published its final rule on Prudential Management. This rule takes effect August 2012 and states: "a regulated entity should have policies that limit concentrations of credit risk and systems to identify concentrations of credit risk" (FHFA 2012). While this rule has potential to constrain disproportionate FHLB lending to large banks, the concentration advances persist.

The incentives in the cooperative structure of the FHLB for extending credit are mixed. In general, the FHLBs would prefer to keep risky banks from accessing advances to protect their charter values, which are derived from implicit US government support. Reputational damage to an FHLB, such as Senator Schumer's public criticism of FHLB Atlanta for lending to Countrywide when no other lender would extend them credit, could invite regulators and Congress to constrain the activities of the FHLBs. The incentive to protect charter value is countered by the bargaining power of large banks as they become more dominant shareholders and borrowers in an increasingly concentrated banking system.

FHLB Advances and Bank Risk

The finance literature is somewhat mixed on the relation between FHLB advances and bank risk. Stojanovich et al. (2008), and Frame and White (2010) claim that the structure of FHLB advances contributes to moral hazard in the lending decisions of member banks as funds

are fungible and not guaranteed to be used in ways that contribute to the mortgage lending mission of the FHLB. However, Deacle and Elyasani (2010) find opposing results at the bank holding company level. Martinez and Li (2011) study the use of FHLB advances by community banks in the Kansas City and San Francisco and find active advances users face higher risks not reflected in the interest charged by the FHLB. Ashley et al. (1993) find a correlation between undercapitalization, risky assets, and FHLB advances, and question why the GSE's benefits of subsidized access to broad capital markets should be extended to large banks that already have pre-existing access to wholesale funding and capital markets. Collander and Frizzell (2002) find that the decision for small banks to become FHLB members is associated with several measures of bank risk. Hall (2005) documents strikingly high use of advances by the riskiest community banks. Davidson (2012) finds that among small banks, advances contribute to mortgage lending but are unlikely to affect lending decisions at large banks that tend to use FHLB advances for general purpose wholesale funding. Scott and Hein (2008, 2009, and 2011) take a more positive stance on FHLB's impact on bank risk, arguing that the FHLB's cooperative structure prevents more risk than it causes, and that the claims of moral hazard from the FHLB's super-lien GSE status are overstated. Deacle and Elyasiani (2011) report evidence of lower market and total risk associated with FHLB membership. Durunger (2012) finds the FHLB's residential mortgage mission is supported by FHLB advances among small and rural banks. Tucillo et al. (2005) and Thompson (2002) find a positive connection between FHLB advances and mortgage community development, agricultural, and small business lending. Frame et al. (2007) counter that this effect is mitigated by the wholesale funding uses of FHLB advances by large banks. Advances have some risk management features that benefit member banks (Scott and Hein 2010, Deacle and Elyasiani 2011, Stojanovic et al. 2008), so an across-the-board increase in all measures of

bank risk associated with FHLB advances should not necessarily be expected. Stark and Spears-Reed (2004) suggest risk management features offered by FHLB advances may be counterproductive for smaller community lenders lacking the sophistication to effectively hedge risks with a variety of FHLB advance products. They note FDIC examinations "clearly show that improper FHLB advances can increase a bank's risk profile." Davidson and Simpson (Forthcoming) find FHLB advances and bank risk are not related for banks with relatively normal default risk, but advances are associated with higher bank risk among high default risk banks. Our study posits that FHLB advances are different for large vs. small banks, while noting that large banks possess greater potential for distortion of the subsidized housing and community development activities of the FHLB system.

Testable Hypotheses

This paper explores whether risk taking incentives associated with FHLB advances are greater for large compared to small banks, and how the relation between FHLB advances and bank size and risk change between the pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-2012) periods. It also investigates whether increased FHLB advances follow higher prior levels of risk and pre-existing business with the FHLB.

Consistent with prior literature, we hypothesize that FHLB advances, priced independently of bank credit risk, are positively related to bank risk-taking activities and thus bank risk. Our first testable hypothesis, stated in alternate form, is:

H1: There is a positive relation between large FHLB advances and bank risk.

We expect banks to be riskier when receiving greater advances.

We hypothesize that prior FHLB advances and risk taking incentives are greater for large banks, where large banks are defined as banks with more than $10 billion in assets, than small banks. If FHLB advances allow large banks to evade market discipline, we would expect larger banks to rely more heavily on FHLB advances, and increase their advances to fund risky activities. Macro-economic conditions, including credit conditions, liquidity, and regulatory regime, change between pre-financial crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) periods. Given the financial crisis and its effects on banking, we expect statistically significant differences between large and small banks between time periods. Specifically, we expect FHLB advances to be positively related to bank risk taking during the crisis compared to pre-crisis periods for large and small firms. This leads to another testable hypotheses, stated in alternate form:

H2: Prior FHLB advances are related to bank risk contingent on bank size differently during the pre-crisis, crisis, and post-crisis periods.

Although not explicitly stated in the above hypotheses, we expect an increase in FHLB advances during the crisis, but a weaker relation between FHLB advances and bank risk during the crisis compared to pre- and post-crisis periods as banks struggle to survive the crisis and its aftermath. We also expect types of risks taken by large banks to be less oriented toward mortgage lending and community development compared to small banks, and increasingly so over time.

Finally, since large banks that subsequently fail tend to receive proportionately greater FHLB advances than small banks, and these advances grow for large banks but decrease for small banks as probability of failure increases, we hypothesize that, after controlling for various measures of bank risk, a bank's pre-existing advances and size will predict advances levels. The

effect of FHLB advances on small banks is less certain, given advances tend to increase, decrease, then increase prior to bank failure, as shown in Figure 1.

III. Sample Selection and Variable Definitions

Sample Selection

Our sample consists of firm-quarter observations for the period Q1 2005 through Q4 2012. To be included in our sample, banks have to be listed in the Federal Financial Institutions Examination Council (FFIEC) Call Reports (Reports of Condition and Income), and thrifts have to be listed in the FFIEC Thrift Financial Report (TFR). We map fields from TFRs into the same fields as those used by Call Reports where possible. Thrift counts are biased downward because new thrifts that enter in 2012 are captured as banks once they start filing Y9-C reports in place of TFRs. We also obtain data from FDIC's failed bank list. The resulting sample consists of 256,556 firm-quarter observations.

We group banks by size, where large banks have $10 billion or more in total assets, and small banks have less than $10 billion. The full sample consists of 9,369 member banks plus 962 member thrifts, of which 160 member banks and 44 member thrifts are large.

Determination of start and finish dates for the financial crisis is problematic. Arguably, the crisis unfolded in five parts: (1) on August 9, 2007, BNP Paribas' ceases participation in three hedge US mortgage debt hedge funds, revealing tens of trillions of dollars in mortgage derivatives were doubtful; (2) on September 15, 2008, Lehman Brothers' bankruptcy shows one bank thought "Too Big to Fail" did fail; (3) on April 2, 2009, G20 leaders commit to a $5 trillion expansion; (4) on May 9, 2010, solvency of Greece and other PIGS/GIPS countries becomes an issue; and (5) on August 5, 2011, S&P lowered US sovereign debt. For simplicity, we define

2008 and 2009 as the financial crisis. Specifically, we group observations as follows: (1) pre-crisis (Q1 2005 through Q4 2007); (2) crisis (Q1 2008 through Q4 2009); and (3) post-crisis (Q1 2010 through Q4 2012). This procedure has the benefit of introducing bias against finding significant differences between periods.

Variable Definitions

Variables used in this study include financial variables from Call Reports and TFRs, and CAMELS rating system variables (excluding profitability "E," as profitability is not used in the same manner as the other risk variables in the rating system). FHLB advances are reported in thousands of dollars, or as FHLB advances to total assets. In many of our tests, we sum lagged FHLB advances for the previous 5 through 8 quarters, and scale the sum by lagged 5th quarter total assets. In other specifications, coefficients on lags 5 through 8 of quarterly FHLB advances are combined. This lag structure reduces endogeneity between risk-taking and advances, and mirrors the procedure employed in Stojanovic et al. (2008). In other advances specification, we measure a bank's share of the outstanding advances divided by all of the FHLB district's advances that we could find as reported in Y9-C and TFR reports of individual banks. One limitation of the latter approach is that this sum does not include advances to other institutions, such as insurance companies, that do not file Call or Thrift reports.

Large banks are banks or thrifts with at least $10 billion in total assets. The thrift, pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) dummy variables are indicator variables set to 1 if the firm is a thrift or the observation is in the relevant period, or 0 if not. Failure probability is a composite risk score predicting a bank's likelihood of failure within two years. 12 month asset growth is the 4-quarter growth in total assets.

Among CAMELS variables, capital adequacy includes equity to total assets and risk-based capital to risk-weighted assets. CAMELS asset quality includes non-performing loans to total loans, commercial real estate loans to total assets, and loan losses to total assets. CAMELS liquidity risk includes non-core funding to total assets and core deposits to loans. CAMELS sensitivity includes 1-year GAP to total assets. Financial variables used to estimate probability of failure include return on assets, commercial loans to total assets, other real estate owned to total assets, past due loans (30 days) to total assets, past due loans (90 days) to total assets, non-accrual loans to total assets, securities to total assets, jumbo CDs to total assets, and the natural log of total assets.

IV. Empirical Results

Descriptive Statistics

Summary descriptive statistics for key variables are reported in Table 1. FHLB advances to total assets lagged between 5 and 8 quarters hovers around 4.30%, with a mean (median) advances of $2 million ($65.9 million). Outliers in Advances include $99.14 Billion, suggesting potential need for Winsorizing. Heterogeneity in CAMELS risk measures and financial variables used to generate failure probability for sample firm-quarter observations is apparent.

[Insert Table 1 here.]

FHLB Advances and Bank Risk

To explore how various measures of bank risk are affected by recently accumulated FHLB advances to the bank, we perform the following regressions with firm and time fixed effects for the period 2005-12:

$$Risk_{i,t} = \sum_{k=5}^{8} \beta \text{Advances}_{i,t-k} + \zeta \text{Size}_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where risk measures are failure probability, 12 month asset growth, equity ratio, risk-based capital ratio, non-core funding/total assets, loans/core deposits, non-performing loans/loans, net loan losses, CRE loans/total assets, and 1-year GAP, FHLB advances are lagged 5 to 8 quarters, size (measured as natural log of assets) is included as a control, and $\varepsilon_{i,t}$ is an error term for bank i at quarter t. We focus on the sum of FHLB advances at this stage of our analysis to ensure our results are comparable with those of Stojanovic et al. (2008). Separate regressions are performed for each risk measure.

[Insert Table 2 here.]

Results of regressions based on Equation (1) are reported in Table 2. In the failure probability regression, the sum of prior FHLB advances for 5 quarters through 8 quarters previous coefficient is 0.092, statistically significantly different from zero at the 1% level. This result suggests banks that receive FHLB advances are more likely to subsequently fail. The sum of prior FHLB advances coefficient is also positive and statistically significantly different from zero for the risk-based capital ratio, non-core funding/total assets, CRE loans/total assets, loan losses/total assets, non-performing loans/loans, and loans/core deposits regressions. Similarly, the sum of prior FHLB advances coefficient is negative and statistically significant for equity ratio – essentially a measure of bank safety. Only the sum of prior FHLB advances coefficients for 1-year GAP and asset growth are negative and thus surprising. However, it is not entirely clear whether 1-year GAP or asset growth are measures of bank risk or safety. We conclude that

the preponderance of evidence in Table 2, i.e., eight out of ten measures of bank risk, is consistent with FHLB advances being positively related to subsequent bank risk. FHLB advances are positively related to bank risk.

FHLB Advances and Bank Size on Bank Risk

To evaluate the difference in risk-taking effects of advances between large and small banks, we employ a modified measure of FHLB advances, this time averaging lagged 5-8 quarter advances/total assets. This measure captures buildup in advances, but averages and scales the effect to facilitate interaction and testing. This model is based on the equation:

$$Risk_{i,t} = \beta_1 Advances_{i,t-5} + \beta_2 Large_{i,t} + \beta_3 (Advances_{i,t-5} * Large_{i,t}) + \varepsilon_{it}, \qquad (2)$$

such that large is a dummy variable equal to one for banks or thrifts with total assets of $10 billion or greater, and zero otherwise. T-tests on the advances interacted with large test for the statistical significance of differences between large and small banks on subsequent year bank probability of failure.

[Insert table 3 here.]

Results of regressions based on Equation (2) are reported in Table 3. In the failure probability index regression reported in Column (1), the coefficient on advances interacted with large is -0.078, significant at the 1% level, and on advances is 0.078, also significant at the 1% level. These results suggest that the higher the prior advances, the lower the failure probability of large banks, and that the higher the prior advances, the higher the failure probability of small banks, with differences between large and small banks statistically significant. However, bank risk comes many forms. In the case of risk-based capital regression reported in Column (2), coefficients on advances interacted with large are -0.012 and on advances is 0.018, significant at

the 1% level. These results suggest the higher the prior advances, the higher the risk-based capital of the bank for large banks, and the smaller the risk-based capital of the bank for small banks. CRE loans/total assets, loan losses/total assets, core deposits/loans, 1-year GAP, asset growth, and equity/total assets also differ significantly between large and small banks, in mixed directions. The effect of prior advances on bank risk is affected by size.

The Dynamics of FHLB Advances, Bank Size, and Bank Risk

In our next series of tests, we employ a difference-in-differences approach to examine whether the relations between advances, bank size, and bank risk, change between the pre-crisis (2005-2007), crisis (2008-2009), and post-crisis (2010-2012) periods. The firm fixed effect regression equation is:

$$Risk_{i,t} = \propto_{pre} + \propto_{crisis} + \propto_{post} + \beta_1 Large_{pre} + \beta_2 Large_{crisis} + \beta_3 Large_{post} +$$
$$\beta_4 Advances_{pre} + \beta_5 Advances_{large,pre} + \beta_6 Advances_{crisis} +$$
$$\beta_7 Advances_{large,crisis} + \beta_8 Advances_{post} + \beta_9 Advances_{large,post}, \quad (3)$$

where large is a dummy variable that equals 1 if a bank's assets are greater than $10B, pre-crisis, crisis, and post-crisis dummies are 1 for each period, and 0 otherwise, and advances are the average lagged 5 to 8 quarter FHLB advances scaled by total assets. This model allows us to test for differences in relations between advances, bank size, and risk, through time, using F-tests on different combinations of coefficients.

[Insert table 4 here.]

Results of these tests are reported in Table 4. F-tests on large bank post-crisis minus large bank crisis are statistically significantly different from zero in the risk-based capital, non-performing loans/total loans, commercial real estate/total assets, and equity/total assets

regressions. These results suggest the relation between FHLB advances and subsequent bank risk taking changes after onset of the financial crisis. F-tests on large bank crisis minus large bank pre-crisis are also statistically significantly different from zero in the failure probability, non-performing loans/total loans, commercial real estate/total assets, loan losses/total assets, noncore funding/total assets, core deposits/loans, asset growth, and equity/total assets, reflecting the dramatic change associated with the financial crisis. F-tests on large post minus large crisis minus small post minus small crisis are universally positive and significant at the 1% level, reflecting significant change in the relation between FHLB advances and subsequent bank risk taking following the crisis that differs between large vs. small banks. F-tests are also significant for changes between banks in the crisis vs. pre-crisis periods, and between the post- vs. pre-crisis periods being different for large banks vs. small for all regressions except commercial real estate/total assets. We conclude that the relations between FHLB advances and risk vary materially between large and small banks, and that these relations change between the three periods. Size and period matter in relations between FHLB advances and bank risk.

FHLB Advances, Existing District Advances Concentration, and Bank Risk

To evaluate the impact of potential large bank bargaining power on lending decisions of regional FHLB districts, after controlling for risk, we adopt a panel regression approach that controls for multiple observations of the same bank in the panel, using the specification:

$$Advances_{i,t} = \beta_1 DistrictAdvances_{i,t-1} + \beta_2 Risk_{i,t-1} + \varepsilon_{it} \quad (4)$$

where advances is a bank's FHLB advances scaled by total assets, district advances is the bank's percentage of the overall reported FHLB advances available from call and thrift reports in the prior period, and risk are the lagged risk variables used in all prior regression specifications.

[Insert table 5 here.]

Results of these regressions are reported in Table 5. In each regression, advances to assets are regressed on bank's lagged percentage of its FHLB District Advances. In these regressions, controls are risk variables defined in prior tests (based on CAMELS categories, SEER risk-rank model inputs, and a combination of these). In each regression, the prior build-up of bank advances as a percentage of overall district advances is positively and significantly related to advances levels, after controlling for risk. The variable of interest here is lagged FHLB advances (% of district). The coefficient is 0.396 (significant at the 1% level), and is thus positively related to contemporaneous advances proportions. In the regression specification using the risk variables from the failure probability model, prior buildup of district FHLB advances gives a positive significant coefficient (at the 1% level) of 0.438. When using all risk variables, the estimate is 0.379 (significant at the 1% level). In each regressions, the district share of advances dominates risk variables used as controls, suggesting that large banks with significant FHLB district ownership and advances are more likely to receive future advances. In each regression, the coefficients on size (log of total assets) is negative. However, the FHLB advances (% of district) variable combines effects of bank size and advances.

V. Robustness Tests

In the first alternative specification of the regression model, we regress each lag (from 5-8 quarters prior to the observation) of FHLB advances, size (+$10B), and the interaction between these variables. This specification mitigates against adverse effects of combining lagged advances. This regression is specified in the following equation:

$$Risk_{it} = \sum_{k=5}^{8} \beta_{1:4} Advances_{i,t-k} + \sum_{k=5}^{8} \beta_{5:8} (Advances_{i,t-k} * Large_t) + \beta_9 Large_t + \sum \gamma Date_t + \varepsilon_{it}. \quad (5)$$

This regression is a fixed effect OLS model that controls for firm-specific heterogeneity and time period.

[Insert table 6 here.]

Results are presented in Table 6. The sum of coefficients β_1 thru β_4 represent the sum of FHLB advances, and the sum of β_5 thru β_8 are the sum of the marginal effects of the inter-action between the large bank dummy and prior advances. If the FHLB advances coefficient sums and the interaction coefficient sums are significant, then advances affect bank risk and an additional marginal effect affects the largest banks. When the sign on the interaction term matches the sign on advances, large banks' buildup of advances intensifies the effect they have on risk noted in smaller banks. When signs diverge, small banks with prior advances display the opposite effect of advances on risk of that shown by large banks.

Failure probability declines for the largest banks after build-up of advances. The summed coefficients on lagged advances interacted with large is a statistically significant -0.058. The failure probability of a small bank increases with advances, but a large bank is insulated from these effects. Prior advances do tend to fuel asset growth, or they are at very least associated with asset growth in the largest banks. The large bank interacted sum of coefficients on advances is 0.061, and is significant at the 5% level. Large banks have a statistically significant lower equity ratio, as judged by the -0.1625 coefficient on the large (+$10 billion) variable in this regression. The marginal effect of a large bank's prior run up of advances is a positive and significant 0.107, indicating that higher levels of advances do not decrease a large bank's equity ratio. Large banks tend to have a lower risk-based capital ratio given by the -0.0593 coefficient on the large variable. The negative coefficient on the sum of marginal effects for lagged advances on large banks is not statistically significant. The presence of advances increases this noncore funding

ratio for the largest banks, with a positive, significant coefficient of 0.12 on the marginal effect of lagged advances for large banks. High prior advances decrease a large bank's loans to core deposits ratio, with evidence of this relationship appearing in the negative coefficient on the marginal effects of advances for the largest banks of -.063, which is significant at the 5% level. Prior advances use by the largest banks does tend to increase (0.068) the level of nonperforming loans, to a greater extent than is predicted by advances alone (0.042). High prior advances decrease a large bank's loans to core deposits ratio, with evidence of this relationship appearing in the negative coefficient on the marginal effects of advances for the largest banks of -.063, which is significant at the 5% level. Judging by the positive coefficient on the marginal effects of advances buildup by the largest banks of -0.068, advances use by the largest banks does tend to increase the level of nonperforming loans, to a greater extent than is predicted by advances alone (0.042). Net loan losses are strongly tied to a bank's size. Advances use, size, and membership in the largest group of banks all add positive explanatory value to the regression, while the significant 0.071 marginal effects on the interacted variables indicate that advances use by the largest banks contributes further to explaining a bank's loan losses. The existence of large banks in the sample tends to decrease predicted CRE loans (-0.0891), while the run-up of advances by larger banks increases CRE loans (0.077). Large banks in the sample tend to have lower 1-year GAP, judged by the significant coefficient on +$10 billion of -0.0828. The positive coefficient on the marginal effects of advances use by the largest banks is not significant in this regression.

FHLB advances play different roles in the risk-taking decisions of large and small banks over the sample. Several signs from prior regressions are reversed, indicating different incentives for risk-taking and different levels of risky activities funded by prior advances. In terms of the potential conflicts and concerns of moral hazard in advances lending, the impact of FHLB

advances on a large bank's noncore funding, nonperforming loans, loan losses, and CRE loans are particularly relevant. However, this analysis may be aggregating multiple effects over different periods of growth, stability, and crisis.

Our next robustness test verifies results from the prior study of pre-crisis, crisis, and post-crisis dynamics of FHLB advances, bank size, and bank risk using the following model:

$$Risk_{it} = \sum_{k=5}^{8} \beta_{1:4} Advances_{i,t-k} + \sum_{k=5}^{8} \beta_{5:8} (Advances_{i,t-k} * Large_t) + \beta_9 Large + \beta_{10} Crisis_t + \beta_{11} PostCrisis_t + \sum_{k=5}^{8} \beta_{12:15} (Crisis_t * Advances_{i,t-k}) + \sum_{k=5}^{8} \beta_{16:19} (Advances_{i,t-k} * Large_t * Crisis_t) + \beta_{20} (Large * Crisis_t) + \sum_{k=5}^{8} \beta_{21:24} (PostCrisis_t * Advances_{i,t-k}) + \sum_{k=5}^{8} \beta_{25:28} (Advances_{i,t-k} * Large_t * PostCrisis_t) + \beta_{29} (Large_t * PostCrisis_t) + \varepsilon_{it} \quad (6)$$

where the coefficients of the main variables of interest are interactions between prior advances by big banks (set as a baseline in the pre-crisis period, using β_5 through β_8 , comparing this to the coefficients on advances ($\beta_{1:4}$)to determine if large banks have a differential effect on risk during the pre-crisis period, comparing to the coefficients on the three-way interactions between large bank advances and crisis ($\beta_{16:19}$**)** and post-crisis ($\beta_{16:19}$**)** to see how the relationship evolved during a period of market contraction and change.

[Insert table 7 here.]

Results are presented in Table 7. FHLB advances consistently increase a bank's probability of failure, as evidenced by the baseline sum of coefficients on FHLB advances of 0.133, the increase in the crisis period to 0.141, and the increase to 0.151 in the post-crisis period. The effect of advances on the largest banks, measured by the 3-way interaction of crisis, large banks, and lagged advances is positive but insignificant, yet it is positive in the post-crisis period at 0.167. This seems to indicate that the large growth in wholesale funding by FHLB advances for pure liquidity purposes has changed the effect that FHLB advances have on a large bank's composite risk of failure, with a growing default risk associated with advances over time.

Large bank advances use does not have a statistically significant effect on a bank's risk-based capital until the post-crisis period, as risk-based capital is rising generally (see the 0.1151 coefficient on the post-crisis dummy variable). The dynamics of advances, size, and risk-based capital show that advances are significantly positively related to risk-based capital in all periods, while size is negatively related to risk-based capital before the crisis, but positively related to risk-based capital in both following periods. Noncore funding is significantly, positively related to large bank advances buildup in the baseline period (0.037, significant at the 5% level), negatively related in the crisis period (-0.058, significant at the 10% level), and positively related in the post-crisis level. This divergent relationship is further complicated by the shifting effect of advances in each period on the entire bank sample (positive in the baseline period at 0.098, negative in the crisis and post-crisis period at -0.048 and -0.262, respectively, with all three statistically significant). Meanwhile, the coefficient on large bank membership is positive in the baseline and crisis period, and strongly negative in the post-crisis period (0.1875, 0.0811, -0.7186, respectively with all three significant). Essentially, banks in general (and big banks in particular) increased noncore funding during the pre-crisis period, and advances heightened this trend. In the crisis period, banks continued the increase in noncore funding, though advances mitigated this effect for all sizes of banks. Finally, in the post-crisis period, advances use offset the *growth* in noncore funding for small banks, and conversely offset the *reduction* in noncore funding for large banks.

In the baseline period, large bank group membership (-0.1468, significant) is the only variable in the regression which negatively relates to nonperforming loans (the marginal effect of large bank advances use in the baseline period is negative, but not significant). The crisis and post-crisis periods both entail full sample increases in nonperforming loans (0.1902, significant,

and 0.2964, significant), while advances explain an additional 0.094 increase in nonperforming loans in the crisis and 0.159 in the post-crisis (both significant). Large banks take the lion's share of nonperforming loans in the crisis with 0.2115 (significant), but the marginal effects of advances buildup during the crisis is not significant in explaining nonperforming loans. In the post-crisis period, large bank membership explains an additional 0.0907 (significant), while large bank use of advances in the post-crisis period explains an additional 0.297 (significant) of nonperforming loans. Net loan losses have a fairly straightforward dynamic through the three time windows studied. Advances increase net loan losses by 0.017 in the baseline period, but the effect of large bank group membership is not significant (size is, however, positively related to net loan losses at 0.135, significant). In the crisis period, net loan losses across the banking system increase by 0.1236 (significant), while advances explain another 0.099 (significant), large bank membership explains another 0.0965 (significant), and the large bank advances buildup in the crisis explains 0.165 (significant). In the post-crisis period, similar results are found as banks increase loan losses system wide by 0.1486 (significant), FHLB advances buildup accounts for an additional 0.102 (significant), large bank membership explains another 0.1627 (significant), and the large bank use of advances explains an additional 0.087 (significant at the 5% level). The marginal effect of large bank advances buildup on CRE loans is not significant in the baseline period, but it contributes 0.124 (significant) during the crisis (even as FHLB advances for smaller banks negatively relates to CRE loans at -0.009), while large bank advances buildup explains an additional 0.087 (significant) in the crisis while smaller bank advances negatively relate to CRE loans in the same period (-0.019, significant). Larger banks display more willingness to fund commercial real estate loans with FHLB advances in the crisis and post-crisis period than smaller banks. The marginal effects of large bank advances buildup is only

significant in the baseline period, where it contributes 0.064 (significant at the 5% level) to explaining 1-year GAP. Advances are negatively related to 1-year GAP in the baseline period (-0.042, significant), positively related in the crisis (0.019, significant), and negatively related in the post-crisis period (-0.025, significant). Large bank group membership explains 0.0738 (significant) in the baseline period, -0.2547 (significant) in the crisis, and -0.187 in the post-crisis period.

For additional robustness tests, the above regressions were repeated without the interaction terms. Different lags on advances were examined. The results are not substantially altered from the current presentation. Variance inflation factors for the main regressions indicate that the results are not driven substantially by multicollinearity in the independent variables.

Given that studies of FHLB advances generally weight each bank equally, with advances scaled by total assets to determine the effect of FHLB advances on individual banks, we present an alternative advances specification which scales FHLB Advances by Total System Advances in each quarter (this is a similarly computed measure to "FHLB Advances (% of District)" from Table 5, except that all of the reported advances in the FHLB system in a given quarter are used to scale a bank's advances). Considering that large banks constitute the lion's share of system advances, regressions which give equal weight to each bank may obfuscate the risk inherent in FHLB advances as a whole. The alternative view in the next robustness test provides a more general look at the risk in the FHLB system, and is performed contemporaneously to evaluate how a dollar of advances at the FHLB system level would affect bank risk variables. This naturally gives a heavy weight to the larger advances borrowers in the system, providing a "value-weighted" examination of the effect of advances in general on risk factors in the banking system, given contemporary levels of banking consolidation.

[Insert table 8 here.]

In Table 8, we find that banks with a higher failure probability are less likely to take FHLB advances (estimate of 0.009, significant), though this may owe to large bank dominance and TBTF banking. Advances are associated with lower Equity Ratios (-0.0002, significant), higher noncore funding (0.0008, significant), lower loans to core deposits (significant at the 5% level), higher nonperforming loans (0.0005, significant), higher net loan losses (significant), and lower commercial real estate loans (-0.2, significant). Asset growth, risk-based capital and 1-year GAP are not statistically significant in this regression specification. This supports previous findings of higher risk on many of the examined bank risk categories, when advances are weighted by value.

To further evaluate the relationship between FHLB advances and bank risk, we add FHLB advances to a predictive model of bank failure to determine if it significantly contributes to the model fit, using the following regression equation:

$$FailFlag_{i,t} = \beta_1 Advances_{i,t-k} + \beta_2 Risk_{i,t-k} + \varepsilon_{it}; \; k = 1 \; to \; 8, \quad (5)$$

where FailFlag is a dummy variable equal to 1 if the bank appears on the FDIC's failed banks list in the 8 quarters prior to the Call Report observation, Advances are FHLB advances scaled by Total Assets, Risk is a vector of bank risk variables chosen to approximate the Federal Reserve's SEER risk rank model taken from Call Reports and TFRs, including ROA, commercial loans/TA, equity/TA, other real estate owned/TA, nonperforming and nonaccrual loans/TA, trading securities/TA, jumbo CDs/TA, residential real estate/TA, and the natural log of total assets. This *ex post* study of failure probability includes weightings on risk variables that were more relevant to bank failures in the crisis period, though this information would not have been available during the evaluation period of the prior models. The null hypothesis is that inclusion

of FHLB advances scaled by total assets will have no impact on a bank's probability of failure within the next 2 years. The results are presented in Table 9, which provides evidence that FHLB advances strongly, positively impact a bank's probability of failure within the next 2 years. The result is significant at the 1% level, and the magnitude of the coefficient estimate dominates the other model inputs.

[Insert table 9 here.]

A final specification to portray a transitional period of interest is presented to demonstrate the effect of banking consolidation and potential capture of a regional FHLB by large banks. I use banking data for Q4 2007, and evaluate the two-quarter growth in advances in this period to straddle a "before" and "after" crisis window with the differencing on one variable. The cross-sectional regression looks at advances growth with size as the key explanatory component, and is presented in Table 10. We create deciles of banks based on asset size, and further isolate banks with more than $10 billion in assets to their own category. We find a monotonic gradient in the coefficient estimates on advances growth between Size Decile 1 (Smallest), which is negative, and Size Decile 10 (largest, excluding $10B banks), which is positive. The smooth monotonic gradient from "slightly negative growth" to "slightly positive growth" is fully dominated by advances growth rates in the largest banks, which is estimated at 15.378%, and is statistically significant at the 1% level. Failure probability and ROE are included as controls. This demonstrates that the claim of FHLB capture by the largest banks is increasingly important in the financial crisis period, when their growth in advances skyrocketed.

[Insert table 10 here.]

VI. Discussion and Conclusion

In this paper, we investigate whether FHLB advances are positively related to bank risk, whether this relation differs for large vs. small banks, and whether these relations change between the pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) periods. We also discuss sources of potential influence for large banks on FHLB districts.

This paper shows that FHLB advances are positively related to bank risk, including eight out of ten measures of bank risk, including failure probability, risk-based capital ratio, non-core funding/total assets, CRE loans/total assets, loan losses/total assets, non-performing loans/loans, loans/core deposits, and leverage (or, equivalently, negatively related to the equity ratio). FHLB advances are related to subsequent bank risk variables, in some cases positively and others negatively, and these relations differ widely between large vs. small banks. Finally, we show that the relation between prior FHLB advances and subsequent failure probability is negative for large bank pre-crisis, less so during crisis, and not significant post-crisis. These relations differ for large vs. small banks, and is mixed for various other bank risk measures. They also change over time. We conclude that relationships between FHLB advances and bank risk, however bank risk is defined, are affected by bank size and change over time.

References and Works Cited

Ashcraft, A., Bech, M. L., & Frame, W. S. (2010). The Federal Home Loan Bank System: The Lender of Next-to-Last Resort? *Journal of Money, Credit, and Banking*, *42*(4).

Ashley, L. K., Brewer, E., & Vincent, N. E. (1993). Access to FHL Bank advances and the performance of thrift institutions. Federal Reserve Bank of Chicago WP, 33–52.

Bennett, R. L., Vaughan, M. D., & Yeager, T. J. (2005). Should the FDIC Worry about the FHLB? The Impact of Federal Home Loan Bank Advances on the Bank Insurance Fund.

Bair, Sheila C. (2003). "Is the Federal Home Loan Bank System Forsaking its Roots?" June 2003, Isenberg School of Management, University of Massachusetts-Amherst.

Davidson, T. R. (2012). Three essays on the federal home loan bank and its members. Doctoral Dissertation.

Davidson, T.R., and Simpson, W. Gary (Forthcoming 2014). Federal Home Loan Bank Advances and Bank Risk, *Journal of Economics and Finance.*

Deacle, S. and Elyasani, E. (2010). The Cost of Debt and Federal Home Loan Bank Funding at U.S. Bank and Thrift Holding Companies. Financial Management Association Conference, 2010, New York, 1–50.

Deacle, S., & Elyasiani, E. (2011). FHLB Membership and Funding and the Level of Bank and Thrift Holding Company Risk. Eastern Finance Association Conference, Savannah, GA. 1–50.

Federal Housing Finance Agency (2012). "Prudential Management and Operating Standards, Final Rule." *Federal Register 77* (June 8, 2012). 33950-33964.

FHFA-OIG. (2012). FHFA's Oversight of the Federal Home Loan Banks' Unsecured Credit Risk Management Practices.

Flannery, M. J., and W. S. Frame (2006). "The Federal Home Loan Bank system: the "other" housing GSE," *Federal Reserve Bank of Atlanta Economic Review*, Third Quarter 33-54.

Frame, W. S., D. Hancock, and S. W. Passmore (2007). "Federal Home Loan Bank Advances and Commercial Bank Portfolio Composition," Federal Reserve Bank of Atlanta Working Paper No. 2007-17.

Frame, W. S., & White, L. J. (2010). The Federal Home Loan Bank System: Current Issues in Perspective. *Reforming Rules and Regulations,* edited by Vivek Ghosal. 255–76.

Hall, J. R. (2005). Blessing or Curse? Community Banks' Use of Federal Home Loan Bank Advances. *Journal of Applied Business Research*, 21(3), 37–46.

Jetter, A. J. (2013) Statement of Andrew J. Jetter, President and CEO Federal Home Loan Bank of Topeka, Before the Senate Committee on Banking, Housing, and Urban Affairs, Subcommittee on Securities, Insurance, and Investment. Hearing, July 23, 2013.

Leggett, K. J., & Strand, R. W. (1996). The Financing Corporation, Government-Sponsored Enterprises, And Moral Hazard, 17(2), 179–187.

Martinez, J., & Li, Q. (2011). Community Banks Use of FHLB Advances across the Kansas City (KC) and San Francisco (SF) Federal Reserve Districts, *Southwestern Economic Review*, *38*, 73–92.

Nickerson, D., & Phillips, R. J. (1999). Financial Déjà vu? The Farm Credit System's Past Woes Could Strike the Federal Home Loan Bank System. *Regulation*, 40–45.

Papagianis, C. (2010). Reform the Forgotten GSE. e21 - An Initiative for 21st Economic Policies, 1–3.

Scott, J. A., & Hein, S. E. (2008). The Federal Home Loan Banks and Commercial Bank Risk Taking: An Overstated Moral Hazard?

Scott, J. A., & Hein, S. E. (2011). The Federal Home Loan Bank System: A Government Sponsored Enterprise that Avoided Conservatorship. *Journal of Applied Finance*, (1), 44–62.

Shen, Jodi. (2013). JP Morgan Taps Taxpayer-Backed Banks for Bailout Rules. *Bloomberg News*. October 10, 2013.

Shumer. C. (2007). Letter to Federal Housing Finance Board Chairman Ronald A. Rosenfeld. November 26, 2007.

Stark, W. A., & Spears-Reed, D. (2004). Federal Home Loan Bank Advances: A Supervisory Perspective. Supervisory Insights, Summer.

Stojanovic, D., M. D. Vaughan, and T. J. Yeager. (2008). Do Federal Home Loan Bank membership and advances increase bank risk-taking? *Journal of Banking & Finance*, 32, 680-698.

Tangel, Andrew. (2013). J.P. Morgan's latest legal tab rises as bank hammers out justice deal. October 19, 2013.

Thomson, J. B. (2002). Commercial Banks' Borrowing from the Federal Home Loan Banks.

Tuccillo, J. A., Flick, F. E., & Ranville, M. R. (2005). The Impact of Advances on Federal Home Loan Bank Portfolio Lending : A Statistical Analysis.

Wall, R.A., and Wall, L.D. (2002). Reforming Deposit Insurance and the FDICIA. Federal Reserve Bank of Atlanta Economic Review. First Quarter 2002.

Warren, E. (2013). Letter to FHFA Acting Director DeMarco. United States Senate.

Figure 1: FHLB Advances Growth Prior to Bank Failure or Assistance

Utilizing Call Report data and the FDIC's failed banks list from 2000-2012, Figure 1 shows differences in the quarterly growth in advances of large and small banks prior to their failure or assistance transactions by the FDIC. Assistance transactions are included because the FHLB will be paid on these advances by the purchaser or the FDIC, so doubling down behavior carries moral hazard even if the bank never technically fails. The notable upward trend in advances for large banks in the quarters leading to FDIC involvement, and the negative trend and reduction in overall advances for small banks over the same window, highlights differences in the level of access to FHLB advances that large banks receive over small.

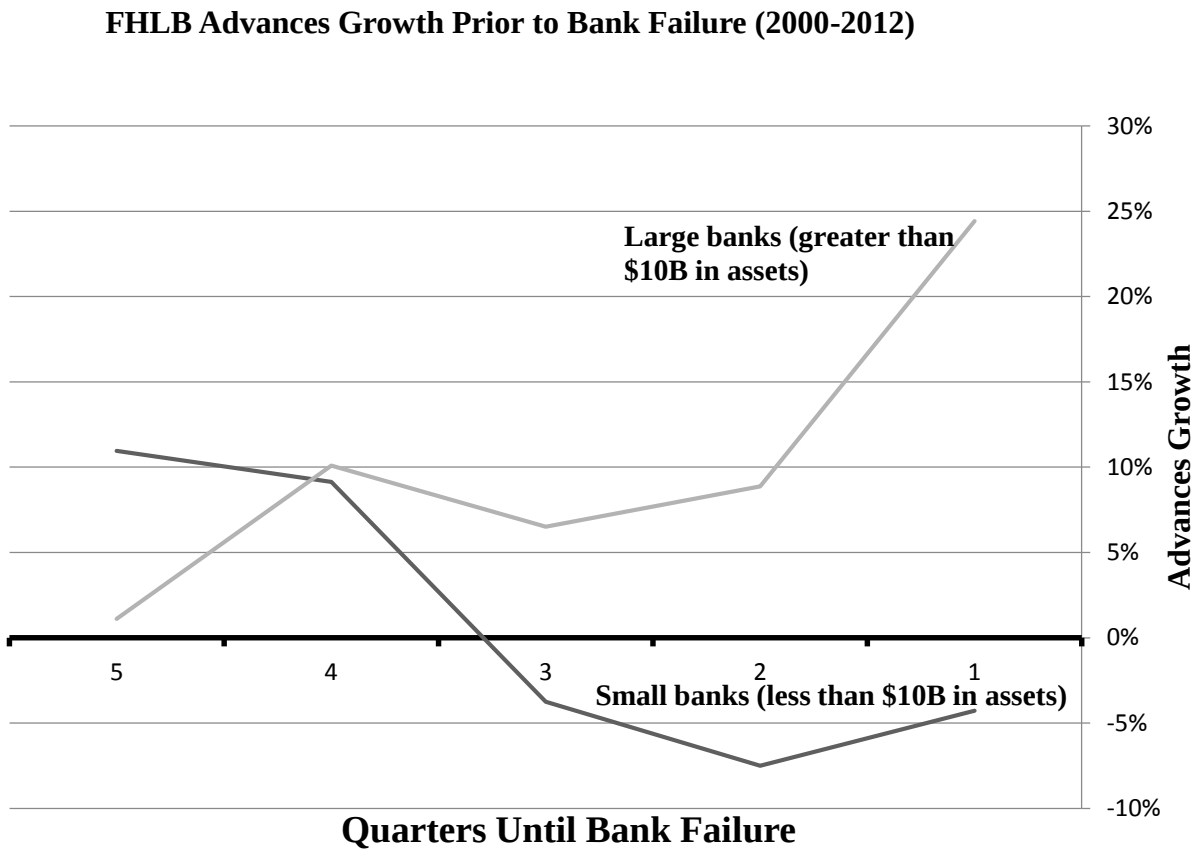

Table 1: Summary Statistics

This Table presents summary statistics for the variables of the study, in the sample of banks and thrifts taken from 2005-2012 Call Reports and Thrift Financial Summary reports. FHLB Advances are described with various transformations used in the tests. Dummy variables are included for time (pre-crisis, crisis, and post-crisis), thrifts, and size (+$10B assets), and their sums show the counts per category.

Variable Name	N	Mean	Min	Median	Max
FHLB Advances	256,556	65,938	0.00	2,000.00	99,140,000
FHLB Advances/TA	256,556	4.06	0.00	1.53	94
FHLB Advances/TA (lag 5)	250,596	4.27	0.00	1.73	94
FHLB Advances/TA (lag 6)	249,332	4.30	0.00	1.73	94
FHLB Advances/TA (lag 7)	248,044	4.31	0.00	1.73	94
FHLB Advances/TA (lag 8)	246,738	4.32	0.00	1.72	94
Sum of Advances(lagged 5-8 qtrs)/TA	250,596	0.17	0.00	0.07	144
Failure Probability (98-93)	241,568	1.21	0.00	0.13	100
Annual Growth/TA	255,421	0.03	-1.00	0.01	962
Equity/TA	256,556	11.77	-214.95	10.10	100
Risk-Based Capital to Risk-weighted Assets	256,556	0.38	-8.18	0.10	158
Non-performing Loans to Total Loans	254,709	1.96	0.00	0.96	131
Commercial Real Estate Loans/TA	256,556	26.50	0.00	24.99	96
Loan Losses/TA	255,578	0.36	-120.06	0.05	107
Noncore Funding/TA	256,556	18.49	0.00	10.11	187
Core Deposits to Total Loans	254,713	385.55	0.00	103.04	12,943,900
1 Year GAP/TA	234,253	0.05	0.00	0.02	2,081
ROA	255,578	0.63	-419.43	0.84	909
Commercial Loans/TA	256,556	8.83	0.00	7.34	96
Other Real Estate Owned/TA	256,556	0.51	-0.19	0.08	31
Past Due Loans (30 days)/TA	256,552	0.87	0.00	0.56	60
Past Due Loans (90 days)/TA	256,552	0.17	0.00	0.01	22
Nonaccrual Loans/TA	256,551	1.08	0.00	0.42	41
Securities/TA	256,556	20.32	0.00	17.39	100
Jumbo CDs/TA	249,712	15.79	0.00	14.38	90
Natural Log of TA	256,556	11.97	4.19	11.83	21

Table 2: The Effect of FHLB Advances on Bank Risk

This table provides results from the firm fixed effects regressions on ten bank risk measures from 2005-2012. FHLB Advances are lagged 5 to 8 quarters, and quarterly time dummies are included in the specification. The regression specification is based on Equation (1) in the text. Failure Probability is a composite risk score predicting a bank's likelihood of failing within 2 years. Risk-based capital ratio is risk-based capital scaled by risk-weighted assets. Non-core Funding/TA describes a bank's dependence on brokered deposits, jumbo CDs, and FHLB advances. CRE loans/TA is risky commercial real estate loans scaled by total assets. Loan Losses/Total Assets describes the risk of a bank's loan portfolio. Nonperforming Loans/Loans gives the percentage of a bank's loans which are delinquent. Loans/core deposits details how much of a bank's loan portfolio is supported by core deposits. 1-Year GAP is the absolute value of the difference between assets and liabilities which re-price in one year. 12m Asset Growth is the 4 quarter growth in total assets. Equity ratio (really a measure of bank safety rather than risk) is Equity/Total Assets. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels.

Dependent Variables	Sum of Coeffs. on FHLB Advances	(p-value)	Size	p-value	R^2	F	p-value	N
Failure Probability	**0.092*** **	(0.00)	**0.012*** **	0.00	0.072	514.2	0.01	256,553
Risk-Based Capital Ratio	**0.003***	0.09)	**0.0244*** **	0.00	0.745	259.1	0.01	256,553
Non-core Funding/TA	**0.09*** **	0.00)	**0.0662*** **	0.00	0.460	233.0	0.01	256,553
CRE Loans/Total Assets	**0.008*** **	0.00)	**-0.0071*** **	0.01	0.051	1,647.1	0.01	256,553
Loan Losses/Total Assets	**0.023*** **	0.00)	**0.1186*** **	0.00	0.276	1,378.3	0.01	256,553
Non-performing Loans/Loans	**0.043*** **	0.00)	**0.1121*** **	0.00	0.190	5,755.8	0.01	256,553
Loans/Core Deposits	**0.084*** **	0.00)	**-0.0276*** **	0.00	0.164	18,744.0	0.01	256,553
1-Year GAP	**-0.044*** **	0.00)	**0.0475*** **	0.00	0.190	795.7	0.01	256,553
12m Asset Growth	**-0.056*** **	(0.00)	**-0.0931*** **	0.00	0.035	185.6	0.01	256,553
Equity Ratio	**-0.099*** **	(0.00)	**0.0394*** **	0.00	0.032	338.6	0.01	256,553

Table 3: The Effect of FHLB Advances on Bank Risk for Large vs. Small Banks

This table examines the differences between large and small banks for the firm fixed effects regressions on Large (a dummy variable equal to 1 if the bank has more than $10B in assets, and 0 otherwise), Average FHLB Advances (computed as the average of lagged quarters 5-8 FHLB Advances/Total Assets), and Average FHLB Advances interacted with Large, and dummy variables for the pre-crisis (2005-2007), crisis (2008-2009), and post-crisis (2010-2012) periods. Other variables are defined in Table 2 and the text. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels. p-values are in parentheses.

	Failure Prob. (1)	Risk-based Cap. (2)	Non-performing Loans/TL (3)	CRE Loans/ TA (4)	Loan Losses/TA (5)	Non-core Fund/TA (6)	Core Dep./ Loans (7)	1-year GAP/TA (8)	Asset Growth (9)	Equity/ TA (10)
Large ($10B+ in Assets)	-0.024 (0.326)	**-0.062*** (0.001)**	**0.066*** (0.005)**	**-0.045* (0.072)**	**0.070*** (0.004)**	**-0.096*** (0.001)**	**0.060** (0.011)**	**-0.477*** (0.001)**	0.028 (0.273)	**-0.146*** (0.001)**
Average FHLB Advances (lags 5-8 Q) /TA(lag 5 Q)	**0.078*** (0.001)**	**-0.012*** (0.001)**	**0.046*** (0.001)**	-0.001 (0.721)	**0.03*** (0.001)**	**0.056*** (0.001)**	**-0.065*** (0.001)**	**-0.043*** (0.001)**	**-0.052*** (0.001)**	**-0.071*** (0.001)**
Average FHLB Advances* Large	**-0.073*** (0.001)**	**0.018* (0.064)**	**0.061*** (0.001)**	**0.06*** (0.001)**	**0.1*** (0.001)**	**0.054*** (0.001)**	0.015 (0.265)	**0.055*** (0.002)**	**0.062*** (0.001)**	**0.097*** (0.001)**
F-Tests on Advances* Large + Advances	**70.183*** (0.001)**	**9.357*** (0.002)**	0.802 (0.370)	**11.4*** (0.001)**	**15.96*** (0.001)**	0.040 (0.842)	**22.006*** (0.001)**	**28.69*** (0.001)**	**38.342*** (0.001)**	**83.959*** (0.001)**
R-Squared	0.071	0.724	0.177	0.045	0.096	0.434	0.169	0.022	0.029	0.028
F-value (model)	**576.394*** (0.001)**	**19,834*** (0.001)**	**1,623.69*** (0.001)**	**358*** (0.001)**	**802.4*** (0.001)**	**5,790*** (0.001)**	**1,538*** (0.001)**	**173.0*** (0.001)**	**228.739*** (0.001)**	**215.5*** (0.001)**
N	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556

Table 4: FHLB Advances, Bank Size, and Bank Risk, Pre-Crisis (2005-2007), Crisis (2008-2009), and Post-Crisis (2010-2012)

This table provides difference-in-difference results for the firm fixed effects regressions on FHLB advances (computed as the sum of lagged quarters 5-8 FHLB advances, scaled by the 5th quarter lag of total assets), Large (a dummy variable = 1 if the bank has greater than $10B in assets), and dummy variables for the pre-crisis (2005-2007), crisis (2008-2009), and post-crisis (2010-2012) periods in the sample. Other variables are defined in Tables 2 and 3, and in the text. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels. p-values are in parentheses.

	Failure Prob. (1)	Risk-Based Cap. (2)	Non-Perf. Loans/TL (3)	CRE Loans/TA (4)	Loan Losses/TA (5)	Noncore Fund/TA (6)	Core Dep. /Loans (7)	1-year GAP/TA (8)	Asset Growth (9)	Equity/ TA (10)
Pre-crisis (2005-2007) dummy	**0.412*** ** (<.001)	**-0.076*** ** (<.001)	**-0.052*** ** (0.003)	**-0.45*** ** (<.001)	**0.046** ** (0.015)	**-0.887*** ** (<.001)	-0.023 (0.211)	**0.682*** ** (<.001)	**0.091*** ** (<.001)	**0.185*** ** (<.001)
Crisis (2008-2009) dummy	**0.525*** ** (<.001)	**-0.107*** ** (<.001)	**0.16*** ** (<.001)	**-0.254*** ** (<.001)	**0.184*** ** (<.001)	**-0.702*** ** (<.001)	**-0.176*** ** (<.001)	**0.667*** ** (<.001)	**0.053*** ** (0.003)	**0.105*** ** (<.001)
Post-crisis (2010-2012) dummy	**0.561*** ** (<.001)	0.014 (0.465)	**0.311*** ** (<.001)	**-0.456*** ** (<.001)	**0.208*** ** (<.001)	**-0.201*** ** (<.001)	**0.209*** ** (<.001)	**0.751*** ** (<.001)	-0.019 (0.331)	**0.082*** ** (<.001)
Interaction of Advances and Pre-Crisis (2005-2007)	**0.142*** ** (<.001)	**0.013*** ** (<.001)	**-0.015*** ** (<.001)	**0.076*** ** (<.001)	-0.001 (0.826)	**0.033*** ** (<.001)	**-0.152*** ** (<.001)	**-0.056*** ** (<.001)	**-0.029*** ** (<.001)	**-0.182*** ** (<.001)
Interaction of Advances and Crisis (2008-2009)	**0.144*** ** (<.001)	**0.019*** ** (<.001)	**0.095*** ** (<.001)	**0.024*** ** (<.001)	**0.094*** ** (<.001)	**0.027*** ** (<.001)	**-0.053*** ** (<.001)	**-0.033*** ** (<.001)	**-0.052*** ** (<.001)	**-0.098*** ** (<.001)
Interaction of Advances and Post-Crisis (2010-2012)	**0.094*** ** (<.001)	**0.147*** ** (<.001)	**0.137*** ** (<.001)	**0.03*** ** (<.001)	**0.106*** ** (<.001)	**-0.173*** ** (<.001)	**-0.085*** ** (<.001)	**-0.009*** ** (0.008)	**-0.076*** ** (<.001)	**0.051*** ** (<.001)
Interaction of Large and pre-crisis (2005-2007)	**0.153*** ** (<.001)	**-0.089*** ** (0.008)	**-0.145*** ** (<.001)	0.05 (0.139)	**-0.113*** ** (<.001)	**0.229*** ** (<.001)	**-0.249*** ** (<.001)	**-0.284*** ** (<.001)	**0.068** ** (0.046)	**-0.302*** ** (<.001)
Interaction of Large and crisis (2008-2009)	**0.156*** ** (<.001)	**-0.06*** (0.066)	**0.086*** ** (0.005)	-0.027 (0.414)	**0.165*** ** (<.001)	**0.298*** ** (<.001)	-0.032 (0.307)	**-0.498*** ** (<.001)	0.018 (0.58)	**-0.281*** ** (<.001)
Interaction of Large and post-crisis (2010-2012)	**-0.181*** ** (<.001)	**-0.056*** (0.064)	-0.03 (0.282)	-0.037 (0.222)	0.006 (0.846)	**-0.493*** ** (<.001)	0.047 (0.106)	**-0.487*** ** (<.001)	0.039 (0.204)	0.031 (0.317)
Interaction of Advances, Large, and Pre-Crisis	**-0.152*** ** (<.001)	0.021 (0.475)	-0.012 (0.672)	**-0.058** ** (0.05)	0.014 (0.637)	0.017 (0.521)	**0.073** ** (0.011)	**0.056*** (0.064)	**0.087*** ** (0.004)	**0.069** ** (0.023)
Interaction of Advances, Large, and Crisis	**-0.066** ** (0.034)	0.006 (0.852)	**0.069** ** (0.016)	**0.094*** ** (0.002)	**0.127*** ** (<.001)	**-0.055** ** (0.043)	**0.078*** ** (0.009)	**0.089*** ** (0.005)	0.022 (0.488)	**0.085*** ** (0.007)
Interaction of Advances, Large, and Post-Crisis	0.031 (0.246)	**0.072*** ** (0.007)	**0.235*** ** (<.001)	**0.102*** ** (<.001)	**0.201*** ** (<.001)	**0.177*** ** (<.001)	**0.062** ** (0.017)	0.043 (0.112)	**0.069** ** (0.011)	0.02 (0.463)
F-tests (Large Post - Large Crisis)	1.576 (0.209)	**27.096*** ** (<.001)	**35.957*** ** (<.001)	0.118 (0.731)	**5.459** ** (0.019)	0.907 (0.341)	1.843 (0.175)	0.342 (0.559)	0.381 (0.537)	**4.928** ** (0.026)
F-tests (Large Crisis - Large Pre)	**5.141** ** (0.023)	0.057 (0.812)	**28.057*** ** (<.001)	**6.698*** ** (0.01)	**29.592*** ** (<.001)	**5.167** ** (0.023)	**7.757*** ** (0.005)	2.07 (0.15)	**4.928** ** (0.026)	**6.55*** ** (0.01)

Table 4: FHLB Advances, Bank Size, and Bank Risk, Pre-Crisis (2005-2007), Crisis (2008-2009), and Post-Crisis (2010-2012) (Con't)

	Failure Prob. (1)	Risk-Based Cap. (2)	Non-Perf. Loans/TL (3)	CRE Loans/TA (4)	Loan Losses/TA (5)	Noncore Fund/TA (6)	Core Dep. /Loans (7)	1-year GAP/TA (8)	Asset Growth (9)	Equity/ TA (10)
F-Tests (Large Post - Large Pre)	**13.585*** ** (<.001)	**25.591*** ** (<.001)	**137.749*** ** (<.001)	**9.585*** ** (0.002)	**66.483*** ** (<.001)	2.071 (0.150)	2.461 (0.117)	0.864 (0.353)	**2.975*** (0.085)	**24.796*** ** (<.001)
F-tests (Small Post - Small Crisis)	**129.777*** ** (<.001)	**847.245*** ** (<.001)	**107.684*** ** (<.001)	1.576 (0.209)	**7.476*** ** (0.006)	**2753.35*** ** (<.001)	**59.058*** ** (<.001)	**28.046*** ** (<.001)	**29.275*** ** (<.001)	**1123.21*** ** (<.001)
F-tests (Small crisis - Small Pre)	0.268 (0.605)	2.026 (0.155)	**739.981*** ** (<.001)	**141.068*** ** (<.001)	**493.132*** ** (<.001)	2.123 (0.145)	**560.566*** ** (<.001)	**28.193*** ** (<.001)	**26.621*** ** (<.001)	**364.865*** ** (<.001)
F-tests (Small Post - Small Pre)	**124.988*** ** (<.001)	**983.081*** ** (<.001)	**1465.75*** ** (<.001)	**116.002*** ** (<.001)	**643.067*** ** (<.001)	**3068.76*** ** (<.001)	**260.666*** ** (<.001)	**117.36*** ** (<.001)	**116.613*** ** (<.001)	**2898.01*** ** (<.001)
F-tests ((Large Adv Post - Large Adv Crisis) - (Small Adv Post - Small Adv Crisis)	**1572.4*** ** (<.001)	**27.445*** ** (<.001)	**797.819*** ** (<.001)	**44.607*** ** (<.001)	**699.401*** ** (<.001)	**76.324*** ** (<.001)	**229.486*** ** (<.001)	**80.652*** ** (<.001)	**200.298*** ** (<.001)	**714.513*** ** (<.001)
F-tests ((Large Adv Crisis - Large Adv Pre) - (Small Adv Crisis - Small Adv Pre))	**1642.73*** ** (<.001)	**13.436*** ** (<.001)	**20.97*** ** (<.001)	**472.665*** ** (<.001)	0.048 (0.826)	**118.551*** ** (<.001)	**2047.04*** ** (<.001)	**254.22*** ** (<.001)	**68.3*** ** (<.001)	**2659.23*** ** (<.001)
F-tests ((Large Adv Post - Large Adv Pre) - (Small Adv Post - Small Adv Pre))	**1642.73*** ** (<.001)	**13.436*** ** (<.001)	**20.97*** ** (<.001)	**472.665*** ** (<.001)	0.048 (0.826)	**118.551*** ** (<.001)	**2047.04*** ** (<.001)	**254.22*** ** (<.001)	**68.3*** ** (<.001)	**2659.23*** ** (<.001)
R-Squared	0.037	0.041	0.172	0.024	0.058	0.275	0.112	0.014	0.017	0.019
F-value (model)	**822.692*** ** (<.001)	**917.328*** ** (<.001)	**4453.02*** ** (<.001)	**525.994*** ** (<.001)	**1313.65*** ** (<.001)	**8118.22*** ** (<.001)	**2706.39*** ** (<.001)	**300.267*** ** (<.001)	**370.837*** ** (<.001)	**419.131*** ** (<.001)
N	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556	256,556

Table 5: Prior Risk and Advances Buildup on the Advances Lending Decision

This table provides panel regression results for the firm fixed effects regressions on FHLB advances to total assets of lagged risk variables and the lagged percentage of FHLB district advances held by a bank. Risk variables for the first regression specification are defined in Table 3, and in the text, while the second specification includes regressors based on the Fed's SEER risk rank model, defined in Table 2 and in the text. The results include cluster-robust standard errors to account for the repeated observations of firms over time. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels.

Sample Period: 2005-2012

	Risk Variables		*Failure Model Risk Variables*		*All Risk Variables*	
Independent Variables (Lagged 1 qtr.)	Estimate	P-value	Estimate	P-value	Estimate	P-value
FHLB Advances (% of District)	**0.396*** **	<.0001	**0.438*** **	<.0001	**0.379*** **	<.0001
Failure Probability	0.001	0.943			0.004	0.756
12m Growth in Assets	-0.004**	0.030			-0.002	0.315
Equity Ratio	**-0.081*** **	<.0001	**-0.078*** **	<.0001	**-0.093*** **	<.0001
Tier 1 Leverage Ratio	0.003	0.530			-0.005	0.348
Noncore Funding to Total Assets	**0.125*** **	<.0001			**0.122*** **	<.0001
Core Deposits to Total Loans	**-0.121*** **	<.0001			**-0.175*** **	<.0001
Nonperforming Loans to Total Loans	**-0.023*** **	<.0001			0.001	0.848
Net Loan Loss	**-0.016*** **	<.0001			**-0.011*** **	<.0001
Commerical Real Estate to Total Assets	**-0.019*** **	<.0001			**-0.021*** **	<.0001
1 Year GAP to Total Assets	**-0.009*** **	0.0009			**-0.013*** **	<.0001
Log of Total Assets	**-0.056*** **	<.0001	**-0.024*** **	<.0001	**-0.044*** **	<.0001
Return on Assets			**0.008*** **	0.001	0.000	0.862
Commercial Loans to Total Assets			**0.018*** **	<.0001	**-0.014*** **	<.0001
Other Real Estate Owned to Total Assets			**-0.030*** **	<.0001	**-0.022*** **	<.0001
Loans Past 30 days Due to Total Assets			0.002	0.253	0.000	0.903
Loans Past 90 days Due to Total Assets			**0.006*** **	0.005	0.005*	0.076
Nonaccrual Loans to Total Assets			**-0.031*** **	<.0001	**-0.029*** **	<.0001
Trading Securities to Total Assets			**0.010*** **	0.002	**0.047*** **	<.0001
Jumbo CDs to Total Assets			**-0.033*** **	<.0001	**-0.085*** **	<.0001
Residential Real Estate to Total Assets			**0.051*** **	<.0001	0.006	0.085
Observations	256,556		256,556		256,556	
R-Square	0.3032		0.2841		0.3125	
Firm Clusters	9,520		9,520		9,520	
Model F-Value	881.48		770.23		754.06	
Model P-Value	<.0001		<.0001		<.0001	

Table 6: The Effect of FHLB Advances and Bank Size on Bank Risk

This table provides results from the firm fixed effects regressions on bank risk measures and bank size from 2005-2012. FHLB Advances are lagged 5 to 8 quarters, and quarterly time dummies are included in the specification. The regression specification is provided in Equation 3. Sum of Coefficients on FHLB Adv.*Large is the variable of interest, which isolates the marginal effect of lagged advances for banks with over $10 billion in assets. +$10B is a dummy variable that equals 1 if a bank has over $10 billion in assets. 12m asset growth is the 4 quarter growth in total assets. 1-year GAP is the absolute value of the difference between assets and liabilities which re-price within one year. CRE loans/TA is commercial real estate loans scaled by total assets. Equity ratio is a bank's equity to total assets. Failure Probability is a composite risk score (detailed in Table 2) predicting a bank's likelihood of failing within 2 years. Loans/Core Deposits details how much of a bank's loan portfolio is supported by core deposits. Net Loan Losses describes the quality of a bank's loan portfolio. Non-core Funding/TA describes a bank's dependence on brokered deposits, jumbo CDs, and FHLB advances. Nonperforming Loans/Loans gives the percentage of a bank's loans which are delinquent. Risk-based capital ratio is risk-based capital scaled by risk-weighted assets. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels. p-values accompany estimates.

Dependent Variables: Risk Measures	Sum of Coefficients on FHLB Advances	Size	+$10B	Sum of Coefficients on FHLB Adv.*Large	R^2 N
Failure Probability	**0.092*** **	**0.012*** **	**-0.047***	**-0.058*** **	0.072
	0.00	0.00	0.07	0.00	256,553
Risk-Based Capital Ratio	**0.003***	**0.0246*** **	**-0.0593*** **	-0.005	0.745
	0.08	0.00	0.00	0.96	256,553
Nonperforming Loans/Loans	**0.042*** **	**0.112*** **	0.0271	**0.068** **	0.190
	0.00	0.00	0.26	0.01	256,553
CRE Loans/Total Assets	**0.007*** **	**-0.0069** **	**-0.089*** **	**0.077*** **	0.051
	0.00	0.01	0.00	0.01	256,553
Losses/TA	**0.022*** **	**0.118*** **	**0.113*** **	**0.071*** **	0.276
	0.00	0.00	0.00	0.00	256,553
Non-core Funding/TA	**0.089*** **	**0.0666*** **	**-0.1836*** **	**0.12*** **	0.460
	0.00	0.00	0.00	0.00	256,553
Core Deposits/Loans	**0.085*** **	**-0.0277*** **	0.0382	**-0.063** **	0.164
	0.00	0.00	0.12	0.03	256,553
1-Year GAP	**-0.044*** **	**0.0477*** **	**-0.0828*** **	0.029	0.190
	0.00	0.00	0.00	0.20	256,553
12m Asset Growth	**-0.057*** **	**-0.0932*** **	**0.0516** **	**0.061** **	0.035
	0.00	0.00	0.05	0.01	256,553
Equity Ratio	**-0.101*** **	**0.0398*** **	**-0.1625*** **	**0.107*** **	0.033
	0.00	0.00	0.00	0.00	256,553

Table 7: Dynamics of FHLB Advances and Bank Failure Probability, Risk, and Bank Size through the Financial Crisis

This table provides results from firm fixed effects regressions on bank risk measures, bank size, and crisis-centered time windows from 2005-2012. FHLB Advances are lagged 5 to 8 quarters, and interacted with dummy variables for bank assets over $10 billion, the Crisis period (2008-2009) and the Post-Crisis period (2010-2012). The regression specification is provided in Equation 4. The marginal effects of interest are 3-way interactions between advances, bank size, and time window. +$10B is a dummy variable that equals 1 if a bank has over $10 billion in assets. 12m asset growth is the 4 quarter growth in total assets. 1-year GAP is the absolute value of the difference between assets and liabilities which re-price in one year. CRE loans/TA is commercial real estate loans scaled by total assets. Equity ratio is a bank's equity to total assets. Failure Probability is a composite risk score (detailed in Table 2) predicting a bank's likelihood of failing within 2 years. Loans/Core Deposits details how much of a bank's loan portfolio is supported by core deposits. Net Loan Losses describes the quality of a bank's loan portfolio. Non-core Funding/TA describes a bank's dependence on brokered deposits, jumbo CDs, and FHLB advances. Nonperforming Loans/Loans gives the percentage of a bank's loans which are delinquent. Risk-based capital ratio is risk-based capital scaled by risk-weighted assets. ***, **, and *** denote statistical significance at the 1%, 5%, and 10% levels. P-values are reported below coefficients.

Dependent Variables: Risk Measures	FHLB (Σ)	Large	Large (ME)	Crisis	FHLB (Σ)	Large	Large (ME)	Post-Crisis	FHLB (Σ)	Large	Large (ME)	R^2 N
Failure Probability	**0.133*** **	**0.063** **	**-0.097*** **	**0.141*** **	**0.065*** **	0.049	0.012	**0.151*** **	**-0.006*** **	**-0.303*** **	**0.167*** **	0.037
	0.00	0.04	0.00	0.00	0.00	0.13	0.57	0.00	0.00	0.00	0.00	256553
Risk-Based Capital	**0.068*** **	**-0.0532***	-0.013	**-0.0211*** **	**0.039*** **	0.047	-0.01	**0.1151*** **	**0.149*** **	**-0.06** **	**0.085*** **	0.037
	0.00	0.08	0.99	0.00	0.00	0.14	1.00	0.00	0.00	0.05	0.00	256553
Nonperforming Loans/Loans	**0.019*** **	**-0.147*** **	-0.033	**0.1902*** **	**0.094*** **	**0.2115*** **	0.073	**0.2964*** **	**0.159*** **	**0.0907*** **	**0.297*** **	0.179
	0.00	0.00	0.72	0.00	0.00	0.00	0.27	0.00	0.00	0.00	0.00	256553
CRE Loans/TA	**0.038*** **	**-0.0546***	0.011	**0.1316*** **	**-0.009*** **	-0.05	**0.124*** **	**-0.035*** **	**-0.019*** **	**-0.0543***	**0.114*** **	0.023
	0.00	0.08	0.36	0.00	0.00	0.12	0.01	0.00	0.00	0.08	0.00	256553
Loan Losses/TA	**0.017*** **	-0.0294	0.018	**0.1236*** **	**0.099*** **	**0.0965*** **	**0.165*** **	**0.1486*** **	**0.102*** **	**0.1627*** **	**0.087** **	0.102
	0.00	0.32	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	256553
Non-core Funding/TA	**0.098*** **	**0.187*** **	**0.037** **	**0.0825*** **	**-0.048*** **	**0.0811*** **	**-0.058***	**0.6148*** **	**-0.262*** **	**-0.7186*** **	**0.175*** **	0.284
	0.00	0.00	0.05	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	256553
Core Deposits/Loans	**0.15*** **	**0.241*** **	-0.041	**0.1455*** **	**-0.047*** **	**-0.1767*** **	-0.064	**-0.2028*** **	**-0.053*** **	**-0.2393*** **	-0.036	0.114
	0.00	0.00	0.52	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.74	256553
1-Year GAP	**-0.04*** **	**0.0738*** **	**0.064** **	**0.209*** **	**0.019*** **	**-0.2547*** **	0.043	**0.4254*** **	**-0.025*** **	**-0.187*** **	-0.038	0.173
	0.00	0.01	0.01	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.46	256553
12m Asset Growth	**-0.05*** **	**0.0918*** **	**0.065** **	**-0.0084** **	**-0.023*** **	**-0.0572***	-0.026	**-0.056*** **	**-0.045*** **	-0.0396	0.011	0.022
	0.00	0.00	0.02	0.01	0.00	0.08	0.56	0.00	0.00	0.20	0.75	256553
Equity/TA	**-0.16*** **	**-0.318*** **	**0.101*** **	**-0.0626*** **	**0.015*** **	-0.0124	0.045	**-0.1445*** **	**0.201*** **	**0.3317*** **	-0.048	0.025
	0.00	0.00	0.00	0.00	0.00	0.70	0.38	0.00	0.00	0.00	0.30	256553

Table 8: The Value-Weighted Effect of Advances on Bank Risk

This alternative specification examines the effect of advances by large banks by transforming the dependent variable (FHLB advances) into a percentage of overall advances held at a given time by one bank. This is a contemporaneous regression that captures cross-sectional variations in bank risk according to the percentage of system advances held by member banks. Here, N=224654 and the R-squared value of the regression is 0.1574.

Dependent Variable: Percentage of Overall FHLB System Advances	Estimate	t	p-value
Intercept	**0.009*** **	5.34	<.0001
Failure Probability	**-0.041*** **	-8.13	<.0001
Risk-Based Capital Ratio	-0.000	-0.17	0.868
Nonperforming Loans/Total Loans	**0.001*** **	4.81	<.0001
CRE Loans/TA	-0.020	-12.28	<.0001
Loan Losses/TA	**0.000*** **	196.24	<.0001
Noncore Funding/TA	**0.001*** **	35.53	<.0001
Core Deposits/Loans	**-0.000** **	-2.22	0.027
1-Year GAP	-0.000	-1.30	0.193
12m Asset Growth	0.0001	0.68	0.499
Equity/TA	**-0.0002*** **	-4.15	<.0001

Table 9: Failure Probability and FHLB Advances

This alternative specification of the failure probability model detailed in Equation 2 and Table 2 includes FHLB Advances (scaled by Total Assets) in the model to determine whether FHLB Advances add to the predictive capacity of a failure probability model. The maximum likelihood parameter estimates of this Probit model show that a bank's failure probability increases as the level of advances increases, and that increases in a bank's level of advances can dominate the effect of other variables in the failure probability model. The model is a post hoc estimation of a bank's failure probability from 2005-2012, using call report data and the FDIC's failed bank list. The dependent variable of the model is a binary variable equal to 1 if a bank fails in the next 2 years from the Call Report observation. 12m asset growth is the 4 quarter growth in total assets. 1-year GAP is the absolute value of the difference between assets and liabilities which re-price in one year. CRE loans/TA is commercial real estate loans scaled by total assets. Equity ratio is a bank's equity to total assets. Failure Probability is a composite risk score (detailed in Table 2) predicting a bank's likelihood of failing within 2 years. Loans/Core Deposits details how much of a bank's loan portfolio is supported by core deposits. Net Loan Losses describes the quality of a bank's loan portfolio. Non-core Funding/TA describes a bank's dependence on brokered deposits, jumbo CDs, and FHLB advances. Nonperforming Loans/Loans gives the percentage of a bank's loans which are delinquent. Risk-based capital ratio is risk-based capital scaled by risk-weighted assets. Statistical significance is indicated by asterisks ('***' indicates significance at 1% levels, '**' at 5%, and '*' at 10%), and p-values accompany estimates.

Dependent Variable: Bank Failure in 2 years	Estimate	Std. Error	Chi^2	p-value
Intercept	**-3.316*** **	0.091	1,333.72	<.0001
ROA	**-0.011*** **	0.002	30.15	<.0001
Commercial Loans/TA	**-0.005*** **	0.002	13.80	0.0002
Equity/TA	**-0.091*** **	0.003	929.51	<.0001
Other Real Estate Owned/TA	**0.042*** **	0.003	118.77	<.0001
Loans Past 30 days/TA	**0.166*** **	0.006	902.35	<.0001
Loans Past 90 days/TA	**0.037*** **	0.009	18.31	<.0001
Nonperforming and Nonaccrual Loans/TA	**0.114*** **	0.003	1,783.64	<.0001
Trading Securities/TA	**-0.0002*** **	0.000	491.48	<.0001
Jumbo CDs/TA	**0.012*** **	0.001	158.31	<.0001
Residential Real Estate/TA	**-0.013*** **	0.001	315.18	<.0001
Natural Log of Total Assets	**0.137*** **	0.006	503.44	<.0001
FHLB Advances/TA	**2.325*** **	0.124	351.31	<.0001

Table 10: Crisis-Centered Growth Rates in FHLB Advances by Size

The following regression evaluates how size contributes to percentage growth in FHLB advances during the crisis period. The dependent variable is growth in advances between Q2 2007 and Q4 2007, centering the differences round the period of economic collapse. A gradient between the coefficients on the smallest banks (banks in the first decile ranking based on size, with banks over $10 billion in assets removed) starts out negative, and monotonically increases to the positive figure for the highest decile ranked banks, excluding banks above $10 billion. These correlations are illustrative but not statistically significant. However, the results for banks above $10 billion are positive and significant in the regression, indicating that as the crisis hit, smaller banks cut back somewhat advances, while the largest banks increased their FHLB advances. The number of observations in this regression is 7,998, and the R-squared value is 0.02.

Dependent Variable: FHLB Advances Growth in Crisis (2007 Q2 – 2007 Q4)	Estimate	Standard Error	t	p-value
Intercept	0.203	0.263	0.77	0.440
Size Decile 1 (Smallest)	-0.221	0.523	-0.42	0.673
Size Decile 2	-0.087	0.514	-0.17	0.865
Size Decile 3	-0.010	0.513	-0.02	0.985
Size Decile 7	0.187	0.512	0.36	0.716
Size Decile 8	0.202	0.513	0.39	0.693
Size Decile 9	0.270	0.514	0.53	0.599
Size Decile 10 (Largest, excluding +$10B banks)	0.856	0.545	1.57	0.117
+$10 Billion in Assets	15.378	1.232	12.48	<.0001
Failure Probability	0.814	3.920	0.21	0.836
ROE	0.0008	0.007	0.11	0.910

Chapter 2: Bank Influence and Moral Hazard at the Federal Home Loan Banks

Abstract

When deciding to lend advances to risky banks and thrifts, the Federal Home Loan Banks (FHLBs) weigh moral hazard incentives against charter value preservation. We hypothesize that FHLBs are more likely to lend to risky large members than risky community banks because large members exert significant influence over the FHLBs through their outsized capital holdings and interest payments on advances, their presence on the Board of Directors, and their ability to obtain advances from multiple FHLB districts. Between 2005 and the financial crisis pinnacle in the third quarter of 2008, the share of advances to large banks surged, even though some of those banks were on the verge of failure. We empirically document a positive relationship among large bank advances, influence metrics, and insolvency risk, consistent with the story that FHLB moral hazard incentives outweigh charter value preservation for their largest members. Regardless of their risk and influence, banks used the advances similarly, primarily as a funding source for new loans.

JEL Classification: G28, G21, H25

Keywords: Federal Home Loan Bank; debt; banks; risk; financial crisis

I. Introduction

In the third quarter of 2007, the Federal Home Loan Bank (FHLB) of Atlanta extended additional advances of $22.2 billion to Countrywide Bank in Alexandria Virginia, a subsidiary thrift of Countrywide Financial Holding Company, raising the troubled lender's advances balance to $51.1 billion, or 37% of the Atlanta FHLB's outstanding advances at the time. These advances were collateralized by $62.4 billion in mortgage loans of questionable quality.[1] Advances became a lifeline to Countrywide; its regular bond issuances stalled and it had drawn down all of its available credit from large financial institutions. FHLB Atlanta effectively became the lender of last resort for Countrywide, which through an acquisition by the Bank of America for $2.1 billion on July 2, 2008, was rescued from failure. Had Countrywide failed, the likely outcome is that the Atlanta FHLB as a secured creditor would have been repaid in full by the Federal Deposit Insurance Corporation (FDIC), which would be obliged to absorb the marginal losses on Countywide's investments from the advances.

The Countrywide loan was not an isolated incident of lending to a risky large member. In the same quarter as the Countrywide advances increase, Washington Mutual increased its advances by $34.6 billion. From the third quarters of 2005 to 2007, advances to IndyMac increased by $4.5 billion, and between the second and third quarters of 2008, advances to Wachovia Bank increased by $7 billion. Washington Mutual and IndyMac failed in the third quarter of 2008, while Wachovia was purchased by Wells Fargo in a hastily arranged transaction to avoid failure.

More generally, FHLB advances to large members surged in the run-up to the financial crisis. Figure 1 plots quarterly inflation-adjusted advances between 2005 and the third quarter of 2008 for large banks (consolidated assets greater than $50 billion), regional banks (consolidated assets between $10 billion and $50 billion), and community banks (consolidated assets less than

[1]The poor quality and misrepresentation of loans in the Countrywide mortgage portfolio contributed to the $16.65 billion settlement by Bank of America with the Department of Justice on August 21, 2014.

$10 billion).[2] The figure shows clearly that the twelve regional Federal Home Loan Banks (FHLBs) lent disproportionately to large banks during this time period. Following Gorton and Metrick (2012), we mark the second quarter of 2007 as the beginning of the financial crisis for banks.[3] Between the beginning of 2005 and the second quarter of 2007, advances to large banks rose by 53% while they declined at regional and community banks by 8% and 18%, respectively. Between June 2007 and September 2008, advances surged by 74% at large banks, and they increased by 7% at regional banks, and 44% at community banks. During the full sample period, the share of advances to large banks increased from 44% to 65%.

[Figure 1]

The FHLBs face a trade-off between moral hazard incentives and preservation of charter value. Because advances are more than fully collateralized—a competitive advantage of the FHLBs derived from the low borrowing costs resulting from their Government Sponsored Enterprise (GSE) status—FHLBs face no credit risk and have powerful moral hazard incentives to lend indiscriminately to any borrower (Ashley, Brewer, & Vincent, 1993; Stojanovic, Vaughan, & Yeager, 2008; Frame and White, 2010; Martinez and Li, 2011). Indeed, the FHLB System (System) has never suffered a loss from default on advances.

The System's GSE status represents its main source of charter value, and the desire to protect charter value constrains the FHLBs moral hazard incentives. Actions that damage the System's reputation could lead Congress to revoke part or all of its charter. Consequently, the FHLBs monitor borrowers and have the ability to limit credit as bank risk increases.

Because there are no statutory restrictions on advances, in most cases the FHLBs must self-regulate lending to members to defend its charter. Bank and thrift supervisors have ultimate

[2] "Bank" refer to commercial banks and thrifts unless otherwise indicated. A consolidated bank is one that is aggregated by its top-tier holding company.

[3]Gordon and Metrick (2012) make the case that the subprime sector of the economy began deteriorating in early 2007 as reflected by higher ABX spreads. The deterioration in the banking system became apparent in the interbank markets in mid-2007, as reflected by a jump in the Libor-OIS spread.

authority over whether a bank or thrift can obtain advances, but these decisions are subjective and slow. The FHLBs, in contrast, can advance large sums of money in a matter of hours. In Countrywide's case, the Office of Thrift Supervision (OTS) could have demanded the immediate repayment of the $22.2 billion advance to the Atlanta FHLB, but such a decision may have led to an immediate run on Countrywide's liabilities had the mandate become public. Unless a supervisory agency explicitly instructs a bank or thrift that further advances are prohibited, the FHLBs make the lending decisions, and they must weigh their moral hazard incentives against the protection of charter value.

We hypothesize that FHLBs extend advances disproportionately to risky large members because large members exert significant influence over FHLB decision making, which leads the FHLBs to amplify the moral hazard incentives and diminish charter value concerns. The influence comes primarily from the high portions of revenue and capital that large banks contribute to the FHLBs. It is more difficult, for example, to decline service to a member that accounts for perhaps a quarter of a Home Loan Bank's annual interest income and capital stock. Large-bank members of the Board of Director may also wield influence over credit outcomes. In addition, though individual banks are confined to borrowing from their regional FHLB, many of the largest BHCs have bank charters in multiple FHLB districts, allowing them to implicitly or explicitly threaten to switch their borrowing to banks in other districts if they are not pleased with the service they are receiving. The influence that a large member exerts over an FHLB makes it more likely that the FHLB will lend rather than protect its charter value.

We find empirical support for our hypothesis. We show that advances flowed disproportionately to the banks with the most influence as the financial crisis deepened. Moreover, the riskier influential members were more likely to receive advances than the safer influential members. These patterns are not present at the community banks. Taken together, the evidence is consistent with an inability of the FHLBs to constrain their moral hazard incentives to the largest and most influential banks.

Our paper is unique in the literature on FHLB advances and bank risk. We are the first to

study the channels of influence that a large bank wields over a regional FHLB. This approach allows us to explain the disproportionate share of advances that flowed to risky large members. Second, we empirically estimate a bank's level of advances obtained from its influence, which allows us to examine whether banks used those advances differently from other advances.

The paper proceeds as follows. Section 2 summarizes relevant literature and develops testable hypotheses. Section 3 describes sample selection, variables, and methodology. Section 4 reports empirical findings. Section 5 reports results of robustness tests and alternate test specifications. Section 6 discusses and concludes.

II. Literature Review and Hypothesis Development

A. Moral Hazard and Charter Value

In this section, we provide an overview of the FHLB System and explain the source of the FHLBs' moral hazard incentives when they extend advances to member banks. We summarize the relevant literature documenting moral hazard activity by the FHLBs and discuss the role of charter value as a counterbalancing incentive.

The FHLB System is comprised of 12 (although this will soon be 11, following a merger) regional and independent member-owned banking cooperatives. Members consist primarily of banks and thrifts. Along with Fannie Mae and Freddie Mac, the System is one of three housing GSEs whose primary mission is to provide liquidity to the residential mortgage market. FHLBs lend collateralized loans, called advances, to members. By pledging (primarily) real estate assets as collateral, members leverage their otherwise illiquid mortgage assets. Terms on advances are set independently by each FHLB. Maturities range from overnight to as much as 20 years, and they are priced at market rates based on macroeconomic variables. Each member is required to purchase equity capital in its respective regional FHLB as a condition of membership, and the minimum capital requirement increases with the member's borrowing. As a consequence, the largest borrowers are also the largest shareholders of their respective FHLBs. Equity infusions during periods of rising demand for advances provide a self-capitalizing wholesale liquidity

source for members (Jetter, 2013). FHLB equity is not traded in the market nor held by non-members, and it can only be purchased and redeemed (with restrictions and lock-out periods) at par value, removing share price incentives for risk-taking by the FHLBs.

FHLB moral hazard incentives ultimately derive from their significant market power. Bonds fund the FHLBs at the System level, which benefits from the GSE status of the System and provides the unique ability to borrow in international markets at nearly risk-free rates. In addition, members are required to borrow from their regional FHLB, preventing explicit competition among the System. These competitive advantages enable the FHLBs to demand significant overcollateralization. While interest rates on advances are not adjusted to reflect the risk of individual banks, collateralization requirements change dynamically. In the event of a member bank failure, advances (and other secured liabilities) receive the highest priority from the FDIC in its receivership role. Should collateral prove insufficient, the FHLB also enjoys a "super-lien" privilege that gives it priority over all other claimants, including the FDIC.

The high collateral requirements combined with super-lien privileges transfer the default risk on advances to the FDIC, which incentivizes the FHLBs to lend to all members with sufficient collateral, regardless of risk. The moral hazard is transferred to banks and thrifts because advances allow members to fund risky assets with liabilities that are not risk-priced (Bennett, Vaughan, & Yeager, 2005; Ashley et al., 1993; Flannery and Frame, 2006; Stojanovic et al, 2008; Frame and White, 2010; and Martinez and Li, 2011; Maloney and Thompson 2002). Material Loss Reviews by the FDIC's Office of Inspector General often cite the use of advances and other volatile wholesale funding sources as causes of failure.[4] Advances are not unique in this regard; insured funding such as brokered deposits provide banks with similar incentives.

A desire to protect charter value constrains the FHLBs moral hazard incentives. FHLBs measure and monitor the credit risk of member banks. Each FHLB is responsible for establishing policies on member credit limits based on creditworthiness and collateral quality.

[4]Material Loss Reviews (MLR) are at www.fdicoig.gov/MLR.shtml.

FHLB credit personnel use internally-developed credit ratings models to evaluate routine advances lending decisions, and higher levels can be approved by board committees at each of the FHLBs. Charter value produces monopoly rents, and actions that damage the System's reputation could lead Congress to revoke part or all of its charter. Lending to a risky member that subsequently fails and imposes large losses on the FDIC will draw the attention of Congress, which has a history of punishing GSEs for risky behavior. Congress stripped the FHLB of its supervisory authority in 1989 because of the perception that it failed to effectively limit thrift risk-taking during the Savings & Loan Crisis. More recently, Congress put Fannie Mae and Freddie Mac under government receivership in September 2008 and diverted all profits to the Treasury after the two mortgage GSEs became insolvent from aggressive lending during the housing boom. Several current proposals for restructuring mortgage financing would abolish these organizations altogether. When assessing advances to risky members, the FHLBs weigh profit incentives against protection of charter value.

Analyses by the FDIC and Federal Housing Finance Agency (FHFA), the FHLBs' regulator, suggest that the FHLBs lent aggressively to risky members through the early stages of the housing bubble burst. The IndyMac failure in July 2008 cost the DIF $10.7 billion (Bloomberg 2011), which included payoff of $6.3 billion in advances and $341.4 million in prepayment fees to the Federal Home Loan Bank of San Francisco (FDIC 2009). A 2009 study by the FHFA concluded that "FHLBanks made 45% of their total advances to members characterized by relatively weakened financial conditions, and that FHLBanks might have over-extended lending to some members with higher levels of nonperforming assets," and that many poorly-rated recipients of FHLB advances subsequently failed, with 149 FHLB Atlanta member failures and 55 San Francisco FHLB member failures, with many of these failed banks having outstanding advances that were paid back by the DIF or assumed by the acquiring institutions (FHFA 2009). "The losses were not incurred by the FHLBanks, but, instead, were absorbed by the FDIC's resolution process" (FHFA-OIG 2012).

Neither the FDIC nor the FHFA tracks the specific volume of losses in resolution due to

advances (FHFA-OIG 2012). The FDIC acknowledged this risk to the DIF in a final rule effective April 2009, when it amended its assessment process to include the increased risk to the DIF from advances and other wholesale funding sources (12 CFR § 327 – Assessments). However, the degree to which this increase sufficiently offsets DIF losses from advances has not been evaluated (FHFA-OIG 2012).

B. Disparate treatment of Large or Influential Banks, and Channels of Influence

In this section, we explain why the FHLBs are more likely to yield to moral hazard incentives and lend to risky large banks while constraining credit to risky community banks to protect System charter value.

Because there are no statutory restrictions on advances, in most cases the FHLBs make the sole determination to extend credit or not. A member bank's regulatory supervisors have the final authority over whether a bank or thrift can obtain further advances, but these decisions are often subjective and slow. The FHLBs, in contrast, can advance large sums of money in a matter of hours, and once the credit is extended, it can be difficult to reverse. In Countrywide's case, the Office of Thrift Supervision (OTS) could have demanded the immediate repayment of the $22.2 billion advance to the Atlanta FHLB, but such a decision may have led to an immediate run on Countrywide's liabilities had the information become public.

We speculate that when making judgment calls about lending to a marginal borrower, FHLBs are more likely to lend to large banks than community banks because of the influence that large banks wield over the cooperatives. This increase in lending to the largest member-banks was especially pronounced during the financial crisis, as documented in Ashcraft et al. (2010), and our research seeks to explain these differences in lending.

Prior research has focused mainly on the size of a bank, and its effect on the riskiness of FHLB lending at the system level. Size variables alone, however, may not tell the whole story. For example, a bank with $25 billion in assets may be one of the largest banks in one district, while it barely classifies as a large bank in a neighboring district. Also, a bank's size alone does

not determine the level of influence it would have on a district bank, since a large bank could ultimately have relatively low levels of business dealings with its district FHLB. The size of a bank is only relevant to the FHLB lending decision when the bank's size is reflected in the size and scope of its involvement with a district FHLB.

Our research offers a unique contribution of measures specifically related to various channels of a bank's influence on its district FHLB. Potential sources of influence that a large bank might wield on an FHLB include voting share power from FHLB directors of large banks, dependence of the FHLBs on large member banks to generate a significant portion of their profits, and the ability of bank holding companies with bank charters in more than one FHLB district to move their business to other districts. Our influence measures are generally inferred from public data, so these measures may be even more useful to regulators and risk analysts within the FHLB who have more direct access to this information. We discuss these alternatives in turn.

Large-bank members could exert influence over marginal FHLB credit decisions if the disproportionate percentage of capital large banks hold results in a disproportionate percentage of voting shares. Regulatory constraints, however, limit a member's voting shares to the average number of shares in its respective state. For example, FHLB Atlanta's 10-K filing at the end of January 2007 show that Countrywide Bank held 21.4% of the Bank's total capital stock, SunTrust Bank held 5.8%, and BB&T held 5.7%. Yet, the highest percentage of voting shares held by a bank with an FHLB director was 0.3%. In addition, at least two-fifths of each FHLB board must be composed of independent (non-member) directors, with at least two "public interest" directors. The statutes limit sharply a large members' control over voting shares. At the System level, the FHLB Combined Financial Report for the third quarter of 2013 shows that 10.2% of outstanding advances were held by members whose officers were FHLB directors (Office of Finance 2013).

A large bank may wield disproportionate influence over an FHLB and its lending decisions through the disproportionate amount of revenue and profits that it bring to the FHLBs. Figures

1, 2, and 3 provide detail on the level of advances held by the FHLB system's largest members.

A third source of influence may come from the large multibank holding companies that have subsidiary banks in multiple FHLB districts. Although a particular bank can borrow only from its regional FHLB, BHCs may gain bargaining power with the threat to move their sizable advances borrowings to another FHLB. JPMorganChase, for example, accesses advances in the Pittsburgh, Cincinnati, San Francisco, and Seattle districts; Bank of America borrows from the Boston, New York, Atlanta, San Francisco, and Seattle FHLBs. These large banking organizations thus have the ability to "shop around" the FHLB System if they are turned down for credit from a given FHLB.

Finally, if a bank has one of its officials elected to its district FHLB, the possibility arises of self-dealing though abnormally large borrowing tunneled to the board member's bank. The difficulty of self-regulating an organization's lending and other business transactions to its most influential clients is not unique to the FHLBs. The inability of banks to restrain lending to their owners and officers even when the lending threatens the solvency of the bank justifies the restrictions embedded in Regulation O.[5] Similar self-dealing concerns motivate barriers on the ability of tax exempt private foundations to lend to their founders and related parties.[6] The abuse of related lending as a tunneling mechanism for insiders and related parties is explored by La Porta et al. (2003). This is the first examination in the literature, to our knowledge, of the use of FHLB directorship data to measure of the governance quality of the district FHLBs and the potential for self-dealing with advances lending.

We develop our testable hypotheses in the following section.

C. Hypotheses

Our first testable hypothesis, stated in alternative form, is:

H1: Growth rates in advances were higher for large banks.

[5]See Regulation O: Loans to Executive Officers, Directors, and Principal Shareholders of Member Banks 12 CFR 215.
[6]See Specific Acts of Self-Dealing 26 CFR 53.4941(D)-2

We then add risk to our analysis, and hypothesize that the FHLBs were more willing to extend advances to risky large banks than risky small banks. Stated in alternative form, the next testable hypothesis is:

H2: A large, risky bank's FHLB advances are expected to increase (consistent with influence over the lending decision), while a small, risky bank's advances are expected to decrease (consistent with FHLB charter value protection).

Next, we examine channels a bank may use to influence the lending decisions of an FHLB. If banks can influence the lending decisions of FHLBs, then we would expect to see larger advances shares associated with our measures of influence. Our third hypothesis, stated in alternative form, is:

H3: Advances shares should be positively correlated with a bank's level of influence, after controlling for risk.

We define several measures of influence to test our third hypothesis. As the member banks are also owners in the FHLB cooperatives, a channel of influence that has not been addressed in the literature is influence on the lending decision via ownership of FHLB capital stock. We hypothesize that banks with the largest share of a district FHLB's capital stock may influence the lending decisions of FHLBs through their ownership stakes. Stated in alternative form, the testable hypothesis is:

H3.1: Implied capital stock will be positively correlated with a bank's share of advances, after controlling for risk.

A concern raised by Sheila Bair (2002) and others regarding the potentially dangerous effects of "district shopping" by bank holding companies with branches in multiple FHLB districts is another channel of influence we test. If a bank holding company's presence in multiple districts threatens any individual district with the loss of capital and revenue, we would expect to see a positive correlation between advances growth and a multi-district holding

company. Stated in alternative form, the testable hypothesis is:

H4: If a bank's holding company operates in multiple FHLB districts, the bank's share of advances will increase, after controlling for risk.

Another possible channel of influence that has been unexplored in the literature is the election of a bank's executives to the board of directors of a district FHLB. If banks were able to use their elected board member's influence to engage in self-dealing of FHLB advances, we would expect a positive correlation between a bank's directors and the risk-adjusted growth in advances to total assets. Stated in alternative form, the testable hypothesis is:

H5: If a bank executive is an FHLB director, the bank's share of advances will increase after controlling for risk.

The tests include an examination of the above hypotheses in terms of levels, short-term changes, and long-term changes in the variables of interest.

To conclude the study, we then focus on the uses of advances after controlling for the predicted impact of influence. We examine how a bank's influence-predicted advances impact liquidity, loans, deposits, and other borrowed money. We expect to see the banks use advances to increase their liquidity, lending, and to substitute for deposits and other borrowed funds.

III. Sample Selection, Variable Definitions, and Methodology

A. Sample Selection

Our sample consists of firm-quarter observations for the period Q1 2005 through Q3 2008. We limit the sample to end in Q3 2008 to make sure that our results are reliable in the face of massive government intervention in the banking system. If a bank received TARP, for instance, its capital increases so that it will look safer. Thus, our tests capture the story of advances use prior to the pinnacle of the financial crisis, when the dual impacts of government liquidity intervention and doubts cast upon housing GSEs by the difficulties facing Fannie Mae and Freddie Mac would be difficult to disentangle from the trends in advances growth. The date of 2005 is our starting point as this is when the FHLBs begin reporting their financial statements to

the SEC, which provides us information on required capital stock levels for membership and activity, and information on bank official directorships held at district FHLBs. To be included in our sample, banks have to be listed in the Federal Financial Institutions Examination Council (FFIEC) Call Reports (Reports of Condition and Income), and thrifts have to be listed in the FFIEC Thrift Financial Report (TFR). We drop any banks and thrifts from the sample who are not FHLB members at any point during the sample. We map fields from TFRs into the same fields as those used by Call Reports where possible[7]. TFR reports over the period are hand-collected and converted to Call Report format. This conversion process is not required for thrifts after March 2012, as the TFR format has been eliminated after the closure of the Office of Thrift Supervision in October 2011: all banks and thrifts are now required to submit Call reports. We obtain data on bank failures and government-assisted transactions from FDIC's failed bank list. We hand-collect FHLB director information and capital stock requirements from FHLB 10-K reports from the SEC, and map this information into our call and thrift report dataset. We obtain savings and loan holding company information from the NIC. The dataset consists of 119,103 firm-quarter observations.

B. Variable Definitions

Variables used in this study include financial variables for advances holdings and bank risk measures that can be extracted from Call Reports and Thrift Financial Reports, stock market data from CRSP for publicly traded banks, SEC 10-K filings for FHLBs, and bank failure information from the FDIC. FHLB advances are reported in millions of dollars per quarter, and we convert these into quarterly and annual percentage point growth rates in advances. A bank's FHLB district is determined by the state of its headquarters as reported in the Call and Thrift reports and

[7] The field mappings between Call Reports and TFRs are based on documentation provided at: http://www.occ.gov/static/ots/thrift-financial-files/trf-call-report-mapping.pdf (last accessed 8/18/2014).

the mapping FHLB districts by state.[8]

System Share of Advances is calculated by summing all reported advances for an FHLB district per quarter, to scale a particular bank's reported advances. The same operation is performed at the district level for robustness. Note that this calculation is only capable of capturing advances which are reported in call and thrift reports, so any remaining advances to credit unions, insurance companies, and other financial institutions are not considered.

Implied capital stock is a novel variable that we construct using publicly available information. FHLB capital stock holdings are not uniquely identified in the Call and Thrift reports. However, the 10-K reports of each district FHLB are filed with the SEC, and they include the provisions for each FHLB's capital plan. Each FHLB sets its own capital stock requirements, subject to regulatory approval, and these plans include details about the capital stock ownership requirements, including membership stock (based on a percentage of a bank's total assets or total mortgage assets, and often subjected to caps and/or floors), and activity stock (based on a member's borrowing activity with the FHLB, which is not limited to advances borrowing). Using these specifications, which were hand-collected from each available district FHLB's 10-K report and matched to each bank and thrift in the sample based on their FHLB district, we compute an implied capital stock measure for each bank. The top 10 implied capital stock holders in quarter of 2005, quarter 3 of 2007, and quarter 3 of 2008 are listed in Appendix 1.

We confirm the validity of this measure by referencing the available information on the top capital stock holders for each district (available from the 10-K), and at the bank holding company level for the largest system borrowers (reported in the annual consolidated financial statements of the FHLB Office of Finance). Our implied capital stock is biased downward (and could be considered a minimum capital stock level that a bank would have been forced to hold at

[8]The district-level measures could be improved if historical membership data was available, but only current bank membership at the district level is posted online at the sites of the district FHLBs.

the FHLB), as our measures do not calculate capital stock that would be held against any other banking activity with the FHLB (standby letters of credit, any capital stock requirements for involvement in FHLB mortgage purchase programs, etc.). Mitigating the downward bias somewhat is that advances and capital stock held by other institutions, such as insurance companies, that do not file Call or Thrift reports are not included in the district capital stock requirements. Also, capital stock of the FHLB is subject to redemption restrictions that might leave an individual bank holding more capital stock from prior FHLB activity than required by its current quarter activity. Given these considerations, we report that our implied capital stock measure retains the appropriate capital stock rankings provided for the largest banks at the district and system level, and we conclude that it is a valid measure to test. Implied Capital Stock is defined for each bank according to the prevailing capital stock requirements for the quarter reported in the FHLB district 10-K reports and we scale this by the total amount of Implied Capital Stock we have calculated for the districts, so that it can be considered an estimate of the percentage of ownership of a district FHLB. We de-mean this variable in each quarter by size peer group so the differences in these measures will be more closely comparable between large and small firms.

The directors of each FHLB and their affiliated member-banks are reported in the district FHLB 10-K reports, and have been hand-collected and matched to the bank and thrift data. We create the dummy variable Bank has FHLB Director with this data, which equals 1 if a bank has an FHLB director in its district during the observation quarter, and 0 otherwise.

We gather information from call reports on bank holding companies, and from the NIC for savings and loan holding companies, to identify banks and thrifts whose holding companies operate in multiple FHLB districts. We create the dummy variable BHC has subsidiaries in multiple FHLB districts if the count of districts associated with the subsidiaries of a holding company in the observation quarter is greater than 1, and 0 otherwise.

Our first measure of risk is expected default frequency (EDF), which applies a probability distribution to a firm's distance to default. Distance to default is commonly calculated as:

$$\frac{\left(Market\,Value\,of\;Assets - Liabilities\,Payable\;\;in\;\;one - year\;period\right)}{One\;year\,standard\;\;deviation\;\;change\;\;in\;\;Market\;\;Value\;\;of\;\;Assets} \quad (1)$$

Higher values for distance to default imply a lower default risk. Market values of assets and asset return volatility cannot be directly observed, so an option pricing model is employed as in Merton 1974. Because equity is a call option on the firm's underlying market value, distance to default is computed from a firm's market equity values, the volatility of a firm's market equity values using lagged 12 monthly returns, and the book value of firm debt (where, as in Vassalou and Xing (2004) and Bharath and Shumway (2008) the relevant portion of the firm's debt is the firm's current liabilities and one-half of the firm's long-term debt). Equity data are from CRSP, and accounting data from COMPUSTAT.

Following Crosbie and Bohn (2003), we use the Black-Scholes option pricing model to calculate one-year distance to default, and we translate distance to default to EDF by applying a normal distribution. Our estimates of EDF will differ from KMV's estimates, which rely on a proprietary option pricing model and historical default distributions. As in Bharath and Shumway (2008), the volatility of asset returns is seeded as a function of equity return volatility and the equity to assets ratio. We demean EDF by size peer group in each quarter to account for distributional differences in EDF across our size strata.

Conditional EDF (Tobit) is a novel variable created to expand the risk analysis to all banks and thrifts in the sample. Utilizing EDF substantially diminishes our sample size, as we can only compute EDF for publicly traded firms. This also biases EDF-based samples towards over-representation of large firms. To create *Conditional EDF (Tobit), w*e perform a two-step procedure using EDF estimates, SEER risk rank model variables, and bank default in the next 8 quarters from the FDIC's failed bank list. Financial variables used to estimate this composite risk score for all banks in the sample include ROA, commercial loans to total assets, other real estate owned to total assets, equity to total assets, past due loans (30 days) to total assets, past due loans (90 days) to total assets, non-accrual loans to total assets, securities to total assets, jumbo CDs to

total assets, residential real estate to total assets, noncore funding to total assets, the log of total assets, commercial real estate to total assets, and 1-year GAP to Total Assets. This composite measure is not used to predict bank failure in our tests, it is simply a risk composite that is calibrated on bank failures which allows us to test and rank banks according to their risk in a given quarter. Considering the FHLBs' access to confidential bank examinations and to the collateral supporting advances, we believe that the FHLB lending decision as captured by the percentage change in a bank's advances should be well-informed by sophisticated risk modeling that we can only infer in hindsight. Thus, any look-ahead bias in our composite risk measure should not be a cause for great concern.

The problem is estimating the likelihood of default when the EDF of the bank is not directly observable because the bank is not publicly traded. Private banks will tend to be, but are not limited to, small (community) banks. Moreover, for some banks, most likely small (community) banks, we can observe failure in subsequent periods.

Let Y_i^* denote the true likelihood of default of bank i in period t. Y_i is the observed likelihood of failure. Specifically,

$$Y_i = \begin{cases} 1 & if \quad Y_i^* > \tau_U \\ EDF_i & if \quad \tau_U \geq Y_i^* \geq \tau_L \\ 0 & if \quad Y_i^* > \tau_L \end{cases} \tag{2}$$

Note that in (1), Y_i is a limited dependent variable that represents a composite default measure. $Y_i = 1$ are banks in quarter t that default sometime in the subsequent eight quarters $t+1$ to $t+8$. $Y_i = 0$ are banks in quarter t that do not experience default in the subsequent eight quarters and are not publicly traded.

We have a vector of variables $\mathbf{X}_i$ that predict Y_i^*; that is, $Y_i^* = \mathbf{X}_i\mathbf{b} + e_i$. These are the right-hand variables in the SEER model. $\mathbf{X}_i$ is always observable but Y_i^* is latent. Using OLS

to estimate $Y_i^* = \mathbf{X}_i\mathbf{b} + e_i$ will yield inconsistent coefficient estimates.[9] The proper procedure is to estimate as a Tobit regression with an unknown upper and lower bound. Because bounds cannot be determined *a priori*, it is acceptable to use $\max(\text{EDF}_i)$ and $\min(\text{EDF}_i)$ as the upper and lower bounds respectively. The impact of changes in upper and lower bounds on the estimated model was evaluated for robustness.

We add a dummy variable that equals 1 if a bank is a thrift, and 0 otherwise, called *Thrift Dummy*, to see if lending patterns are different between commercial banks and thrifts, (or alternatively, to absorb any systematic bias that could be present in the TFR to Call Report mapping scheme).

In the long-term advances and influence study, the change in flows between 2005 and 2008 is computed as follows:

$$\frac{(ADV_{i,2000:3} - ADV_{i,2008:3-4}) - (ADV_{i,2005:4} - ADV_{i,2005:4-4})}{\sum_i \left[(ADV_{i,2008:3} - ADV_{i,2008:3-4}) - (ADV_{i,2005:4} - ADV_{i,2005:4-4})\right]} \tag{3}$$

The lagged regressor when using the above specification is:

$$(ADV_{i,2005:4} - ADV_{i,2005:4-4}) / \sum_i (ADV_{i,2005:4} - ADV_{i,2005:4-4}) \tag{4}$$

The alternative specification for flows scaled by advances in 2008-2005 is:

$$\frac{(ADV_{i,2008:3} - ADV_{i,2008:3-4})}{\sum_i ADV_{i,2008:3-4}} - \frac{(ADV_{i,2005:4} - ADV_{i,2005:4-4})}{\sum_i ADV_{i,2005:4-4}} \tag{5}$$

The lagged regressor when using the above specification is:

$$(ADV_{i,2005:4} - ADV_{i,2005:4-4}) / \sum_i ADV_{i,2005:4-4} \tag{6}$$

The control measures used in our study include cash and securities scaled to total assets, the quarterly annualized return on assets, quarterly net interest income to net income, quarterly

[9]Without the Tobit boundary conditions in an OLS specification, the expected default frequency for some banks can be strongly negative. These specifications were performed for robustness, but interpretation

noninterest income to net income, total loans to total assets, total deposits to total assets, and other borrowed money (calculated without advances) to total assets.

C. Methodology

We employ several methods to test our hypotheses. First, to show that large banks accumulated disproportionately large shares of FHLB advances, we present regression results that focus on advances shares between the largest and smallest banks as the financial crisis deepened. All of our pooled OLS regressions are essentially SUR regressions, in which both a large bank regression and a small bank regression are separately nested in the overall regression specification. We achieve this by interacting each explanatory variable with the *large* and *(1-large)* dummy variables, which decomposes the explanatory variables into size strata. This allows us to test the significance of differences in variation across the size groups and within the size groups. The specification for these regressions follows:

$$Advances\ Share_i = \left\{ \begin{array}{l} \alpha_1 * D_i + \alpha_2 * (1 - D_i) \\ +\beta_1 Risk_{i,t-1} * D_i + \beta_2 Risk_{i,t-1} * (1 - D_i) \\ +\beta_3 Capital\ Stock_{i,t-1} * D_i + \beta_4 Capital\ Stock_{i,t-1} * (1 - D_i) \\ +\beta_5 Risk_{i,t-1} * Capital\ Stock * D_i \\ +\beta_6 Risk_{i,t-1} * Capital\ Stock * (1 - D_i) \\ +\beta_7 Director_{i,t-1} * D_i + \beta_8 Director_{i,t-1} * (1 - D_i) \\ +\beta_9 District_{i,t-1} * D_i + \beta_{10} District_{i,t-1} * (1 - D_i) \\ +\beta_{11} Controls_{i,t-1} * D_i + \beta_{12} Controls_{i,t-1} * (1 - D_i) \end{array} \right\} + e_i \quad (7)$$

where $D_i = 1$ if the bank is large and 0 otherwise. *Risk* is first defined as Demeaned EDF, and then as Demeaned Conditional EDF (Tobit) in each series of tests. *Capital Stock* is peer-group Demeaned Implied Capital Stock. *Director* is the dummy variable Bank has FHLB Director, and *District* is the dummy variable BHC has subsidiaries in multiple FHLB districts. *Controls* include annualized quarterly return on assets, (cash + sec) to assets, other borrowed money to assets, total loans to assets, deposits to assets, the thrift dummy, and quarterly time

dummies. All explanatory variables are lagged one quarter. We capture the predicted values, residuals, and coefficients on influence variables from these regressions to use in later stages of testing. Attempts to anchor the above regression with a lagged dependent variable induces a unit root problem, and so the dependent variable must be differenced. These results are omitted for brevity, but are largely consistent with the moral hazard and influence story.

We conduct tests on the long-term changes in advances flows across our sample period, reducing each bank to a single observation of changes from 2005 to 2008. These tests are specified by the following regression equation:

$$Advances\ Flows_{i,2008:3-2005:4} = \left\{ \begin{array}{l} \alpha_1 * D_{i,2005:4} + \alpha_2 * (1 - D_{i,2005:4}) \\ +\beta_1 Avg\ Risk_{i,2005} * D_{i,2005:4} \\ +\beta_2 Avg\ Risk_{i,2005} * (1 - D_{i,2005:4}) \\ +\beta_3 \Delta Avg\ Risk_{i,2008-2005} * D_{i,2005:4} \\ +\beta_4 \Delta Avg\ Risk_{i,2008-2005} * (1 - D_{i,2005:4}) \\ +\beta_5 Capital\ Stock_{i,2005:4} * D_{i,2005:4} \\ +\beta_6 Capital\ Stock_{i,2005:4} * (1 - D_{i,2005:4}) \\ +\beta_7 \Delta Capital\ Stock_{i,2008-2005} * D_{i,2005:4} \\ +\beta_8 \Delta Capital\ Stock_{i,2008} * (1 - D_{i,2005:4}) \\ +\beta_9 Director_{i,2005:4} * D_{i,2005:4} \\ +\beta_{10} Director_{i,2005:4} * (1 - D_{i,2005:4}) \\ +\beta_{11} District_{i,2005:4} * D_{i,2005:4} \\ +\beta_{12} District_{i,2005:4} * (1 - D_{i,2005:4}) \\ +\beta_{13} Controls_{i,2005:4} * D_{i,2005:4} \\ +\beta_{14} Controls_{i,2005:4} * (1 - D_{i,2005:4}) \end{array} \right\} + e_i \quad (8)$$

$D_{i,2005:4}$ is the dummy variable equal to 1 if a bank had greater than $10 billion in assets in the fourth quarter of 2005 ($Advances\ Flows_{i,2008:3-2005:4}$ is the 2008 – 2005 change in advances flows, as specified in Equation 3. The alternative specification presented for the flows variable in Equation 5 is also explored. $Avg.Risk_{i,2005}$ is presented first as the quarterly average Demeaned EDF, and then as the quarterly average Demeaned Conditional EDF (Tobit) for 2005. $\Delta Avg.Risk_{i,2008-2005}$ subtracts the trailing 4 quarter average risk measure for Q3 2008 from the

quarterly average risk measure for 2005. $Capital\ Stock_{i,2005:4}$ is the Demeaned Implied Capital Stock for the firm as of Q4 2005. $\Delta Avg.Capital\ Stock_{i,2008-2005}$ subtracts the trailing 4 quarter average Implied Capital Stock measure for 2008 Q3 from the quarterly average Implied Capital Stock measure for 2005. $Director_{i,2005:4}$ is the dummy variable that indicates if a firm had an FHLB director in the fourth quarter of 2005. $District_{i,2005:4}$ is the dummy variable that indicates if a holding company operated in multiple FHLB districts in the fourth quarter of 2005. The controls are all taken in the fourth quarter of 2005, and include the appropriate lagged regressors from Equations 4 and 6, and annualized quarterly return on assets, (cash + sec) to assets, other borrowed money to assets, total loans to assets, deposits to assets, and the thrift dummy. All variables are again interacted with *large* and *(1-large)* to separate the effects by size. The combinations of risk specifications and dependent variable specifications lead to 4 main tests in this battery.

We collect the predictions and residuals from the tests using the pooled OLS regressions in Equation 7 for use in the next series of tests. The predicted change in advances becomes our measure of advances changes that we would predict based on influence, and the residual becomes the random component. This construction allows us to separate the portion of advances associated with endogenous shifts in advances due to a bank's influence on the FHLB, and a more exogenous component of advances that was not predicted by our influence model. The first specification of this regression style is as follows:

$$\Delta Balance\ Sheet_{i,t:t-1} = \left\{ \begin{array}{l} \alpha_1 * D_i + \alpha_2 * (1 - D_i) \\ +\beta_1 Influence\ Advances_{i,t-1} * D_i \\ +\beta_2 Influence\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_3 NonInfluence\ Advances_{i,t-1} * D_i \\ +\beta_4 Noninfluence\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_5 Positive\ Residual\ Advances_{i,t-1} * D_i \\ +\beta_6 Positive\ Residual\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_7 Negative\ Residual\ Advances_{i,t-1} * D_i \\ +\beta_8 Negative\ Residual\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_9 Controls_{i,t-1} * D_i + \beta_{10} Controls_{i,t-1} * (1 - D_i) \end{array} \right\} + e_i \quad (9)$$

$\Delta BalanceSheet_{i,t:t-1}$ is the lagged-asset-scaled quarterly difference in the following variables of interest: cash + securities + fed funds sold + reverse repos, net loans, deposits, and other borrowed money (adjusted to remove advances). D_i =1 if the bank is large and 0 otherwise. $\widehat{InfluenceAdvances}$ is calculated by applying the coefficients for demeaned implied capital stock, districts, and director from the regression in Equation 7, and multiplying them by each firm's values for these variables. This creates a predicted advances share that has controlled for each of the risk and control variables included in the Equation 7. $\widehat{NonInfluenceAdvances}$ is calculated by subtracting $\widehat{InfluenceAdvances}$ from the regression prediction. This captures the predicted values for advances shares which are not based on the influence variables, but are predicted based on risk and control variables. $PositiveResidualAdvances$ is the upside shock from the prediction model, and is calculated as the greater of 0 or the residual on the observation. $NegativeResidualAdvances$ is the downside shock from the prediction model, and is calculated as the lesser of 0 or the residual on the observation. The controls remain the same as in Equation 7.

For robustness, we conduct a similar test of balance sheet changes that employs the prediction and the residual from Equation 7 without breaking the prediction into "influenced and non-influenced advances". The regression model follows:

$$\Delta Balance\ Sheet_{i,t:t-1} = \left\{ \begin{array}{l} \alpha_1 * D_i + \alpha_2 * (1 - D_i) \\ +\beta_1 Advances_{i,t-1} * D_i \\ +\beta_2 Advances_{i,t-1} * (1 - D_i) \\ +\beta_3 Positive\ Residual\ Advances_{i,t-1} * D_i \\ +\beta_4 Positive\ Residual\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_5 Negative\ Residual\ Advances_{i,t-1} * D_i \\ +\beta_6 Negative\ Residual\ Advances_{i,t-1} * (1 - D_i) \\ +\beta_9 Controls_{i,t-1} * D_i + \beta_{10} Controls_{i,t-1} * (1 - D_i) \end{array} \right\} + e_i \quad (10)$$

where *Advances* is the predicted share of system advances from Equation 7. The remainder of the variables in Equation 10 are equivalent to their counterparts in Equation 9 in this specification.

IV. Empirical Results

A. Descriptive Statistics

Table 1 provides details on inflation-adjusted advances growth percentages in each quarter between March 2005 and September 2008 (the first values provided in the table are in June 2005, representing growth from Q1 to Q2), at the industry level, at the individual bank level for community banks and large banks, at an individual bank and a holding company basis. Support for the first research question is provided in the table, particularly in Panel C, which shows that advances flowed disproportionately to the largest banks as the financial crisis deepened.

[Table 1]

Panel A provides the raw growth numbers at the industry level, community bank level <$10 billion in assets) and large bank level (>$50 billion in assets), at the top-holder level for each category. Average quarterly growth rates for each category are provided in the final column, and the rates reported are sums of advances at the industry level, and are not averages of individual bank advances growth rates. Notably, in Panel A, we can deduce that the average growth rate in advances at the industry level of 4.6% was driven mostly by growth in the advances of large banks (7.8% growth at the bank level, and 7.7% growth at the holding

company level). In particular, the extreme growth between June and September 2007 captures a majority of the buildup in advances, including the growth in advances to Countrywide, and massive increases in other large bank advances positions (including Citibank, Washington Mutual, Bank of America, and Wells Fargo). From Panel A, we report that the period leading to the height of the financial crisis yielded a large increase in advances to the largest member banks, while community banks saw anemic growth rates in advances (1.7%, or 1.8% at the holding company level, on average). Advances dollars and classifications are adjusted for inflation using a basis of January 2007 GDP levels. Panel B shows how community banks and large banks diverged from industry averages: community banks experienced 2.8% lower growth than average, while large banks experienced 3.2% higher growth than average. Panel C provides direct comparisons of advances growth differences between community banks and large banks, and shows that community banks advances growth over the period was 6.0% lower than advances growth for large banks.

Summary statistics for the relevant test variables are presented in Table 2, and are grouped by community, regional, and large bank qualifiers.

[Table 2]

B. FHLB Advances Shares by Bank Size, Risk, and Influence

Table 3a and 3b report regression results for the advances share on size, risk, and influence. The dependent variable are the shares of FHLB advances across banks. Periodicity is quarterly. The period is from 2005 to third quarter of 2008, and the tests are pooled OLS with quarter dummies. In the first, EDF is used as the measure of bank failure, which limits the sample size to include only publicly traded banks. In the second, for non-publicly traded banks, bank failure includes EDF and a dummy variable that equals 1 if banks defaulted in the subsequent eight (8) months. Tobit is used in the second set of results.

The intuition in the Tobit regressions is recognizing that bank failure is a latent variable. EDF is a good proxy, but it is observable only for publicly traded banks. Based on the

characteristics of publicly traded banks that have an EDF, the procedure imputes an EDF for banks that failed in the subsequent eight (8) months as well as for banks where there is no information about its likelihood of failure. The first and 99th percentiles on EDF are used as the lower and upper bounds respectively. The characteristics of publicly traded banks in this range are used as the reference group.

[Table 3a]

In Column 1 of Table 3a, using demeaned EDF as the risk measure, we can clearly see the large banks accumulating larger shares of system advances even as they become more risky (consistent with moral hazard), while smaller banks increase advances shares only when they are less risky (consistent with protection of FHLB charter value). Using EDF limits the sample size to 14,023 observations. The positive and significant coefficient on the *large* variable (3.23) and *Demeaned EDF$_{t-1}$ * large* (1.04) indicate that large banks accumulate more system advances, and that risk does not impede this process. For smaller banks, the story is mixed: the positive and significant coefficient on the *(1-large)* variable indicates that smaller banks in general increased their shares of system advances, but the negative coefficient on *Demeaned EDF$_{t-1}$ * (1-large)* of (-0.07) indicates that smaller risky banks did not increase their advances shares. Column 2 of Table 3a removes the impacts of risk to evaluate size and influence variables on advances shares. Note that the large and small intercepts are now significantly negative for both large (-0.59) and small banks (-0.27). This is because asset size is a less specific measure of bank influence than *Demeaned Implied Capital Stock$_{t-1}$*, which is significant and positive for both large banks (0.80) and small banks (0.23). Large banks with FHLB directors are seen to increase advances shares somewhat (0.05), while this impact is not significant for small banks. Among the publicly traded banks in the EDF sample, access to multiple district FHLBs increases the share of system advances (0.04), but again this is not a significant effect for smaller banks. Column 3 of Table 3a includes size, risk, and implied capital stock in the specification. Again, pure size effects for both large (-0.56) and small (-0.27) banks are overwhelmed by the more specific measure of

Demeaned Implied Capital Stock$_{t-1}$, which retains its significant and positive impacts from the previous regression for both large (0.80) and small (0.23) top-level publicly traded banks in the sample. The risk measure *Demeaned EDF$_{t-1}$* is again significant and positive for large banks (0.32, consistent with moral hazard), but insignificant for small banks. Column 4 of Table 3a adds the interaction of risk and capital stock to the regression, and the results on the interaction terms clearly demonstrate the moral hazard problem with the banks that have larger shares of advances than their large group peers: *Demeaned EDF$_{t-1}$ * Demeaned Implied Capital Stock$_{t-1}$* is positive and significant for the large banks (0.35), but insignificant for the smaller banks. The remaining coefficients are consistent in sign and magnitude with the regressions presented in columns 2 and 3. Column 5 evaluates the model with the risk measure, the interaction between capital stock and risk, and the influence variables. Here, we can see the size dummies once again load positively and significantly in the absence of the implied capital stock measure (2.69 for the large group, 1.04 for the small group), and the interaction of capital stock and risk is positive and significant for the large bank sample (0.85) but insignificant for the smaller banks. Notably, removing implied capital stock here induces instabilities among the remaining influence variables, with *Bank Has FHLB Director$_{t-1}$* becoming significantly negative for the large banks, and *BHC has subsidiaries in multiple FHLB districts$_{t-1}$* increasing by an order of magnitude (0.39) for the large banks. Column 6 provides the fully saturated model, which will be used to predict advances shares in the regressions presented in tables 6a and 7a. Here, the size coefficients are again negative and significant, being dominated by the capital stock measure, for both large (-0.51) and small (-0.23) banks. Interestingly, in the fully saturated model, *Demeaned EDF$_{t-1}$* does not significantly load for either large or small banks. The effect of capital stock on advances shares is again positive and significant for large (0.78) and small (0.23) banks. The interaction of risk and capital stock is again positive and significant for the largest banks (0.35), consistent with the moral hazard narrative that large, risky, influential banks will increase advances shares, but smaller, risky banks will see shrinking advances shares as they are subject to FHLB charter value protection. Large banks with directors appear to use their positions to

build advances shares in ways that small banks do not (0.05), and large banks with presences in multiple FHLB districts also seem to be at an advantage in building advances shares (0.04), an effect not seen in the smaller banks.

Table 3b presents similar results to Table 3a, but uses the *Demeaned Conditional EDF (Tobit)*$_{t-1}$ as the risk variable, which increases the sample size to 104,925 observations.

[Table 3b]

In the larger sample including private banks, the size variables remain positive and significant for the large banks and the small banks in all regression specifications. Moral hazard is evident in the signs and magnitude of the *Demeaned conditional EDF (Tobit)*$_{t-1}$ for the large banks in columns 1 (21.57), 5 (18.06), and 6 (5.23), although it does change signs in the specification with risk and capital stock in column 3. Moral hazard appears for the small banks in the positive coefficients on *Demeaned Conditional EDF (Tobit)*$_{t-1}$ ** (1-large)* in column 1 (0.26) and column 5 (0.13), though both positive coefficients are substantially lower in magnitude than their large bank counterparts. *Demeaned Implied Capital Stock*$_{t-1}$ is positive and significant in both size groups across all regression specifications, indicating the persistent effect of influence in the expanded sample. The impact of peer group Demeaned implied capital stock is greater in magnitude for the large banks. The interaction term *Demeaned Conditional EDF (Tobit)*$_{t-1}$ ** Demeaned Implied Capital Stock*$_{t-1}$ is positive and significant in all regression specifications for the larger banks, demonstrating a consistent result with Table 3a with large, risky, influential banks accumulating larger shares of advances than their smaller counterparts. The coefficients for the smaller banks are either negative or much lower in magnitude for the interaction variable. Again we see positive, significant coefficients for large banks with FHLB directors in all specifications, and no significant loading on this variable for smaller banks. Interestingly, in the larger sample including private banks, the impact of *BHC has subsidiaries in multiple FHLB districts*$_{t-1}$ is negative in three out of four specifications, where it was positive in the public sample. Small banks do not significantly load on these factors in either risk specification.

The results show that moral hazard and influence impact the share of advances that banks receive from the FHLB. Moral hazard is significant only for large banks. Further, the likelihood of failure and implied capital stock are correlated. Banks with high ownership and likelihood of failure receive a larger share of FHLB advances. The interactions between the likelihood of failure and implied capital stock are positive and significant. Moral hazard played a role in the share of FHLB advances that banks received. Specifically, through each quarter from 2005 through the third quarter of 2008, a bank's share of FHLB advances is greater, the higher is the bank's probability of failure. As expected, the impact of failure on the share of advances is significant only for large banks and not for small (community) banks. Moral hazard is evident throughout this period.

The tables also show that influence played a role in a bank's share of FHLB advances. Banks with larger implied capital stock relative to the average of its peer group of large or small (community) banks received a significantly larger share of advances. Moreover, the magnitude is significantly greater for large than small (community) banks. For large banks, the presence of a director on the FHLB bank also raised its share of FHLB advances. Lastly, the impact of operating in multi-districts was relatively minor and significantly negative only for small (community) banks (as expected).

The regressions control for bank characteristics. Banks that were more profitable, experienced higher growth in liquidity and lending, as well as less dependent on deposits and other borrowed funds, received higher shares of FHLB advances. These results are robust to model specification[10] and show clearly that moral hazard and influence are important determinants of the share of FHLB advances across banks. This finding is novel in the literature. Prior studies implicitly assumed that the level of FHLB advances and changes in the level of

[10]Alterative specifications include using the SEER model of bank failure probability and using unrestricted OLS rather than Tobit-estimated EDF, using the share of quarterly advances flows as the dependent variable, orthogonalization of the dependent variables, performing the tests at the bank and thrift level rather than the top-holder level, and varying the size threshold for the *large* dummy variable.

FHLB advances reflect moral hazard.

Note that for the case where banks are restricted to publicly traded banks with EDFs, the coefficient on default likelihood is negative and significant for large banks. For the case where all banks are considered, the story of moral hazard and influence continues to hold. Simply adding a lagged dependent variable, $ADV_{i,t-1}/\sum_i ADV_{i,t-1}$, to these equations is econometrically problematic as it induces a unit root problem. These terms introduce bank specific autoregressive error terms into essentially cross-sectional regressions.

Optimally, we would like to directly estimate changes in the share (or use) of advances over time. The above results provide evidence that banks with more influence over the FHLB tend to hold more advances in the short-run, even as those banks grow riskier. However, the dynamics of advances over longer time horizons may paint a different picture, and FHLB charter value concerns may dominate moral hazard incentives. To directly address the change in the share (or use) of advances over time, the next phase of analysis is conducted on a cross-section of long-term changes in advances and risk across the sample period. The most powerful evidence of moral hazard would be that a given bank is obtaining more advances even as its risk profile grows, and this is the focus of our investigation in the next set of tests.

Table 4a presents the first of our long-term advances flows tests, using the dependent variable *Advances Flows 2008:3-2005:4 scaled by 2005:4 system advances* presented in Equation 3, and EDF as the risk measure of interest. Using EDF in this specification limits our sample to 254 observations.

[Table 4a]

The long-term advances and risk regressions are more subtle than the pooled OLS regressions presented in tables 3a and 3b. Note that in Column 1 of Table 4a, only the size dummy variables and the initial levels of *Demeaned avg. quarterly* EDF_{2005} are included in the analysis, and only the large size dummy shows a significant coefficient loading (0.07). In each specification, the large dummy retains its positive loading, though its magnitude and significance

are diminished in tests that include capital stock. Notably, *Demeaned avg. quarterly EDF * large*$_{2005}$ is only significant in the specifications of column 3 and column 7, and it is negative in both specifications. This indicates a twist in the moral hazard story that is missed by cross-sectional tests that only capture short-term effects: in the long run, it appears that riskier banks may be less likely to sustain high levels of advances borrowing. In the long run, it appears that the protection of FHLB charter value may be more important than the moral hazard story. However, with the relative insignificance on this coefficient across regression specifications, it is important not to read too much into this result. The consistently negative and significant coefficients on *Demeaned avg. quarterly* Δ*EDF * large* $_{2008\text{-}2005}$ provide more compelling results. Large banks that became more risky than their peers between 2005 and 2008 were less likely to receive larger flows of advances over the same period. We can also see that *Demeaned Implied Capital Stock * large*$_{2005:4}$ is negative and significant in 5 out of 6 regression specifications in which it appears, so the anchored value of beginning capital stock does not predict the overall changes in advances. Influence on the FHLB lending decision also appears to be a more short-term phenomenon. A more specific interpretation of this result is that as the financial crisis deepened, large banks who may not have started with large levels of advances flows were likely to become significant advances borrowers, displacing the existing heaviest users of advances and capturing more of the overall system flows of advances. Indicating the shifting dynamics of influence over the period, the coefficients on Δ*Avg. Implied Capital Stock * large* $_{2008\text{-}2005}$ are positive and significant in each regression specification. *BHC has subsidiaries in multiple FHLB districts* only significantly impacts the large banks (0.002) in the fully saturated model in Column 8, while the *Bank has FHLB director* variable is omitted from the presentation because no banks in the publicly traded EDF sample with available data in 2005 and 2008 had an FHLB director. Note that the small bank regressors of interest are insignificant in each regression specification.

Table 4b presents a similar regression specification to Table 4a, replacing EDF as the risk variable with the conditional expected EDF from the Tobit model. This substantially increases

the sample size to 5,317.

[Table 4b]

The conclusions from Table 4b are similar to Table 4a in many ways (large banks received more flows, beginning risk and beginning capital stock is negatively related to long-term advances flows in most specifications, and few of the variables explain changes in advances flows for the smaller banks), but the differences are worth highlighting. We do see a positive relationship between large risky banks at the beginning of the period and advances flows in two of the specifications: column 6 (0.01) and the fully saturated model in column 8 (0.01). We also see some evidence of moral hazard in the larger banks which whose risk increased, from the 0.07 and 0.06 coefficients on *Demeaned avg. quarterly* Δ *Tobit EDF * large* $_{2008\text{-}2005}$ in columns 2 and 3. Beginning capital stock is significantly negatively related to advances flows for the large and small banks in all specifications, and again the change in capital stock for the large banks is positively related to advances flows in columns 5, 6, and 8. Large banks who begin the period with FHLB directors are less likely to receive higher advances flows in the long run, while the coefficient loading on *BHC has subsidiaries in multiple FHLB districts * large* $_{2005:4}$ offers mixed results of low magnitude across the regression specifications. When the sample is expanded to include the private banks, the long-term moral hazard interpretation becomes harder to ignore. Perhaps what is driving the differences in Table 4a and 4b is a difference in the long-term treatment of a publicly traded, risky, influential bank by the FHLB and an equivalent privately held bank. These results are mixed, and invite further investigation of long-term influence and moral hazard at the FHLBs.

We conduct these regressions again with our alternative dependent variable specification, advances flows scaled to the system changes in flows (Equation 5). Table 5a presents these results with EDF as the risk variable, again providing 254 observations.

[Table 5a]

With this dependent variable specification, the coefficient magnitudes are stronger, the overall model fit is higher, and the signs of all significant coefficients mirror the results from Table 4a. Again we see that large banks increased their advances flows in all specifications, and *Demeaned avg. quarterly EDF * large*$_{2005}$ is again negative in the two specifications in which it is significant, while the change in EDF is negatively significant across all specifications. Beginning implied capital stock remains negative in the regressions in which it is significant, while the increase in capital stock for large banks increases advances flows each time it is included in the model. *BHC has subsidiaries in multiple FHLB districts * large* $_{2005:4}$ is only significant in the fully saturated model, and no banks with directors make it into the EDF-based sample.

Table 5b repeats the process from Table 4b, using the alternative advances flow measure and *Conditional EDF (Tobit)* as the risk measure.

[Table 5b]

The large dummy variable remains positive and significant in this specification, as it was in 4b. Consistently across all regression specifications in Table 4a, 4b, 5a, and 5b, we have found a substantial increase in advances flows for the largest banks, which corresponds to the trend reported in Figure 1 and Table 1. Table 5b does differ from Table 4b in several columns, specifically the regressions from columns 5, 6, and 8. Here, the signs on *Demeaned Implied Capital Stock * Large*$_{2005:4}$ flip to positive (0.003, 0.003, and 0.002 respectively), though the magnitude on these coefficients is quite low across all specifications. Also, in this specification, no value of *Demeaned Implied Capital Stock * (1-large)*$_{2005:4}$ is significant, which contrasts with the coefficients from Table 4b. The remainder of the coefficients retain their signs from table 4b and generally increase in magnitude.

We return next to the full data set and the pooled OLS regressions to evaluate the impact of advances share on four balance sheet items of interest: change in cash + securities + fed funds sold + reverse repos to assets, change in net loans to assets, change in deposits to assets, and

change in other borrowed money (less advances) to assets. We use the test specification in Equation 9 and the predictions and residuals on advances shares from Column 6 of Table 3a in Table 6a.

[Table 6a]

This table presents regressors which include the size dummy variables and a decomposition of advances shares into the prediction of advances share that can be explained by influence, the prediction of advances share that is not associated with influence variables, and the residuals of the prediction and the observed advances share, split between positive residuals and negative residuals. Note that the estimations used in Table 6a were based on Table 3a, which used EDF as the risk variable and thus reduced the final sample size to 13,636 observations. The first column examines liquidity with the variable *Change in Cash, Sec, FFS, RR* which is scaled to lagged assets. Large banks tended to increase liquidity during the sample, (39.51), while small banks decreased liquidity (-19.16). The influence-predicted share of system advances is not significant for the large banks, but the influence-predicted share of system advances for the smaller banks leads to a decline in liquidity (-9.74). So, smaller, influential banks did not use their advances shares to increase their liquidity. The non-influence-predicted share of system advances is significantly positive for the large banks (7.48) and negative for the small banks (-55.10). A positive shock to advances shares for larger banks was not used to increase liquidity for the larger banks (-2.22), but smaller banks who experienced positive shocks to advances shares used these shocks to increase liquidity (16.76). When large banks received less than the predicted amount of advances, they increased liquidity (1.24), but when small banks received similar negative shocks, they decreased liquidity substantially (-31.85). This likely reflects differences in funding sources for large and small banks, and the criticality of advances funding for the smaller banks. There were significant differences in the relationship between advances and liquidity among the large and small banks. The second column of the table examines the quarterly change in net loans to assets. Large banks increased net loans over the period, while smaller banks

decreased lending. Again, the influence-predicted share of system advances is not significant for the large banks, but it is significant and negative for the smaller banks (-48.00). The large bank non-influence-predicted share of advances is positive and significant (36.94: when large banks received advances in accordance with risk modeling and firm characteristics, and were not using their clout to influence further advances, they tended to increase their lending). The opposite story appears for the smaller banks and their predicted non-influenced share of advances, as this is associated with a significantly negative change in net loans (-272.31). Large banks who received positive shocks to advances decreased net loans (6.11), while the small banks experiencing positive shocks increased net loans (-157.32). Large banks experiencing negative shocks increased net loans (6.11), while small banks with negative shocks decreased net loans (-157.32). The third column captures the change in deposits to total assets, which should substitute for advances. Large banks saw an increase in deposits while small banks saw a decrease. Influence-predicted advances share increases for large banks decreased the deposits of small banks (-43.65). The non-influence-predicted share of system advances for large banks is associated with an increase in deposits (33.56), while it is associated with a decrease in deposits for the smaller banks (-247.43). Positive shocks to system advances induce decreases in deposits for large banks (-9.96) and increases in deposits for small banks (75.36), while negative shocks for large banks increase the reliance on deposits (consistent with substitution at the larger banks, at 5.56) while small banks with negative shocks to advances experience declines in advances (indicating that negative shocks may indicate more severe problems for small banks). The fourth column explores the change in other borrowed money (calculated without advances and scaled by assets). Large banks showed an overall increase in OBM, while small banks in the public sample saw a decrease. The influence-predicted share of advances for the small banks is associated with a decline in OBM for the smaller banks (-5.95). Non-influence-predicted advances share is positively related to OBM for the larger banks (4.58) and negatively related to OBM for the small banks (-33.80). Positive shocks to advances shares were negatively related to OBM for the large banks (-1.36), and positively related to OBM for the smaller banks (10.30).

Negative shocks to advances share are positively related to OBM for the large banks, and negatively related to OBM for the smaller banks.

The consistency across the signs for large and small banks across each of the balance sheet measures compels us to examine the larger sample more intently. The small bank underrepresentation in the EDF sample may be driving much of the sign consistency here. Table 6b presents the same regression specification, using the Conditional EDF (Tobit) risk measure in the prediction regressions from Table 3b, column 6, resulting in an expanded sample size of 97,197 that includes public and private banks.

[Table 6b]

Large banks tended to increase liquidity (1.87), increased loans (2.00), increased deposits (3.35), and increased OBM (0.10) during the sample period, while small banks decreased liquidity (-0.05). Large bank influence-predicted advances share was associated with less net loans (-0.01) and less OBM (-0.001). Small bank influence-predicted advances share was associated with less liquidity (-0.16), lower net loans (-0.39), reduced deposits (-0.54), and lower OBM (-0.02). The non-influence-predicted component of advances was related to fewer net loans (-0.09) and less OBM (-0.01) for large banks, while it was only associated with lower OBM for small banks (-0.03). Positive shocks to system shares of advances are associated with lower liquidity (-0.06), lower net loans (-0.06), and lower deposits (-0.11) for large banks, and lower liquidity (-0.31) and lower deposits (-0.42) for small banks. Negative shocks to advances shares were associated with increased liquidity (0.06), increased net loans (0.07), increased deposits (0.12) and increased OBM (0.004) for the large banks, and with lower OBM (-0.02) for the small banks.

We conduct a similar study in which the predicted advances are not decomposed by influence- and non-influence components, which follows the specification from Equation 10. Table 7a presents this specification using the predictions from table 3a, column 6, which used EDF as the risk metric and ultimately produces a sample with 13,363 observations.

[Table 7a]

The results are generally consistent with table 6a, by design. The difference here is in the variable *Predicted share of system advances*$_{t-1}$, which is associated with statistically significant decreases in liquidity (-14.31), net loans (-70.58), deposits (-64.17) and OBM (-8.76) for the small banks.

In case the consistency of these coefficient estimates are being driven by the lack of private banks in the EDF sample, we also include table 7b, which presents this general specification while using the predictions and residuals from table 3b, column 6, using the conditional expected EDF (Tobit) estimation, providing a sample size of 97,917 observations.

[Table 7b]

The results here substantially mirror the results of table 6b, by design. The significant difference is in the combination of the predicted variables into the *Predicted share of system advances*$_{t-1}$, which is associated with lower OBM for the large banks (-0.001), and lower liquidity (-0.17), net loans (-0.40), deposits (-0.55), and OBM (-0.01) for the small banks.

V. Robustness Tests

One of the traditional dependent variables to test in the advances literature is advances scaled to assets. When we conduct the advances to assets tests, we can consider the share of advances to be another version of the influence variable. We conduct the following OLS regressions with firm and year fixed effects over the same sample period. We also provide an additional size strata in this regression specification to separate the community banks (with less than $10 billion in assets) and the largest banks (with greater than $50 billion in assets). This construction means that the base case is those banks between $10 billion and $50 billion in assets, which we loosely refer to as regional banks. Note that without the full suite of size dummy interactions used in the prior tests, these are not SUR regressions. We use our estimation of the SEER risk rank model, which incorporates the same right-hand-side variables used in the Tobit EDF estimation to construct the probability that a bank will fail within the next 8 quarters.

We do not combine EDF in this risk estimation. The sample is taken at the bank and thrift level, and we conduct F-tests on the significance of the interactions between the risk and size variables. Table 8a presents these tests.

[Table 8a]

The large bank dummy is significantly associated with a lower advances to assets ratio across all regression specifications, which is likely due to the overall lower percentage of assets in the largest banks that are likely to be funded purely by advances. Some bank holding companies maintain branches which will borrow heavily from the home loan banks, but these branches rarely cross into our largest size category in these tests. Risk is positively associated with advances to total assets in all specifications in this table, which reiterates concerns about moral hazard. When we examine the interactions between size and risk, in community banks we find mixed results: in column 1 we find a 0.09 coefficient, while in the fully saturated model in column 5 we alternatively see a -0.03 coefficient, and the remainder of the specifications are insignificant. For the largest banks, however, the moral hazard story is much more distinct. In all specifications, the variable $Large_{t-1}$* $risk_{t-1}$ is positive and significant. Advances share in this regression specification is performed at the district level, and is positively related to the advances to assets ratio in each specification in which it appears. District percentage of implied capital stock is positively related to the advances ratio in column 2, but when combined with the district share of advances in column 5, the two variables compete for explanatory power. *Bank Has FHLB Director*$_{t-1}$ is positively, significantly related to the advances ratio across all specifications, as is the dummy variable *Holding company in multiple districts* $_{t-1}$. Influence significantly impacts the traditional measures of advances used in prior research, and size matters: the difference between the large and small variables is significant in 3 of the 5 F-tests, and the differences between the risk and size interactions are significant in all 5 of the F-tests.

In a similar progression from levels of advances to changes in advances that we used earlier in the paper, we also conducted this set of regressions using quarterly advances growth, which

we Winsorized at the 1% and 99% levels. As these tests are on differences, we do not employ the firm fixed effect specification, although we do include quarterly time dummies. The results are presented in Table 8b.

[Table 8b]

Notably, the reduced growth in advances among the community banks is significant in all specifications, while the large bank growth in advances is also significant. The moral hazard story, however, only appears in the risk interaction for the largest banks, where it is significant and positive across all regression specifications. Lagged district share of advances and implied capital stock are negatively related to quarterly growth, while a bank having an FHLB director is positively related to advances growth, and banks whose holding companies operate in multiple districts saw greater advances growth as well. The F-tests comparing the size variables are significant across all specifications, but overall the panel of quarterly advances growth offers the least convincing model in terms of R-squared. We attribute this to scaling problems in advances growth which still create outliers in the data, even after Winsorization.

We have performed these regressions across multiple specifications: orthogonalized influence variables, merger-adjusted advances levels, using standardized fractiles of the risk measure, using various thresholds for the Winsorization technique (including omitting it altogether), and conducting the tests at the top-holder level.

VI. Discussion and Conclusion

In this paper, we show that advances flowed disproportionately to the largest banks as the financial crisis deepened. The large banks that received additional advances had risk profiles at least as high as the community banks that did not receive additional advances, and the access to advances prior to bank failure was substantially higher for larger banks than for community banks. Controlling for risk, banks with the most economic influence over their respective FHLBs were more likely to obtain advances. We provide more nuanced measures of influence that may allow for further analysis than a simple size cutoff, and our results paint a cautionary

tale about the incentives embedded in the advances product, and the pitfalls of assuming that prudent lending standards and self-regulation will suffice to protect the FHLB System (and ultimately the taxpayer through the FDIC's Deposit Insurance Fund).

Large banks have become the primary consumers of FHLB advances, and tend to treat FHLB advances as wholesale fungible capital at favorable rates, in part as a result of government guarantees (Frame et al., 2007; Davidson 2012). With documented connections between FHLB advances and moral hazard, the costs of unravelling a large bank's FHLB advances in times of trouble, and the ultimate externalization of these costs to the FDIC if a member bank is taken into receivership, the moral hazard incentives presented to large banks warrant a policy discussion about the appropriate constraints on borrowing from this government-sponsored enterprise. Even Countrywide's CEO, Angelo Mozilo, condemned his firm's dependence on FHLB advances after public scrutiny of the 2007 increase in advances, stating: "You can't just get a charter and go in and borrow from the bank, and that's it, that's your franchise. You have to have a reliable source of deposits" (Vekshin 2007). Further, the issues of systemic risk from the nation's largest, most interconnected banks borrowing from a GSE composed of the banking industry should be addressed.

The FHLB played a role as a liquidity provider in the financial crisis, but careful thought is needed to ensure that this special crisis role does not become a new norm. With the growth in FHLB advances by large banks, and their treatment of advances as fungible non-risk priced capital, it is important that the FHLB focus on its core mission of expansion of residential mortgage and community development financing.

We believe that the discretion that the FHLBs have to lend to member banks must be limited by regulation. A proposal that we advocate is that advances be treated the same as brokered deposits where access is diminished as the bank's risk increases. Indeed, it is likely that such a policy would be in place already had Countrywide failed. The FHLBs escaped intense Congressional scrutiny following the subprime financial crisis in large part because Countrywide losses were absorbed by Bank of America shareholders rather than the FDIC. The level to which

large banks are allowed to participate in and thus dominate the system of banking cooperatives is also worthy of further study, especially given their existing access to other wholesale funding markets and their potential to distort the mortgage lending of the GSE by funding wider portfolios of banking activity, and given the risk that the failure of any large banking institution poses to the FDIC's Deposit Insurance Fund.

Areas for further research include a quantification of DIF costs from advances and prepayment penalties (though a policy goal of tracking this information at the FDIC and FHFA level is also recommended), an examination of the differential uses of short-term and long-term advances over time and across varying levels of bank size and interconnectedness, and an estimation of the existence and levels of the supposed discount provided from larger member-banks through the depth of the FHLB debt market, reflected in the borrowing costs of small mortgage lenders without their own access to wholesale funds. Analysis of differences in each district's FHLB advances lending decision based upon the concentration of influence in that particular district would extend our results. The sample could also be expanded towards the smaller end with the addition of FHLB members who file 5300 Call Reports with the National Credit Union Administration, though mapping these fields back to Call and Thrift reports would require many adjustments to the variables used in this study due to reporting differences in the data sets. Alternative specifications of risk could also be investigated. Naturally, any information on other FHLB advance users, such as insurance companies, would also be beneficial, as well as any information about other FHLB services besides advances lending that members may utilize. Also, not all TFR schedules from each quarter's thrift reports were available to the public, so researchers with access to confidential schedules in OTS databases might be able to expand and enhance the results. Further stock and bond market reactions could also be incorporated into the analysis.

References and Works Cited

Ashcraft, A., Bech, M. L., and Frame, W. S. (2010). The Federal Home Loan Bank System: The Lender of Next-to-Last Resort? Journal of Money, Credit, and Banking, 42(4).

Ashley, L. K., Brewer, E., and Vincent, N. E. (1993). Access to FHL Bank advances and the performance of thrift institutions. Federal Reserve Bank of Chicago WP, 33–52.

Bennett, R. L., Vaughan, M. D., and Yeager, T. J. (2005). Should the FDIC Worry about the FHLB? The Impact of Federal Home Loan Bank Advances on the Bank Insurance Fund.

Bair, S. C., "Is the Federal Home Loan Bank System Forsaking its Roots?" June 2003, Isenberg School of Management, University of Massachusetts-Amherst.

Bassett, W. F., Chosak, M. B., Driscoll, J. C., and Zakrajsek, E. (2012). Changes in Bank Lending Standards and the Macroeconomy. Working Papers 2012-24. Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs. Federal Reserve Board, Washington, DC. Accessed August 12, 2014 at: http://www.federalreserve.gov/pubs/feds/2012/201224/201224pap.pdf.

Bharath, S.T., and Shumway, T. (2008). Forecasting Default with the Merton Distance to Default Model. *The Review of Financial Studies,* 21, 1339-1369.

Bloomberg L.P. (2011). "U.S. 2011 Failed Banks FDIC Cost Rises to $6.962 Billion." Accessed 7/18/2014 at http://mobile.bloomberg.com/news/2011-10-31/u-s-2011-failed-banks-fdic-cost-rises-to-6-962-billion-table-.

Cassell, M.K., and Hoffman, S.M. (2009). Not all housing GSEs are alike: An analysis of the Federal Home Loan Bank System and the Foreclosure Crisis. Public Administration Review, PAR Symposium.

Courchane, M.J., and Steeg, D. (2005) A comparative analysis of FHLBank Mortgage Lending. Contract report, Welch Consulting.

Coy, P. (2008). "Is the Federal Home Loan Banking System at Risk?" Businessweek. Retrieved at http://www.businessweek.com/stories/2008-11-05/is-the-federal-home-loan-banking-system-at-risk

Craig, B. E. N. R., and Thompson, J.B. (2003). Federal Home Loan Bank Lending to Community Banks: Are Targeted Subsidies Desirable? Journal of Financial Services Research, 23(1), 5-28.

Crosbie, P., and Bohn, J. (2002). Modeling Default Risk. KMV.

Davidson, T. and Simpson, W.G. (2014). Federal Home Loan Bank advances and bank risk. *Journal of Economics and Finance.* August 2014.

Deacle, S. and Elyasani, E. (2010). The Cost of Debt and Federal Home Loan Bank Funding at U.S. Bank and Thrift Holding Companies. Financial Management Association Conference,

2010, New York, (2004), 1–50.

Deacle, S., & Elyasiani, E. (2011). FHLB Membership and Funding and the Level of Bank and Thrift Holding Company Risk. Eastern Finance Association Conference, 2011, Savannah, GA. (pp. 1–50).

Durguner, S. (2012). The Determinants of FHLB Advance Use Levels for Small Banks: A Tobit Analysis. SSRN Electronic Journal, 1-131. DOI:10.2139/ssrn.2028187.

FDIC's Advisory Committee on Banking Policy, Federal Home Loan Bank System Paper (April 2003).

FDIC (2009). "FDIC Board Approves Letter of Intent to Sell IndyMac Federal." Press release. January 2, 2009. Accessed 7/18/2014 at http://www.fdic.gov/news/news/press/2009/pr09001.html.

FDIC-OIG. (2009). Material Loss Review of First Priority Bank, Bradenton, Florida. Report No. AUD-09-003. Accessed 6/14/14 at http://www.fdicoig.gov/reports09/09-003.pdf.

FDIC-OIG. (2009). Material Loss Review of Integrity Bank, Alpharetta, Georgia. Report No. AUD-09-006. Accessed 6/14/14 at http://www.fdicoig.gov/reports09/09-006.pdf.

FDIC-OIG. (2009). Material Loss Review of The Columbian Bank and Trust Company, Topeka, Kansas. Report No. AUD-09-005. Accessed 6/14/14 at http://www.fdicoig.gov/reports09/09-005.pdf.

Federal Housing Finance Agency. "Prudential Management and Operating Standards, Final Rule." Federal Register 77 (June 8, 2012). 33950-33964. Print.

FHFA, (2009) Risk Monitoring Updates, Commercial Bank and Thrift Member Performance – Does Lending to Risky Members Pose Additional FHLBank Risks?

FHFA-OIG. (2012). FHFA's Oversight of the Federal Home Loan Banks' Unsecured Credit Risk Management Practices.

FHLB-OF. (2011). FHLBanks Satisfy REFCORP Obligations; Launch Joint Capital Enhancement Agreement. (Press Release). Retrieved from: http://www.fhlbof.com/ofweb_userWeb/resources/PR_20110808_FHLBank_System_Capital_Initiative_Launch.pdf.

Flannery, M. J., and W. S. Frame, 2006, "The Federal Home Loan Bank system: the "other" housing GSE," Federal Reserve Bank of Atlanta Economic Review, Third Quarter 33-54.

Frame, W. S., D. Hancock, and S. W. Passmore, 2007, "Federal Home Loan Bank Advances and Commercial Bank Portfolio Composition," Federal Reserve Bank of Atlanta Working Paper No. 2007-17.

Frame, W. S. and White, L. J. (2010). The Federal Home Loan Bank System: Current Issues in Perspective. Reforming Rules and Regulations, edited by Vivek Ghosal. (pp. 255–76).

Gorton, G. and Metrick, A. (2012). Securitized banking and the run on repo. Journal of Financial Economics, 104(3), 425-451.

Hall, J. R. (2005). Blessing or Curse? Community Banks' Use of Federal Home Loan Bank Advances. Journal of Applied Business Research, 21(3), 37–46.

Hoffmann, S. M. and Cassell, M.K. (2010). Mission Expansion in the Federal Home Loan Bank System. State University of New York Press. Albany, New York.

Jetter, A. J. (2013). Statement of Andrew J. Jetter, President and CEO Federal Home Loan Bank of Topeka, Before the Senate Committee on Banking, Housing, and Urban Affairs, Subcommittee on Securities, Insurance, and Investment. Hearing, July 23, 2013. Available at: http://www.fhlbanks.com/assets/pdfs/section-newsevents/congress_testimony/ August 2013WrittenTestimony-AndrewJetterSenateSubcommittee_July23_2013.pdf; Accessed 2/26/14.

Kane, E.J. (1999). Housing Finance GSEs: Who Gets The Subsidy? Journal of Financial Services Research, 15(3), 197-209.

La Porta, R., Lopez-de-Silanes, F., and Zamarripa, G. (2003). Related Lending. Quarterly Journal of Economics, 118(1), 231-268.

Leggett, K. J., and Strand, R. W. (1996). The Financing Corporation, Government-Sponsored Enterprises, And Moral Hazard, 17(2), 179–187.

Maloney, D.K. and Thompson, J.B. (2003). The Evolving Role of the Federal Home Loan Banks in Mortgage Markets. Economic Commentary, Federal Reserve Bank of Cleveland, June.

Martinez, J. and Li, Q. (2011). Community Banks Use of FHLB Advances across the Kansas City (KC) and San Francisco (SF) Federal Reserve Districts, Southwestern Economic Review, 38, 73–92.

Merton, R.C. (1974). On the pricing of corporate debt: The risk structure of interest rates. *Journal of Finance* 29, 449-470.

Nickerson, D. and Phillips, R. J. (1999). Financial Déjà vu? The Farm Credit System's Past Woes Could Strike the Federal Home Loan Bank System. Regulation, 40–45.

Papagianis, C. (2010). Reform the Forgotten GSE. e21 - An Initiative for 21st Economic Policies, 1–3.

Scott, J. A. and Hein, S. E. (2008). The Federal Home Loan Banks and Commercial Bank Risk Taking: An Overstated Moral Hazard? Retrieved from Available at SSRN: http://ssrn.com/abstract=1175366

Scott, J. A. and Hein, S. E. (2011). The Federal Home Loan Bank System: A Government Sponsored Enterprise that Avoided Conservatorship. Journal of Applied Finance, (1), 44–62.

Shen, Jodi. JP Morgan Taps Taxpayer-Backed Banks for Bailout Rules. Bloomberg News. October 10, 2013. http://www.bloomberg.com/news/2013-10-10/jpmorgan-taps-taxpayer-backed-banks-for-bailout-rules.html

Shumer. C. (2007). Letter to Federal Housing Finance Board Chairman Ronald A. Rosenfeld. November 26, 2007. Available at: http://online.wsj.com/news/articles/SB119610390093704160.

Stark, W. A. and Spears-Reed, D. (2004). Federal Home Loan Bank Advances: A Supervisory Perspective. Supervisory Insights, Summer.

Stojanovic, D., M. D. Vaughan, and T. J. Yeager. (2008) "Do Federal Home Loan Bank membership and advances increase bank risk-taking?" Journal of Banking & Finance, 32, 680-698.

Tangel, A. J.P. Morgan's latest legal tab rises as bank hammers out Justice deal. October 19, 2013. http://www.latimes.com/business/money/la-fi-mo-jpmorgans-latest-legal-tab-rises-as-bank-continues-to-negotiate-20131019,0,340906.story?track=rss.

Thomson, J. B. (2002). "Commercial Banks' Borrowing from the Federal Home Loan Banks." Federal Reserve Bank of Cleveland.

Tuccillo, J. A., Flick, F. E., and Ranville, M. R. (2005). The Impact of Advances on Federal Home Loan Bank Portfolio Lending : A Statistical Analysis.

Vassalou, M. And Xing, Y. (2004). "Default Risk in Equity Returns." Journal of Finance, 59, 831-868.

Vekshin, Alison. "Countrywide Falls as Schumer Seeks Probe of Advances (Update2)." Bloomberg 26 November 2007. Web. Accessed 6/14/14 at: http://www.bloomberg.com/apps/news?pid=newsarchive&sid=algJDiv8HfXg.

Wall, R.A., and Wall, L.D. Reforming Deposit Insurance and the FDICIA. Federal Reserve Bank of Atlanta Economic Review. First Quarter 2002.

Warren, E. (2013). Letter to FHFA Acting Director DeMarco. United States Senate. http://www.warren.senate.gov/files/documents/20130624FHFALetter.pdf.

Figure 1. Trends in FHLB Advances at Top Holder Level, by Bank Size, in millions of Jan. 2007 dollars

This figure examines the growth in FHLB advances (adjusted for inflation using a base year of January 2007 and the GDP deflator from the St. Louis Federal Reserve's FRED website). In this chart, community banks are defined as banks and thrifts with less than $10 billion in assets, regional banks have between $10 and $50 billion in assets, and larger banks and thrifts have more than $50 billion in assets (in January 2007 dollars). The banks and thrifts are defined at their top holding company level, and advances balances are obtained from call and thrift reports. The left axis is in thousands of dollars, while the right axis is in percentages to capture the percentage of system-level advances held by the largest banks.

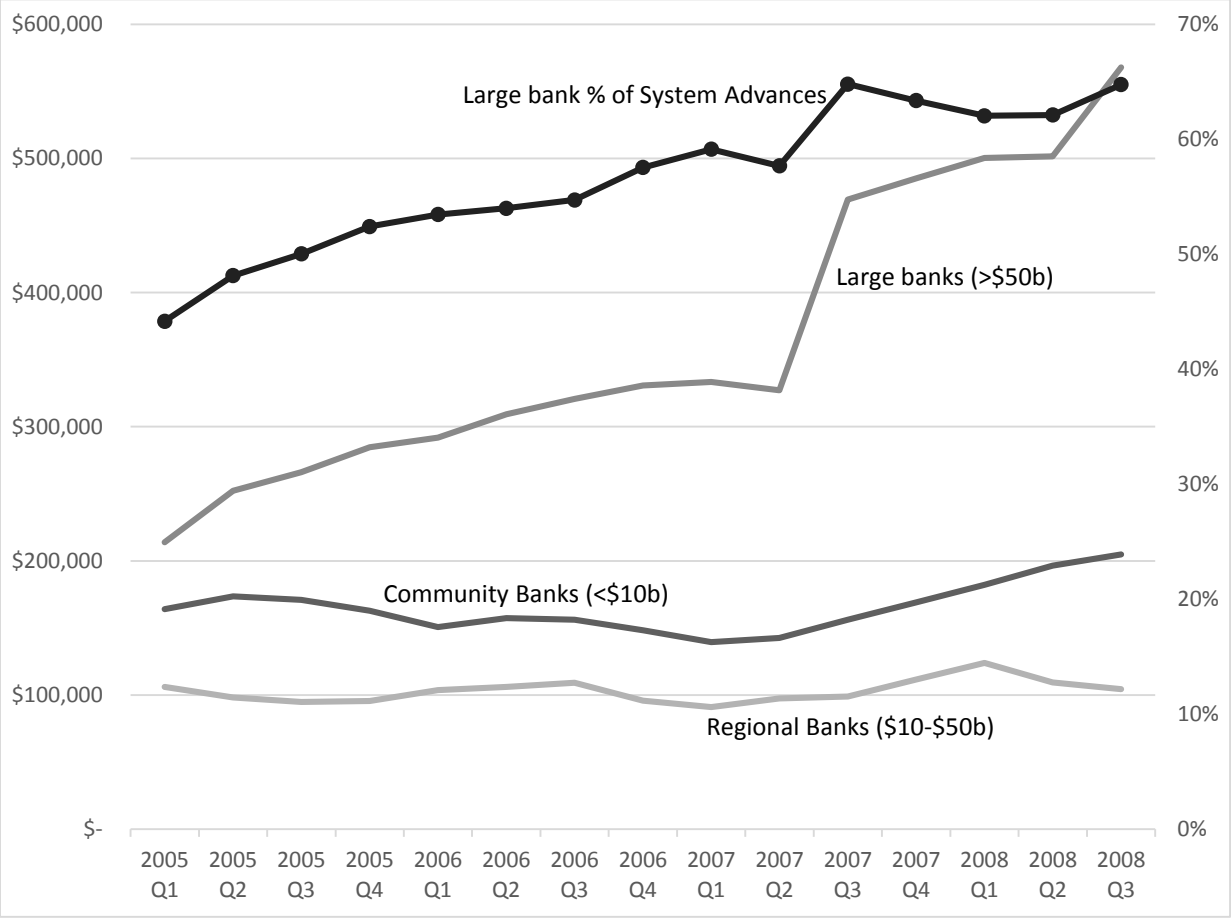

Table 1: Advances Growth Trends and Differences in Advances Growth between Large and Small Banks and Thrifts

The following table shows quarterly advances growth at the industry, community bank (>$10 billion in assets), and large bank (>$50 billion in assets) levels. Panel A provides the growth in each category at the consolidated company levels. Panel B shows the difference between the industry mean and the community and large banks at the bank and holding company level, and Panel C shows the differences in community bank and large bank advances growth at the bank and holding company level. Advances figures are taken from call and thrift reports. The presentation covers the period of interest and ends with Q3 2008. All figures obtained from call and thrift reports are inflation-adjusted to January 2007 dollars.

	Jun 05	Sep 05	Dec 05	Mar 06	Jun 06	Sep 06	Dec 06	Mar 07	Jun 07	Sep 07	Dec 07	Mar 08	Jun 08	Sep 08	Avg.
Panel A: Advances Growth (Bank and Holding Company Level for Community and Large Banks															
Industry	8.3%	1.5%	2.1%	0.5%	4.9%	2.3%	-1.9%	-1.9%	0.6%	27.7%	5.7%	5.3%	0.1%	8.6%	4.6%
Large banks, >50b	18.1%	5.5%	7.0%	2.5%	6.0%	3.6%	3.1%	0.8%	-1.9%	43.5%	3.4%	3.2%	0.2%	13.2%	7.7%
Community banks, <$10b	5.7%	-1.4%	-4.8%	-7.5%	4.5%	-0.8%	-5.1%	-6.0%	2.3%	9.5%	8.2%	7.9%	7.9%	4.2%	1.8%
Panel B: Differences from Industry-Level Advances Growth (Bank - Industry)															
Large Banks - Industry	9.7%	4.0%	4.9%	2.0%	1.1%	1.4%	5.1%	2.7%	-2.5%	15.7%	-2.3%	-2.2%	0.1%	4.6%	3.2%
Community Banks - Industry	-2.6%	-2.9%	-6.9%	-8.1%	-0.4%	-3.0%	-3.2%	-4.1%	1.7%	-18.2%	2.5%	2.6%	7.7%	-4.4%	-2.8%
Panel C: Differences from Community to Large Bank Advances Growth (Community - Large)															
Community – Large Banks	-12.3%	-6.9%	-11.7%	-10.1%	-1.4%	-4.4%	-8.3%	-6.8%	4.2%	-33.9%	4.9%	4.7%	7.6%	-9.0%	-6.0%

Table 2: Descriptive Statistics (Large banks)

Panel A: Large Banks: Panel data quarterly variables (2005 Q1 to 2008 Q3) for top-level banks and thrifts above $10 billion in assets, full panel.

Variable	N	Mean	Min.	Max.
FHLB Advances ($000,000's)	2,771	$4,280	$0	$99,140
Total Assets ($000,000's)	2,771	$105,425	$10,013	$1,855,429
Share of system advances (%)	2,771	0.660	0.000	15.99
Quarterly change in share of system advances	2,761	0.033	-3.301	12.74
EDF	1,998	0.043	-0.238	1.000
SEER failure probability (%)	2,771	2.361	0.000	84.25
Conditional EDF (Tobit)	2,771	0.231	0.067	0.394
Implied Capital Stock (%)	2,771	0.647	0.000	11.91
Bank has FHLB Director	2,771	0.068	0.000	2.000
BHC has subsidiaries in multiple FHLB districts	2,771	0.384	0.000	1.000
Annualized quarterly return on assets	2,771	1.041	-33.08	11.19
Quarterly net interest income to net income	2,769	2.019	-372.7	329.0
Quarterly noninterest income to net income	2,769	1.213	-191.4	72.03
(Cash + sec) to assets	2,771	21.84	0.000	93.69
(Cash+sec+fed funds sold+rev. REPO) to assets	2,771	0.246	0.001	0.944
Quarterly change in (cash+sec+fed funds sold+rev. REPO) to lagged assets	2,765	0.556	0.001	742.9
Total loans to assets	2,771	63.97	1.692	96.76
Net loans to assets	2,771	0.632	0.017	0.965
Quarterly change in net loans to lagged assets	2,765	1.376	-0.494	3659
Deposits to assets	2,771	66.26	0.570	93.74
Quarterly change in deposits to lagged assets	2,765	1.283	-0.520	3326
Other borrowed money to assets	2,771	4.091	0.000	81.44
Quarterly change in other borrowed money to lagged assets	2,765	0.168	-0.459	454.3
Thrift dummy	2,771	0.156	0.000	1.000

Table 2: Descriptive Statistics (Small banks, continued)

Panel B: Small Banks: Panel data quarterly variables (2005 Q1 to 2008 Q3) for top-level banks and thrifts below $10b in assets, full panel.

Variable	N	Mean	Min	Max
FHLB Advances ($000,000's)	103,566	$35	$0	$5,077
Total Assets ($000,000's)	103,566	$484	$0.517	$9,999
Share of system advances (%)	103,566	0.006	0.000	0.927
Quarterly change in share of system advances	102,397	0.000	-1.034	0.222
EDF	12,013	0.038	0.000	1.000
SEER failure probability (%)	103,564	0.865	0.000	99.99
Conditional EDF (Tobit)	103,305	0.137	-1.151	1.027
Implied Capital Stock	103,566	0.007	0.000	0.709
Bank has FHLB Director	103,566	0.011	0.000	3.000
BHC has subsidiaries in multiple FHLB districts	103,566	0.019	0.000	1.000
Annualized quarterly return on assets	103,566	0.951	-244.2	909.1
Quarterly net interest income to net income	103,419	4.316	-3253	3381
Quarterly noninterest income to net income	103,419	0.894	-3566	989.9
(Cash + sec) to assets	103,566	24.02	0.000	100.0
(Cash+sec+fed funds sold+rev. REPO) to assets	103,566	0.273	0.000	1.000
Quarterly Change in (cash+sec+fed funds sold+rev. REPO) to lagged assets	102,414	0.279	0.000	44.92
Total loans to assets	103,566	66.95	-0.054	100.4
Net loans to assets	103,566	0.661	-0.044	0.987
Quarterly change in net loans to lagged assets	102,414	0.019	-0.955	39.98
Deposits to assets	103,566	80.89	0.000	98.85
Quarterly change in deposits to lagged assets	102,414	0.019	-0.900	42.37
Other borrowed money to assets	103,566	0.229	0.000	78.90
Quarterly change in other borrowed money to lagged assets	102,414	0.000	-0.540	2.076
Thrift dummy	103,566	0.118	0.000	1.000

Table 2: Descriptive Statistics, Change Regression Variables

Change regression variables for large and small banks and thrifts, at the top-holder level. Dependent variables in the change regressions are the changes in flows between 2008 and 2005, scaled either by the respective year's advances, or the overall change in system flow between 2008 Q3 and 2005 Q4. Risk variables and implied capital stock variables are averaged over quarterly observations for 2005. The remainder of the variables are taken from 2005 Q4.

Large banks and thrifts (>$10b in assets):

Description	N	Mean	Min	Max
(Advances Flow 08/Advances 08) - (Advances Flow 05/Advances 05)	75	0.001	-0.012	0.048
Advances Flow 08-05 / sum(Advances Flow 08-05)	75	0.010	-0.084	0.500
Avg. quarterly EDF 2005	38	0.003	0.000	0.059
Avg. conditional EDF (Tobit) 2005	75	0.214	0.107	0.288
Implied Capital Stock (%) 2005:4	75	0.577	0.000	4.895
Bank has FHLB Director 2005:4	75	0.027	0.000	2.000
BHC has subsidiaries in multiple FHLB districts 2005:4	75	0.347	0.000	1.000
Annualized quarterly return on assets 2005:4	75	1.311	-0.356	5.395
(Cash + sec) to assets 2005:4	75	18.41	0.000	83.56
Total loans to assets 2005:4	75	66.26	7.352	96.38
Deposits to assets 2005:4	75	63.24	4.788	85.27
Other borrowed money to assets 2005:4	75	4.895	0.000	71.75

Small banks and thrifts (<$10b in assets):

Description	N	Mean	Min	Max
(Advances Flow 08/Advances 08) - (Advances Flow 05/Advances 05)	5,296	0.000	-0.004	0.002
Advances Flow 08-05 / sum(Advances Flow 08-05)	5,296	0.000	-0.018	0.024
Avg. quarterly EDF 2005	254	0.011	0.000	0.619
Avg. conditional EDF (Tobit) 2005	5,492	0.129	-0.892	0.253
Implied Capital Stock (%) 2005:4	5,504	0.005	0.000	0.709
Bank has FHLB Director 2005:4	5,504	0.003	0.000	1.000
BHC has subsidiaries in multiple FHLB districts 2005:4	5,504	0.014	0.000	1.000
Annualized quarterly return on assets 2005:4	5,504	1.068	-42.39	267.3
(Cash + sec) to assets 2005:4	5,504	25.36	0.219	98.57
Total loans to assets 2005:4	5,504	65.78	0.000	97.88
Deposits to assets 2005:4	5,504	81.46	0.154	94.58
Other borrowed money to assets 2005:4	5,504	0.200	0.000	71.41

Table 3a: Size, risk, and influence on the share of system advances (Actual EDF)

This table presents the results of pooled quarterly OLS regressions on the impact of size, risk, and influence on the share of system advances held by a bank or thrift. The sample is 2005 Q1 to 2008 Q3, at the top holder level. Large is a dummy variable equal to 1 if the institution's asset size is above $10 billion. DM EDF is the institution's EDF, Demeaned by size peer group, which limits the sample results to publicly traded institutions. DM ImpCapStock is the implied FHLB capital stock held by the institution, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC. Director is a dummy variable equal to 1 if the bank is represented on the board of an FHLB in the period. HC Multdist is a dummy variable equal to 1 if the firm has branches in multiple FHLB districts. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift, and quarterly time dummies. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Share of system advances (%)						
	(1)	(2)	(3)	(4)	(5)	(6)
large	3.23***	-0.59***	-0.56***	-0.50***	2.69***	-0.51***
	(0.11)	(0.06)	(0.06)	(0.05)	(0.11)	(0.06)
(1-large)	1.16***	-0.27***	-0.27***	-0.22***	1.04***	-0.23***
	(0.10)	(0.05)	(0.05)	(0.05)	(0.09)	(0.05)
Demeaned EDF $_{t-1}$ * large	1.04***		0.32***		0.08	-0.02
	(0.09)		(0.04)		(0.08)	(0.04)
Demeaned EDF $_{t-1}$ * (1-large)	-0.07*		0.02		-0.10**	0.02
	(0.04)		(0.02)		(0.05)	(0.02)
Demeaned ImpCapStock $_{t-1}$ * large		0.80***	0.80***	0.78***		0.78***
		(0.00)	(0.00)	(0.00)		(0.00)
Demeaned ImpCapStock $_{t-1}$ * (1-large)		0.23***	0.23***	0.23***		0.23***
		(0.02)	(0.02)	(0.02)		(0.02)
Demeaned EDF $_{t-1}$ * Demeaned Implied Capital Stock $_{t-1}$ * large				0.35***	0.85***	0.35***
				(0.01)	(0.02)	(0.01)
Demeaned EDF $_{t-1}$ * Demeaned Implied Capital Stock $_{t-1}$ * (1-large)				0.00	0.26	-0.05
				(0.09)	(0.23)	(0.11)
Bank has FHLB Director $_{t-1}$ * large		0.06***		0.05**	-0.18***	0.05**
		(0.02)		(0.02)	(0.05)	(0.02)
Bank has FHLB Director $_{t-1}$ * (1-large)		-0.00		-0.00	0.00	-0.00
		(0.01)		(0.01)	(0.02)	(0.01)
BHC has subsidiaries in multiple FHLB districts $_{t-1}$ * large		0.04***		0.04***	0.39***	0.04***
		(0.01)		(0.01)	(0.02)	(0.01)
BHC has subsidiaries in multiple FHLB districts $_{t-1}$ * (1-large)		0.00		0.00	-0.01	0.00
		(0.01)		(0.01)	(0.02)	(0.01)
Observations	14,023	14,023	14,023	14,023	14,023	14,023
R-Squared	0.23	0.83	0.83	0.84	0.33	0.84
F-value (model)	140***	2017***	2150.3***	2104***	188***	1993***

Table 3b: Size, risk, and influence on the share of system advances (Tobit EDF)

This table presents the results of pooled quarterly OLS regressions on the impact of size, risk, and influence on the share of system advances held by a bank or thrift. The sample is 2005 Q1 to 2008 Q3, at the top holder level. Large is a dummy variable equal to 1 if the institution's asset size is above $10 billion. DM Tobit EDF is the institution's conditional expectation of default probability, Demeaned by size peer group. DM ImpCapStock is the implied FHLB capital stock held by the institution, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC. Director is a dummy variable equal to 1 if the bank is represented on the board of an FHLB in the period. HC Multdist is a dummy variable equal to 1 if the firm has branches in multiple FHLB districts. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift, and quarterly time dummies. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Institutional share of system advances						
	(1)	(2)	(3)	(4)	(5)	(6)
large	2.09***	0.13***	0.09***	0.05***	0.69***	0.20***
	(0.03)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)
(1-large)	0.22***	0.02***	0.02***	0.01***	0.10***	0.03***
	(0.01)	(0.005)	(0.01)	(0.0050)	(0.01)	(0.01)
Demeaned Conditional EDF (Tobit)$_{t-1}$ * large	21.57***		-0.51***		18.06***	5.23***
	(0.15)		(0.08)		(0.08)	(0.09)
Demeaned Conditional EDF (Tobit) $_{t-1}$ * (1-large)	0.26***		-0.01		0.13***	-0.00
	(0.02)		(0.01)		(0.01)	(0.01)
Demeaned ImpCapStock $_{t-1}$ * large		0.81***	0.81***	0.64***		0.55***
		(0.00)	(0.00)	(0.00)		(0.00)
Demeaned ImpCapStock $_{t-1}$ * (1-large)		0.26***	0.27***	0.31***		0.29***
		(0.01)	(0.01)	(0.01)		(0.01)
Demeaned Conditional EDF (Tobit) $_{t-1}$ * Demeaned ImpCapStock $_{t-1}$ * large				4.71***	15.34***	6.13***
				(0.04)	(0.03)	(0.05)
Demeaned Conditional EDF (Tobit) $_{t-1}$ * Demeaned ImpCapStock $_{t-1}$ * (1-large)				-0.70***	2.51***	-0.67***
				(0.1653)	(0.1015)	(0.16)
Bank has FHLB Director $_{t-1}$ * large		0.13***		0.20***	0.46***	0.24***
		(0.01)		(0.01)	(0.01)	(0.01)
Bank has FHLB Director $_{t-1}$ * (1-large)		-0.00		-0.00	0.00	-0.00
		(0.00)		(0.00)	(0.00)	(0.00)
BHC has subsidiaries in multiple FHLB districts $_{t-1}$ * large		-0.06***		-0.03***	0.05***	-0.04***
		(0.00)		(0.00)	(0.01)	(0.00)
BHC has subsidiaries in multiple FHLB districts $_{t-1}$ * (1-large)		-0.00		-0.00	-0.00	-0.00
		(0.00)		(0.00)	(0.00)	(0.00)
Observations	104,925	104,925	104,925	104,925	104,925	104,925
R-Squared	0.35	0.85	0.85	0.86	0.80	0.87
F-value (model)	1847***	17153***	18165***	18545***	11658***	18276***

Table 4a: Size, risk, and influence on 2008-2005 changes in flows scaled to advances (EDF)

This table presents a regression on changes in long-term advances flows scaled to total advances between 2008:3 and 2005:4, at the top holder level. Large is a dummy variable equal to 1 if the firm had assets above $10 billion in 2005. DM Avg EDF is the institution's average quarterly EDF in 2005, Demeaned by size peer group. DM Avg ΔEDF is the change in average 2008 EDF from average 2005 EDF, Demeaned by size peer group. DM ImpCapStock is the implied FHLB capital stock held by the institution in 2005:4, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC, Demeaned by peer size group. ΔImp Cap Stock is the change in average implied capital stock 2008-2005, Demeaned by peer size group. Director dummy is a dummy variable equal to 1 if the firm had an FHLB director in 2005:4. HC Multidist is a dummy variable equal to 1 if the firm had branches in multiple FHLB districts in 2005:4. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Advances Flows 2008:3-2005:4, scaled by 2005:4 system advances.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large $_{2005:4}$	0.07***	0.06***	0.07***	0.07***	0.02***	0.02*	0.08***	0.02*
	(0.01)	(0.01)	(0.01)	(0.010)	(0.01)	(0.01)	(0.01)	(0.011)
(1-large) $_{2005:4}$	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Demeaned avg. quarterly EDF * large $_{2005}$	-0.03	-0.03	-0.08**			0.028	-0.08*	0.02
	(0.04)	(0.04)	(0.04)			(0.04)	(0.04)	(0.04)
Demeaned avg. quarterly EDF * (1-large) $_{2005}$	0.00	0.00	0.00			0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly ΔEDF * large $_{2008-2005}$		-0.01**	-0.01***					-0.01***
		(0.00)	(0.00)					(0.00)
Demeaned avg. quarterly ΔEDF * (1-large) $_{2008-2005}$		-0.00	-0.00					-0.00
		(0.00)	(0.00)					(0.00)
Demeaned Implied Capital Stock * large $_{2005:4}$			-0.004***	-0.003***	-0.001**	-0.00	-0.004***	-0.001**
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demeaned Implied Capital Stock * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ΔAvg. Implied Capital Stock * large $_{2008-2005}$					0.002***	0.002***		0.002***
					(0.00)	(0.00)		(0.00)
ΔAvg. Implied Capital Stock * (1-large) $_{2008-2005}$					0.00	0.00		0.00
					(0.00)	(0.00)		(0.00)
BHC has subsidiaries in multiple FHLB districts * large $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.002*
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Table 4a: Size, risk, and influence on 2008-2005 changes in flows scaled to advances (EDF) (Con't)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BHC has subsidiaries in multiple FHLB districts * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	254	254	254	254	254	254	254	254
R-Squared	0.47	0.48	0.58	0.54	0.66	0.66	0.55	0.67
F-value (model)	14***	13***	15***	16***	23***	21***	15***	20***

Table 4b: Size, risk, and influence on 2008-2005 changes in flows scaled to advances (Tobit EDF)

This table presents a regression of changes in long-term advances flows scaled to total advances between 2008:3 and 2005:4, at the top holder level. Large is a dummy variable equal to 1 if the firm had assets above $10 billion in 2005. DM Avg Tobit EDF is the institution's average quarterly Tobit-estimated EDF in 2005, Demeaned by size peer group. DM Avg ΔTobit EDF is the change in average 2008 Tobit-estimated EDF from average 2005 Tobit-estimated EDF, Demeaned by size peer group. DM ImpCapStock is the implied FHLB capital stock held by the institution in 2005:4, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC, Demeaned by peer size group. ΔAvg Imp Cap Stock is the change in average implied capital stock 2008-2005, Demeaned by peer size group. Director dummy is a dummy variable equal to 1 if the firm had an FHLB director in 2005:4. HC Multidist is a dummy variable equal to 1 if the firm had branches in multiple FHLB districts in 2005:4. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Advances Flows 2008:3-2005:4, scaled by 2005:4 system advances.								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large $_{2005:4}$	0.01***	0.02***	0.005***	0.01***	0.004***	0.005***	0.01***	0.005***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
(1-large) $_{2005:4}$	0.00	0.0001	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly Tobit EDF * large $_{2005}$	-0.04***	-0.03***	-0.01***			0.01***	-0.01***	0.01***
	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly Tobit EDF * (1-large) $_{2005}$	0.00	0.00	0.001*			0.0007*	0.0007*	0.001*
	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly ΔTobit EDF * large $_{2008-2005}$		0.07***	0.06***					-0.00
		(0.00)	(0.00)					(0.00)
Demeaned avg. quarterly ΔTobit EDF * (1-large) $_{2008-2005}$		0.00	0.00					0.00
		(0.00)	(0.00)					(0.00)
Demeaned Implied Capital Stock * large $_{2005:4}$			-0.001***	-0.001***	-0.003***	-0.0004***	-0.001***	-0.0004***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demeaned Implied Capital Stock * (1-large) $_{2005:4}$			-0.001***	-0.0004**	-0.0003**	-0.001***	-0.001***	-0.001***
			(0.00)	(0.0002)	(0.00)	(0.00)	(0.00)	(0.00)
ΔAvg. Implied Capital Stock * large $_{2008-2005}$					0.002***	0.002***		0.002***
					(0.00)	(0.00)		(0.00)
ΔAvg. Implied Capital Stock * (1-large) $_{2008-2005}$					0.00	0.00		0.00
					(0.00)	(0.00)		(0.00)

Table 4b (Continued): Size, risk, and influence on 2008-2005 changes in flows scaled to advances (Tobit EDF)

Dependent Variable: Advances Flows 2008:3-2005:4, scaled by 2005:4 system advances.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank has FHLB Director * large $_{05:4}$			-0.01***	-0.01***	-0.01***	-0.01***	-0.01***	-0.01***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.0004)	(0.0003)
Bank has FHLB Director * (1-large) $_{05:4}$			-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BHC has subsidiaries in multiple FHLB districts * large $_{2005:4}$			0.001***	0.002***	-0.001***	-0.001***	0.002***	-0.001***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.0002)
BHC has subsidiaries in multiple FHLB districts * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	5,356	5,356	5,356	5,356	5,356	5,356	5,356	5,356
R-Squared	0.17	0.24	0.33	0.28	0.50	0.51	0.28	0.51
F-value (model)	68***	93***	108***	101***	245***	227***	93***	209***

Table 5a: Size, risk, and influence on 2008-2005 changes in flows scaled to system changes in flows (EDF)

This table presents a regression of changes in long-term advances flows scaled to total system flows between 2008:3 and 2005:4, at the top holder level. Large is a dummy variable equal to 1 if the firm had assets above $10 billion in 2005. DM Avg EDF is the institution's average quarterly EDF in 2005, Demeaned by size peer group. DM Avg ΔEDF is the change in average 2008 EDF from average 2005 EDF, Demeaned by size peer group. DM ImpCapStock is the implied FHLB capital stock held by the institution in 2005:4, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC, Demeaned by peer size group. ΔImp Cap Stock is the change in average implied capital stock 2008-2005, Demeaned by peer size group. Director dummy is a dummy variable equal to 1 if the firm had an FHLB director in 2005:4. HC Multidist is a dummy variable equal to 1 if the firm had branches in multiple FHLB districts in 2005:4. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Advances Flows scaled by total system flows, 2008:3-2005:4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large $_{2005:4}$	0.78***	0.73***	0.79***	0.77***	0.29***	0.23**	0.88***	0.21**
	(0.07)	(0.07)	(0.09)	(0.08)	(0.08)	(0.10)	(0.09)	(0.09)
(1-large) $_{2005:4}$	0.00	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.06)	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.06)	(0.05)
Demeaned avg. quarterly EDF * large $_{2005}$	-0.44	-0.50	-0.86**			0.30	-0.88**	0.23
	(0.35)	(0.34)	(0.36)			(0.33)	(0.38)	(0.32)
Demeaned avg. quarterly EDF * (1-large) $_{2005}$	-0.00	-0.00	-0.00			0.00	0.00	-0.00
	(0.03)	(0.03)	(0.03)			(0.02)	(0.03)	(0.02)
Demeaned avg. quarterly ΔEDF * large $_{2008-2005}$		-0.08***	-0.10***					-0.07***
		(0.02)	(0.02)					(0.02)
Demeaned avg. quarterly ΔEDF * (1-large) $_{2008-2005}$		-0.00	-0.00					-0.00
		(0.01)	(0.01)					(0.01)
Demeaned Implied Capital Stock * large $_{2005:4}$			-0.03***	-0.02***	0.00	0.00	-0.03***	-0.00
			(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
Demeaned Implied Capital Stock * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
ΔAvg. Implied Capital Stock * large $_{2008-2005}$					0.02***	0.02***		0.02***
					(0.00)	(0.00)		(0.00)
ΔAvg. Implied Capital Stock * (1-large) $_{2008-2005}$					-0.00	-0.00		-0.00
					(0.01)	(0.01)		(0.01)

Table 5a: Size, risk, and influence on 2008-2005 changes in flows scaled to system changes in flows (EDF) (Con't)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BHC has subsidiaries in multiple FHLB districts * large $_{2005:4}$			0.01	0.01	0.01	0.01	-0.00	0.01*
			(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
BHC has subsidiaries in multiple FHLB districts * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
Observations	254	254	254	254	254	254	254	254
R-Squared	0.54	0.56	0.62	0.56	0.72	0.72	0.56	0.74
F-value (model)	18***	18***	18***	18***	32***	29***	17***	28***

Table 5b: Size, risk, and influence on 2008-2005 changes in flows scaled to system changes in flows (Tobit EDF)

This table presents a regression of chances in long-term advances flows scaled to total system flows between 2008:3 and 2005:4, at the top holder level. Large is a dummy variable equal to 1 if the firm had assets above $10 billion in 2005. DM Avg Tobit EDF is the institution's average quarterly Tobit-estimated EDF in 2005, Demeaned by size peer group. DM Avg ΔTobit EDF is the change in average 2008 Tobit-estimated EDF from average 2005 Tobit-estimated EDF, Demeaned by size peer group. DM ImpCapStock is the implied FHLB capital stock held by the institution in 2005:4, which is calculated by applying the prevailing district and time period capital stock rules filed with the SEC, Demeaned by peer size group. ΔAvg Imp Cap Stock is the change in average implied capital stock 2008-2005, Demeaned by peer size group. Director dummy is a dummy variable equal to 1 if the firm had an FHLB director in 2005:4. HC Multidist is a dummy variable equal to 1 if the firm had branches in multiple FHLB districts in 2005:4. Control variables (unreported) include ROA, and cash and securities/TA OBM (less advances)/TA, Loans/TA, Deposits/TA, a dummy variable = 1 if the institution is a thrift. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variable: Advances Flows scaled by total system flows, 2008:3-2005:4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large $_{2005:4}$	0.12***	0.04***	0.05***	0.13***	0.04***	0.05***	0.11***	0.05***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)
(1-large) $_{2005:4}$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly Tobit EDF * large $_{2005}$	-0.30***	-0.29***	-0.22***			0.04*	-0.21***	0.05**
	(0.03)	(0.03)	(0.03)			(0.03)	(0.03)	(0.03)
Demeaned avg. quarterly Tobit EDF * (1-large) $_{2005}$	0.00	0.00	0.00			0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)			(0.00)	(0.00)	(0.00)
Demeaned avg. quarterly ΔTobit EDF * large $_{2008-2005}$		0.74***	0.65***					-0.07**
		(0.03)	(0.03)					(0.03)
Demeaned avg. quarterly ΔTobit EDF * (1-large) $_{2008-2005}$		0.00	0.00					0.00
		(0.01)	(0.00)					(0.00)
Demeaned Implied Capital Stock * large $_{2005:4}$			-0.005***	-0.01***	0.003***	0.003***	-0.01***	0.002***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Demeaned Implied Capital Stock * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ΔAvg. Implied Capital Stock * large $_{2008-2005}$					0.02***	0.02***		0.02***
					(0.00)	(0.00)		(0.00)
ΔAvg. Implied Capital Stock * (1-large) $_{2008-2005}$					0.00	0.00		0.00
					(0.00)	(0.00)		(0.00)

Table 5b (continued): Size, risk, and influence on 2008-2005 changes in flows scaled to system changes in flows (Tobit EDF)

Dependent Variable: Advances Flows scaled by total system flows, 2008:3-2005:4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank has FHLB Director * large $_{05:4}$			-0.05***	-0.05***	-0.03***	-0.03***	-0.06***	-0.03***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Bank has FHLB Director * (1-large) $_{05:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BHC has subsidiaries in multiple FHLB districts * large $_{2005:4}$			0.01***	0.02***	-0.01***	-0.01***	0.02***	-0.01***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BHC has subsidiaries in multiple FHLB districts * (1-large) $_{2005:4}$			0.00	0.00	0.00	0.00	0.00	0.00
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	5,356	5,356	5,356	5,356	5,356	5,356	5,356	5,356
R-Squared	0.20	0.27	0.32	0.26	0.55	0.55	0.26	0.55
F-value (model)	82.85***	111.18***	103.18***	92.10***	291.23***	267.34***	86.59***	247.19***

Table 6a Influence-predicted, non-influence-predicted, and residual advances on Balance Sheet Changes (EDF)

This table presents pooled OLS regressions of quarterly balance sheet changes on top-holder banks and thrifts from 2005:1 to 2008:3. Test variables are derived from the output of Table 3a, Column 6, estimated with EDF. Large is a dummy equal to 1 if the institution has over $10 billion in assets. Influence-pred. Advindpct is the sum of the size group influence coefficients (DM ImpCapStock, HC Multidist, director) multiplied by an institution's quarterly values for these variables. Non-influence-pred. Advindpct is the difference between the predicted value of advances share and the influence-predicted value of advances share. Pos. Resid. Advindpct is the positive residual value from the prediction of advances share and the actual value of advances share. Neg. Resid. Advindpct is the negative residual value from the prediction of advances share and the actual value of advances share. Dependent variables include quarterly changes in failure probability, quarterly changes in Cash, Securities, Fed Funds Sold and Reverse Repos to TA, Deposits to TA, and OBM (less advances) to TA. Controls include ROA, Interest income and noninterest income scaled by NI, and the controls from Table 3a. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variables:	Change in Cash, Sec, FFS, RR	Change in Net Loans	Change in Deposits	Change in OBM (-advances)
large	39.51***	194.01***	176.48***	24.10***
	(2.20)	(10.83)	(9.84)	(1.34)
(1-large)	-19.16***	-94.92***	-86.19***	-11.77***
	(1.96)	(9.66)	(8.78)	(1.20)
Influence-predicted share of system advances$_{t-1}$ * large	0.05	0.28	0.25	0.03
	(0.19)	(0.92)	(0.84)	(0.11)
Influence-predicted share of system advances$_{t-1}$ * (1-large)	-9.74***	-48.00***	-43.65***	-5.95***
	(2.34)	(11.56)	(10.51)	(1.44)
Non-influence-predicted share of system advances$_{t-1}$ * large	7.48***	36.94***	33.56***	4.58***
	(1.25)	(6.14)	(5.58)	(0.76)
Non-influence-predicted share of system advances$_{t-1}$ * (1-large)	-55.10***	-272.31***	-247.43***	-33.80***
	(5.25)	(25.90)	(23.54)	(3.22)
Pos. Resid. share of system advances$_{t-1}$ * large	-2.22***	-10.97***	-9.96***	-1.36***
	(0.64)	(3.18)	(2.89)	(0.39)
Pos. Resid. share of system advances$_{t-1}$ * (1-large)	16.76***	82.96***	75.36***	10.30***
	(4.70)	(23.20)	(21.09)	(2.88)
Neg. Resid. share of system advances$_{t-1}$ * large	1.24***	6.11***	5.56***	0.76***
	(0.44)	(2.19)	(1.99)	(0.27)
Neg. Resid. share of system advances$_{t-1}$ * (1-large)	-31.85***	-157.32***	-142.97***	-19.53***
	(5.74)	(28.29)	(25.72)	(3.51)
Observations	13,636	13,636	13,636	13,636
R-Squared	0.1103	0.1066	0.1066	0.1065
F-value (model)	40.12***	38.60***	38.62***	38.59***

Table 6b: Influence-predicted, non-influence-predicted, and residual advances on Balance Sheet Changes (Tobit EDF)

This table presents pooled OLS regressions of quarterly balance sheet changes on top-holder banks and thrifts from 2005:1 to 2008:3. Test variables are derived from the output of Table 3b, Column 6, estimated with Tobit EDF. Large is a dummy equal to 1 if the institution has over $10 billion in assets. Influence-pred. Advindpct is the sum of the size group influence coefficients (DM ImpCapStock, HC Multidist, director) multiplied by an institution's quarterly values for these variables. Non-influence-pred. Advindpct is the difference between the predicted value of advances share and the influence-predicted value of advances share. Pos. Resid. Advindpct is the positive residual value from the prediction of advances share and the actual value of advances share. Neg. Resid. Advindpct is the negative residual value from the prediction of advances share and the actual value of advances share. Dependent variables include quarterly changes in failure probability, quarterly changes in Cash, Securities, Fed Funds Sold and Reverse Repos to TA, Deposits to TA, and OBM (less advances) to TA. Controls include ROA, Interest income and noninterest income scaled by NI, and controls from Table 3b. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variables:	Change in Cash, Sec, FFS, RR	Change in Net Loans	Change in Deposits	Change in OBM (-advances)
large	1.87***	2.00***	3.35***	0.10***
	(0.04)	(0.05)	(0.08)	(0.00)
(1-large)	-0.05***	0.03	0.00	0.00
	(0.02)	(0.02)	(0.04)	(0.00)
Influence-predicted share of system advances$_{t-1}$ * large	-0.01	-0.01*	-0.01	-0.001***
	(0.00)	(0.01)	(0.01)	(0.00)
Influence-predicted share of system advances$_{t-1}$ * (1-large)	-0.16**	-0.39***	-0.54***	-0.02***
	(0.07)	(0.08)	(0.13)	(0.00)
Non-influence-predicted share of system advances$_{t-1}$ * large	-0.02	-0.09*	-0.09	-0.01***
	(0.04)	(0.05)	(0.08)	(0.00)
Non-influence-predicted share of system advances$_{t-1}$ * (1-large)	0.03	-0.19	-0.17	-0.03***
	(0.18)	(0.21)	(0.33)	(0.01)
Pos. Resid. share of system advances$_{t-1}$ * large	-0.06***	-0.06***	-0.11***	0.00
	(0.01)	(0.02)	(0.03)	(0.00)
Pos. Resid. share of system advances$_{t-1}$ * (1-large)	-0.31**	-0.22	-0.42*	0.00
	(0.13)	(0.16)	(0.25)	(0.01)
Neg. Resid. share of system advances$_{t-1}$ * large	0.06***	0.07***	0.12***	0.004***
	(0.01)	(0.01)	(0.02)	(0.00)
Neg. Resid. share of system advances$_{t-1}$ * (1-large)	-0.00	-0.24	-0.26	-0.02**
	(0.18)	(0.21)	(0.33)	(0.01)
Observations	97,197	97,197	97,197	97,197
R-Squared	0.61	0.03	0.02	0.02
F-value (model)	3570.59***	59.35***	58.71***	58.68***

Table 7a: Predicted and residual advances on Balance Sheet Changes (EDF)

This table presents pooled OLS regressions of quarterly balance sheet changes on top-holder banks and thrifts from 2005:1 to 2008:3. Test variables are derived from the output of Table 3a, Column 6, estimated with EDF. Large is a dummy equal to 1 if the institution has over $10 billion in assets. Advindpcthat is the predicted value of industry share of advances from Table 3a, column 6. Pos. Resid. Advindpct is the positive residual value from the prediction of advances share and the actual value of advances share. Neg. Resid. Advindpct is the negative residual value from the prediction of advances share and the actual value of advances share. Dependent variables include quarterly changes in failure probability, quarterly changes in Cash, Securities, Fed Funds Sold and Reverse Repos to TA, Deposits to TA, and OBM (less advances) to TA. Controls include ROA, Interest income and noninterest income scaled by NI, and controls from Table 3a. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variables:	Change in Cash, Sec, FFS, RR	Change in Net Loans	Change in Deposits	Change in OBM (-advances)
large	41.75***	205.08***	186.54***	25.47***
	(2.11)	(10.41)	(9.47)	(1.29)
(1-large)	-14.60***	-72.36***	-65.70***	-8.97***
	(1.85)	(9.14)	(8.31)	(1.14)
Predicted share of system advances$_{t-1}$ * large	0.27	1.38	1.25	0.17
	(0.18)	(0.91)	(0.82)	(0.11)
Predicted share of system advances$_{t-1}$ * (1-large)	-14.31***	-70.58***	-64.17***	-8.76***
	(2.29)	(11.31)	(10.28)	(1.40)
Pos. Resid. share of system advances$_{t-1}$ * large	-3.59***	-17.72***	-16.10***	-2.20***
	(0.61)	(3.03)	(2.75)	(0.38)
Pos. Resid. share of system advances$_{t-1}$ * (1-large)	28.41***	140.57***	127.70***	17.45***
	(4.56)	(22.47)	(20.42)	(2.79)
Neg. Resid. share of system advances$_{t-1}$ * large	2.27***	11.19***	10.17***	1.39***
	(0.42)	(2.08)	(1.89)	(0.26)
Neg. Resid. share of system advances$_{t-1}$ * (1-large)	-8.89*	-43.74*	-39.79*	-5.43*
	(4.91)	(24.21)	(22.01)	(3.01)
Observations	13,636	13,636	13,636	13,636
R-Squared	0.10	0.10	0.10	0.10
F-value (model)	39.47***	37.88***	37.89***	37.87***

Table 7b: Predicted and residual advances on Balance Sheet Changes (Tobit EDF)

This table presents pooled OLS regressions of quarterly balance sheet changes on top-holder banks and thrifts from 2005:1 to 2008:3. Test variables are derived from the output of Table 3b, Column 6, estimated with EDF. Large is a dummy equal to 1 if the institution has over $10 billion in assets. Advindpcthat is the predicted value of industry share of advances from Table 3b, column 6. Pos. Resid. Advindpct is the positive residual value from the prediction of advances share and the actual value of advances share. Neg. Resid. Advindpct is the negative residual value from the prediction of advances share and the actual value of advances share. Dependent variables include quarterly changes in failure probability, quarterly changes in Cash, Securities, Fed Funds Sold and Reverse Repos to TA, Deposits to TA, and OBM (less advances) to TA. Controls include ROA, Interest income and noninterest income scaled by NI, and controls from Table 3b. Statistical significance of coefficients reported as "***": 0.01, "**": 0.05, "*": 0.1.

Dependent Variables:	Change in Cash, Sec, FFS, RR	Change in Net Loans	Change in Deposits	Change in OBM (-advances)
large	1.87***	2.00***	3.35***	0.10***
	(0.04)	(0.05)	(0.08)	(0.00)
(1-large)	-0.05**	0.03	0.01	0.00
	(0.02)	(0.02)	(0.04)	(0.00)
Predicted share of system advancest-1 * large	-0.01	-0.01**	-0.01	-0.001***
	(0.00)	(0.01)	(0.01)	(0.00)
Predicted share of system advancest-1 * (1-large)	-0.17**	-0.40***	-0.55***	-0.01***
	(0.07)	(0.08)	(0.13)	(0.00)
Pos. Resid. share of system advancest-1 * large	-0.06***	-0.05***	-0.10***	0.00
	(0.01)	(0.02)	(0.03)	(0.00)
Pos. Resid. share of system advancest-1 * (1-large)	-0.30**	-0.21	-0.40	0.00
	(0.13)	(0.15)	(0.25)	(0.01)
Neg. Resid. share of system advancest-1 * large	0.06***	0.07***	0.11***	0.003***
	(0.01)	(0.01)	(0.02)	(0.00)
Neg. Resid. share of system advancest-1 * (1-large)	-0.11	-0.35*	-0.47	-0.02
	(0.15)	(0.18)	(0.28)	(0.01)
Observations	97,197	97,197	97,197	97,197
R-Squared	0.61	0.03	0.02	0.02
F-value (model)	3749.10***	62.24***	61.59***	61.34***

8a: Influence on the Advances Lending Decision, using FHLB Advances/TA, at the Bank and

Firm fixed effects regressions on FHLB Advances/TA from Q1 2005-Q3 2008. Community is a dummy that equals 1 if the firm's assets are less <$10 billion. Large is a dummy equal to 1 if the firm's assets are >$50B. Risk is a composite risk score calibrated on a firm's probability of failure in the next 8 quarters. The interaction terms between the two size variables risk capture advances increases within the size categories for banks with a higher composite risk score. District % Advances is the percentage of advances a bank holds in their FHLB district. District % Implied Capital Stock measures the minimum capital stock a firm would need to hold at their district FHLB. Bank has FHLB Director =1 if a bank has a director at the FHLB. Holding Company in multiple districts=1 if a bank's holding company has branches in multiple FHLB districts. ROA is Return on Assets (quarterly), Cash and Securities/TA is a bank's cash and securities scaled by total assets, Modified OBM/TA is a firm's other borrowed money (without advances) scaled to total assets, Total Loans/TA is a firm's total loans to total assets, and Thrift Dummy equals 1 if the firm is a thrift. Dummy variables for time and FHLB district are omitted from the presentation. F-tests on the differences between the size variables and the size and failure interaction variables are reported. Standard errors are in parentheses (rounded up to 0.01), and asterisks indicate statistical significance (*** is 1%, ** is 5%, and * is 10%).

Dependent Variable: FHLB Advances/TA. Firm FE regressions.

	Pred.	(1)	(2)	(3)	(4)	(5)
Community $_{t-1}$	(-)	0.06	0.03	-0.05	-0.05	0.07*
		(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
Large $_{t-1}$	(+)	-0.22***	-0.23***	-0.16***	-0.15**	-0.21***
		(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Risk $_{t-1}$	(-)	0.10*	0.09*	0.05**	0.05**	0.04*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Community $_{t-1}$*risk $_{t-1}$	(-)	0.09*	-0.03	-0.01	-0.02	-0.03*
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Large $_{t-1}$ * risk $_{t-1}$	(+)	0.12***	0.16***	0.19***	0.18***	0.11***
		(0.04)	(0.04)	(0.05)	(0.05)	(0.04)
District % Advances $_{t-1}$	(+)	0.46***				0.60***
		(0.01)				(0.01)
District % Implied Capital Stock $_{t-1}$	(+)		0.4***			-0.15***
			(0.01)			(0.01)
Bank has FHLB Director $_{t-1}$	(+)			0.05**		0.05***
				(0.02)		(0.02)
Holding company in multiple districts $_{t-1}$	(+)				0.06***	0.05***
					(0.02)	(0.01)
ROA $_{t-1}$	(-)	0.07*	-0.01***	-0.01***	-0.01***	0.00
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Cash and Securities/TA $_{t-1}$	(+)	0.04***	0.04***	0.04***	0.04***	0.04***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Modified OBM $_{t-1}$/TA $_{t-1}$	(+)	0.04***	0.04***	0.00	0.00	0.04***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Total Loans $_{t-1}$/TA $_{t-1}$	(+)	0.07***	0.08***	0.11***	0.11***	0.07***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Thrift Dummy $_{t-1}$	(+/-)	-0.02	-0.03	-0.01	0.00	0.00
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)

8a: Influence on the Advances Lending Decision, using FHLB Advances/TA, at the Bank and Thrift level (Con't)

	(1)	(2)	(3)	(4)	(5)
Large v Small (F-test)	18.23***	14.32***	2.18	1.95	17.68***
Large Risk v Small Risk (F-test)	19.39***	26.11***	23.37***	23.34***	16.5***
Observations	111,830	111,830	111,830	111,830	111,830
R-Squared	0.25	0.20	0.05	0.05	0.26
F-value (model)	1517.6***	1123.5***	226.56***	227.06***	1382.2***

8b: Influence on Winsorized Advances Growth, at the Bank and Thrift level

Regressions on winsorized quarterly growth in advances from Q1 2005-Q3 2008. Community is a dummy that equals 1 if the firm's assets are less <$10 billion. Large is a dummy equal to 1 if the firm's assets are >$50B. Risk is a composite risk score calibrated on a firm's probability of failure in the next 8 quarters. The interaction terms between the two size variables risk capture advances increases within the size categories for banks with a higher composite risk score. District % Advances is the percentage of advances a bank holds in their FHLB district. District % Implied Capital Stock measures the minimum capital stock a firm would need to hold at their district FHLB. Bank has FHLB Director =1 if a bank has a director at the FHLB. Holding Company in multiple districts=1 if a bank's holding company has branches in multiple FHLB districts. ROA is Return on Assets (quarterly), Cash and Securities/TA is a bank's cash and securities scaled by total assets, Modified OBM/TA is a firm's other borrowed money (without advances) scaled to total assets, Total Loans/TA is a firm's total loans to total assets, and Thrift Dummy equals 1 if the firm is a thrift. Dummy variables for time and FHLB district are omitted from the presentation. F-tests on the differences between the size variables and the size and failure interaction variables are reported. Standard errors are in parentheses (rounded up to 0.01), and asterisks indicate statistical significance (*** is 1%, ** is 5%, and * is 10%).

Dependent Variable: Winsorized Quarterly Growth in Advances

	Pred.	(1)	(2)	(3)	(4)	(5)
Intercept		1.21	-0.44	-2.33	-3.09	-1.29
		(2.54)	(2.55)	(2.44)	(2.46)	(2.57)
Community $_{t-1}$	(-)	-6.94***	-5.43***	-3.8**	-3.41**	-5.26***
		(1.86)	(1.87)	(1.75)	(1.76)	(1.88)
Large $_{t-1}$	(+)	9.69***	8.54**	0.09*	0.09*	5.24
		(3.81)	(3.85)	(3.75)	(3.75)	(3.87)
Risk $_{t-1}$	(-)	0.07	-0.20	-0.58	-0.47	-0.41
		(1.63)	(1.63)	(1.62)	(1.62)	(1.63)
Community $_{t-1}$*risk $_{t-1}$	(-)	-0.28	-0.01	0.37	0.26	0.20
		(1.63)	(1.63)	(1.62)	(1.62)	(1.63)
Large $_{t-1}$ * risk $_{t-1}$	(+)	12.08***	13.28***	13.86***	13.63***	9.89***
		(2.97)	(2.97)	(2.97)	(2.97)	(2.98)
District % Advances $_{t-1}$	(+)	-0.60***				-2.55***
		(0.13)				(0.35)
District % Implied Capital Stock $_{t-1}$	(+)		-0.35**			2.51***
			(0.15)			(0.43)
Bank has FHLB Director $_{t-1}$	(+)			3.66**		4.33***
				(1.66)		(1.67)
Holding company in multiple districts $_{t-1}$	(+)				1.63***	1.58***
					(0.63)	(0.63)
ROA $_{t-1}$	(-)	0.00	0.00	0.00	0.00	0.00
		(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Cash and Securities/TA $_{t-1}$	(+)	0.09***	0.09***	0.10***	0.10***	0.10***
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Modified OBM $_{t-1}$/TA $_{t-1}$	(+)	0.07	0.08	0.08	0.07	0.06
		(0.07)	(0.07)	(0.07)	(0.07)	(0.07)
Total Loans $_{t-1}$/TA $_{t-1}$	(+)	0.20***	0.20***	0.20***	0.21***	0.21***
		(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Thrift Dummy $_{t-1}$	(+/-)	0.23	0.14	0.05	0.26	0.42
		(0.53)	(0.53)	(0.53)	(0.53)	(0.53)

8b: Influence on Winsorized Advances Growth, at the Bank and Thrift Level (Con't)	(1)	(2)	(3)	(4)	(5)
Large v Small (F-test)	21.26***	14.25***	9.2***	8.26***	7.92***
Large Risk v Small Risk (F-test)	0.92	1.07	1.10	1.08	0.57
Observations	102,233	102,233	102,233	102,233	102,233
R-Squared	0.01	0.01	0.01	0.01	0.01
F-Value (model)	62.81***	62.07***	62.06***	62.13***	57.64***

Appendix 1: Implied Capital Stock by Top 10 Holders at Selected Dates

Holding companies with the 10 highest implied capital stock are listed for Q1 2005, Q3 2007, and Q3 2008. Implied capital stock is listed as a percentage of system capital stock, and in thousands of dollars.

Holding Company Name	Implied Capital Stock (%)	Implied Capital Stock ($000)
Panel A: Top 10 Holders of Implied Capital Stock as of Q1 2005		
WASHINTON MUTUAL BANK	9.090	3,161,306.15
WELLS FARGO & COMPANY	4.871	1,694,052.58
HSBC HOLDINGS PLC	3.263	1,134,987.82
CITIGROUP INC.	2.657	924,115.88
BANCO SANTANDER CENTRAL HISPANO S.A.	2.640	918,299.55
COUNTRYWIDE FINANCIAL CORPORATION	2.385	829,375.00
ROYAL BANK OF SCOTLAND GROUP PLC, THE	1.845	641,592.10
ABN AMRO HOLDING N.V.	1.717	597,289.64
NATIONAL CITY CORPORATION	1.716	596,817.60
SUNTRUST BANKS INC.	1.564	543,802.74
Panel B: Top 10 Holders of Implied Capital Stock as of Q3 2007		
CITIGROUP INC.	9.864	4,684,580.00
WASHINTON MUTUAL BANK	5.251	2,493,931.67
BANK OF AMERICA CORPORATION	4.925	2,338,837.10
COUNTRYWIDE FINANCIAL CORPORATION	4.890	2,322,250.00
JPMORGAN CHASE & CO.	4.045	1,921,033.50
BANCO SANTANDER S.A.	3.382	1,606,331.16
HSBC HOLDINGS PLC	3.028	1,437,926.18
WELLS FARGO & COMPANY	2.452	1,164,338.05
PNC FINANCIAL SERVICES GROUP INC., THE	2.276	1,080,972.25
ROYAL BANK OF SCOTLAND GROUP PLC, THE	2.182	1,036,504.96
Panel C: Top 10 Holders of Implied Capital Stock as of Q3 2008		
JPMORGAN CHASE & CO.	11.911	6,617,312.67
CITIGROUP INC.	7.249	4,027,191.00
BANK OF AMERICA CORPORATION	4.972	2,761,961.79
COUNTRYWIDE FINANCIAL CORPORATION	3.645	2,025,043.99
WELLS FARGO & COMPANY	2.724	1,513,419.03
PNC FINANCIAL SERVICES GROUP INC., THE	2.587	1,437,367.17
BANCO SANTANDER S.A.	2.583	1,435,009.31
HSBC HOLDINGS PLC	2.376	1,320,197.84
U.S. BANCORP	1.918	1,065,730.70
CAPITAL ONE FINANCIAL CORPORATION	1.612	895,326.22

Conclusion

These two dissertation chapters provide a glimpse into the causes and effects of FHLB advances on the banking system. In the first chapter, we found that FHLB advances are positively related to contemporary bank risk, but the relation between prior advances and subsequent risk varies between large and small banks depending upon the risk measure used. We documented that the relation between FHLB advances and various measures of bank risk varies between pre-crisis (2005-07), crisis (2008-09), and post-crisis (2010-12) periods differently for large vs. small banks. FHLB advances are related to bank risk, but the nature of these relations is contingent on bank size and time period.

In the second chapter, we reframed the advances and bank risk discussion as a conflict between the preservation of GSE charter value and the moral hazard incentives of the FHLBs, which could be influenced by certain banks, given the economic incentives and governance structure of the FHLB. We explored the channels of influence that a large, risky bank might use to increase its advances borrowing beyond normal prudent lending standards, and found a positive relationship among large bank advances, influence metrics, and insolvency risk, consistent with the story that FHLB moral hazard incentives outweigh charter value preservation for their largest members. Regardless of their risk and influence, banks used the advances similarly, primarily as a funding source for new loans.