Housing Price Risks and Lending Behavior of Banks before and after the 2008 Financial Crisis

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Abstract

As a large volatility in asset values can negatively affect collateral values and increase the likelihood of defaults by loan borrowers, facing high price risks in real-estate markets, banks need to lower risk exposures and reduce loans. However, our analysis of US commercial banks shows that banks in Metropolitan Statistical Areas (MSAs) with higher housing price risks make more real estate loans before the 2008 financial crisis but make less loans after the crisis. While increasing their loans in markets with high risks, these banks do not prepare for more reserves for loan losses in the pre-crisis period. Our results suggest that banks with higher housing price risks have taken excessive risks before the 2008 crisis. Banks operating in single MSA tend to show higher risk taking behavior than those operating in multi-MSAs.

Key words: Housing Loans, Risk Taking, Housing Price Risks, Price Volatility, Financial Crisis

JEL: G01, G21, G28

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1. Introduction

In most banks the largest borrower group is households. Household mortgage loan amounts 40.3% of total assets, and 63.7% of total loans. Housing assets account for two-thirds of households' portfolio in the US (Goetzmann, 1993; Brueckner, 1997; Bayer et al., 2010). As making housing loans is a major activity of most commercial banks, previous studies have examined channels through which the price levels of real-estate markets are related to mortgage loans. For example, a rise in real estate prices can increase bank lending through households' higher demand for borrowing, banks' higher lending capacity and lower non-performing loans. Like the increase in other asset values, increases in real estate prices raise collateral values, households' borrowing capacity and their borrowing demands (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Gerlach and Peng, 2005; Nkusu, 2011; Beck et al., 2013). With higher housing values, households are better able to pay back their loans and reduce non-performing loans (Davis and Zhu, 2009; Ghosh, 2015). In addition, as an increase in real estate prices increases values of real estate assets that banks hold, real estate prices affect bank balance sheet and lending capacity (Gerlach and Peng, 2005).

However, US real estate markets have experienced several boom and bust cycles yielding great volatility of housing prices. The historical trends of housing prices for the last 100 years have showed wide fluctuations (Beracha and Skiba, 2013). Housing prices for almost two decades in 2000s also show high volatility (Huang and Tang, 2012; Glaeser et al., 2008). According to the Case-Shiller 10-city composite price index, for example, real house prices rose by over 80% between 2001 and 2006, then fell by over 40% between 2006 and 2010 (Han, 2013). From 2001 to 2014, the standard deviation of national housing price indices has raised from 9.7 in 2001 to 29.7 in 2006 and 24.3 in 2014. The standard deviation of housing price return has almost tripled from 2.9% to 8.4% over the past 10 years.

Independent of the level of real estate prices, the volatility of housing prices imposes a risk to banks. In real estate loans or mortgage loans, household borrowers pledge housing as collateral and take loans from banks. A high volatility in real estate prices indicates a higher probability that real estate prices can go down, and consequently collaterals can lose values as well. When real estate prices decline or price-increase interrupts, default rates on home mortgages increase (Case et al., 1995). As household borrowers often strategically default and do not pay their debts when their collateral value declines, a larger volatility in collateral values increases default rates (Guiso et al., 2013). In addition, as collateral might lose its value more with a higher volatility, banks face a larger risk of not receiving their loans (Jokivuolle and Peura, 2003). In short, considering the importance of household loans in banking activities, a high price volatility or a real-estate market risk pose a great potential risk to banks even when current real estate price levels are high.

When price risks of assets are large and important, the banking literature suggests that price risks should constitute an important part of bank risk management. Similarly, banks should consider large price risks in real estate loans in their lending decisions. On the one hand, when banks operate in a market with high risks, banks should be aware of the potential credit risks and should make a loan decision considering such risks (Froot and Stein, 1998). To lower their exposure to potential credit risks (Philippe, 2001; Duffie and Pan, 1997), banks facing larger credit risks often tighten their lending standards (Asea and Blomberg, 1998; Berger and Udell, 2004; Lown and Morgan, 2006). Furthermore, facing an increase in default risks of borrowers, banks have to prepare for greater allowances for larger expected losses.

On the other hand, banks might neglect high fluctuations in housing prices in their lending decisions. Furthermore, banks can make more secured real estate loans (R.E. loans) decisions for several reasons. First, as banks can liquidate seized collateral when borrowers cannot repay their loans, banks think that collateral lowers their risk exposures (Bester, 1985). Second,

exploiting the fluctuation of real-estate collateral values and deposit insurance, banks can gamble with the future value of collateral and make loans to risky borrowers (Niinimäki, 2009). When the price appreciates while a deposit insurer covers the cost of extreme downfalls of collateral values and bank failures, banks benefit from higher collateral values (Niinimäki, 2009). Third, as larger and more profitable firms pay their CEOs more (Barro and Barro, 1990; Jensen and Murphy 1990; Crawford et al., 1995; Hubbard and Pelia, 1995; Bliss and Rosen 2001), bank CEOs have an incentive to increase their bank lending and prepare for smaller allowances for loan losses while ignoring real-estate market risks. In short, previous banking studies suggest that housing price volatility can affect bank lending. Due to incentive reasons under seized real-estate collateral however, the ex-ante effects of housing price risks are not necessarily negative to bank loans. Past studies on lending examined the effects of price levels of the real-estate and bank lending behavior. However, few studies have systematically evaluated the effects of housing price risks.

Unlike past studies, we examine whether housing price risks affect banks' lending behaviors controlling for real estate price levels. When housing prices in a market are volatile, how do banks respond to such volatility? Do banks lend less when they face a larger potential downside risks? Do banks respond differently to systematic risks and idiosyncratic risks? Do banks prepare for higher Allowance for Loan and Lease Losses (ALLL) when they operate in markets with high price risks? To our knowledge, our study is the first that has fully investigated the relationship between lending behavior of banks and housing price risks.

Using quarterly data on all commercial banks from 2001 to 2014 we show that banks in Metropolitan Statistical Area (MSA) with higher housing price risks have more housing loans than banks in MSA with lower risks before the crisis. In contrast, in the post-crisis period, banks show lower loan ratios when they are in MSAs with high housing risks. Even when banks face larger potential downside risks in housing prices, banks still make more mortgage

loans before the crisis. When housing prices face larger idiosyncratic risks, banks exhibit higher household loan ratios. However, banks do not seem to make more loans when housing prices face larger systematic risks. These findings are robust in both banks operating in a single MSA and those operating in multiple MSAs. In addition, banks belonging to bank holding company (hereafter BHC) and other banks show such lending behaviors. Our results are robust when we use different housing price volatility measures and when volatilities are measured on different time spans.

In addition, we find that banks have not prepared for potential risks while making more real estate loans in MSAs with high price risks. More loans without higher reserves for loan losses suggest that before the 2008 crisis, banks have not fully considered potential credit risks that housing price risks can cause. While banks incorporate housing price level information, banks ignore housing price volatility in making real-estate loan decisions, thereby taking risks.

Our study suggests two implications related to the 2008 financial crisis. Before the crisis, banks have made more loans to household borrowers in MSAs with greater potential price volatilities. Upon the burst of housing price bubble, many house loan borrowers would have failed paying their loans and services. So, our study suggests that bank lending decisions without considering housing price risks might have contributed to the 2008 banking crisis. Our results raise a possibility that bank CEO incentives might have contributed to the risk taking of their banks in markets with high price risks. When CEOs have incentives to exaggerate bank size and bank performance, their firms are likely to make more real estate loans while not preparing for more ALLLs despite more risks.

The rest of the paper proceeds as follows. Section 2 reviews related literature and presents our hypotheses. Section 3 describes the data and methodology used in our analysis, and Section 4 presents the empirical results and discusses them. Finally, Section 5 concludes.

2. Literature on Real estate prices, Price Risks and Bank Lending

Previous studies suggest conflicting effects of real estate prices on bank lending. On the one hand, an increase in real estate prices can raise lending capacity of banks through several channels. Higher prices of real-estate properties lead to increases in collateral values, asset values of banks, households' borrowing capacity and their borrowing demands (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Gerlach and Peng, 2005; Nkusu, 2011; Beck et al., 2013). Higher real estate prices can reduce the likelihood of credit defaults (Daglish, 2009; Niinimaki, 2009; Koetter and Poghosyan, 2010) and reduce non-performing loans (Davis and Zhu, 2009; Ghosh, 2015). With improved lending capacity, increased loan demands and better performance of loans, banks can provide more loans when real-estate market prices appreciate. So, an increase in real-estate market prices accelerates aggregate credit supply (Goodhart, 1995; Hofmann, 2003; Goodhart et al., 2006; Gerlach and Peng, 2005).

On the other hand, several studies indicate that a rapid growth of real-estate market prices can generate negative effects on stability, default risks and lending in the banking sector. Soaring housing prices could cause moral hazard or adverse selection problems of banks (Bernanke and Gertler, 1989, 1995; Allen and Gale, 2000). Housing price increases yield long-term opposite effects on owners and tenants or future home buyers can deteriorate the health of the banking sector that plays a critical role as mortgage lenders (Goodhart and Hofmann, 2007). Deviations from the fundamental value of real estate properties contribute to bank instability and increase the bank's probability of default (Koetter and Poghosyan, 2010). A circular relationship between real estate prices and lending behaviors leads to fluctuations in real estate prices (Hott, 2011).

Unlike a positive relationship between risks and returns in a stock market, there is a puzzling negative relationship between price risks and returns in housing markets, which

indicates that future housing returns tend to be lower when current price risks are high. Higher price risks in some markets show lower returns in the future (Han, 2013).

Independent of housing price levels, the volatility of housing price can also generate conflicting effects on housing loans. When they anticipate a downward trend in housing markets, banks tighten their lending standards (Asea and Blomberg, 1998; Berger and Udell, 2004; Lown and Morgan, 2006). Facing a downward risk, banks take less risks and make loans more conservatively in order to cope with a drop in collateral value or to reduce loan defaults thereby maintaining their charter values (Keeley, 1990; Demsetz et al., 1996; Hellman et al., 2000; Repullo, 2004).

Conversely, anticipating higher future housing prices, a bank can increase the amount of loans secured by collaterals. Upward housing price movements can increase the value of collateral, or the value of recovered loans from collateral. When a borrower cannot repay his loans due to insufficient income, a bank can make up for its loss by seizing the collateral (Bester, 1985). So, an upward price trend reduces bank losses even when a secured loan borrower defaults.

However, several studies indirectly imply that the fluctuations in housing prices do not necessarily reduce secured real estate loans. Although price volatility incurs potential risks in the future, managers do not necessarily prepare for potential risks. As bank CEOs get higher compensation when bank size is larger and profits are larger (Barro and Barro, 1990; Jensen and Murphy, 1990; Crawford et al., 1995; Hubbard and Pelia, 1995; Bliss and Rosen, 2001), they have an incentive to increase their lending but not to prepare for allowances for loan losses while ignoring real-estate market risks.

Furthermore, capitalizing on large volatility in real-estate collateral values, banks can increase their loans secured by real-estate collaterals. When collateral values determine its lending decisions, a bank can neglect the costly efforts of borrower screening and makes loans

to risky borrowers (Freixas et al., 2004). When its future collateral value is high, a bank makes a profit. When its collateral value dramatically depreciates, a bank faces severe losses which can cause the bank to fail. If a bank failure occurs, however, a deposit insurer pays for the cost of failure. In fact, the fluctuation of real-estate collateral values can generate moral hazard problems under deposit insurance and exacerbate risk-taking behavior in lending (Niinimäki, 2009). So, with larger volatility in real-estate markets, banks can finance risky borrowers against real-estate collateral and gamble with the future value of collateral.

Past studies suggest that the effects of housing price volatilities on bank lending are related to macro-economic conditions. An investigation into the housing price volatility for eight capital cities in Australia finds that macro-economic conditions determine the volatility (Lin Lee, 2009). The volatility of home value appreciation interacts with macro-economic variables (Miller and Peng, 2006). Some studies propose an asset pricing model for housing risk-return including several macro factors and momentum factor (Beracha and Skiba, 2013; Case et al., 2011).

3. Data and Methodology

3.1. Data Sources

Our data includes information on commercial banks from 2001 to 2014 collected from several sources. Bank-specific financial information is from the Consolidated Reports of Condition and Income (Call Reports) of the Federal Financial Institutions Examination Council (FFIEC). Branch-level information comes from the Summary of Deposits (SOD) database of the Federal Deposit Insurance Corporation (FDIC).

For other macro-economic conditions, we use MSA-level information such as Total Real GDP (Total RGDP) from the Bureau of Economic Analysis (BEA) and Herfinahl-Hirschman Index (HHI) indicates banking industry concentration in each MSA or state based on bank

deposits from SOD. Treasury bill rates are from Federal Reserve Economic Data (FRED) and monetary aggregate variables are from the Federal Reserve Board (FRB). Housing Price Index (HPI), the fundamental basis for the main explanatory variables, is from the Federal Housing Finance Agency (FHFA). As a bank can operate multiple branches in different MSAs, we use MSA-level information weighted by the relative deposit of each branch within a bank. All macro variables are value-weighted by the deposit in each branch across MSAs. A branch with no MSA location information has the state-level information of that branch.

We exclude banks with zero total assets and branches with zero total deposits. We winsorize all variables at the top and bottom 1% of the distribution of each variable. The number of final sample is 417,442 bank branch-quarter observations. The definitions and constructions of all the variables used in this study along with their sources are in Table 1.

<Insert Table 1 around here>

Table 2 shows summary statistics of variables used in this study, including their means for different time periods. The ratio of secured R.E. loans over total loans is about 0.64 for the whole period and this ratio is the highest (about 0.67) during the crisis period. *HPI* has the highest value during the crisis and its post-crisis value remains below its pre-crisis value.

<Insert Table 2 around here>

3.2. Methodology and Variables

We examine how housing price risks are related to bank lending. As bank lending depends on bank specific variables, and MSA level or country level macro variables, we control bank-specific characteristics, MSA-level business and real-estate market conditions, and nation-wide macro-economic conditions in order to reduce omitted variable bias.

$$Y_{it} = \beta_0 + \beta_1 \cdot \boldsymbol{H}_{it} + \beta_2 \cdot \boldsymbol{B}_{it-1} + \beta_3 \cdot \boldsymbol{X}_{it} + \omega_i + \mu_t + \varepsilon_{it} \quad (1)$$

The dependent variable in equation (1) is bank lending behavior measured through the ratio of loans secured by real estate collateral over total assets for bank *i* at time *t,* ($Secured\ R.E.\ loans_t/Total\ Assets_t$). This variable reflects the existing level of a bank's risk exposure for secured R.E. loans.

We test the effects of housing price risks on bank loans using all samples and three sub-period samples, respectively. As the 2008 global financial crisis causes structural changes in the economy, we divide the data into three groups across time: pre-crisis, crisis, and post-crisis. The pre-crisis period is from the first quarter of 2001 to the second quarter of 2007; the crisis period is from the third quarter of 2007 to the second quarter of 2009; the post-crisis period is from the third quarter of 2009 to the fourth quarter of 2014.

The main explanatory variable, $\boldsymbol{H_{it}}$ represents housing price risks. We construct several proxies for MSA-level housing price risks based on housing price returns: Volatility, Systematic Risk, Idiosyncratic Volatility, and Downside Risk (or Semi-variance). Housing Price Return (hereafter HPR) is the log differences of housing price indices (HPI) or log return of HPI, i.e. $\log(HPI_t) - \log(HPI_{t-1}) = \log(HPI_t/HPI_{t-1})$.

HPR Volatility (*HPR VOL*) is the standard deviation of HPR for the past 40 quarters from t-1 to t-40 in each MSA, representing overall real estate price risks. In equation (2), $\overline{HPR_i}$ is the mean of HPR in each MSA, N=40.

$$HPR\ VOL_{i,t} = \sqrt{\frac{1}{N}\sum_{k=t-N}^{t-1}(HPR_{i,k} - \overline{HPR_i})^2} \qquad (2)$$

We also construct *Downside VOL* or semi-variance (Markowitz, 1959; Mao, 1970a, b; Porter, 1977), representing downside risk of HPR. Semi-variance uses only observations whose values are lower than a threshold, theta. Previous studies using semi-variance often use zero, or the mean of samples as a threshold (Markowitz et al., 1993; Estrada, 1997; Fabozzi, 2001). Note that HPR Vol uses all observations including those whose values greater than the mean

value in (2). While HPR VOL cannot distinguish an upward trend from a downward trend of housing price, a semi-variance can distinguish them. For example, consider case A in which HPI moves from 1, 2, 3, 4, 5 over time and case B in which HPI changes from 5, 4, 3, 2, 1. While HPR Vol in both cases gives the same value of 0.09, Downside Vol (with zero as a threshold) is zero in case A, and 0.17 in case B. We calculate the semi-variance as follows.

$$Downside\ VOL_{i,t} = \sqrt{\frac{1}{N}\sum_{k=t-N}^{t-1}\left(HPR_{i,k} - Theta\right)^2} \text{ where } HPR_{i,k} < Theta \quad (3)$$

We also construct *HPR Beta* to examine a systematic risk of HPR, representing how closely HPR of each MSA moves in the same direction in which national HPR moves. Similar to capital asset pricing (CAPM) model in asset pricing literature (Sharp, 1964; Lintner, 1965; Black, 1972), we conjecture the relationship between MSA-level HPR and national level HPR_m as equation (4). *HPR Beta* represents the degree of co-movement of housing price return of each MSA with national HPR. This measure indicates how HPR in MSA real-estate market is exposed to HPR in the national real-estate market. $HPR\ Beta$ is the estimated coefficient, β_i, in (4).

$$HPR_{i,t} = \alpha_i + \beta_i HPR_{m,t} + \epsilon_{i,t} \quad (4)$$

Idiosyncratic Volatility of HPR (*HPR IVOL*) is the standard deviation of residuals from the relationship between national-level HPR and MSA HPRs similar to idiosyncratic volatility in CAPM model (Lintner, 1965). *HPR IVOL* indicates idiosyncratic housing price risks in each MSA. Following CAPM, as in equation (4), $HPR\ IVOL_i$ is the standard deviation of the error terms $(\epsilon_{i,t})$ from equation (4). While Fama and French (1996) argues that IVOL should not be priced when investors fully diversify their portfolio, Merton (1987) argues that idiosyncratic volatility should be positively rewarded if investors are not able to fully diversify their

portfolios. As most banks operate in one or a few MSAs, a bank cannot fully diversify its idiosyncratic risks of housing prices in markets where it operates. So, banks need to consider both the systematic risk and the idiosyncratic risk in housing prices. When *HPR IVOL* is high, real estate prices in the market face larger non-systematic risks, and can have great fluctuations independent of the movement of nation-wide HPR movements. Unless banks operate in fully diversified market, they need to address idiosyncratic volatility in housing prices in markets they operate.

$\boldsymbol{B_{it-1}}$ denotes several bank characteristics such as *BIS ratio, Core deposit ratio, NPL ratio, Total assets,* and *ROA*. To reduce endogeneity issues, we use its lagged value.

$\boldsymbol{X_{it}}$ denotes MSA- and national-level macro-variables such as *HPI, Total RGDP, HHI, T-bill* and *M2/GDP* that can affect loan demands. For a bank that operates multiple branches in different MSAs, we use weighted MSA-level information. ω_i is an unobserved bank-fixed effect, μ_t is a time-fixed effect, and we assume ε_{it} is a serially and cross-sectionally uncorrelated error term.

4. Empirical Results

4.1. The Trends of Key Variables Across Time

A historical trend of housing price indices shows wide fluctuations over time (Figure 1A). While the housing price index reaches its peak right before the 2008 financial crisis and then declines, annual housing price indices in the US market shows several booms and bursts over the last 100 years. The annual trend of HPR denoting one year returns from investing in housing markets shows wide fluctuations over time as well (Figure 1B). These figures show that housing prices have large variations, and are not stable. Figures 1C and 1D show standard

deviations of HPI and HPR with the base value of 100 in 1890. Standard deviations are large, indicating that HPI and HPR widely fluctuate.

<Insert Figure 1 around here>

Figure 2 shows trends of our housing price risk variables during 2001-2014. *HPI VOL* dramatically increases during the 2008 financial crisis in Figure 2A. The trend of *Downside VOL* (Figure 2B) is similar to that of *HPR VOL*. All variables show high risks in the post-crisis period as well. *HPR Beta* representing systematic risks (Figure 2C) and *HPR IVOL* representing idiosyncratic risks (Figure 2D) gradually increase over time and remain high in the post-crisis period as well. Housing price risk variables based on HPR information over 20 or 30 quarters show larger fluctuations than those based on 40 quarters.

<Insert Figure 2 around here>

4.2. Multivariate Regression

Using all samples in analysis (column 1), *HPR VOL* shows a positive and significant coefficient on secured R.E. loan ratios, suggesting that banks increase their secured real estate loans when they operate in MSAs with higher *HPR VOL*. Analyses of subsample periods show different relationships between *HPR VOL* and R.E. loan ratios. The coefficient of *HPR VOL* is positive and significant on R.E. loan ratios in the pre-crisis period (column 2) but in the post-crisis period the coefficient is negative and significant (column 4). Banks in MSAs with higher housing price risks show a higher lending level before the crisis but show a lower lending level after the crisis.

<Insert Table 3 around here>

Table 4 shows the effects of downside risks of housing prices on secured R.E. loan ratios. *Downside VOL* in Panel A measures the downside risk that HPR falls below zero. Note that a negative HPR indicates that a housing price index goes down below the previous period index

level. *Downside VOL* in Panel B estimates relative downside movements of the housing price compared to the average of housing prices during the past 40 quarters as a threshold value.

In both panels, regardless of the levels of thresholds, the coefficients of *Downside VOL* are positive and significant in the pre-crisis period (column 2) and are negative and significant in the post-crisis period (column 4) like those in Table 3. *Downside Vol* supports our hypothesis that banks have more loans in MSAs with larger downside risks.

<Insert Table 4 around here>

4.3. Robustness Test Results

4.3.1. Systematic and Idiosyncratic Price Risks

Table 5 shows how systematic risks (*HPR Beta*) and idiosyncratic risks (*HPR IVOL*) of housing prices affect housing loans in the first four and the last four columns, respectively. While an analysis using all samples shows that the coefficient of *HPR Beta* is negative and significant (see column 1), subsample analyses show the coefficients of *HPR Beta* vary across time periods. The coefficient of *HPR Beta* is positive but insignificant in pre-crisis period. In contrast, the coefficients of *HPR Beta* are negative and significant in the crisis and post-crisis periods. These results suggest that real estate price risks do not affect bank lending decisions before the 2008 crisis. However, during crisis and post-crisis periods, banks lowered their loans when their MSAs have high price risks.

The coefficient of *HPR IVOL* is positive in analysis using all samples. In the pre-crisis period, the coefficient of *HPR IVOL* is positive and significant (column 6). However, the coefficients of *HPR IVOL* are negative and significant in subsample analyses in the crisis and post-crisis periods (columns 7 and 8). Before the crisis, banks did not lower their lending when their real-estate markets face large idiosyncratic risks. Instead, banks facing high idiosyncratic risks have increased their loans, suggesting their risk taking behavior in loan decisions.

These results indicate that banks in the pre-crisis period do not consider potential real estate price risks synchronized with those in the national markets. Furthermore, they have ignored potential real estate price risks in their specific markets. Banks in markets with large idiosyncratic risks make more housing loans than those in markets without such risks.

<Insert Table 5 around here>

4.3.2. Single Market vs. Multiple Markets

Table 6 shows the results of basic regressions in two subsamples depending on whether a bank operates in only one MSA or multiple MSAs in Panels A and B, respectively. When a bank operates in multiple MSAs, housing price risks exposed in one market can be, to some extent, offset by those in other markets. In contrast, a bank operating in only one MSA cannot reduce its exposure to the MSA's real estate price risks. So, the need to consider price risks in their lending decisions can be mitigated in banks operating multiple markets.

The results in Panels A and B in Table 6 are almost the same. Regardless of whether a bank operates in multiple MSAs or not, the coefficient of *HPR VOL* is positive and significant on secured R.E. loan ratios in pre-crisis period (columns 2 and 6),

<Insert Table 6 around here>

4.3.3. Bank Holding Company

We also test whether banks take more risks in markets with greater housing price volatility when they have a better capacity for risk management or risk diversification. We divide our sample in two groups depending on whether a bank belongs to a BHC or not. A bank belongs to BHC has an advantage regarding risk management than a bank not in BHC (Demsetz and Strahan, 1997).

The results in Panel A based on banks in BHC in Table 7 are similar to those in Panel B based on banks not in BHC. In both panels, in the pre-crisis period, the coefficient of *HPR VOL*

are positive and significant, suggesting that banks have made more real estate loans, regardless of whether they belong to a BHC or not. However, the coefficient of *HPR VOL* of pre-crisis period in Panel A (column 2) is more significant than that of pre-crisis period in Panel B (column 6). Although there are differences in terms of significance, both Panels A and B suggest that banks take excessive risks in the lending decisions in the pre-crisis period.

<Insert Table 7 around here>

4.3.4. Price Volatility over Different Time Spans

We also examine whether our results are robust when we construct volatility using HPR information over different time spans such as the past 20 or 30 quarters. With a shorter time span, our volatility measures focus on recent-year information on real-estate market conditions.

The coefficient of *HPR VOL* is positive and significant on secured R.E. loan ratios in the pre-crisis period of Panel A (column 2) and Panel B (column 6). In post-crisis period the coefficient of Panel A (column 4) and Panel B (column 8) are negative and significant. During the crisis period however, the coefficient of *HPR VOL* is negative when volatility is calculated using information on a longer time span (column 3), but the coefficient is positive when the volatility uses information on a shorter time span (column 7).

<Insert Table 8 around here>

4.3.5. Price Volatility and Commercial and Industrial Loans

We explore an alternate hypothesis that banks have increased all types of loans in pre-crisis period in MSAs with higher housing price volatilities. In this alternate hypothesis, the increase in R.E. loan ratios reflects a general trend of large loans in the region with higher housing price risks. The alternate hypothesis argues that borrowers who do not pledge real-estate collaterals can get more loans from banks. In this case, other loan ratios would be higher in regions with high price risks. To address this issue, we examine the effects of housing price risks on total loan ratio or commercial and industrial (C&I) loan ratio. Unlike secured real estate loans whose

collateral value or default risks are directly related to housing price risks, C&I loan and total loan ratios are not directly related to housing price risks.

The coefficients of *HPR VOL* of Panel A (column 2) and Panel B (column 3) in Table 9 are negative and insignificant. These results are different results from positive effects of housing price risks on secured real estate loans. The effects of housing market risks on total loans or C&I loans are indirect and weak, refuting an alternate hypothesis that banks make loans more to all types of borrowers in such regions in the pre-crisis.

<Insert Table 9 around here>

4.3.6. Price Volatility and Allowance for Loan and Lease Losses

We explore whether banks have prepared for potential risks while making more real estate loans in MSAs with high price risks. We test how price risks affect allowance for loan and lease losses (hereafter ALLL) ratio over total assets. A positive relationship between housing price risks and ALLL suggests that banks increase allowance in MSAs with high risks. As high reserves for potential losses lower accounting performance of banks, a positive relationship refute managerial incentives as a main reason for why banks ignore real-estate market price risks. However, a negative or insignificant relationship do not rule out that managerial incentives constitute a cause.

Regardless of the price risk measures, Table 10 shows the relationship between price risks and ALLL ratio is negative and significant in some cases. In Panel A, the empirical analyses show that the coefficient of *HPR VOL* is negative and insignificant (column 2). Banks in MSAs with higher housing price risks do not have higher ALLL ratio than banks in MSAs with lower housing price risks before the crisis. Panel B shows the effects of the systematic risk or idiosyncratic risk on ALLL ratio. The coefficient of *HPR Beta* on *ALLL ratio* in pre-crisis (column 2) is negative and significant. Banks in MSAs with higher systematic housing price risks have lower ALLL ratios rather than higher ALLL ratios. The coefficient of *HPR IVOL* on

ALLL ratio in pre-crisis (column 6) is also negative. Panel C shows the relationship between *ALLL ratio* and *Downside VOL*. Regardless of the threshold, the coefficient of *Downside VOL* is negative and insignificant in pre-crisis period (columns 2 and 6).

<Insert Table 10 around here>

4.4. Summary and Discussion

We investigate the relationship between housing price risks and bank lending before and after the 2008 financial crisis. We find that banks in MSAs with higher housing price risks show a higher lending level but not a higher ALLL ratio before the crisis. In contrast, these banks show a lower lending level after the 2008 crisis. Banks facing large idiosyncratic risks lent more money than those which do not face. These results are robust in all groups of banks regardless of whether a bank operates in single MSA or belongs to BHC, and are robust across diverse volatility measures.

We argue that banks should have considered housing price risks in determining their secured R.E. loans for the following reasons. One, our analysis shows a high economic significance of housing price risks. For example, when *HPR VOL* increases by one standard deviation from its mean, banks increase secured R.E. loan ratio by 1.5% (or 0.063 percentage point) in the pre-crisis period, and heavily cut down secured loan ratio by 4.9% (or 2.14%) in the post-crisis period. Two, a large drop in secured R.E. loan ratios after the bubble burst in markets with high housing price risks suggests that pre-crisis R.E. loan ratios were excessively high. After the 2008 subprime mortgage crisis, banks might have overreacted to *HPR VOL* and reduced secured R.E. loan ratio too much in the post-crisis period. Nevertheless, banks had to correct the positive relationship between *HPR VOL* and secured R.E. loans. Three, in both pre-crisis and post-crisis periods, the economic significance of *HPR VOL* in determining secured R.E. loan ratio is greater than those of NPL ratio, or return on assets (ROA).

Our analyses include MSA macroeconomic variables like the housing price levels, real GDP data, banking sector concentrations and time dummies in order to control potential demand side effects. Nevertheless, we note that we do not fully control demand side effects perfectly. Future studies using aggregate loan application information of each MSA can complement our study.

We do not access borrower-loan level information, and are not able to establish direct evidence that banks in MSAs with higher housing price risks have higher lending levels and allocate loans to riskier borrowers. Future studies can extend our study using borrower-loan information or loan application information.

5. Conclusions

We examine how housing price risks in real-estate markets affect bank lending in household loans before and after the 2008 financial crisis. Using quarterly data on all commercial banks from 2001 to 2014 we show that banks in MSAs with higher housing price risks have more housing loans but do not set more allowances for loan losses than banks in MSAs with lower risks before the crisis. When housing prices in their markets face larger idiosyncratic risks, banks show larger mortgage loan ratios. However, banks do not seem to make more loans when housing prices face larger systematic risks. Even when banks face larger potential downside risks in housing prices, banks still make more mortgage loans.

Banks show such risk-taking lending behaviors in the pre-crisis period, not in the post-crisis period. A negative coefficient of housing price risks on secured loan ratios in the post-crisis period suggests that after experiencing a bubble burst, banks become more aware of housing price risks and lowered their housing loans in markets with high price risks.

Future studies can expand our studies to examine bank lending behaviors in other countries that have experienced real-estate market bubbles. When banks in these countries also exhibit

similar lending behaviors, we argue that banks do not conservatively make loan decisions in the pre-crisis period or during a bubble period or ignore the risks at the least. Furthermore, with evidence of positive relationship between real estate price risks and loan ratios, we can argue that banks exploit high price risks and make more loans during a bubble period thereby contributing to excessive credit supply.

In addition, future studies can try to identify factors that cause such risk taking and lending behaviors of banks. When future studies confirm that bank managers earn more in markets with high real-estate market risks, our results suggest that managerial incentives can be a main reason for why banks ignore, at the least, or exploit real-estate market price risks in their lending decisions.

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Figure 1. Annual Housing Price Index and its growth

The figures show the annual average value of HPI, the log growth of HPI and their standard deviations with the base value of 100 in 1890. The data are from Robert Shiller's "Irrational Exuberance" website.

Figure 1A. Historical HPI

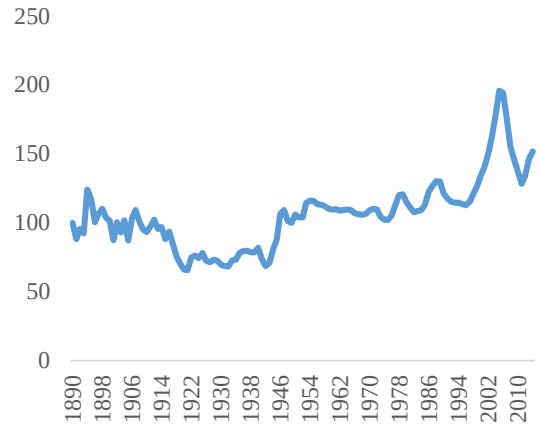

Figure 1B. Housing Price Return (HPR)

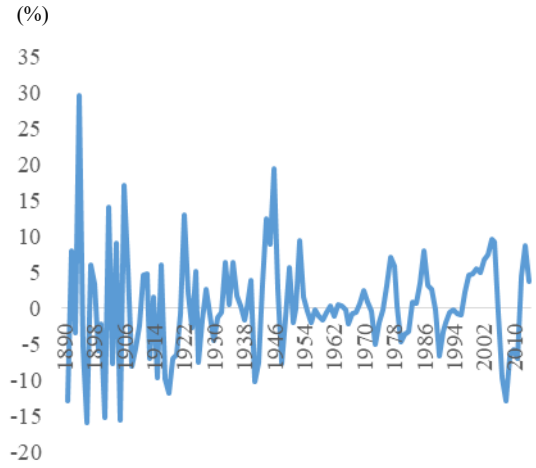

Figure 1C. STD of HPI

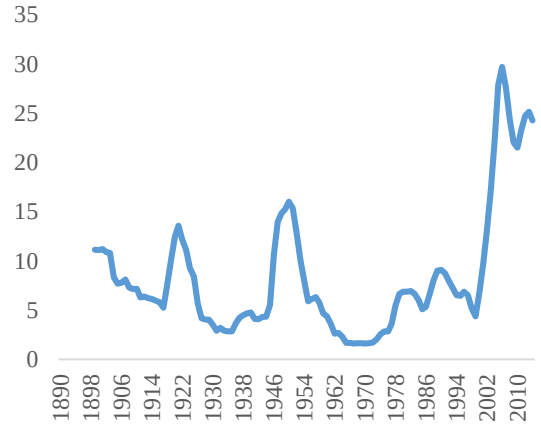

Figure 1D. STD of HPR

Figure 2. Average Housing Price Risks across MSAs over Pre-, During and Post-Crisis periods

The figures show the quarterly average value of the housing price risks across MSAs using 40, 30 and 20 quarters of information. See Table 1 for definition of HPR VOL, HPR Beta, HPR IVOL, and Downside VOL. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q.

Figure 2A. *HPR VOL*

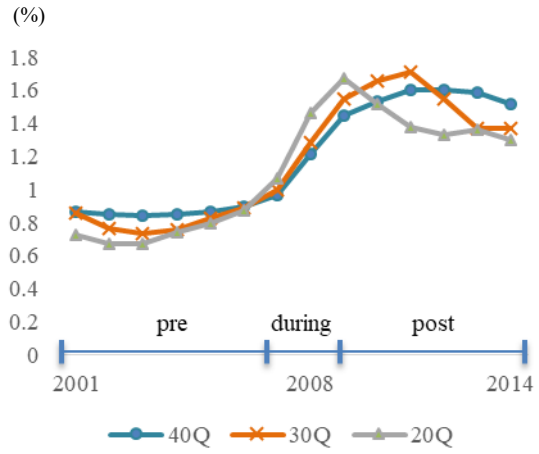

Figure 2B. *HPR Beta* (Systemic Risk)

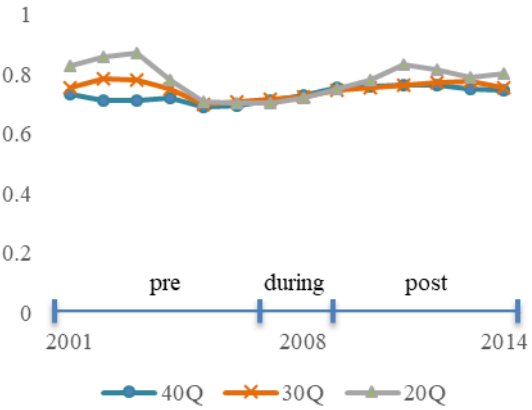

Figure 2C. *HPR IVOL* (Idiosyncratic Risk)

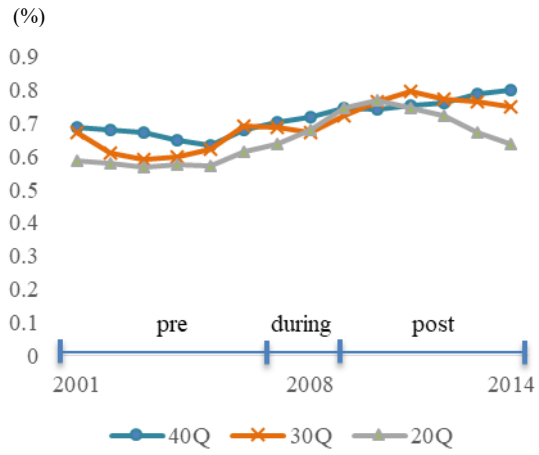

Figure 2D. *Downside VOL*

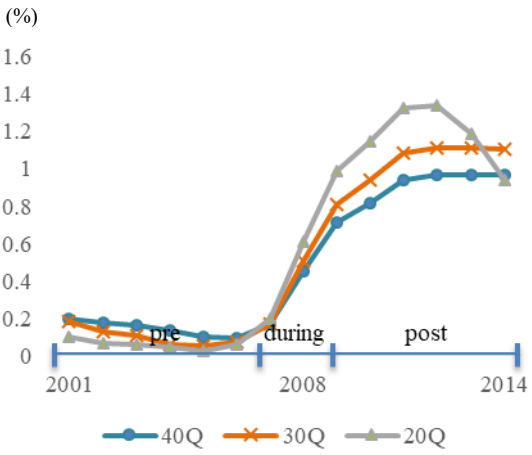

Table 1. Definitions of the variables and data sources
Each variable is measured at the level specified at the source.

Variable	Definition	Source	Level
HPR VOL	The standard deviation of HPR in the MSA or state	FHFA SOD	Bank
HPR Beta	The beta is calculated using CAPM model for HPR representing systematic risk.	FHFA SOD	Bank
HPR IVOL	The idiosyncratic volatility is standard deviation of error term in CAPM model for HPR.	FHFA SOD	Bank
Downside VOL	The standard deviation of semivariance calculated by measuring the dispersion of data that fall below a threshold (0 or mean value)	FHFA SOD	Bank
BIS Ratio	The equity capital to its total risk-weighted assets, representing the financial soundness of the bank.	FFIEC	Bank
Core deposit Ratio	The core deposit to the sum of the core deposit and wholesale funding of the bank.[1] It represents the financial stability of the bank.	FFIEC	Bank
NPL Ratio	The ratio of a bank's total non-performing loans to its total loans.	FFIEC	Bank
Total assets	The amounts of the assets of the bank in $1000	FFIEC	Bank
ROA	The return on asset.	FFIEC	Bank
Secured R.E. loan ratio	The ratio of a bank's secured by real estate loans to its total assets (Secured R.E. loans/total assets).	FFIEC	Bank
Total loan ratio	The ratio of a bank's total loans to its total assets (total loans/total assets).	FFIEC	Bank
C&I loan ratio	The ratio of a bank's commercial and industrial loans to its total assets (commercial and industrial loans/total assets).	FFIEC	Bank
ALLL Ratio	Allowance for loan and lease losses to total assets	FFIEC	Bank
HPI	The weighted average of the housing price index of the MSAs or states	FHFA	MSA
Total RGDP	The weighted average of the total real GDP of the MSAs or states	BEA	MSA
HHI	Herfindahl-Hirschman Index measuring banking sector market concentration in each MSA or state	FDIC SOD	MSA
T-Bill	Three-month Treasury bill rate	FRED	Macro
M2/GDP	Money supply, measured as M2 divided by GDP	FRB	Macro

Note: Consolidated Reports of Condition and Income (Call Reports); Federal Financial Institutions Examination Council (FFIEC); Summary of Deposits (SOD); Bureau of Economic Analysis (BEA); Federal Housing Finance Agency (FHFA); Federal Reserve Economic Data (FRED); Federal Reserve Board (FRB)

[1]Wholesale funding refers to the sum of federal funds purchased, securities sold under agreements to repurchase, subordinated notes and debentures, brokered deposits, other borrowed money, deposits in foreign offices, and uninsured long-term deposits (Kim, 2015).

Table 2. Summary Statistics

This table provides the descriptive statistics for the variables used in the analysis. Table 1 lists the definition and construction of each variable. Variables except for *T-Bill* and *M2/GDP* are winsorized at 1st and 99th percentiles. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q.

	Whole period				Pre-Crisis	During Crisis	Post-Crisis
	MEAN	STD	MIN	MAX	MEAN	MEAN	MEAN
Total assets ($1000)	467,298	1,512,374	7,687	20,938,997	388,598	469,898	580,968
Secured R.E. loans ($1000)	188,072	520,962	0	6,502,157	150,517	211,070	233,290
Total loans ($1000)	294,963	935,041	818	13,268,055	241,439	317,118	363,816
C&I loans ($1000)	38,457	177,496	0	2,681,911	29,877	41,417	49,740
Secured R.E. loan ratio	0.4303	0.1803	0.0000	0.9843	0.4146	0.4658	0.4386
Total loan ratio	0.6264	0.1635	0.0003	1.2073	0.6281	0.6602	0.6099
C&I loan ratio	0.0227	0.0559	0.0000	0.9821	0.0190	0.0251	0.0272
HPR VOL	0.0116	0.0074	0.0029	0.0475	0.0086	0.0120	0.0156
HPR Beta	0.7306	0.6300	-0.5796	3.1310	0.7111	0.7315	0.7587
HPR IVOL	0.0071	0.0037	0.0024	0.0247	0.0067	0.0072	0.0077
Downside VOL	0.0045	0.0057	0.0000	0.0338	0.0014	0.0044	0.0092
BIS Ratio	0.1776	0.1021	0.0012	1.3746	0.1794	0.1738	0.1767
Core deposit Ratio	0.7766	0.1705	0.0000	1.0000	0.7555	0.6928	0.8421
NPL Ratio	0.0137	0.0214	0.0000	0.1911	0.0078	0.0153	0.0216
ROA	0.0052	0.0164	-0.5587	3.1193	0.0065	0.0036	0.0039
ALLL Ratio	0.0096	0.0065	0.0000	0.3673	0.0088	0.0093	0.0109
HPI	170.89	32.69	108.72	337.39	163.71	188.62	174.00
Total RGDP ($Billion)	97,498	104,957	1,539	459,699	93,243	101,541	102,024
HHI	0.0717	0.0520	0.0063	0.5038	0.0724	0.0709	0.0708
T-Bill	0.0151	0.0161	0.0001	0.0494	0.0264	0.0098	0.0007
M2/GDP	0.5476	0.0556	0.4802	0.6604	0.5039	0.5383	0.6152
Observations	417,442				211,868	60,265	145,309

Table 3. Effects of HPR Volatility to the Secured R.E. loan ratio

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

Dependent Variable	*Secured R.E. loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.5908***	1.3755***	-0.5511	-2.4725***
	(6.10)	(6.07)	(-1.45)	(-9.80)
BIS Ratio	-0.2994***	-0.2436***	-0.2154***	-0.3584***
	(-54.15)	(-34.15)	(-20.12)	(-25.95)
Core deposit Ratio	-0.0544***	-0.0574***	-0.0313***	-0.0254***
	(-15.92)	(-12.64)	(-5.46)	(-5.49)
NPL Ratio	-0.1543***	-0.2217***	-0.2795***	-0.0248
	(-10.53)	(-8.82)	(-12.81)	(-1.50)
Log(Total assets)	0.0153***	0.0196***	-0.0041	0.0202***
	(11.71)	(9.64)	(-1.09)	(7.42)
ROA	0.1370***	0.0591**	0.1116***	0.1927***
	(3.82)	(2.12)	(2.99)	(6.70)
Log(HPI)	0.0685***	0.0311***	-0.0217	0.0533***
	(19.13)	(5.64)	(-1.30)	(6.66)
Log(Total RGDP)	0.0117***	0.0128***	0.0091**	0.0005
	(5.63)	(4.25)	(2.42)	(0.12)
HHI	0.1617***	0.0705**	0.0337	0.0303
	(6.42)	(2.23)	(0.83)	(0.75)
T-Bill	0.0043	0.0000	0.0000	-0.0044
	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0001	0.0000	0.0000	-0.0355
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187
R-squared	0.8837	0.9247	0.9692	0.9460

Table 4. Effects of Downside Volatility to the Secured R.E. loan ratio

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A: Threshold = 0				Panel B: Threshold = Mean			
Dependent Variable	*Secured R.E. loan ratio*				*Secured R.E. loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
Downside VOL	0.8256***	2.9661***	0.1719	-3.4336***	0.6581***	2.0597***	0.0727	-2.7289***
	(6.29)	(8.70)	(0.57)	(-9.27)	(5.22)	(5.88)	(0.20)	(-9.38)
BIS Ratio	-0.2993***	-0.2432***	-0.2154***	-0.3587***	-0.2995***	-0.2434***	-0.2154***	-0.3585***
	(-54.11)	(-34.03)	(-20.11)	(-26.00)	(-54.17)	(-34.08)	(-20.12)	(-26.02)
Core deposit Ratio	-0.0544***	-0.0569***	-0.0312***	-0.0249***	-0.0544***	-0.0571***	-0.0312***	-0.0259***
	(-15.90)	(-12.55)	(-5.45)	(-5.35)	(-15.91)	(-12.61)	(-5.45)	(-5.59)
NPL Ratio	-0.1547***	-0.2190***	-0.2800***	-0.0292*	-0.1512***	-0.2211***	-0.2798***	-0.0238
	(-10.55)	(-8.72)	(-12.84)	(-1.78)	(-10.33)	(-8.80)	(-12.83)	(-1.44)
Log(Total assets)	0.0152***	0.0199***	-0.0040	0.0203***	0.0154***	0.0198***	-0.0040	0.0203***
	(11.69)	(9.82)	(-1.08)	(7.45)	(11.82)	(9.75)	(-1.07)	(7.45)
ROA	0.1372***	0.0584**	0.1154***	0.1961***	0.1380***	0.0599**	0.1146***	0.1785***
	(3.81)	(2.07)	(3.07)	(6.81)	(3.82)	(2.13)	(3.05)	(6.23)
Log(HPI)	0.0812***	0.0680***	0.0082	0.0274***	0.0699***	0.0392***	0.0030	0.0617***
	(17.19)	(14.45)	(0.54)	(3.06)	(18.41)	(8.19)	(0.19)	(7.76)
Log(Total RGDP)	0.0111***	0.0129***	0.0089**	0.0023	0.0113***	0.0127***	0.0090**	0.0013
	(5.38)	(4.36)	(2.37)	(0.60)	(5.45)	(4.26)	(2.39)	(0.35)
HHI	0.1638***	0.0722**	0.0359	0.0462	0.1569***	0.0656**	0.0347	0.0359
	(6.50)	(2.29)	(0.88)	(1.14)	(6.25)	(2.08)	(0.85)	(0.89)
T-Bill	0.0043	0.0000	0.0000	0.0784	0.0043	0.0000	0.0000	0.0708
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0001	0.0000	0.0000	0.0003	0.0001	0.0000	0.0000	-0.0029
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	407,541	202,274	60,039	145,187
R-squared	0.8837	0.9247	0.9692	0.9460	0.8837	0.9247	0.9692	0.9460

Table 5. Effects of Systematic risk and Idiosyncratic risk to the Secured R.E. loan ratio

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

Dependent Variable	*Secured R.E. loan ratio*								
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)		Whole(5)	Pre-Crisis(6)	During Crisis(7)	Post-Crisis(8)
HPR Beta	-0.0073***	0.0015	-0.0083***	-0.0397***	*HPR IVOL*	1.5965***	2.0139***	-2.6991***	-1.3073***
	(-8.28)	(1.61)	(-3.23)	(-8.82)		(8.83)	(8.47)	(-3.74)	(-3.79)
BIS Ratio	-0.2993***	-0.2434***	-0.2149***	-0.3568***	*BIS Ratio*	-0.2992***	-0.2440***	-0.2159***	-0.3568***
	(-53.78)	(-33.69)	(-20.58)	(-25.93)		(-54.06)	(-34.22)	(-20.16)	(-25.78)
Core deposit Ratio	-0.0535***	-0.0575***	-0.0312***	-0.0261***	*Core deposit Ratio*	-0.0549***	-0.0568***	-0.0312***	-0.0269***
	(-15.58)	(-12.48)	(-5.45)	(-5.56)		(-16.04)	(-12.51)	(-5.45)	(-5.80)
NPL Ratio	-0.1288***	-0.2170***	-0.2752***	-0.0270*	*NPL Ratio*	-0.1501***	-0.2235***	-0.2775***	-0.0278*
	(-9.00)	(-8.34)	(-12.69)	(-1.65)		(-10.31)	(-8.91)	(-12.73)	(-1.69)
Log(Total assets)	0.0160***	0.0198***	-0.0039	0.0205***	*Log(Total assets)*	0.0153***	0.0194***	-0.0043	0.0209***
	(12.38)	(9.67)	(-1.03)	(7.54)		(11.80)	(9.55)	(-1.14)	(7.61)
ROA	0.1335***	0.0599**	0.1127***	0.1792***	*ROA*	0.1337***	0.0577**	0.1128***	0.1938***
	(3.80)	(2.10)	(3.06)	(6.20)		(3.77)	(2.07)	(3.03)	(6.74)
Log(HPI)	0.0633***	0.0477***	0.0012	0.0638***	*Log(HPI)*	0.0664***	0.0430***	-0.0092	0.0630***
	(19.26)	(10.11)	(0.16)	(7.98)		(19.85)	(9.58)	(-1.13)	(7.91)
Log(Total RGDP)	0.0097***	0.0096***	0.0084**	0.0031	*Log(Total RGDP)*	0.0140***	0.0147***	0.0066*	-0.0010
	(4.72)	(3.24)	(2.18)	(0.81)		(6.66)	(4.85)	(1.71)	(-0.24)
HHI	0.1245***	0.0695**	0.0285	0.0445	*HHI*	0.1644***	0.0708**	0.0298	0.0122
	(5.02)	(2.18)	(0.70)	(1.11)		(6.48)	(2.24)	(0.73)	(0.30)
T-Bill	0.0042	0.0000	0.0000	0.1571	*T-Bill*	0.0043	0.0000	0.0000	0.1562
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0001	0.0000	0.0000	0.0767	*M2/GDP*	0.0001	0.0000	0.0000	0.0752
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	Observations	407,541	202,274	60,039	145,187
R-squared	0.8837	0.9246	0.9692	0.9460	R-squared	0.8837	0.9247	0.9692	0.9459

Table 6. Effects of HPR Volatility to the Secured R.E. loan ratio operating in a single MSA vs multiple MSAs

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A: Single MSA				Panel B: Multiple MSAs			
Dependent Variable	*Secured R.E. loan ratio*				*Secured R.E. loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.9681***	1.0740***	-0.0062	-2.4915***	0.2075	1.7254***	-0.8186*	-2.4177***
	(8.07)	(3.95)	(-0.01)	(-7.99)	(1.14)	(4.21)	(-1.68)	(-5.83)
BIS Ratio	-0.2964***	-0.2397***	-0.2140***	-0.3685***	-0.3877***	-0.4212***	-0.2471***	-0.2825***
	(-48.73)	(-31.76)	(-18.02)	(-22.73)	(-24.00)	(-12.75)	(-11.09)	(-14.15)
Core deposit Ratio	-0.0549***	-0.0558***	-0.0330***	-0.0146***	-0.0338***	-0.0338***	-0.0305***	-0.0403***
	(-13.59)	(-10.88)	(-4.86)	(-2.61)	(-5.81)	(-3.85)	(-3.12)	(-5.23)
NPL Ratio	-0.1071***	-0.1760***	-0.2315***	-0.0174	-0.2373***	-0.3041***	-0.4329***	-0.0349
	(-6.22)	(-6.66)	(-8.92)	(-0.92)	(-8.70)	(-4.33)	(-11.84)	(-1.21)
Log(Total assets)	0.0065***	0.0150***	-0.0083*	0.0182***	0.0111***	0.0163***	-0.0094*	0.0175***
	(3.87)	(5.91)	(-1.85)	(5.16)	(4.76)	(3.98)	(-1.67)	(4.27)
ROA	0.1386***	0.0472*	0.1179***	0.1618***	0.4370***	0.2680	0.1106	0.2531***
	(3.49)	(1.79)	(2.75)	(4.88)	(4.61)	(1.59)	(1.64)	(4.73)
Log(HPI)	0.0757***	0.0528***	-0.0128	0.0698***	0.0692***	0.0144	-0.0015	0.0173
	(17.24)	(8.03)	(-0.54)	(7.00)	(10.68)	(1.42)	(-0.07)	(1.29)
Log(Total RGDP)	0.0188***	0.0202***	0.0151***	-0.0039	-0.0008	-0.0035	0.0043	0.0144***
	(5.35)	(3.45)	(2.89)	(-0.72)	(-0.29)	(-0.88)	(1.07)	(3.23)
HHI	-0.0139	0.0194	-0.0254	0.0249	0.0606	-0.0496	0.0564	0.0600
	(-0.45)	(0.53)	(-0.51)	(0.49)	(1.52)	(-0.91)	(1.04)	(0.95)
T-Bill	-0.0139	0.0000	0.0000	0.0000	0.1250	0.0000	0.0000	0.0000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0000	0.0000	0.0000	0.0000	0.0007	0.0000	0.0000	0.0000
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	294,627	153,317	42,859	98,429	112,903	48,946	17,169	46,766
R-squared	0.8958	0.9305	0.9696	0.9521	0.8709	0.9136	0.9682	0.9313

Table 7. Effects of HPR Volatility to the Secured R.E. loan ratio whether belonging to Bank Holding Company or not

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A: BHC				Panel B: No BHC			
Dependent Variable	*Secured R.E. loan ratio*				*Secured R.E. loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.7055***	1.0417***	-0.4271	-1.5823***	0.2405	0.8826*	-1.2239	-3.8340***
	(6.49)	(4.03)	(-1.06)	(-5.40)	(1.08)	(1.88)	(-1.28)	(-8.56)
BIS Ratio	-0.3124***	-0.2599***	-0.1808***	-0.3522***	-0.2965***	-0.2453***	-0.2422***	-0.3357***
	(-37.94)	(-24.56)	(-12.06)	(-20.24)	(-36.68)	(-22.38)	(-17.16)	(-14.46)
Core deposit Ratio	-0.0491***	-0.0627***	-0.0253***	-0.0239***	-0.0625***	-0.0363***	-0.0444***	-0.0281***
	(-12.92)	(-12.79)	(-3.93)	(-4.56)	(-8.95)	(-3.70)	(-4.11)	(-3.01)
NPL Ratio	-0.1299***	-0.1560***	-0.2904***	-0.0353*	-0.1416***	-0.3482***	-0.2449***	0.0131
	(-8.18)	(-5.65)	(-12.24)	(-1.94)	(-4.54)	(-6.36)	(-5.15)	(0.37)
Log(Total assets)	0.0139***	0.0178***	0.0002	0.0169***	0.0026	0.0142***	-0.0118**	0.0225***
	(9.24)	(7.74)	(0.05)	(6.11)	(0.96)	(3.07)	(-2.25)	(3.20)
ROA	0.4161***	0.4191***	0.1183***	0.2545***	0.0580**	0.0123	0.0892	0.0757
	(10.58)	(6.61)	(2.64)	(7.32)	(2.23)	(0.78)	(1.50)	(1.64)
Log(HPI)	0.0798***	0.0399***	0.0004	0.0696***	0.0406***	0.0311***	-0.0968**	0.0053
	(19.84)	(6.18)	(0.02)	(7.68)	(5.28)	(2.84)	(-2.30)	(0.32)
Log(Total RGDP)	0.0102***	0.0073**	0.0042	0.0019	0.0191***	0.0362***	0.0269**	0.0097
	(4.54)	(2.37)	(1.27)	(0.46)	(2.97)	(2.90)	(2.20)	(1.12)
HHI	0.1853***	0.0021	0.1006**	-0.0268	-0.0036	0.2487***	-0.1288*	0.1587**
	(6.69)	(0.06)	(2.17)	(-0.60)	(-0.07)	(3.52)	(-1.65)	(2.00)
T-Bill	-0.0087	0.0000	0.0000	0.0708	0.7020	-0.1312	0.0000	0.0708
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0000	0.0000	0.0000	-0.0029	0.0056	-0.0010	0.0000	-0.0029
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	321,553	157,715	47,788	116,009	85,977	44,548	12,240	29,148
R-squared	0.8812	0.9239	0.9701	0.9430	0.9137	0.9380	0.9697	0.9578

Table 8. Effects of HPR Volatility to the Secured R.E. loan ratio in different constructing periods

Dependent variables are the ratio of loans secured by real estates over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A: 30 quarters				Panel B: 20 quarters			
Dependent Variable	*Secured R.E. loan ratio*				*Secured R.E. loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.4560***	1.6458***	0.1752	-0.8402***	0.1871***	0.7977***	0.4818**	-0.6392***
	(5.60)	(8.53)	(0.62)	(-7.52)	(2.79)	(5.12)	(2.19)	(-6.61)
BIS Ratio	-0.2996***	-0.2439***	-0.2154***	-0.3580***	-0.3001***	-0.2438***	-0.2155***	-0.3559***
	(-54.16)	(-34.22)	(-20.12)	(-26.01)	(-54.25)	(-34.15)	(-20.13)	(-25.82)
Core deposit Ratio	-0.0543***	-0.0572***	-0.0313***	-0.0273***	-0.0543***	-0.0571***	-0.0312***	-0.0281***
	(-15.88)	(-12.63)	(-5.45)	(-5.89)	(-15.85)	(-12.57)	(-5.44)	(-6.05)
NPL Ratio	-0.1513***	-0.2222***	-0.2799***	-0.0226	-0.1407***	-0.2218***	-0.2819***	-0.0275*
	(-10.36)	(-8.86)	(-12.83)	(-1.36)	(-9.69)	(-8.84)	(-12.90)	(-1.67)
Log(Total assets)	0.0153***	0.0193***	-0.0040	0.0206***	0.0157***	0.0196***	-0.0041	0.0205***
	(11.80)	(9.51)	(-1.07)	(7.55)	(12.08)	(9.64)	(-1.10)	(7.49)
ROA	0.1386***	0.0572**	0.1152***	0.1755***	0.1375***	0.0584**	0.1175***	0.1706***
	(3.82)	(2.04)	(3.07)	(6.16)	(3.82)	(2.07)	(3.12)	(6.03)
Log(HPI)	0.0666***	0.0294***	0.0086	0.0635***	0.0623***	0.0356***	0.0253*	0.0708***
	(19.10)	(5.71)	(0.54)	(7.97)	(18.72)	(6.72)	(1.86)	(8.70)
Log(Total RGDP)	0.0113***	0.0136***	0.0089**	0.0015	0.0106***	0.0115***	0.0087**	0.0016
	(5.47)	(4.55)	(2.37)	(0.38)	(5.12)	(3.87)	(2.33)	(0.42)
HHI	0.1612***	0.0881***	0.0356	0.0378	0.1476***	0.0815**	0.0420	0.0484
	(6.40)	(2.78)	(0.87)	(0.94)	(5.89)	(2.57)	(1.02)	(1.20)
T-Bill	0.0044	0.0000	0.0000	-0.0044	0.0044	0.0000	0.0000	0.1562
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0001	0.0000	0.0000	-0.0355	0.0001	0.0000	0.0000	0.0752
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	407,541	202,274	60,039	145,187
R-squared	0.8837	0.9247	0.9692	0.9460	0.8836	0.9247	0.9692	0.9459

Table 9. Effects of HPR Volatility to the Total loan ratio or C&I loan ratio

Dependent variables are the ratios of the Total loans or C&I loans over total assets as a proxy for banks' lending behaviors. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A: Total loan ratio				Panel B: C&I loan ratio			
Dependent Variable	*Total loan ratio*				*C&I loan ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.2811**	-0.1118	-0.2082	-2.9386***	-0.1263	-0.2788	0.1549	-0.5627***
	(2.48)	(-0.43)	(-0.48)	(-9.48)	(-1.26)	(-1.28)	(0.52)	(-3.03)
BIS Ratio	-0.4485***	-0.4222***	-0.2923***	-0.5006***	-0.0775***	-0.1055***	-0.0357**	-0.0583***
	(-67.92)	(-44.88)	(-24.04)	(-30.51)	(-6.79)	(-6.51)	(-2.25)	(-3.65)
Core deposit Ratio	-0.0654***	-0.0653***	-0.0271***	-0.0379***	-0.0006	0.0014	0.0057	-0.0026
	(-17.44)	(-12.58)	(-4.02)	(-6.17)	(-0.18)	(0.30)	(1.05)	(-0.47)
NPL Ratio	-0.3477***	-0.3193***	-0.3377***	-0.2045***	-0.1379***	-0.2472***	-0.0522***	-0.1768***
	(-22.01)	(-10.41)	(-14.56)	(-11.49)	(-8.95)	(-4.80)	(-2.75)	(-8.67)
Log(Total assets)	0.0059***	-0.0033	-0.0246***	0.0203***	-0.0097***	-0.0120***	-0.0286***	0.0128***
	(4.08)	(-1.52)	(-4.76)	(6.23)	(-4.25)	(-4.49)	(-4.20)	(6.61)
ROA	0.1465***	0.0521	0.1164***	0.2267***	0.0836**	0.2251***	0.0285	-0.0141
	(3.60)	(1.56)	(2.65)	(6.08)	(2.17)	(3.47)	(0.76)	(-0.59)
Log(HPI)	0.0429***	0.0391***	-0.0199	0.0055	-0.0245***	-0.0147***	0.0106	-0.0375***
	(11.45)	(7.12)	(-1.04)	(0.55)	(-6.25)	(-2.79)	(0.83)	(-4.73)
Log(Total RGDP)	0.0159***	0.0071**	0.0026	0.0066	0.0077***	-0.0011	0.0016	0.0104***
	(6.78)	(2.14)	(0.34)	(1.34)	(4.43)	(-0.43)	(0.60)	(4.10)
HHI	0.1979***	0.0810**	0.1075**	0.0785*	0.0896***	-0.0668**	0.0181	0.1047***
	(7.89)	(2.51)	(2.33)	(1.81)	(3.95)	(-2.33)	(0.70)	(3.72)
T-Bill	0.0100	0.0000	0.0000	0.0708	0.1240	0.0000	0.0000	0.0784
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0003	0.0000	0.0000	-0.0029	0.0003	0.0000	0.0000	0.0003
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	94,308	37,144	14,606	42,517
R-squared	0.8323	0.8946	0.9447	0.9126	0.8578	0.9090	0.9594	0.9301

Table 10. Effects of housing price risks to the ALLL ratio

Dependent variables are the ratio of the ALLL over total assets as a proxy of banks' risk management for lending. Table 1 defines the variables. Pre-crisis is from 2001:1Q to 2007:2Q, during crisis is from 2007:3Q to 2009:2Q and post-crisis is from the 2009:3Q to 2014:4Q. Each regression includes quarterly dummies and bank dummies. T-statistics in parentheses are based on standard errors clustered by bank and robust to heteroskedasticity. ***, **, * represent significance at the 1%, 5%, 10% levels, respectively.

	Panel A			
Dependent Variable	*ALLL Ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
HPR VOL	0.0665***	-0.0368	0.0604	-0.0060
	(4.35)	(-0.97)	(1.46)	(-0.33)
Total loan ratio	0.0100***	0.0079***	0.0047***	0.0098***
	(19.15)	(11.42)	(9.53)	(19.97)
BIS Ratio	-0.0016***	-0.0035***	-0.0016***	-0.0094***
	(-4.42)	(-4.90)	(-3.40)	(-12.20)
Core deposit Ratio	0.0009***	0.0011**	-0.0002	-0.0001
	(2.70)	(2.15)	(-0.69)	(-0.16)
NPL Ratio	0.1041***	0.0716***	0.0760***	0.0590***
	(48.44)	(14.55)	(23.94)	(33.83)
Log(Total assets)	-0.0001	-0.0003**	-0.0006**	-0.0017***
	(-1.02)	(-2.01)	(-2.55)	(-8.64)
ROA	-0.0362***	-0.0063**	-0.0438***	-0.0679***
	(-4.36)	(-2.49)	(-8.16)	(-14.89)
Log(HPI)	-0.0032***	-0.0011***	-0.0092***	-0.0062***
	(-12.39)	(-4.37)	(-5.03)	(-10.30)
Log(Total RGDP)	0.0001	-0.0003	0.0007**	-0.0002
	(0.70)	(-1.56)	(2.30)	(-0.78)
HHI	-0.0066***	0.0018	-0.0027	-0.0064**
	(-4.67)	(0.97)	(-0.97)	(-2.47)
T-Bill	0.0007	0.0214	-0.1197	0.0003
	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0002	-0.0008	0.0056	-0.0353
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187
R-squared	0.6410	0.7388	0.7991	0.8207

Panel B									
Dependent Variable	*ALLL Ratio*								
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)		Whole(5)	Pre-Crisis(6)	During Crisis(7)	Post-Crisis(8)
HPR Beta	0.0001	-0.0002***	0.0013***	0.0000	*HPR IVOL*	0.0051	-0.0550	0.0565	-0.0483**
	(0.95)	(-2.81)	(6.11)	(0.06)		(0.16)	(-1.13)	(0.68)	(-2.23)
Total loan ratio	0.0100***	0.0079***	0.0048***	0.0098***	*Total loan ratio*	0.0100***	0.0079***	0.0047***	0.0098***
	(24.01)	(10.15)	(9.22)	(19.63)		(19.50)	(11.29)	(9.50)	(20.13)
BIS Ratio	-0.0017***	-0.0035***	-0.0017***	-0.0094***	*BIS Ratio*	-0.0017***	-0.0035***	-0.0016***	-0.0094***
	(-4.80)	(-4.55)	(-3.57)	(-11.98)		(-4.49)	(-4.95)	(-3.37)	(-12.30)
Core deposit Ratio	0.0009***	0.0011**	-0.0002	-0.0001	*Core deposit Ratio*	0.0009***	0.0011**	-0.0002	-0.0001
	(3.01)	(2.06)	(-0.69)	(-0.17)		(2.69)	(2.14)	(-0.70)	(-0.13)
NPL Ratio	0.1063***	0.0714***	0.0753***	0.0590***	*NPL Ratio*	0.1063***	0.0717***	0.0760***	0.0590***
	(58.26)	(13.51)	(23.27)	(33.71)		(52.22)	(14.49)	(23.94)	(33.86)
Log(Total assets)	0.0000	-0.0003**	-0.0006**	-0.0017***	*Log(Total assets)*	0.0000	-0.0003*	-0.0006**	-0.0017***
	(-0.39)	(-1.97)	(-2.53)	(-8.57)		(-0.35)	(-1.94)	(-2.55)	(-8.70)
ROA	-0.0364***	-0.0063**	-0.0439***	-0.0679***	*ROA*	-0.0364***	-0.0062**	-0.0441***	-0.0677***
	(-4.41)	(-2.46)	(-8.21)	(-15.48)		(-4.37)	(-2.48)	(-8.15)	(-14.84)
Log(HPI)	-0.0040***	-0.0012***	-0.0118***	-0.0061***	*Log(HPI)*	-0.0040***	-0.0014***	-0.0114***	-0.0062***
	(-16.29)	(-3.06)	(-17.39)	(-10.35)		(-15.56)	(-4.85)	(-15.27)	(-10.42)
Log(Total RGDP)	-0.0001	-0.0003	0.0008**	-0.0002	*Log(Total RGDP)*	-0.0001	-0.0004*	0.0008**	-0.0003
	(-0.89)	(-1.28)	(2.47)	(-0.76)		(-0.58)	(-1.65)	(2.36)	(-1.10)
HHI	-0.0090***	0.0015	-0.0018	-0.0064**	*HHI*	-0.0091***	0.0018	-0.0027	-0.0068***
	(-6.64)	(0.80)	(-0.66)	(-2.54)		(-6.58)	(0.97)	(-0.97)	(-2.65)
T-Bill	0.0599	0.0220	-0.1516	-0.0029	*T-Bill*	0.0059	0.0026	0.0000	-0.0047
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0172	-0.0009	0.0070	-0.0355	*M2/GDP*	0.0017	-0.0001	0.0000	0.1039
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	Observations	407,541	202,274	60,039	145,187
R-squared	0.6403	0.7388	0.7993	0.8207	R-squared	0.6403	0.7388	0.7990	0.8207

Panel C								
	threshold = 0				threshold = mean			
Dependent Variable	*ALLL Ratio*				*ALLL Ratio*			
Period	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)	Whole(1)	Pre-Crisis(2)	During Crisis(3)	Post-Crisis(4)
Downside VOL	0.0992***	-0.0015	0.1342***	-0.1153***	0.0938***	-0.0135	0.1160***	0.0330
	(5.66)	(-0.07)	(4.20)	(-4.44)	(5.08)	(-0.37)	(2.96)	(1.57)
Total loan ratio	0.0100***	0.0079***	0.0047***	0.0098***	0.0100***	0.0079***	0.0047***	0.0099***
	(19.28)	(11.40)	(9.56)	(19.98)	(19.35)	(11.40)	(9.56)	(19.93)
BIS Ratio	-0.0016***	-0.0035***	-0.0016***	-0.0095***	-0.0016***	-0.0035***	-0.0016***	-0.0093***
	(-4.35)	(-4.89)	(-3.35)	(-12.40)	(-4.37)	(-4.88)	(-3.37)	(-12.06)
Core deposit Ratio	0.0009***	0.0011**	-0.0002	0.0000	0.0009***	0.0011**	-0.0002	-0.0001
	(2.71)	(2.15)	(-0.59)	(0.02)	(2.72)	(2.15)	(-0.65)	(-0.21)
NPL Ratio	0.1039***	0.0715***	0.0759***	0.0590***	0.1040***	0.0715***	0.0760***	0.0590***
	(49.47)	(14.73)	(23.91)	(33.92)	(49.01)	(14.62)	(23.96)	(33.75)
Log(Total assets)	-0.0001	-0.0003**	-0.0006***	-0.0018***	-0.0001	-0.0003**	-0.0006**	-0.0017***
	(-1.13)	(-2.08)	(-2.60)	(-8.77)	(-1.04)	(-2.08)	(-2.54)	(-8.52)
ROA	-0.0361***	-0.0063**	-0.0433***	-0.0676***	-0.0360***	-0.0063**	-0.0435***	-0.0678***
	(-4.36)	(-2.49)	(-8.14)	(-14.87)	(-4.35)	(-2.49)	(-8.14)	(-14.87)
Log(HPI)	-0.0017***	-0.0016***	-0.0052***	-0.0074***	-0.0028***	-0.0015***	-0.0069***	-0.0061***
	(-4.25)	(-2.97)	(-3.24)	(-11.06)	(-10.49)	(-5.23)	(-4.08)	(-10.37)
Log(Total RGDP)	0.0000	-0.0003	0.0006**	-0.0001	0.0001	-0.0003	0.0007**	-0.0002
	(0.25)	(-1.35)	(2.08)	(-0.59)	(0.63)	(-1.37)	(2.19)	(-0.79)
HHI	-0.0062***	0.0019	-0.0018	-0.0056**	-0.0066***	0.0019	-0.0026	-0.0065**
	(-4.43)	(1.02)	(-0.62)	(-2.19)	(-4.71)	(1.01)	(-0.94)	(-2.54)
T-Bill	0.0060	0.0029	-0.0060	0.1044	0.0069	0.0276	-0.0744	0.0767
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
M2/GDP	0.0002	-0.0001	0.0003	0.0752	0.0020	-0.0011	0.0042	0.0809
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	407,541	202,274	60,039	145,187	407,541	202,274	60,039	145,187
R-squared	0.6411	0.7388	0.7992	0.8208	0.6411	0.7388	0.7991	0.8207