Securities' Trading by Banks: Micro-Evidence

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Abstract

We analyze security-trading activities of banks depending on their liabilities – capital –, and the associated spillovers to credit supply. We use a unique proprietary dataset of *all investments* of German banks at the *security-level* in conjunction with the credit register. We find that strongly capitalized banks increase their overall investments in securities during the crisis. They also buy more securities whose prices have previously fallen, especially in investments with higher fundamental risk (proxied by lower ratings) and with higher liquidity risk (proxied by longer maturity). We do not find these effects in normal times. Finally, we find that strongly capitalized banks reduce their overall supply of credit in crisis times.

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Introduction

The role of security trading by banks has assumed significant importance in the modern financial system. Commercial banks today hold a significant amount of securities in their asset portfolio (e.g., 20% in USA and 19% in Germany). In the aftermath of the current financial crisis, there is considerable debate both in academic and policy circles about the implications of security trading by banks' for credit supply and asset markets. An argument has been that securities trading activities by banks have led to reduction in credit supply and increased the risk of the financial system. Furthermore, there have been several policy initiatives to impose some restrictions on banks trading activities (Volcker rule in USA, the Liikanen Report in Europe, and the Vickers Report in the UK). Therefore, it is of utmost importance to understand security-trading activities of banks.

On the theoretical front, there are several papers that explain the role of security trading by banks and its implications for credit supply and asset markets. Diamond and Rajan (2009) show that during a crisis, the anticipation of fire sales in asset markets by distressed banks can lead well capitalized banks to hoard liquidity to acquire these assets in the future, thus leading to a reduction in credit supply. Shleifer and Vishny (2010) show that during a crisis, as a result of fire sales in asset markets, the return from engaging in trading activities are higher than lending. Thus, in a crisis, banks allocate scare equity capital to security trading leading to a reduction in credit supply. From the perspective of asset markets, (Brunnermeier and Pedersen (2009); He and Krishmurthy (2013) show that during crises, equity capital constraints by financial intermediaries play an important role in the intermediary demand for risky assets.[1] Hanson et al. (2014) show

[1] These theories model intermediary demand for risky assets based on leverage constraints or risk-aversion of the intermediary arising due constraints on raising equity. As discussed later, in the related literature section, we present a nonexhaustive list of papers that follow this approach.

synergies between bank assets and liabilities. They argue that safer traditional banks (due to higher equity capital and stable liability structure) have a comparative advantage at holding fixed-income assets that are relatively illiquid and have substantial transitory price volatility.

Despite the importance for theory and policy of understanding banks' trading in securities and its implications for credit supply and asset markets, the empirical evidence is scant. The main constraint that has hampered empirical research is lack of micro data at the security level on banks trading activities. Comparing aggregate data on security holdings of banks does not present a clear picture about differences in investment behavior, as it does not take into account the security characteristics (riskiness, liquidity etc.). For instance, imagine two banks holding the same overall level of securities, but one holds entirely AAA rated securities, while the other holds securities that are below investment grade. Examining aggregate data would be misleading as the overall level of investments are the same, however the composition of risk is very different.[2]

In this paper, we overcome this hurdle using a unique, proprietary dataset from the Bundesbank that provides us with information on all the security level holdings of banks in the German banking system at a quarterly frequency for the period between 2005-2012. Each security is also matched with security level information, notably price, rating, coupons and maturity. Importantly, we not only have the security holdings of each bank but also information on individual loans made by banks.

Motivated by the theoretical literature discussed above, we primarily focus on the effects of the level of bank-capital on security trading activities and credit supply. We

[2] Even among securities with the same rating, the security characteristics like liquidity, maturity, coupons could vary substantially.

examine whether there are differences in the level of investments in securities, based on the level of bank-capital, in crises versus normal times. We do this analysis for overall investments, and also for the intensity of buys and sells. Importantly, we analyze compositional effects of investment with respect to risk proxied by price changes. For identification, we control for bank and security*time fixed effects to account for unobserved heterogeneity across banks and securities.[3] Thus, we examine, the changes in level of holdings for the same security by different banks based on their capital levels. We also analyze the associated lending behavior of banks, controlling for credit demand using borrower*time fixed effects (as is standard in the literature).[4] We compare lending by banks with different capital levels to the same firm at the same time. Moreover, we analyze loan defaults to examine whether the differences in credit supply stem from differences in risk-taking in lending.

We define the crisis period from July 2007 when problems in the banking sector surfaced to the last quarter of 2009 when Germany came out of the economic recession. We first examine whether banks with higher level of capital, hold higher rated assets in the pre-crisis period (before July 2007). We find that, in the pre-crisis period, banks with higher levels of capital hold a larger fraction of higher rated securities in their portfolio. In the pre-crisis period, well-capitalized banks also hold higher levels of longer maturity assets.

We then examine the overall level of investments in securities by banks during the crisis. In the crisis, we find that higher level of bank capital is associated with higher level of overall investments in securities. More precisely, controlling for unobserved

[3] In some specifications, we also control for time varying heterogeneity across banks and securities using both bank*time and security*time fixed effects.
[4] See Khwaja and Mian (2008).

characteristics of securities and banks, we find that increases in the level of bank equity are associated with higher level of investments in securities. We do not find any significant differences in the overall level of investments in securities across banks in the pre-crisis period.

To further examine whether there are differences in the buying and selling behavior of banks, we examine the intensity of buys and sells separately. We find that, in the crisis, banks with higher level of equity increase their investments in securities whose price has previously fallen by more. Importantly, we do not find this differential behavior in normal times (either pre-crisis or after the financial crisis and economic recession). Moreover, we find that the increase in investment in securities that experience a larger price drop is concentrated among securities that are rated below AAA and securities that have longer maturity. This effect is not significant for investments in AAA rated securities or shorter maturity securities. Thus, well capitalized banks increase their investment in securities that have larger price drop, especially securities with higher credit risk (proxied by ratings) and higher liquidity risk (proxied by maturity).

Examining these compositional effects individually across each of the quarters in the crisis, we find that in most of the quarters, banks with higher level of capital increase their investments in securities that have a higher percentage drop in price in the previous quarter. However, during the quarter where Lehman failed, we find no effects. In that particular quarter, the coefficient on the interaction of capital and percentage price change is positive and close to zero. We also find that the prices of securities revert over the subsequent quarters, thus increasing the realized return on investments for well-capitalized banks.

During the crisis, we do not find any significant differences in the selling of securities whose price has fallen, based on the level of capitalization of banks. Thus banks, irrespective of their level of capitalization, do not differ in their selling behavior of securities where there has been a price drop. However, we find that banks with higher levels of capital sell a larger volume of securities where they have higher accumulated loses.

Is the behavior by banks driven by equity capital constraints or by window-dressing activities? That is, do banks buy securities (whose price has fallen) to prop up the price to make their investment portfolio look better? If window dressing were a prime driver of banks' behavior, one would expect banks to buy more of the securities, which have fallen in price in their investment portfolio. However, examining the buying behavior, based on cumulative loses/gains on the securities already existing in the investment portfolio, we do not find any significant differences. In fact, as reported above, we find that banks with higher level of capital sell more of the securities where they have higher accumulated loses. Another potential channel could be that banks with low levels of capital cannot buy securities whose prices have fallen due to regulatory scrutiny. To address this concern, we estimate the results for banks with capital levels above the average, and find similar behavior. These banks are less likely to face regulatory scrutiny as they have sufficient capital buffers.[5]

An important question that arises is whether increase in investments in securities by well-capitalized banks has any effects on the supply of credit to the real economy. Given that the equity capital of a bank is used support a given level of assets like

[5] As discussed later in the results section, we also do not find significant effects of liquidity availed from the central bank on the buying of assets that have fallen in price.

securities, loans and other liquid assets, it is possible that when banks increase their investments in securities, they might have to rebalance their portfolio of loans. This could be especially true in crisis periods, when it is difficult for banks to raise more equity.[6] Therefore, we examine the lending behavior of banks based on the level of bank capitalization. We use borrower*time fixed effects to control for time-varying credit demand and risk of borrowers. Thus, we examine for the same borrower, in the same period, whether well-capitalized banks cut back on lending.

We find that banks with higher levels of capital decrease their supply of credit during the crisis as compared to other banks. Moreover, we also do not find any differences in the subsequent default rate for borrowers. This suggests that the differences in credit supply are not stemming from different bank risk-taking incentives arising from different capital levels. In contrast, in the other periods, we find that there is no significant difference in the lending behavior of banks based on the level of capital. These results suggest that in crisis times, returns that banks can obtain from investment in securities can crowd out lending.

Overall our results suggest that, in a crisis, capital constraints of banks play an important role in their demand for risky assets. Banks, with higher levels of capital, buy securities that have higher risk, and in-turn act as risk absorbers. These results are consistent with models where higher risk bearing capacity associated with higher levels of equity affect banks demand for risky assets. We also find that well-capitalized banks cut back on lending. Thus in times of crises, our results suggest that returns from investing in securities compete with returns from lending. These results hold important

[6] Constraints on raising equity could have an effect on intermediary assets either due to leverage constraints or via risk aversion.

policy implications. Our results suggest that monetary policy interventions that help in recovery of prices in asset markets could be important to stimulate lending. Furthermore, to the extent that banks are dominant players in the securities markets, our results suggest that restricting on trading activities of banks could have an impact on the liquidity of asset markets.

The remainder of the paper is structured as follows. Section 2 discusses the related literature. Section 3 presents the institutional details and data. Section 4 discusses the empirical strategy and results. Section 4 concludes highlighting some implications for theory and policy.

Related Literature:

Our results contribute to several strands of the literature. Our results contribute to theories that highlight strong synergies between the asset and liability of banks (Diamond and Dybvig (1983), Diamond and Rajan (2001), Kashyap, Stein and Rajan (2002), Gennaioli, Shleifer and Visnhy (2013), Hanson et al., (2014).[7] Our results highlight these synergies as better capitalized banks take on higher fundamental and liquidity risk in crisis times as compared to lower capitalized banks. Our results also contribute to the literature that shows that security trading by banks can affect credit supply, as return from investments in the asset markets in volatile periods, is higher than returns from lending (Diamond and Rajan (2009), Shleifer and Vishny (2010)).

Given our findings on bank capital and asset trading, our results are consistent with models of financial intermediation where capital constraint of banks has effects on asset demand and liquidity (Geanokoplos and Fostel (2008), Adrian and Shin (2010), and Brunnermeier and Pedersen (2009), Gromb and Vayanos (2002) constrast, in Xiong

[7] Gatev and Strahan (2006) provide evidence on the synergies between deposit taking and lending.

(2001) and Brunnemeier and Sannikov (2010) He and Krishmurthy (2013).[8] These models relate equity constraints to intermediary demand for risky assets either due to the prevalence of leverage constraints or due risk aversion. Our results are also consistent with models of fire sales and lack of arbitrage capital (Allen and Gale (2005); Shleifer and Vishny (1992, 1997)).[9]

Our results also add to the literature that examines investment behavior of banks in sovereign debt during the European sovereign crisis (Battestini, Pagano, and Simonelli (2013); Acharya and Steffen, 2014; Drechsler et al, 2014). The main focus of these papers is to examine risk-shifting incentives of weakly capitalized banks.[10] Finally, our results also contribute to the literature that examines the effects on credit supply during a crisis (Ivashina and Scharfstein, 2010; Iyer et al., 2013; Acharya et al., 2014; Becker and Ivashina, 2014). These papers document a decrease in lending by banks during the crisis, especially those banks more exposed to the shock.

Data

The data we use for the analysis is obtained from the Deutsche Bundesbank (micro and macro-prudential supervisor of the German banking system). We have access to the microdata on all securities investments of banks (negotiable bonds and debt securities, equities, and mutual fund shares).[11] The data comprises of all investments of German banks at the security-level on a quarterly frequency from the last quarter of 2005

[8] See also Allen and Gale (1994), Holsmtrom and Tirole (1998) and Kashyap and Stein (2004) that share similar predictions.

[9] See also Gorton and Metrick, 2009; and He and Xiong, 2010.

[10] These papers examine sovereign debt investments of banks during the sovereign debt crisis (corresponding to the post-crisis period in our data). Acharya and Steffen find that weakly capitalized increase their investments in risky sovereign debt consistent with risk shifting and moral suasion (using a sample of Euro area banks). Dreschler et al.,(2014) examine the collateral posted by banks in the euro area to avail liquidity from ECB and find evidence consistent with risk-shifting incentives of weakly capitalized banks.

[11] Note that, the reporting requirement specifies that securities holdings, which are passed on or acquired as part of a repo contract, are not doublecounted in the securities database. Also, securities holdings of banks in special purpose vehicles are not reported as these are off balance sheet items.

to the last quarter of 2012. We merge the data on security investments with the Euro-systems centralized securities database (CSDB) to obtain further information regarding the issuer of the security (domicile country and sector), and price data (nominal currency, market price).[12] Furthermore, we also obtain security-level information on rating, coupons and maturity from FactSet.

We supplement this database on security investments with confidential monthly balance-sheet statistic. In particular, we collect monthly balance sheet items such as each bank's equity capital, total assets, interbank borrowings and savings deposits. In addition, we include records of each bank's return on equity retrieved from the Bundesbank's annual statistic of the bank's profit and loss accounts.

Finally, we obtain data on individual loans made by banks from the German credit register maintained by the Deutsche Bundesbank. Banks have to report on a quarterly frequency, individual borrowers whose overall credit exposure exceeds EUR 1.5 million. Note that lending to small and medium-sized firms might not be fully covered by this dataset. However, the credit register covers nearly 70% of the total credit volume in Germany. The credit register provides information on the amount of loans outstanding at the borrower level for each bank. In addition, it also provides information on the date of default (where applicable). The credit register, however, does not record the maturity and interest rate associated with the loans.

The complete securities holdings data consists of 9,480,764 observations with information on 999,133 securities held by 2,057 banks. We prune this data as follows. First, we delete the security holdings for which the total holdings were below EUR 10

[12] For a subset of securities where we could obtain price data from Bloomberg, we found similar prices reported by Bloomberg and CSDB. This provides consistency check of the price data reported by CSDB.

million.[13] This comprises of xxxx % of the total holdings. For the analysis, we consider only debt securities and exclude equities and shares of mutual funds. As a fraction of total holdings of securities bonds comprise of (XXX%) of the investments. We also exclude banks with total assets below EUR 1 billion.[14] We exclude Landesbanks and mortgage banks from the analysis.[15] The Final sample consists of 599 banks holding xxxx securities and xxx% of security holdings of the total banking system and providing YYY loans to XXX borrowers.

Results:

Table 1 (panel A) presents the summary statistics of the security characteristics over the entire sample. The average rating of the securities over the entire sample period is 24. This corresponds to a rating of AA. The average maturity of securities is 62 months and the average adjusted current yield of securities is 3.18%. We further decompose the security characteristics into sub-periods. We split our sample into three subsamples covering the key periods of the crisis. We denote the period until 2007:Q2 as the pre-crisis period, while we define the subsample 2007:Q3 – 2009:Q4 as the crisis period. Since 2009:Q4 is the last quarter with year-to-year negative GDP growth in Germany, we refer to the period thereafter as the post-crisis sample. Panel B, C and D report the summary statistics separately for each of the three sub-periods. The average rating of securities are very similar in pre-crisis and crisis periods (24 in each of

[13] We do this, as ratings, maturity and coupon information for many of these securities are not available. These securities account for a very small fraction of the overall asset holdings.

[14] The banks with below 1 billion in assets are generally not very active in securities markets and their holdings are a very small fraction of the aggregate security holdings of banks.

[15] Landesbanks are (at least partly) owned by the respective federal state and thus considered to enjoy an implicit fiscal guarantee. Mortgage banks are prohibited by law to engage in (risky securities) investments. As discussed later, the results are robust to including these banks in the sample.

the periods). However, post-crisis, we find that the average rating of securities drops to 22. This corresponds to an average rating of Below AA. In terms of maturity, we find that there is a drop in the average maturity of securities from the pre-crisis period to the post-crisis. The average maturity is 65 months in the pre-crisis period, 63 months during the crisis, and 60 months in the post-crisis period.[16] We also find that the average adjusted current yield declines from 4.4% in the pre-crisis period to 2.7% in the post-crisis period.[17]

In Table 2, we report the summary statistics of bank characteristics over the entire sample. The average total assets of banks' over the entire sample is 9.3 billion Euros. The average ratio of equity to total assets is 5.12%. The average fraction of interbank borrowings to total assets is 18.1%. The average fraction of savings deposits to total assets and return-on-equity are 25.6% and 18% respectively. Examining the differences in bank characteristics across of each of the sub-periods (Panel B, C and D), we find that there is an increase in average total assets of banks' from the pre-crisis to the post-crisis period. The average total assets of banks' are 7.9 billion Euros in the pre-crisis period, 9 billion Euros in the crisis period, and 10 billion Euros in the post-crisis period. In terms of average equity to total assets, we do not find much of a difference in the pre-crisis and the crisis period (5% in each of the periods). However, in the post-crisis period, this ratio is higher at 5.2%. The average return-on-equity is lower in the crisis period (17.4%) as compared to 18.9% in the pre-crisis period and 18.3% in the post-crisis period. The average fraction of interbank borrowings to total assets is similar in the pre-crisis and the

[16] However, this drop could be mechanical due to the decrease in the time to maturity of securities as we move along from the pre-crisis to the post-crisis periods.

[17] This drop could be attributed to the loose monetary policy conditions prevailing in the post-crisis periods.

crisis period (18%) and is lower at 17% in the post-crisis period. The average fraction of saving deposits to total assets drops from 28.2 % in the pre-crisis period, to 23.8% in the crisis period and then increases to 25.5% in the post-crisis period.

In table 3, we report the average fraction of securities holdings to total assets (at the bank level) and the composition of security holdings. Panel A reports the summary statistics for the entire sample period. The average fraction of security holdings to total assets of banks is 18.7%. Securities with AAA rating on average account for 16.85% of the total securities. The average fraction of domestic securities to total security holdings is 79%. while long-term securities account for 89% of the total security holdings. The average fraction of sovereign debt to total securities is 12%. New investments (Buys) in securities as a fraction of total assets are on average 2.57%, while fraction of securities assets sold by banks is 0.47%.

Panel B, C and D, reports these summary statistics across the three different time periods. In the pre-crisis period, the average fraction of security holdings to total assets is 18.7%; this increases to 19% in the crisis and 21% in the post-crisis period. The average fraction of AAA securities to total securities is 16.8% in the pre-crisis period, decreases to 14.6% in the crisis and then increases to 17% in the post-crisis period. The average fraction of domestic securities decreases from 82% in the pre-crisis period to 79.6% in the crisis and further decreases to 76.7% in the post-crisis period. On the other hand, the average fraction of long-term securities increases from 87.2% in the pre-crisis period to 89.3% in the crisis and then to 91% in the post-crisis period. The average fraction of sovereign debt is 12.9% in the pre-crisis period. During the crisis, the fraction of sovereign holdings decreases to 10.1% and then increases back to 13.9% in the post-crisis period. New

investments to total assets are on average 4.5% in the pre-crisis period. During the crisis, the fraction of new investments declines to 2.3%. This fraction further decreases to 1.6% in the post-crisis period. The average fraction of securities sold to total assets is 0.8% in the pre-crisis period and decreases to 0.41% in the crisis and further decreases to 0.33% in the post-crisis period.

While the above tables present a picture at the aggregate level on the evolution of security characteristics over the sample period, we now move to the main question of interest. That is to examine whether there are differences in security trading activities of banks based on the level of capitalization. Before presenting the results, we first discuss the main econometric specification that we use for the analysis. Below we present the model for examining the intensity of buys/sells. The models which we use for other estimations are minor variants of this model. Our model for the intensity of buys/sells takes the following form:

$$\text{Log}(\text{Amount}^{\text{buy/sell}})_{ibt} = \beta_1 ' X_{b,(t-1)} + \beta_2 ' X_{b,(t-1)} Y_{i,(t-1)} + \alpha_b + \alpha_{it} + \varepsilon_{ibt} \qquad (1)$$

where *amount* refers to either nominal amount purchased ('buy') or sold ('sell') of security. In the buy regressions, the nominal amount takes the value of 0 if the security has been sold or if there is no change in the level of holdings. Similarly in the sell regressions the nominal amount takes the value of 0 if the security has been sold or if there is no change in the level of holdings. 'X' is a vector of bank specific monthly balance sheet variables such as capital as a fraction of total assets. The vector 'Y' captures security-level variables like percentage change in price. We use lagged values (from the previous quarter) for all the dependent variables to ensure that these variables are pre-determined. We include a bank fixed effect to account for unobserved

heterogeneity in bank characteristics and also control for the overall investment position of *each bank*. We also include security*time fixed effects to control for time variant unobserved characteristics of individual securities. The inclusion of security*time fixed effects also helps us to control for –in each time period- how much of *each security* is issued and outstanding.[18] The main intuition behind the estimation approach is the following. Imagine that there is only a single security in the market with unlimited supply that banks can invest. Examining the differences in the level of investment in this security by banks based on the level of capital provides a clean estimation of the effects. The estimation approach we use compares whether the level of investments in the security differs based on the level of capitalization, for two banks that buy the same security.[19] A positive coefficient on B1 implies that banks with higher levels of capital increase their investment more in securities. A negative coefficient on the interaction term (B2) implies that banks with higher levels of capital increase their investments of securities that had a larger drop in price in the previous quarter. Note that inclusion of inclusion of security*time fixed effects captures all the price variation in securities, thus the estimated coefficients are similar whether we use nominal holdings or holding at market value as a dependent variable.

We first begin by examining whether banks with different levels of capitalization differ in terms security composition in the pre-crisis period. We estimate the following variant of the model specified in equation (1) separately for three of the quarters in the pre-crisis period (2005:Q4, 2006:Q2 and 2007:Q2).

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[18] In some specifications, we include both bank*time and security*time fixed effects and estimate the coefficient on the interaction term.

[19] EXAMINING aggregate holdings of banks in securities could be misleading as it masks important differences in….. (security composition of banks).

$$\log(\text{holdings})_{ibt} = \beta_1' X_{b,(t-1)} + \beta_2' X_{b,(t-1)} Y_{i,(t-1)} + \alpha_b + \alpha_{it} + \varepsilon_{ibt}$$

Holdings refers to the nominal amount of security 'i' held by bank 'b' at quarter 't'. The coefficient of interest is the interaction term of the bank capital and security characteristics. Note that we include bank fixed effects in the empirical estimation to capture unobserved characteristics of banks that could lead them to maintain higher levels of equity. Several papers have argued that some banks maintain significantly higher levels of equity capital due reasons like ownership structure or unobserved characteristics. Thus inclusion of bank fixed effects helps us to identify the effect of equity capital. Given that we estimate this equation separately for each quarter (along with bank and security fixed effect), we can only estimate the interaction term as the other terms are completely captured by the fixed effects.

Table 4 presents the results. We find that banks with higher levels of capital hold more of higher rated securities (columns 2, 3 and 4). We also find that well-capitalized banks hold higher levels of longer maturity assets (column 2 and 4). Towards, the end of the period (2007: Q2), we also find that banks with higher levels of capital hold more of securities with higher adjusted current yield.

The results above provide a snap shot of the differences in composition of securities held by banks with higher levels of capital, in the pre-crisis period. However, the results of the estimation do not tell us much about whether the overall levels of investments in securities differs across banks with different levels of capital. We use the following estimation equation:

$$\log(\text{holdings})_{ibt} = \beta_1' X_{b,(t-1)} + \beta_2' X_{b,(t-1)} Y_{i,(t-1)} + \alpha_b + \alpha_{it} + \varepsilon_{ibt}$$

Holdings refers to the nominal amount of security 'i' held by bank 'b' at quarter 't'. A positive coefficient on B1 implies that banks with higher levels of capital increase their overall level of holdings of securities. Table 5, reports the results for the differences in overall investments in securities across each of the sub-periods. In column 1, 2, we show the results for pre-crisis period. We find that there are no significant differences in the overall level of investments in securities based on the level of bank capital. Examining the overall level of investments in the crisis period, we find that banks with higher levels of capital have higher levels of investments in securities (column 3, 4). The coefficient on the level of equity capital is 0.05 and significant at 1%. We also find that overall level of investments by well-capitalized banks is significantly higher in the post-crisis period (column 5, 6).

Higher level of investments in securities by well-capitalized banks the crisis period, could be due to additional investments by these banks in securities. Alternatively, the difference in overall level of investments could be due to banks with lower capital levels selling more securities in the crisis. Furthermore, the differences in overall level of investments, does not tell us whether there are differences in the composition of investments. We therefore examine, the intensity of buys and sells separately. For this estimation, we use the model specified by equation (1)

In table 5, we discuss the results for the crisis period. We do not find significant differences in the level or composition of buys and sells based on the level of bank capital, in the pre-crisis and post-crisis period (discussed later in Table 7). From Table 5, columns 1, and 2, we see that banks with higher levels of capital (lagged) have

significantly larger investments in securities. Well-capitalized buy higher volume of securities as compared to banks with lower levels of capital.

To examine whether there are differences in the composition of securities bought, we interact the percentage price change of a security in the previous quarter with bank capital. We use lagged percentage price change as proxy for securities that have higher risk and expected returns. The ratings, maturity, adjusted current yield of securities are taken into account by the security level fixed effects. Note that including interactions of bank capital with other security characteristics (like ratings etc.) does not alter the results. Furthermore, in panel b, we estimate whether the coefficient on the interaction of bank capital and lagged percentage price change varies for securities with different ratings and maturity.

From column 1, 2, and 3, we find that the coefficient on the interaction term is negative and significant (at xxx%). Thus, banks with higher capital levels (lagged) buy more of securities that had a larger drop in price. In column 3, we include both bank*time and security*time fixed effects to account for all time variant heterogeneity in bank and security characteristics. In column 4, we control for the liquidity availed from the ECB. We do not find any significant effect of the interaction of liquidity availed and percentage change in price. That is, banks that avail higher amounts of liquidity from the ECB do not buy larger amounts of securities that have a larger drop in price. More importantly, the coefficient on the interaction of bank capital and percentage change in price still remains significant.

We further examine whether the behavior of banks differs across securities with different ratings and maturity. In panel B, we estimate the coefficient on the interaction term of

bank capital and percentage change in price across different rating and maturity categories. From columns 1, 2 and 3, we see that the coefficient on the interaction term is significant for non-AAA rated securities. Examining the buying behavior across securities with different maturities, the coefficient on the interaction term is significant for securities with maturity longer than one year (column 4, 5 and 6). These results suggest that well-capitalized banks buy more of securities whose prices have previously fallen, especially in investments with higher fundamental risk proxied by lower ratings and with higher liquidity risk proxied by longer maturity.

We further examine the coefficient on interaction term of bank capital and lagged percentage change in price for each of quarters. Table 6 presents the results. We find that for most of the quarters in the crisis period (up to 2009:Q2) the coefficient on the interaction is negative and significant.[20] However in the quarter that Lehman failed, the coefficient on the interaction terms is close to zero and not significant. Panel B and C of reports the coefficients on the interaction term for the non-AAA rated securities and securities with residual maturity higher than one year. We find similar results even for these sub-samples.

While the results above suggest that equity capital constraints of banks play an important role in their demand for risky securities, it is important to examine other possible explanations. Banks with higher capital might buy securities that have a larger price drop in an effort to increase the price of these securities to make their existing portfolio look good. Thus, banks with higher level of capital might engage in window dressing activities to make their existing investment portfolio look better. To examine this explanation, we include in the estimation the lagged cumulative gains/losses of the existing securities in a

banks' investment portfolio. From column 5 and 6, we do not see any significant effect of lagged cumulative gains/loses of the securities held by banks on the buying behavior of banks. Also, as discussed later, we in fact find that banks with higher level of capital sell more of securities where they have accumulated larger loses in their existing investment portfolio.

Another reason for our finding might be that better capitalized banks –as opposed to less capitalized banks – can in fact engage in the purchase of securities that experience a larger price drop because regulatory monitoring is less binding for them. In column 4, we estimate the interaction term using a sub-sample of banks with capital levels above average. For these banks, regulatory constraints are unlikely to be binding. We find that even for this sub-sample, the coefficient on the interaction term is negative (-1.08) and significant at 1% level. The results above suggest that higher risk bearing capacity of banks with higher levels of capital play an important role in acquisition of securities with higher risk.

While in Table 5 and 6, we examine the buying behavior of banks, it is important to examine whether the levels and composition of securities sold by banks differs based on the level of capitalization. Table 7, reports the results for selling behavior of banks in the crisis period. From column 1 and 2, we see that there is not difference in the volume of sells across banks with different levels of capital. The coefficient on bank capital is 0.01 and not significant relative to coefficient of 0.28 for buys reported earlier. The coefficient on the interaction of bank capital and lagged percentage fall in price is also not significant. Thus there is no difference in the volume of securities sold that had a larger drop in price based on the level of bank capitalization.

In column 4, we examine estimate the interaction term for banks with above average levels of capital. We find similar results to those reported above even for this sub-sample. In column 5, we examine whether banks sell higher volume of securities where they have larger accumulated gains or losses in their existing investment portfolio. We find that banks sell higher volume of securities where they have accumulated larger losses (column 5). Interestingly, this magnitude is higher for banks with higher levels of capital (column 6). This suggests that banks with higher levels of equity also are more likely to book loses in assets where they have large accumulated loses. Thus, these results suggest that weakly capitalized banks are more likely to have a hangover of bad assets in their investment portfolio.

In table 8, we examine the intensity of buys and sells during the pre-crisis and post-crisis period. Panel A presents the estimates for the pre-crisis period. As can be seen from column 1 and 2, we do not find significant differences in the level or composition of buys across banks with different level of capitalization. Similarly, we also do not find any differences in the post-crisis period (Panel B). While Panel A and B report the results for the entire pre-crisis and post-crisis period, there are some quarters during this period where there is a substantial drop in prices (Greek crisis). Thus, examining the composition of investments over the entire period could mask differences in individual quarters. In Panel C, we examine the composition of buys for each of the quarters in the pre-crisis and post-crisis period. We see that in general the coefficient on the interaction term of bank capital and lagged percentage price change is not significant in most of the quarters. However, there are some quarters where the interaction term is significant. Mapping the quarters to the graph of security price changes, we see that the interaction

term is negative and significant in quarters where there is an average drop in prices of securities.

The overall results discussed above suggest that banks with higher level of capital increase their holdings of securities that have higher risk. Our results suggest that capital constraints by banks play an important role in their ability to acquire securities that have fallen in price. However, an important question that arises is whether increase in investments by well-capitalized banks in securities has any effect on credit supply. Given that the equity capital of banks supports a given level of assets held on the balance sheet (securities, loans and other liquid assets), it is possible that increase in investments in securities might lead to a rebalancing of the loan portfolio. Thus, in situations like in a crisis when it difficult to raise additional equity, they might have to cut back on loans (either due leverage constraints or risk aversion). In table 9, we examine the lending behavior of banks based on the level of capitalization. We control for time varying credit demand and risk of borrowers using borrower*time fixed effects. Thus, we compare the difference in the level credit for the same borrower across banks with different levels of capital, in the same time period.

We find that in the periods before and after the crisis, There is no difference in the lending behavior of banks with higher levels of capital. Column 1, 7 reports the results for the sample that comprises of both firms and households. While column 2, 8 presents the results only for firms. In the crisis, banks with higher levels of capital cut back their supply of credit (Column 4 and 5). Thus, in the crisis, for the same borrower, we find well-capitalized bank decrease the amount of lending. In the post-crisis period, we do not find any differences in credit supply across banks with different levels of capital. To

examine, whether the difference in lending stems from differences in bank risk taking incentives, we look at future defaults. From column 3, 6, and 9, we see that the coefficient on the interaction of future default with bank capital is not significant any of the periods.

The results above in conjunction with the results from the trading behavior of banks suggest that, during a crisis, well-capitalized banks increase their overall investments in risky securities and cut back on credit. Thus, these results suggest that in crisis times, the returns from investing in securities compete with returns from lending. Given constraints on capital, well-capitalized banks rebalance their portfolio more to securities and cut back on lending.

Our results hold important policy implications. Our results suggest that during a crisis, depressed prices of securities can crowd out lending. Thus, to simulate lending, recovery of asset markets is important. Therefore, monetary policy interventions like direct purchases of securities by central banks could play an important role in increasing the supply of credit. Our results also consistent with theories that emphasize the price stabilization role performed by well capitalized in securities markets. Thus, to the extent that these intermediaries are dominant players in these markets, our results suggest that restrictions on trading activities of banks could affect the liquidity of these markets.

Conclusion

We examine the security trading activities of banks based on their level of capitalization. We find that banks with higher levels of capital increase their overall investments in securities during a crisis. Furthermore, well-capitalized banks buy more securities that

have a larger drop in price, especially non-AAA rated securities and securities with lower maturity. We also find that well-capitalized banks sell more of securities where they have larger accumulated loses in their existing investment portfolio. Finally, we find that well-capitalized banks reduce their supply of credit.

Our results suggest higher risk bearing capacity of well-capitalized banks plays an important role in their demand for risky securities. Banks with higher levels of capital in-turn act as risk absorbers. The question that this naturally raises is whether absent banks, would other intermediaries be able to absorb the risk and provide liquidity to the asset markets. While this is beyond the scope of this paper, there is some evidence that other intermediaries like shadow banks, were deleveraging during the crisis, and selling risky assets. Thus, to the extent that banks are large players in these markets, our results suggest that restrictions on trading in securities by banks could affect prices and liquidity in these markets.

Our results also hold important implications for monetary policy. Our results suggest that during a crisis, returns from investing in securities can crowd out lending. Thus, to stimulate lending, recovery of asset prices is important. Therefore, monetary policy interventions like direct asset purchases, which aim to increases prices of securities, could be important improving credit supply. In addition, given our findings that banks with lower level of equity hold on to assets where they have accumulated losses, these interventions could also help reduce the hangover of distressed assets in banks' balance sheet.

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TABLE 1 - Summary Statistics of Security Variables

	Variables	Units	Average	SD	Median	N
All periods						
	Quarterly Price Change	%	0.0021072	0.0401173	0.0001591	150080
	Adjusted Current Yield	%	3.639299	4.68687	2.979099	166403
	Maturity	Months	62.45706	72.03267	42	166403
	Rating	Numerical Scale	24.53619	3.393884	25	119498
Pre-crisis						
	Quarterly Price Change	%	-0.0052905	0.0175508	-0.0003789	29280
	Adjusted Current Yield	%	4.442661	5.963468	3.87097	37258
	Maturity	Months	65.01117	75.67834	42	37258
	Rating	Numerical Scale	24.44322	3.158261	24	25705
Crisis						
	Quarterly Price Change	Number	0.0036317	0.0519004	0.0009337	50124
	Adjusted Current Yield	%	4.419625	4.893434	3.805608	52968
	Maturity	Months	63.13518	75.5475	39	52968
	Rating	Numerical Scale	24.69306	3.288958	25	38366
Post-crisis						
	Quarterly Price Change	%	0.0040907	0.0367607	0.0012743	70676
	Adjusted Current Yield	%	2.703794	3.511026	2.057395	76177
	Maturity	Months	60.73634	67.51529	43	76177
	Moody's Rating	Numerical Scale	24.47073	3.562985	25	55427

TABLE 2 - Summary Statistics of Bank BS variables

	Variables	Units	Average	SD	Median	N
All periods						
	Total Assets (TA)	Million €	9377.161	4.26E+04	1832.159	15297
	Size (Logarithm of TA)	Logs	14.72221	1.112463	14.42101	15297
	Capital / TA	%	5.126049	1.698124	5.03458	15297
	Interbank Borrowing / TA	%	18.04403	12.54385	15.37468	15297
	Savings Deposits / TA	%	25.64335	12.63204	26.76942	15297
	Return on Equity	%	18.18903	7.91048	17.41629	15271
Pre-crisis						
	Total Assets (TA)	Million €	7962.264	30426.76	1625.991	3696
	Size (Logarithm of TA)	Logs	14.60505	1.132743	14.30163	3696
	Capital / TA	%	5.015065	1.584907	4.941307	3696
	Interbank Borrowing / TA	%	18.71647	13.00805	15.74513	3696
	Savings Deposits / TA	%	28.24264	13.13058	30.20148	3696
	Return on Equity	%	18.99685	7.533341	18.19734	3689
Crisis						
	Total Assets (TA)	Million €	9046.515	36059.62	1794.04	5277
	Size (Logarithm of TA)	Logs	14.70939	1.119561	14.39998	5277
	Capital / TA	%	5.056129	1.586181	4.956481	5277
	Interbank Borrowing / TA	%	18.86227	12.81366	16.12112	5277
	Savings Deposits / TA	%	23.89756	12.21355	24.42678	5277
	Return on Equity	%	17.48732	8.187838	16.31634	5270
Post-crisis						
	Total Assets (TA)	Million €	10479.99	52624.09	1935.739	6324
	Size (Logarithm of TA)	Logs	14.80137	1.087984	14.476	6324
	Capital / TA	%	5.249258	1.839037	5.172563	6324
	Interbank Borrowing / TA	%	16.96825	11.94893	14.55385	6324
	Savings Deposits / TA	%	25.58099	12.42146	26.78913	6324
	Return on Equity	%	18.30279	7.840004	17.79094	6312

TABLE 3 - Summary Statistics of Banks' Securities Holdings

	Variables	Units	Average	SD	Median	N
All periods						
	Securities Holdings / TA	%	19.76989	10.81172	17.5695	15300
	% Aaa securities	%	16.1921	13.16817	13.90671	15300
	% domestic securities	%	79.13983	21.12084	86.51711	15300
	% long-term securities	%	89.60019	8.831836	91.51631	15300
	% sovereign securities	%	12.40553	15.3207	7.460083	15300
	Buys / TA	%	2.564449	4.39982	1.374301	15300
	Sells / TA	%	0.4609095	1.202949	0	15300
Pre-crisis						
	Securities Holdings / TA	%	18.64961	10.65672	16.57955	3695
	% Aaa securities	%	16.8636	13.44038	14.28983	3695
	% domestic securities	%	82.4764	18.65303	89.25465	3695
	% long-term securities	%	87.23409	10.29432	89.49	3695
	% sovereign securities	%	12.94564	15.91408	7.777897	3695
	Buys / TA	%	4.468396	7.591201	1.68975	3695
	Sells / TA	%	0.7505122	1.893857	0.0069065	3695
Crisis						
	Securities Holdings / TA	%	19.05765	10.38077	16.87884	5276
	% Aaa securities	%	14.6627	12.79218	12.28899	5276
	% domestic securities	%	79.66627	20.73742	86.75594	5276
	% long-term securities	%	89.33149	9.029193	91.24274	5276
	% sovereign securities	%	10.19142	14.16242	5.287924	5276
	Buys / TA	%	2.36086	2.781701	1.635044	5276
	Sells / TA	%	0.4147425	0.8994346	0.0012376	5276
Post-crisis						
	Securities Holdings / TA	%	21.01767	11.12532	19.0079	6329
	% Aaa securities	%	17.075	13.20496	15.19243	6329
	% domestic securities	%	76.75301	22.4606	84.46643	6329
	% long-term securities	%	91.20555	7.269944	92.73167	6329
	% sovereign securities	%	13.93593	15.67947	9.191316	6329
	Buys / TA	%	1.622603	1.91673	1.117942	6329
	Sells / TA	%	0.3303194	0.8140355	0	6329

TABLE 4. SECURITY COMPOSITION BEFORE THE CRISIS

	2005 - Q4		2006 - Q2		2007 - Q2	
Capital / TA * Adjusted Current Yield	-0.00601***	-0.000699	-0.0015142	-0.0004064	0.000235	0.00856***
	(0.00195)	(0.00238)	(0.0026999)	(0.002605)	(0.00135)	(0.00247)
Capital / TA * Rating	0.0111	0.0158**	0.0128623**	0.0151731**	0.0184***	0.0193***
	(0.00827)	(0.00789)	(0.0064476)	(0.0075556)	(0.00544)	(0.00605)
Capital / TA * Maturity	0.000360	0.000629*	0.0005088**	0.0001678	0.000399	0.000384*
	(0.000529)	(0.000346)	(0.0005088)	(0.0001678)	(0.000247)	(0.000219)
Observations	14,879	14,879	15683	15683	18,115	18,115
R-squared	0.310	0.559	0.3006	0.548	0.291	0.534
Bank FE	Y	Y	Y	Y	Y	Y
Security FE	N	Y	N	Y	N	Y

Notes: The dependent variable is the logarithm of the nominal value of the holdings of security i by bank b at time t. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects are included ("Y") or not included ("N"). *** Significant at 1 percent level; ** Significant at 5 percent level; * Significant at 10 percent level.

TABLE 5. SECURITY COMPOSITION DURING, BEFORE, AND AFTER THE CRISIS

	Crisis		Pre-crisis		Post-crisis	
Capital / TA	0.0462***	0.0582***	0.00107	0.00552	0.0615**	0.0531**
	(0.0145)	(0.0200)	(0.00454)	(0.00690)	(0.0252)	(0.0235)
Observations	354,288	354,288	230,444	275,534	512,513	512,513
R-squared	0.528	0.579	0.500	0.500	0.534	0.580
Bank Controls	Y	Y	Y	Y	Y	Y
Time FE	Y	><	Y	><	Y	><
Security FE	Y	><	Y	><	Y	><
Bank FE	Y	Y	Y	Y	Y	Y
Security * Time FE	N	Y	N	Y	N	Y

Notes: The dependent variable is the logarithm of the nominal value of the holdings of security *i* by bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). *** Significant at 1 percent level; ** Significant at 5 percent level; * Significant at 10 percent level.

TABLE 6. BUYING BEHAVIOR DURING THE CRISIS

PANEL A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Capital / TA	0.308***	0.332***					
	(0.0504)	(0.0766)					
Capital / TA * % Change in Price	-0.708***	-0.716***	-0.850***	-0.932**	-1.610**	-0.879***	-0.874***
	(0.207)	(0.227)	(0.226)	(0.377)	(0.665)	(0.145)	(0.149)
Liquidity Alloted from ECB * % Change in Price					-0.031		
					(0.038)		
Cumulative Gains on the Security / TA						-0.001	-0.002
						(-0.001)	(0.001)
Cumul. Gains on the Sec. / TA * C / TA							-0.0001
							(0.0001)
Observations	223,306	223,306	223,306	73,874	91,020	213,528	213,528
R-squared	0.240	0.377	0.416	0.6086	0.4545	0.461	0.461
Bank Controls	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	><	><	><	><	><	><
Security FE	Y	><	><	><	><	><	><
Bank FE	Y	Y	><	><	><	><	><
Security * Time FE	N	Y	Y	Y	Y	Y	Y
Bank * Time FE	N	N	Y	Y	Y	Y	Y

PANEL B	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**
Capital / TA * % Change in Price	-1.583	-1.299***	-0.662***	-0.697	-0.978***	-0.680**
	(1.467)	(0.402)	(0.217)	(0.568)	(0.290)	(0.346)
Observations	57,503	61,900	103,903	41,576	128,506	53,224
R-squared	0.4495	0.4365	0.4363	0.492	0.4207	0.457
Sample	Aaa - rated securities	Aa - rated securities	Below Aa - rated securities	Below 1 year securities	1 to 5 year securities	More than 5 year securities
Bank Controls	Y	Y	Y	Y	Y	Y
Security * Time FE	Y	Y	Y	Y	Y	Y
Bank * Time FE	Y	Y	Y	Y	Y	Y

Notes: The dependent variable is the logarithm of the amount bought (in nominal value) of security *i* by bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects and other controls are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

TABLE 7. BUYING BEHAVIOR DURING THE CRISIS: QUARTER-BY-QUARTER

	2007Q3	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4
PANEL A: all securities										
Capital / TA	-4.281***	5.149*	-3.931*	-1.405**	0.0464	-2.529***	-1.054***	-1.112***	-0.664	-0.105
	(1.639)	(2.963)	(2.012)	(0.680)	(0.263)	(0.794)	(0.184)	(0.349)	(0.473)	(0.180)
Observations	21,420	22,035	21,366	20,981	20,903	20,614	19,997	20,078	22,274	23,860
R-squared	0.476	0.448	0.423	0.449	0.486	0.437	0.487	0.447	0.458	0.495
PANEL B: securities rated below Aaa										
Capital / TA	-5.472**	5.199	-3.228	-2.071***	0.104	-2.110***	-1.164***	-0.981***	-0.402	0.651
	(2.166)	(3.487)	(3.119)	(0.538)	(0.418)	(0.800)	(0.298)	(0.325)	(0.450)	(0.657)
Observations	17,042	17,036	16,620	16,359	15,966	16,088	15,454	15,519	17,111	18,608
R-squared	0.456	0.414	0.357	0.410	0.448	0.387	0.423	0.380	0.418	0.457
PANEL C: securities with remaining maturity longer than one year										
Capital / TA	-4.745***	8.155***	-5.397*	-2.333***	0.287	-2.806***	-1.143***	-1.366***	-0.469	0.794
	(1.788)	(2.877)	(2.969)	(0.645)	(0.399)	(0.908)	(0.233)	(0.469)	(0.420)	(0.780)
Observations	18,355	18,640	18,086	17,760	17,481	17,779	17,343	16,855	18,865	20,566
R-squared	0.444	0.409	0.372	0.401	0.437	0.397	0.420	0.403	0.409	0.444
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Security FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: The dependent variable is the logarithm of the amount bought (in nominal value) of security *i* by bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects and other controls are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

TABLE 8. SELLING BEHAVIOR DURING THE CRISIS

PANEL A	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Capital / TA	0.045*	0.041					
	(0.027)	(0.040)					
Capital / TA * % Change in Price	-0.014	-0.218	0.107	0.507**	0.031	0.164	0.218
	(0.208)	(0.225)	(0.248)	(0.242)	(0.410)	(0.264)	(0.267)
Liquidity Alloted from ECB * % Change in Price					-0.033		
					(0.023)		
Cumulative Gains on the Security / TA						-0.004***	-0.004***
						(0.0013)	(0.0014)
Cumul. Gains on the Sec. / TA * C / TA							-0.0012*
							(0.0007)
Observations	238,898	238,898	238,898	81,702	113,325	226,838	226,838
R-squared	0.2512	0.3882	0.4134	0.5919	0.4604	0.423	0.423
Bank Controls	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	><	><	><	><	><	><
Security FE	Y	><	><	><	><	><	><
Bank FE	Y	Y	><	><	><	><	><
Security * Time FE	N	Y	Y	Y	Y	Y	Y
Bank * Time FE	N	N	Y	Y	Y	Y	Y

Notes: The dependent variable is the logarithm of the amount sold (in nominal value) of security *i* by bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects and other controls are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

TABLE 9. BUYING AND SELLING BEHAVIOR OUTSIDE THE CRISIS

PANEL A: BUYING AND SELLING OUTSIDE THE CRISIS

	PRE-CRISIS				POST-CRISIS			
	BUYS		SELLS		BUYS		SELLS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Capital / TA	-0.191*	0.124	0.088	0.107	-0.103	-0.114	0.056	0.063
	(0.115)	(0.121)	(0.144)	(0.130)	(0.086)	(0.083)	(0.118)	(0.101)
Capital / TA * % Change in Price	-0.652	-0.452	0.884	1.071	-0.431	-0.557	-0.318	-0.214
	(0.849)	(1.259)	(1.156)	(1.214)	(0.327)	(0.355)	(0.291)	(0.367)
Observations	116,658	116,658	103,912	103,912	347,557	347,557	362,787	362,787
R-squared	0.256	0.359	0.278	0.400	0.345	0.460	0.277	0.410
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	><	Y	><	Y	><	Y	><
Security FE	Y	><	Y	><	Y	><	Y	><
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Security * Time FE	N	Y	N	Y	N	Y	N	Y

PANEL B: BUYING PRE-CRISIS, QUARTER-BY-QUARTER

	2006Q2	**2006Q3**	**2006Q4**	**2007Q1**	**2007Q2**
Capital / TA * % Change in Price	-0.282	-0.741	-1.431	-12.50***	-3.168
	(1.296)	(0.875)	(2.464)	(4.289)	(2.093)
Observations	19,519	20,033	20,682	19,943	20,483
R-squared	0.454	0.470	0.491	0.459	0.453
Bank Controls	Y	Y	Y	Y	Y
Security FE	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y

PANEL C: BUYING POST-CRISIS, QUARTER-BY-QUARTER

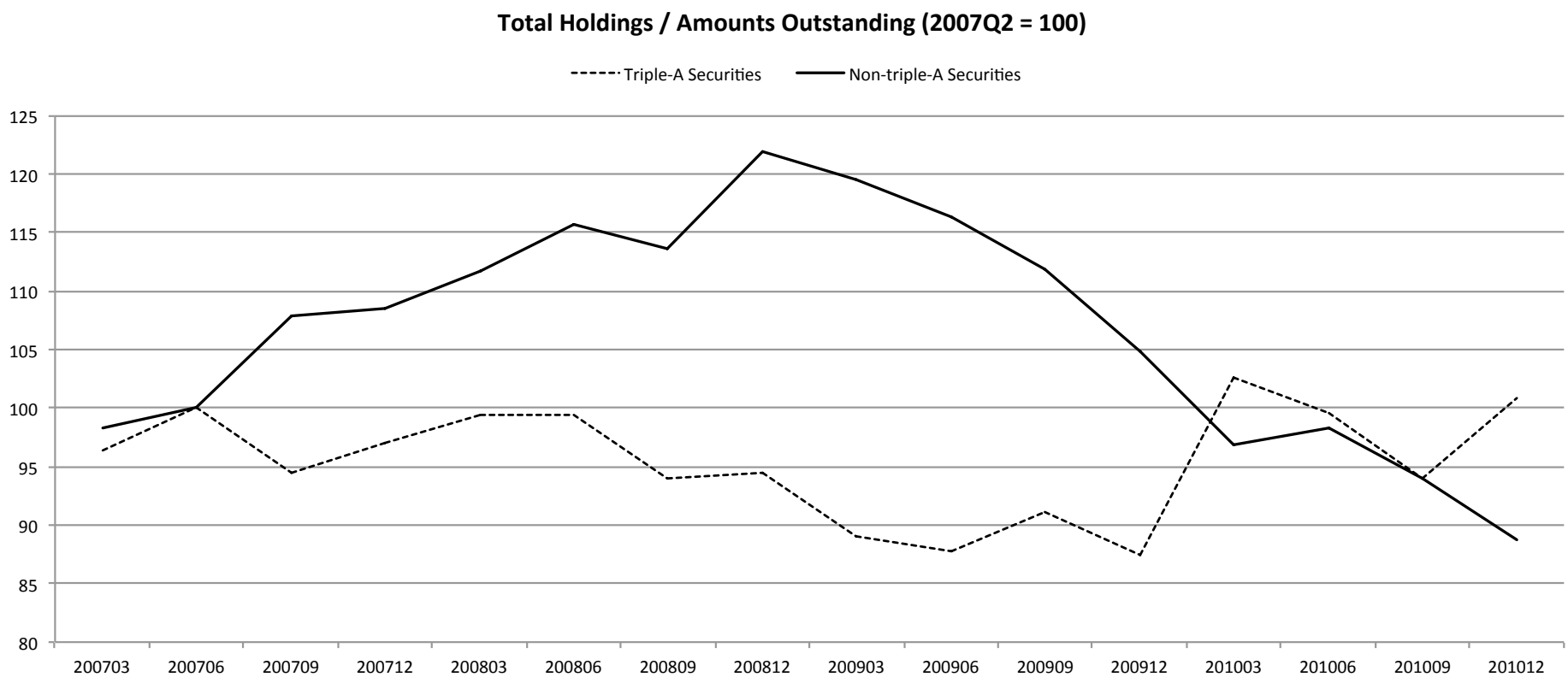
	2010Q1	**2010Q2**	**2010Q3**	**2010Q4**	**2011Q1**	**2011Q2**	**2011Q3**	**2011Q4**	**2012Q1**	**2012Q2**	**2012Q3**	**2012Q4**
Capital / TA * % Change in Price	0.674	-0.517	-2.957***	1.491	-1.974*	0.777	-1.282	-0.952**	-2.906*	0.898**	0.0156	1.093*
	(0.614)	(1.205)	(0.885)	(1.063)	(1.049)	(0.864)	(0.974)	(0.433)	(1.607)	(0.451)	(0.901)	(0.592)
Observations	26,722	26,065	28,834	29,831	30,332	28,427	28,989	29,711	29,101	29,795	31,356	32,365
R-squared	0.447	0.462	0.440	0.459	0.442	0.467	0.459	0.467	0.451	0.479	0.494	0.479
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Security FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

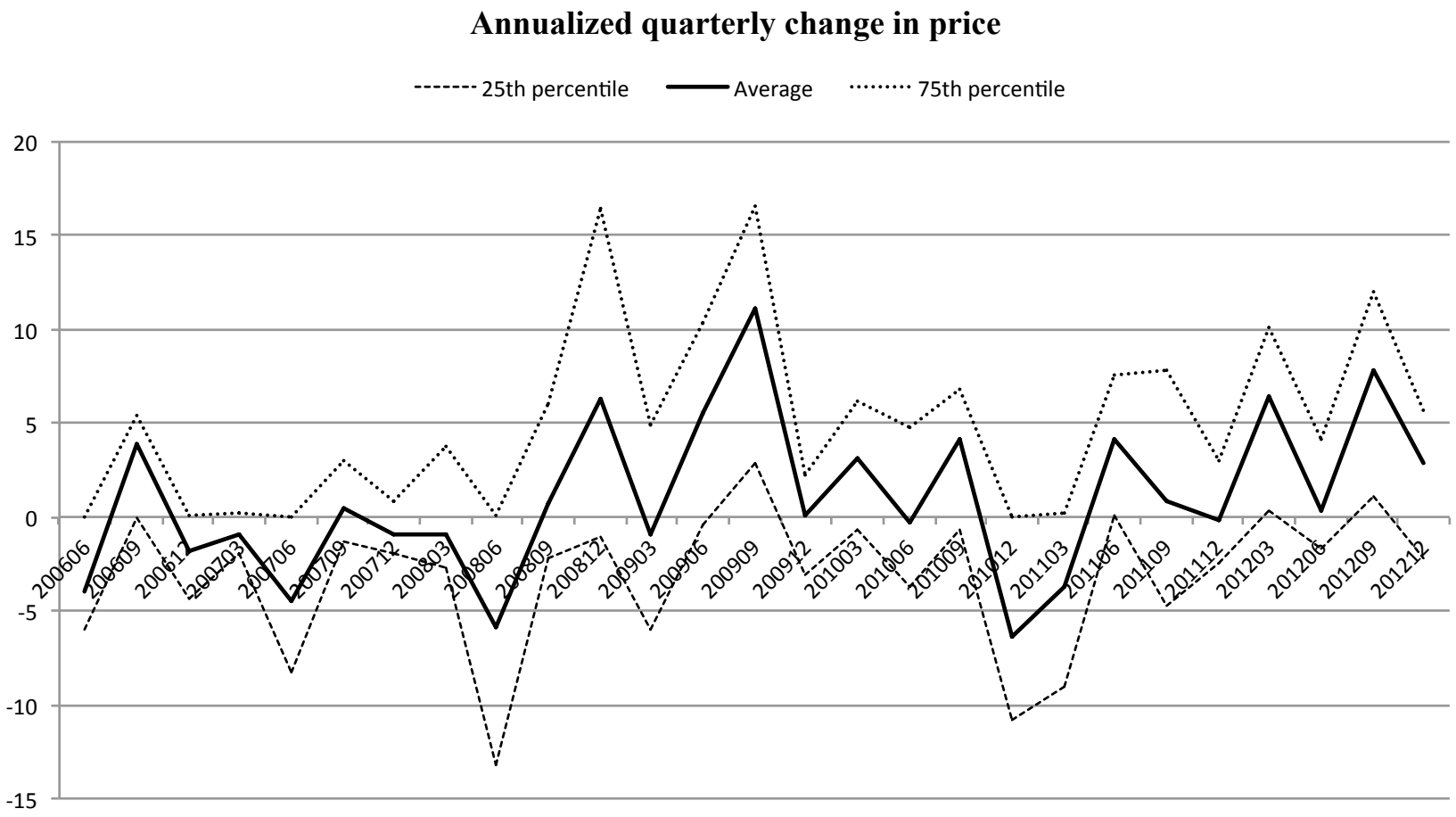
Notes: The dependent variable is the logarithm of the amount bought / sold (in nominal value) of security *i* by bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects and other controls are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). ***: Significant at 1 percent level; **: Significant at 5 percent level; *: Significant at 10 percent level.

TABLE 10. CREDIT SUPPLY DURING, BEFORE, AND AFTER THE CRISIS

	Crisis			Pre-crisis			Post-crisis		
Capital / TA	-0.039**	-0.044**	-0.043**	0.010*	0.015**	0.016**	-0.008	-0.013	-0.012
	(0.019)	(0.020)	(0.019)	(0.006)	(0.007)	(0.007)	(0.031)	(0.033)	(0.033)
Capital / TA * Future Default			-0.015			-0.060			-0.036
			(0.036)			(0.058)			(0.065)
Observations	613,047	554,485	554,485	327,704	263,606	263,606	854,160	784,377	784,377
R-squared	0.6336	0.6261	0.6261	0.6387	0.6197	0.6197	0.6335	0.6295	0.6295
Bank Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Borrower * Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: Dependent variable: logarithm of 1 + total debt from borrower *j* to bank *b* at time *t*. The table reports the estimated coefficients and robust standard errors (in parentheses) clustered at bank level estimated using least squares. Fixed effects are included ("Y"), not included ("N"), or spanned by other fixed effects ("><"). *** Significant at 1 percent level; ** Significant at 5 percent level; * Significant at 10 percent level.


Total Holdings / Amounts Outstanding (2007Q2 = 100)
Triple-A Securities
Non-triple-A Securities
125
120
115
110
105
100
95
90
85
80
200703
200706
200709
200712
200803
200806
200809
200812
200903
200906
200909
200912
201003
201006
201009
201012


Annualized quarterly change in price
25th percentile
Average
75th percentile
20
15
10
5
0
-5
-10
-15
200606
200609
200612
200703
200706
200709
200712
200803
200806
200809
200812
200903
200906
200909
200912
201003
201006
201009
201012
201103
201106
201109
201112
201203
201206
201209
201212