Volatile Lending and Bank Wholesale Funding

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Abstract: The paper presents the first empirical study of the relation between bank loan volume volatility and bank retail and wholesale liabilities. We argue that since the volume of retail deposits is inflexible, banks facing volatile loan demand tend to fund loans with larger shares of wholesale rather than retail liabilities. We empirically confirm this argument using a dataset constructed from the weekly financial reports of 104 large U.S. commercial banks. Our results imply that the introduction of regulatory limits on wholesale liabilities could increase the exposure of banks to loan demand shocks.

Key words: wholesale funding, retail deposits, loan volume volatility

JEL: G21, E44

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1. Introduction

The 2007-2009 financial crisis illustrated that excess reliance on wholesale funding increases the exposure of banks to liquidity risk. In the course of the crisis it became evident that banks which fund a substantial share of their assets with wholesale liabilities become under unfavorable conditions subject to liquidation pressures. These pressures give rise to negative externalities with adverse effects for the financial system as a whole. Such externalities include higher volatility of bank asset volumes and an amplification of macroeconomic shocks (see Ratnovski and Huang 2011, Ivashina and Scharfstein 2010, Segura and Suarez 2012, Brunnermeier and Oehmke 2013). In response to these negative externalities of wholesale funding a number of regulatory policy measures such as Basel III's net stable funding ratio and the introduction of a tax on non-core bank liabilities (Shin et al 2011) have been proposed. These proposed measures aim at stabilizing the banking system by limiting the use of wholesale funding.

However, predicting the effect of these regulatory measures is still challenging since both the academic and the policy debate have so far been based on a quite incomplete understanding of banks' motives to use wholesale funding. In particular, although some recent insightful theories (Song and Thakor 2008, Diamond and Rajan 2012) have put forward the analysis of the asset-liability matching problem in the direction of synergies between lending and core deposits, the empirical relevance of the these synergies for the choice of bank liabilities structure is severely underexplored. Moreover, the broad debate on how wholesale funding generates liquidation pressures and thus increases asset volatility ignores the possibility that volatile assets could themselves generate incentives for banks to use wholesale funding.

In this paper we address these open issues and empirically examine the relation between bank asset volatility and the form of liabilities a bank employs. Our interest is in identifying the effect of bank-level asset volatility –more specifically loan volatility - on the funding structure of the bank. We provide evidence that loan volume volatility encourages banks to use wholesale funding. This effect can be explained by the fact that banks with volatile loan volumes value the ability to adjust the volume of their liabilities quickly and with minimal costs. This is easier when a larger portion of a bank balance sheet is funded with wholesale rather than with retail deposits[1]. The advantage of wholesale funding for banks facing volatile assets stems from the flexibility of wholesale relative to retail deposits[2]. As the banking literature has recognized (see Flannery 1982, Song and Thakor 2008) retail deposits represent an inflexible source of funding[3]. The inflexibility of retail deposits is related to the substantial costs that banks have to incur if they wish to adjust retail funding quickly. These costs accompany positive but also negative changes in the volume of retail deposits. An increase in the volume of retail deposits that goes beyond an exogenous shift in deposit supply will generate expenses associated with the change of deposit rates (Hannan and Berger 1991), with a compensation for depositors' switching costs (Sharpe 1997), or with costs of building new branches or merging with banks rich in retail deposits, and so forth. Similarly, any decrease in the volume of retail deposits is again costly since depositors have to be compensated for their decision to "abandon" the bank[4]. This type of costs associated with a reduction in deposit volumes are particularly relevant for banks which have "overinvested" in retail deposits (that is banks that have collected more deposits than optimal under the ex post realization of the loan volume). If these banks do not manage to scale down their retail deposits they have to incur potential losses stemming

[1] Throughout the paper we use the term wholesale liabilities to denote uninsured short-term bank liabilities. Both aggregate and bank-level data suggest that uninsured bank debt effectively has a much shorter maturity relative to retail bank liabilities.

[2] Similar results are well established in both the investment and the labor literature where it has been shown that firms facing a large degree of demand uncertainty produce with more flexible forms of capital (Bloom et al 2007) and are more likely to use temporary employed labor (Laird and Williams 1996).

[3] The inflexibility of retail deposits motivates Flannery (1982) to define deposits as "quasi-fixed" factors of production in common with the firm production function literature.

[4] Flannery and James (1984) provide indirect empirical evidence based on interest rate sensitivity that independent of their de jure maturities retail bank liabilities typically have a maturity of significantly more than one year.

from the fact that the surplus of deposits over loans can only be invested in alternatives generating a return lower than the return on loans and potentially even lower than the costs of collecting and servicing the deposits. This unattractiveness of an overinvestment in retail deposits is reinforced in times of very low market interest rates, since the costs of deposit collection are nominally fixed and independent of interest rates, at the same time that returns on surplus deposits are particularly low[5].

Contrary to retail deposits, wholesale liabilities bear the advantage that their volumes can typically be adjusted quickly and almost free of costs. The flexibility of wholesale funding is at the core of the empirical observations (Shin 2011) that in credit booms some banks are able to quickly inflate their balance sheet by heavier use of wholesale liabilities. However, one important exception to wholesale volume flexibility exists: a bank can lose control over the volume of wholesale funding it is able to attract (or hold on its balance sheet) in situations when either the bank or the banking system as a whole is in distress. The recent literature (Huang and Ratnovski 2011, Segura and Suarez 2012) has focused almost exclusively on such situations when banks lose access to wholesale funding so that from the point of view of the bank short-term wholesale funding becomes inflexible. We argue here that this exclusive focus on the rare events of substantial wholesale market distress omits the potentially important advantages of wholesale funding in normal times as well as the risks of "overinvesting" in inflexible retail funding. A thorough analysis of the effects of wholesale funding regulation should, however, account for this "dark side" of wholesale funding bans. For the sake of completeness, and in order to understand the differences in the flexibility of wholesale funding under different systemic conditions, we examine the relation between loan volatility and funding sources not only in normal times but also in crisis times.

[5] Some anecdotal evidence claims that wholesale funding is preferred by banks since it is cheap. Although this claim has not been thoroughly empirically exploited so far, back-of-the-envelope comparison of retail and wholesale funding interest rates show that retail rates are typically much lower than wholesale rates. The claim of "cheap" wholesale funding can, therefore, only be defended relative to the costs of accumulating and servicing retail deposits.

Our empirical strategy is based on exploring how various measures of bank-specific loan volatility affect bank funding choices. The analysis employs weekly data on key bank balance sheet positions for a sample of large US commercial banks in the period 1997-2009. We study the impact of bank-level loan volatility on both (i) the liability structure in static panel and in recursive panel VAR models and (ii) the dynamics of retail and wholesale liabilities by estimating a panel vector error correction model of the reaction of retail deposits to changes in loan volumes and volatility. The static analysis serves as a starting point that establishes key stylized facts about the determinants of bank liability structure. It raises a few issues about identification, in particular concerns related to the fact that observable loan volume volatility reflects not only loan demand but also loan supply, which in turn depends on banks' funding sources. To address the identification issues we present estimates of the response of liabilities structure to innovations in loan volume volatility in a structural VAR framework, where identification is derived from the high frequency of the data. We also present a dynamic framework that precisely tracks the timing of changes in loans and liabilities.

The results of our analysis show an economically and statistically strongly significant effect of bank-level loan volatility on the structure of bank liabilities. Banks with high volatility of loan volumes have significantly lower ratios of retail deposits to total liabilities. Moreover, a positive shock of loan volume volatility is found to be followed by a decrease in the share of retail deposits. Also, banks with volatile loan volumes tend to adjust their retail deposit volumes to loan volume shocks more slowly than do banks facing lower volatility. The former banks react to loan shocks by mainly adjusting their wholesale volumes while the later are quicker to modify retail deposit volumes.

These results are consistent with our argument that the use of flexible wholesale liabilities is not only a determinant but also a consequence of loan market volatility, as indicated by loan volume fluctuations. They are also consistent with a situation, where banks with more favorable access to wholesale funding self-select in serving more volatile types of lending. For example, large banks associated with too-big-to-fail perceptions might - because of their cheaper access to flexible wholesale liabilities - have a business model that allows for more variability in lending volumes, while such a business model is not attractive for smaller predominantly retail-funded banks. Although, in this later case, the positive correlation between wholesale funding and loan volume volatility is driven by selection rather than causality, the policy implications with regard to the introduction of regulatory limitation to wholesale funding are very similar. In both cases limiting the banks' use of wholesale funding will inhibit the banking system's ability to serve the more volatile loans. One implication of such a regulation is that the probability of excessive credit booms is reduced but also lending recovers more slowly from recessions. Another implication of such a regulation is that in times of high demand for loans banks may be inclined to expand the amount of retail deposits. Since these retail deposits are difficult to reduce once the demand for loans is reversed, banks become more likely to approve funding to projects which they would have otherwise rejected[6]. In sum, even though a cap on wholesale liabilities can decrease lending cycles' volatility and banks' funding risk, the effect on financial system stability will be ambiguous since it also increases banks' exposure to asset-side – in particular, loan demand- shocks.

This paper provides several contributions to the extant literature. To start with, this is the first empirical study that examines the relation between bank loan volume volatility and bank liabilities. To this end it contributes to the debate on the negative externalities of wholesale funding (Ratnovski and Huang 2011, Ivashina and Scharfstein 2010, Segura and Suarez 2012, Brunnermeier and Oehmke 2013) by providing richer evidence on the link between wholesale liabilities and lending. Also, our results add asset volatility to the battery of proposed liability structure determinants, which

[6] This implication is related to Acharya and Naqvi's (2012) argument that excess liquidity generates incentives for banks to expand the risk range of the projects approved for funding.

so far includes liquidity provision (Berger and Bowman 2009, Diamond and Rajan 2012); stable funding for information-opaque assets (Song and Thakor 2008); bank market power (Berlin and Mester 1998; Craig and Dinger, 2010) and market entry barriers (Park and Pennacchi 2009; Dinger and von Hagen 2009); taxes (Pennacchi et al 2010); a shift to a new originate-and-distribute business model (Gorton and Metrick 2011); as well as the fact that in periods of lending booms the growth rate of deposits is insufficient to cover loan demand needs (Shin et al 2011) as alternative determinants.

Next we contribute to the literature focused on the effect of bank financial flexibility by illustrating the different dynamics of retail and wholesale liabilities. For example, our results are consistent with the finding of Billet and Garfinkel (2004) that banks which have higher costs of switching between retail and wholesale markets will have a higher propensity to hold low-return liquid assets.

The rest of the paper is organized as follows. Section 2 presents the data sources and the sample. Section 3 discusses measurement issues and the identification and establishes the key summary statistics concerning wholesale funding. Section 4 presents the empirical methods employed and their results. Section 5 explores how the relation between bank specific loan volatility measures and funding modes is modified during times of wholesale market disruptions. Section 6 concludes.

2. Data

The analysis is based on data from the "Weekly Report of Selected Assets and Liabilities of Domestically Chartered Commercial Banks and U.S. Branches and Agencies of Foreign Banks". These "Weekly Reports", which present data on key balance sheet positions[7], are required by the

[7] The weekly reports include a substantially smaller set of variables relative to the quarterly call reports. In particular they do not include a distribution of loans and deposits across different maturities. We nevertheless base the analysis on the

Federal Reserve System from the largest regulated institutions as well as from a few smaller banks. The time period is limited to the weeks between the beginning of January 1997 and end of July 2009. Extending the sample beyond this period would have raised some comparability concerns since substantial changes in the format of the "Weekly Report" were introduced prior to and after the sample period.

In this period a total of 104 U.S banks submitted weekly reports, although smaller banks coming into the sample or rotating out of the sample, or for all banks mergers and bank failures lead to an unbalanced panel of bank observation. The summary of the number of banks covered by the sample and their average size illustrates the substantial consolidation of the banking industry which took place during this period. As presented in Table 1, the number of sample banks significantly declines during the examined period but the volume of individual banks' total assets increased tremendously.

A comparison with the aggregate size of the US commercial banking sector as presented in the "Flow of Funds" issues of the Federal Reserve System shows that the total banking assets covered in our sample reflect throughout the sample years an almost constant portion of 43-47% of the banking sector. In order to control for the obviously large number of mergers which can substantially affect the volatility measures used in the analysis we add information on the timing of bank mergers from the Supervisory Master File of Mergers and Acquisitions. The period when a bank was involved in a merger are excluded from the computation of the volatility measures.

Table 1

The time span of the data enables us to track the dynamics of an individual bank's liabilities during a period for which it has often been claimed that a substantial shift in the funding modes have taken place (Gorton and Metrick 2011). As illustrated in figure 1, the notorious shift towards

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weekly reports' information since the high frequency observations of assets and liabilities dynamics are used to identify statistical estimation.

wholesale funding reflects the situation of a few individual institutions rather than a general trend affecting the banking industry as a whole.

Figure 1

The share of retail deposits in total liabilities aggregated across all US banks varies between 43 and 49% in the time period (without an unambiguous time trend); whereas the variation across banks is huge in each of the sample years: while some banks have less than 1% of their total liabilities as retail funding[8] others have a share of retail deposits in total liabilities of more than 90%. Note that this variation is present even when we cover only the largest banking institutions, so diversity of liability structure is present even within a sample of very large US banking institutions. The exploration of this huge cross-sectional variation which to our knowledge has not been duly explored so far is a major contribution of this paper.

The time period of the sample encompasses a few periods of financial system distress such as the LTCM failure, September 11, and the financial system turmoil of 2007-2009 that mark substantial shocks to the functioning of the markets for wholesale funding. The inclusion of these periods allows us to address the differences in the bank's reaction to loan market volatility in times of well-functioning versus distressed markets for wholesale funding.

A number of additional variables such as proxies for deposit market expenses which are not reported with a weekly frequency are taken from the Quarterly Report on Conditions and Income. Aggregate level variables from the Federal Reserve Bank of St. Louis (FRED) database reflecting market interest rates, average costs of bank wholesale funding, etc. are also included.

[8] The institutions with almost no retail deposits are mostly subsidiaries of Bank Holding Companies set up to perform trust business. They can be viewed as outliers for the analysis we present here, so that as robustness check we have rerun the regressions excluding institutions with less than 10% retail deposits. The results stay qualitatively the same.

3. Measuring loan volume volatility and liability structure

3.1. Loan volatility

We focus on loan volume volatility as a proxy of the volatility of the volume of assets that a bank has to fund. This focus on loans (which ignores the volatility of other bank assets) is justified by the fact that loans are the most important illiquid assets of a bank and thus a major determinant of a bank's funding needs. This is the case, since most alternative bank assets are both easier to liquidate and suitable for direct refinancing operations (for example, repo transactions) without further affecting the funding needs of a bank. Moreover, since loans are relatively illiquid, the use of bank loan volatility as a proxy for asset volatility enables us to utilize the advantages of the weekly data when we identify our econometric models. Using weekly data on loan dynamics we can employ alternative identification schemes for the analysis of how loan volatility affects liability structure. The identification would have been substantially more challenging if we had used alternative bank assets such as securities whose volumes can almost immediately be adjusted to liability shocks.

Loan volume volatility can arise from various sources. Clearly these include volatile business cycles as well as shocks to aggregate uncertainty levels, which mostly affect the time-series variation of loan volume volatility. These sources can also generate some cross-sectional variation in volatility in the sense that banks specialized in lending to firms which are over-proportionally affected by aggregate fluctuations face stronger volatility of lending. However, the major source of the cross-sectional variation in loan volume volatility presumably lies in the fact that different banks have different informational advantages and expertise which causes them to specialize in lending to different types of borrowers with different types of projects. Banks specialized in lending to businesses with volatile or lumpy demand for capital – e.g. large firms with lumpy investments - will naturally face more volatile loan demand. Obviously, banks have alternative approaches at their disposal to smooth their idiosyncratic loan demand volatility ranging from industry and geographical diversification to building loan syndicates. However, the benefits of specialization might impose some limits to diversification so that banks whose main customers are idiosyncratic in their capital needs will have idiosyncratic and more volatile loan demand. In an unrestricted environment of bank wholesale funding, banks can use wholesale liabilities to deal with the undiversified variation in loan demand.

We use three empirical measures for the volatility of loan volumes. We start with the standard deviation of the loan volume (LOANS SD) as a classical measure of volatility. The disadvantage of the standard deviation is its symmetric reflection of positive and negative loan volume changes. Further, we account for the potential asymmetry, e.g. the possibility that large negative shocks to loan volumes generate a stronger reluctance of the bank to produce with inflexible "inputs", by introducing the negative skewness (NEGATIVE SKEWNESS) of the loan volume as an additional measure of volatility. Unlike the standard deviation, negative skewness isolates the impact of the large, infrequent and abrupt loan volume drops[9]. The standard deviation and the negative skewness are generated for each individual bank by constructing rolling windows including the loan volume observations of the past 52 weeks. And last but not least, we include the conditional volatility of the bank's loan volumes predicted by a GARCH (1,1) model (LOANS GARCH) as a volatility measure. Note that all these measures reflect the volatility of the stock of loans on bank books which is related not only to the volume of newly originated loans but also to the volume of maturing loans.

3.2. Liability structure

We base the choice of empirical measures of liability structure on a broad distinction between retail (insured) and wholesale (uninsured) liabilities which we can track with weekly frequency. The first category includes classical deposit products such as checking accounts, money market deposit

[9] Tornell et al (2008), for example, employ loan volume skewness as a volatility measure in an aggregate level analysis of financial system risk.

accounts, and certificates of deposits with a nominal value of less than USD 100,000 (computed as the sum of line 2215 "*total transaction accounts*" and line 2385 "*total non-transaction accounts*"). The latter category includes all other liabilities of the bank (defined as the difference between bank liabilities - excluding equity- and retail deposits) such as federal funds purchased, subordinated debt, commercial paper borrowing of the bank as well as funds sold under agreement to repurchase.

3.3. Identification challenges

The analysis of the empirical relation between the volatility of loan volumes and the liability structure of the bank faces several major identification challenges. The first challenge is the existence of reverse causality which is suggested by both theory (Huang and Ratnovsli 2011) and by empirical evidence from the 2007-2009 financial crisis (Ivashina and Scharfstein 2010). Reverse causality in this case implies that wholesale funding can generate loan volume volatility since banks heavily relying on wholesale funds find themselves in a situation when they are unable to rollover short-term wholesale debt and have to liquidate loans. To solve this identification challenge one has to focus on movements in loan volumes which are not related to a bank's ability to rollover wholesale debt. To this end, we exploit the high frequency of our data which allows us to assert convincing identifying assumptions in the timing of loan, deposit and wholesale funding volume changes and to focus on loan market dynamics which are not driven wholesale funding.

A second challenge reflects a possible spurious relation between securitization, loan volume volatility and funding structure. Using on-balance-sheet loan volume variation as a measure of volatility bears the risk that banks operating according to an originate-and-distribute model systematically have higher loan-volume volatility if loans appear on the balance sheet immediately after origination and disappear from the balance sheet once they are transferred to a special purpose vehicle for securitization. For those banks we will observe both a high volatility of the loan volume and a low reliance on retail liabilities for reasons that have nothing to do with the flexibility of wholesale funding. We address this by using a broader measure of bank loan volume. This measure includes the joint volume of on-the-balance-sheet loans plus sold and/or securitized loans serviced by the bank[10]. The advantage of this measure is that it will not reflect the ups and downs of the loan volume solely generated by the securitization process. As a robustness check we rerun the estimations using only on-balance-sheet loans. The results which for the sake of parsimonious exposition are not reported here are qualitatively the same.

A third challenge is related to the fact that the observed positive correlation between wholesale funding and loan volatility can emerge from a self-selection of immanently more risky banks into both riskier funding as well as riskier (more volatile) assets. This selection concern is mitigated by the fact that our focus is on the volatility of loan volumes rather than of loan returns (which is a more direct measure of the bank riskiness). We also solve the selection issue by explicitly focusing on the dynamics of bank liabilities as they react to individual loan volume shocks.

And last but not least, as mentioned in the introduction, the same results as those reported in this paper can emerge from a self-selection of banks with better access to wholesale funding into the market for volatile lending opportunities. This challenge is related to the fact that we only observe the loan volumes on bank balance sheets and these observable loan volumes reflect both loan demand and loan supply. Potentially observable loan volume volatility might not only be related to more volatile loan demand but also to the fact that banks with better access to wholesale funding are more willing to supply volatile (or lumpy) loans while banks relying on retail funding focus on serving more stable loan demand. We address this also in the context of our high frequency data. For example, we focus only on the retail deposit volume adjustments to observable loan volume

[10] Unfortunately we have no information on the volumes of loans which are issued and sold by the bank if these loans are not serviced by the bank.

shocks. Some concerns, however, still remain. In particular, if banks simultaneously decide on whether to supply a loan and how to fund it, lumpy and sporadic loans will only be supplied by banks which can flexibly fund them. Nevertheless, these concerns do not threaten the validity of the main implications of our results with regard to the effects of imposing regulatory limits on wholesale funding. More specifically, the implication that restricting the use of wholesale funding is likely to affect the ability of banks to serve volatile lending, emerges independently of whether banks facing volatile lending choose more wholesale funding or banks with better access to wholesale funding self-select into serving the more volatile loan demand.

4. Empirical Model

4.1. Loan volatility and liability structure: a static analysis

We start the empirical analysis by estimating the relations between loan volatility and the share of retail deposits in banks' liabilities in a static framework using the following econometric model:

$$deposit\_share_{i,t} = \alpha_0 + \alpha_1 * volatility_{i,t} + \alpha_2 * X_{i,t} + \varepsilon_{i,t} \qquad (1)$$

where $deposit\_share_{i,t}$ denotes the (log of the) share of retail deposits to total liabilities[11] of bank *i* in week *t*, $volatility_{i,t}$ is a measure of the loan volatility faced by the bank in the corresponding period (we estimate the model using each of the volatility measures discussed in Section 3).

Since a bank's liability structure potentially depends on a number of bank characteristics, we extend the static model to a multivariate framework which includes the vector of control variables $X_{i,t}$. $X_{i,t}$ consists of a number of variables that could affect the link between loan volatility and bank funding structure. To start with, we include the size of the bank as measured by the natural

[11] An alternative formulation of the empirical model that uses the share of wholesale to total liabilities naturally produces very similar results.

logarithm (BANK SIZE) of its total assets, along with its quadratic, BANK SIZE SQUARED, to control for non-linearity in the relationship. Bank size can affect the examined relation since due to too-big-to-fail concerns, economies of scale, etc. it is assumed to be an important determinant of banks' costs of retail and wholesale funding. Also bank size matters since larger banks can more easily establish special purpose vehicles to fund assets. Next we include the share of loans to total assets (LOANS) as an indicator of the business model of the bank. This variable indicates whether a bank pursues an originate-and-distribute model or a classical deposit – loan origination model. Its inclusion also controls for the relative importance of loan volume volatility in the volatility of bank total assets. The ratio of bank equity capital[12] to total assets (CAPITAL) serves as a proxy of bank capitalization and the general riskiness of the bank which can affect the trade-off between using insured vs uninsured liabilities. Also since the use of wholesale funding correlates with funding via special purpose vehicles, which in turn allows banks to reduce the required amount of regulatory capital, the inclusion of CAPITAL as a control variable also allows us to control for capital arbitrage as a potential determinant of funding structure.

We use several interest rate variables as controls. The information on the costs of wholesale funding is captured by the spread between 3-month LIBOR interbank rate (as reported by the Federal Reserve Bank of St. Louis' information system FRED) and the 3-month T-Bill rate (LIBOR SPREAD). The spread reflects only the average costs of market funding for all banks at a given point of time. The de facto cost of a bank's wholesale funding can substantially differ from this rate, but the differences are potentially endogenous with respect to liability structure of the banks so that for the sake of identification we use this average measure of wholesale funding spread[13]. In addition, we control for the spread of the three-month T-Bill rate over the deposit rates offered by the bank

[12] Since the weekly report presents no explicit information on equity, the value is approximated by line wrbk3212 "residual" that is computed as the difference between total assets and total liabilities.
[13] A similar measure of the costs of uninsured bank liabilities has been proposed by Billet and Garfinkel 2004.

(RETAIL SPREAD) as a proxy for the variable costs of retail deposits. We use an average deposit rate imputed from the quarterly call report of the bank as the ratio between bank interest expenses on deposits and the total volume of deposits reported in a given quarter. The spread represents a bank specific cost of insured retail liabilities reflecting numerous factors previously reported in the literature to affect liability structure such as the deposits market power of the bank (Hannan and Prager 2006, Dinger and von Hagen 2009, Craig and Dinger 2011). Since retail deposits are insured and thus less risk sensitive we are not concerned about the endogeneity of the RETAIL SPREAD.

Our interest rate variables also include a general rate level, the three-month T-Bill rate (T-BILL RATE). If the overhead costs of accumulating and servicing deposits are insensitive to the interest rate level, the T-Bill rate is related to the difference between the costs of wholesale and retail deposits. If the T-Bill rate is low, retail deposits become relatively more expensive since their costs contain a component (personnel costs, branch maintenance, etc) which is interest-rate-insensitive. And finally, we include a slope of the yield curve (YIELD) measured by the difference between the 10-year T-Bill rate and the 2-year T-Bill rate. This controls for the profitability of lending by measuring the return generated from maturity intermediation as well as for general economic activity, which affects lending dynamics.

The summary statistics of the variables employed in the model estimation are illustrated in Table 2.

Table 2

Table 3 presents the results of the estimations of the static model described in (1). This table contains a column for each of the three alternative measure of loan volume volatility.

Table 3

These static results indicate a robust statistically significant negative relation between all three measures of bank loan volume volatility and the share of retail deposits. The economic significance of the effect, however, differs substantially across the different volatility measures. So for example, raising the standard deviation of loans by 10% corresponds to reducing the share of deposits to total liabilities by roughly 8%. Similarly, a 10% percent increase in NEGATIVE SKEWNESS corresponds to a drop in the share of deposits in total liabilities of about 3%. And finally a 10% rise in LOANS GARCH relates to only a 1.4% decline in the share of deposits.

Most control variables enter the regressions with the expected signs. So as previously documented (e.g. Park and Pennacchi 2009) we show that larger banks fund a smaller share of their assets by retail deposits. However, the positive sign of the squared size terms indicates that this effect tapers off quickly. Also, we find that banks with a large share of loans in their assets tend to have larger shares of retail deposits in their liabilities. This result is consistent with Song and Thakor's (2008) hypothesis that banks tend to fund loans predominantly with retail deposits which are more stable and react less to potentially noisy information about opaque loans. The level of bank capitalization also positively affects the share of retail deposits in bank total liabilities implying that well capitalized banks tend to use more retail funding. The T-Bill rate enters the regressions with statistically insignificant coefficients. The positive statistically significant coefficients of the slope of the yield curve suggest that steeper yield curves are related to a higher reliance of banks on retail funding.

Somehow surprisingly the coefficients of the LIBOR SPREAD are negative indicating that the share of retail funding is low when the costs of interbank liabilities are relatively high. This result, together with the negative (significant in two out of the three specifications) coefficients of the retail spread suggests that since in this static model we simply reflect the stock of wholesale and retail funding which is quite sluggish, we are unable to precisely measure the reaction of funding structure to the changes in the relative costs of wholesale and retail funding. These results could reflect a situation where in times when many banks have high demand for wholesale funding its average price (approximated here by the LIBOR SPREAD) rises. In the dynamic form of the analysis presented in Section 4.3. the sign of the LIBOR SPREAD's coefficient is reversed, suggesting that the surprising sign of the coefficient here is indicative of the identification issues faced by the static analysis that will be discussed in the following sections.

In sum, the results presented in Table 3 confirm our hypothesis that banks facing higher degrees of loan volume volatility fund smaller shares of their assets by retail deposits. A graphical illustration of this econometrically documented negative link between loan volume volatility and the share of deposits in bank's total liabilities is given in Figure 2, which plots loan and deposit volumes of two of the sample banks.

Figure 2

The left panel reflects a bank with very volatile loan volumes. One can easily see that deposits hardly react to loan volume fluctuations and that the bank funds a substantial share of its assets with non-deposit liabilities. The bank reflected in the right panel, on the contrary, has a stable loan volume trend. For this bank the largest portion of loans are funded by retail deposits.

4.2. Loan volatility and liability structure: high frequency panel SVAR analysis

The consistency of the estimated parameters of the static model presented above is challenged by the identification issues discussed in Section 3. In particular, the reverse causality between the use of wholesale funding and loan volatility emerging from the potential inability to rollover short-term wholesale debt is a severe obstacle for any inference based on the results presented in Table 3. We, therefore, interpret these initial results solely as evidence of a robust positive correlation between loan volume volatility and the relative volume of wholesale liabilities.

The high frequency of the data allows us to explore the robustness of this positive correlation using a panel structural vector-autoregressive (SVAR) approach with using a Cholesky decomposition while assuming alternative orderings of the endogenous variables. To this end we estimate recursive VAR models where the share of deposits and the volatility of loan volumes are both allowed to be endogenously related. Further, since the link between bank funding structure and loan volume volatility is reflected in the dynamics of the share of loans in total bank assets, we include LOANS as a third endogenous variable in the model. This inclusion is motivated by the fact that if a banks' loan volatility is increased because of loan liquidation caused by the inability of the bank to roll-over wholesale debt, we should observe that a bank shortens its liquid asset positions – thus increasing the share of loans in its assets - prior to liquidating loans[14]. In addition to the endogenous variables we also include (mirroring the static model) CAPITAL, T-BILL RATE, YIELD and BANK SIZE as exogenous variables in the model.

Following our presumption that innovations to loans volume volatility affect the ratio of loans to total assets and the share of deposits in total liabilities we first estimate a recursive SVAR model ordering the shocks to VOLATILITY first, followed by LOANS and DEPOSITS/LIABILITIES shocks. The impulse responses derived from this estimation are presented in Figure 3 which contains a panel for each of the three volatility measures introduced in the previous section.

Figure 3

The response of the ratio of deposit to total assets to an innovation in volatility is statistically significantly negative in the case of both LOANS SD and LOANS GARCH. The estimated impulse responses of DEPOSITS/LIABILITIES to innovations in NEGATIVE SKEWNESS are not statistically significant. One potential explanation for the insignificant response of deposits to

[14] The impulse responses derived from the alternative model specifications do not qualitatively change if we exclude the LOANS variable from the set of endogenous variables and estimate the SVAR with only two endogenous variables: VOLATILITY and DEPOSITS/LIABILITIES.

innovations in negative skewness is may lie in the high frequency nature of the data, combined with a slowness in response in sloughing off perceived excess deposits.

In a next step, to assure the robustness of the results, we also estimate the recursive model using the other five possible orderings of the endogenous variables in the structural decomposition. It turns out that for all alternative orderings the estimated impulse responses are qualitatively the same as those presented in Figure 3. For the sake brevity, in Figure 4 we only illustrate the impulse responses estimated in the case when DEPOSITS/LIABILITIES is ordered first, followed by LOANS and VOLATILITY.

Figure 4

In sum, we can confirm under various identification assumptions that for two of the three volatility measures a positive shock in loan volume volatility is followed by a reduction in the share of retail deposit to total liabilities.

4.3. Loan volatility and the adjustment of retail deposits to loan shocks

In this subsection we address the shortcomings of the static analysis – in particular those reflecting identification, but also the challenge of using stock rather than flow variables - by presenting a dynamic econometric model. In the dynamic model we focus on estimating the speed of adjustment of retail deposit volumes to loan volume changes and how this speed of adjustment is affected by loan volume. The underlying hypothesis of the dynamic analysis is that banks facing more stable loan volume dynamics adjust their deposit volumes faster to an observed change in the loan volume. Since loan volume dynamics of those banks is more stable, they can better predict the amount of required funding and match it with stable retail funds. Banks with more volatile loan volumes, on the contrary, are hesitant and slow to adjust inflexible retail deposit volumes to a loan volume shock. Those banks tend to fund loan demand peaks with wholesale liabilities whose volumes they can easily reverse.

We start the dynamic analysis by exploring the time series characteristics of the volumes of loans and retail deposits in the context of the high frequency panel data. For both the loan and the deposit series a battery of econometric tests confirm a unit root of the time series. The use of a standard vector-autoregression model is, therefore, implausible. As a next step we perform a panel cointegration test using the tests suggested by Westerlund (2007) that are general enough to allow for substantial heterogeneity, both in the long-run cointegrating relationship and in the short-run dynamics. All tests overwhelmingly reject the null of no cointegration between the deposit and loan volumes.

Having shown the existence of cointegration we next proceed to estimating a panel vector error correction model (VECM) explaining retail deposit volume dynamics as a function of loan volume dynamics. Under the assumption of the model both the long-term cointegration relation between loan and retail deposit volumes and the short-term speed of adjustment toward the long-term effect are allowed to depend on volatility. Formally the model is given by the following equation:

$$\begin{aligned}&\Delta_{(t+1)-(t)}Deposits_i = \alpha_0 + \alpha_1 * \Delta_{(t)-(t-1)}Deposits_i + \alpha_2 * \Delta_{(t)-(t-1)}Loans_i + \\ &\alpha_3 * TotalDeposits_{i,t-1} + \alpha_4 * TotalLoans_{i,t-1} + \alpha_5 * Volatility_{i,t} + \\ &\alpha_6 * Volatility_{i,t} * \Delta_{(t)-(t-1)}Loans_i + \alpha_7 * X_{i,t-1} + \varepsilon_{i,t}\end{aligned} \qquad (2)$$

where $\Delta_{(t+1)-(t)}Deposits_i$ and $\Delta_{(t)-(t-1)}Loans_i$ denote the changes in deposit and loan volumes between period *t* and *t+1*. In our baseline specification we use one week as the frequency interval. In other words, we estimate the speed of adjustment of deposits in week *t+1* to a loan volume shock in week *t*.[15] $TotalDeposits_{i,t-1}$ and $TotalLoans_{i,t-1}$ denote the volumes of retail deposits and of loans. The subscript *i* refers to the bank and *t* to the period of the observation. $volatility_{i,t}$ is one of the measures of loan volume volatility of the bank (LOANS SD, NEGATIVE SKEWNESS or LOANS GARCH) and $X_{i,t}$ reflects the vector of control variables such as the bank size, the average spread in the wholesale and retail liabilities market, etc. In order to reduce endogeneity concerns bank-specific control variables are taken with one period lag.

Given the dynamic nature of the model its estimation employs the GMM technique suggested by Arellano and Bond (1991), which ensures efficiency and consistency of the estimates. A main advantage of the model is that it is fairly general to fit banks with different degrees of specialization in deposit collection or loan provision. In particular heterogeneity across banks both in terms of the determination of the long-term relation between loans and deposit and in terms of the speed of adjustment towards the long-term relation is allowed.

Dynamic Identification

The dynamic empirical model alleviates the identification concerns related to the self-selection of banks with flexible funding into more volatile loans. This is the case since we not only illustrate static correlations but show that ex ante volatility affects deposit volume changes in reaction to observable loan volume shocks.

Further, we address the concerns about the endogeneity of loan volatility with respect to liability structure. To this end we base the identification on the assumption that given the high frequency of the observations both loan volume changes and loan volatility are exogenous with respect to deposit volume changes. This claim would represent a serious challenge if we would estimate the model on

[15] As a robustness check in a specification that will be presented later we also allow for longer intervals for the adjustment to take place and rerun the model for the adjustment of deposits in the four weeks following the loan volume change.

low frequency data, where we cannot control for the possibility that loan volumes are responding to deposit volume changes. However, in the high frequency framework adopted here we motivate this assumption by the fact that loan volume expansions require sufficient amount of time for both the establishment of new customer relationship and for the formal credit quality assessment and loan approval which even given automated loan processing require a few weeks[16]. The only possibility of a quick loan volume expansion reflects a situation when a substantial portion of customers pull down their approved credit lines, but this event will be driven by reasons other than a deposit volume shock and are therefore also exogenous. Looking at negative shifts, on the other hand, we argue that given the longer average maturity of bank loans, a drop in the loan volumes is unlikely to follow almost immediately after a drop in deposit volumes. Furthermore, we similarly exclude the possibility that loan volume dynamics is driven by expectations about deposit volume changes which realize in the following weeks, since the de facto withdrawal of significant amounts of retail deposits is typically hard to predict.

Table 4 presents the results of our baseline dynamic specification.

Table 4

We find that the NEGATIVE SKEWNESS and the LOANS GARCH are significantly negatively related to the change of retail deposits following a loan volume shock. This result is consistent with our hypothesis that loan volume volatility generates incentives for banks to fund larger portions of their loans with wholesale liabilities, so that we observe that banks with more volatile loans adjust their retail deposits only slowly to loan volume shocks. The standard variation of the loan volume enters this baseline dynamic regression with a statistically insignificant coefficient. We assume that the lack of a statistically significant effect of this measure of loan

[16] Mester (1997) reports evidence that even after the introduction of automated credit score procedures loan approval times where well above 3 days. This time should be added to the time required to attract potential loan applicants.

volume volatility related to the potentially asymmetric adjustment to positive and negative shock and discuss the asymmetry later in this subsection.

In terms of control variables we confirm the negative relation between bank size and retail deposits use documented in the static analysis. Also, we find that when the LIBOR SPREAD is high – that is when the average costs of wholesale funding is substantially higher relative to the T-Bill rate – banks adjust to loan volume increases by faster increasing their retail deposits. The fact that we get this plausible LIBOR SPREAD coefficient in the dynamic analysis illustrates the advantages of the dynamic over the static framework in term of identification. Moreover, while the T-Bill rate itself does not significantly affect the adjustment of retail deposit volumes, the slope of the yield curve substantially reduces the speed of retail deposit volume adjustment. This result suggests that in periods with steeper yield curves which typically coincide with times of strong economic activity banks are more likely to fund a larger share of their increased loan demand with wholesale rather than retail deposits. This finding is consistent with a situation where banks perceive that loan volume increases in such periods as transitory shocks which will be reversed in the future. Funding these loan volume peaks via wholesale funding allows more flexible reaction when the shocks are reversed. This finding is also consistent with the argument of the inability of banks to quickly attract sufficient amounts of retail funds to cover lending bubbles (Shin and Shin 2011).

The results presented in Table 4 stem from econometric models which do not distinguish between positive and negative changes in the loan volume. These models implicitly assume that the reaction to positive and negative shocks is symmetric. This assumption is challenged by the different costs of adjusting retail deposits in a downward and upward direction as well as by the different persistency of positive relative to negative loan volume shocks. Therefore, in a next set of regressions we explore the potential asymmetry in the adjustment to loan shocks in different directions by re-estimating the models for only positive and only negative loan volume changes.

Once we distinguish between positive and negative loan volume changes we are also able to examine the effect of the interaction between the magnitude of the loan volume change and the volatility measure[17]. For this purpose we introduce the cross-products of each of the volatility measures and the magnitude of the loan volume change as additional covariates. The results of these regressions are presented in Table 5.

Table 5

The first three columns of Table 5 contain the results obtained when we only examine the adjustment to positive loan volume changes, while column (4)-(6) report the results of the regressions including only negative loan volume changes. These results suggest that deposit volumes react stronger to positive loan volume changes than to negative ones. This fact is evident from the observation that the coefficients of the $\Delta_{(t)-(t-1)}$LOANS variable in the regressions including only positive loan volume changes are of a significantly higher magnitude relative to that of the regressions including only the negative loan volume changes and to the adjustment coefficient reported in Table 4 for the full sample. These results signal that banks retail deposit volumes are featured by a particularly strong downward inflexibility. Earlier studies have related this downward inflexibility to customers' inertia and high switching costs of changing a deposit accounts, etc (Sharpe 1997). The evidence on downward rigidity of retail deposit volumes presents strong empirical support for the claim that retail deposit are an inflexible funding source.

The effect of loan volatility on the adjustment of retail deposit volumes is also shown to be asymmetric. We find that both LOAN SD and LOANS GARCH inhibit more the retail volume adjustment to small negative loan volume changes than to small positive ones (the absolute value of

[17] A meaningful interpretation of the cross-product terms between loan volume change and loan volume volatility in a model that pools positive and negative loan volume changes together is infeasible because both components of the cross-product could take negative values which than generate a positive value of the cross-product equal to the one generated by two positive components.

the estimated coefficients of both volatility measures is statistically significantly higher in the regressions including only negative loan volume changes than in those including only positive loan volume changes). In terms of negative skewness we find that it significantly affects the adjustment to positive shocks but not the adjustment to negative shocks. However, the coefficients of the interaction terms suggest that the adjustment of retail deposit volumes to larger shocks is slower in the positive than in the negative direction.

The economic significance of the impact is different across the three volatility measures. To illustrate this we can track the differences in the adjustment to an average positive loan volume change that in our sample is in magnitude of 448 million. In this setting, we find that a ceteris paribus increase of the LOAN SD variable in the magnitude of one standard deviation (equal to 0.977) will reduce the increase of the retail deposits by roughly 72 (=-10.602*0.977-0.142*0.977*448) million USD. A corresponding change one standard deviation of negative skewness (equal to 2.243) will inhibit the adjustment to this average positive change in the loan volume by about 114 (=2.243*7.406 -0.13*2.243*448) million USD. And finally, a one standard deviation increase in the LOANS GARCH will ceteris paribus inhibit the adjustment of the deposit volume by roughly 129 (=-4.336*2.227-0.12*2.227*448) million USD. The negative coefficients of all three interaction variables suggest that in all three cases the relative slowdown of the reaction to positive loan volume changes will be of even higher magnitude in the case of larger loan volume shocks.

If we examine the speed of adjustment to an average negative loan volume change of -455 million USD we find that the effect of loan volume volatility is still mostly statistically significant but the economic significance is lower than in the case of positive loan volume shocks. For example, NEGATIVE SKEWNESS has no significant effect on the speed of adjustment to negative loan changes. In the case of LOANS SD and LOANS GARCH we find a statistically significant effect but of much lower magnitude. This can be illustrated by tracking the effect of one standard deviation increase in these volatility measures. In the case of LOANS SD a change of volatility by one standard deviation is associated with a ceteris paribus reduction of the adjustment of about -11.5 (=-18.184*0.977+-0.014*0.977*(-455)) million USD, while in the case of LOANS GARCH we estimate the effect on adjustment to be at about -8 (=-8.219*2.227--0.01*2.227*(-455)) million USD.

This asymmetric effect implies that loan volume volatility substantially decreases the speed of adjustment to positive loan volume changes – and especially to large positive changes - while it has a much smaller impact on the speed of adjustment to negative loan volume changes. In sum these findings imply that banks with volatile loan volumes slowly increase retail deposits but more quickly decrease them in response to loan volume shocks. That outcome is consistent with the evidence on negative correlation between loan volatility and retail funding based on the models presented in Section 4.1. and 4.2.

The results presented in Table 4 and Table 5 are focused on the speed of adjustment of deposit volumes that takes place in the week following the week of the loan volume change. We next present in Table 6 the results of a model where the adjustment during the four weeks following the loan volume change is used as a dependent variable. These results are qualitatively the same as those reported in Table 4.

Table 6

In sum, all results concerning the speed of adjustment are consistent with our hypothesis that banks operating in volatile environments employ relatively low volumes of retail deposits which are perceived to be an inflexible funding form.

5. Loan volatility and wholesale funding in times of distressed wholesale funding markets

The underlying hypothesis of the analysis presented in Section 4 is derived from the assumption that short-term wholesale funding is cheaper to adjust relative to retail deposit funding. However, as illustrated by earlier studies (Huang and Ratnovski 2010 etc) this assumption only holds if markets for wholesale funding function smoothly and provide solvent banks with the desired liquidity. Our sample period, however, also encompasses periods of substantial disruptions in the functioning of the market for wholesale bank funding, when banks' access to wholesale funding was potentially either prohibitively expensive or even impossible. The most notorious of these periods has been the time immediately after the failure of Lehman Brothers in September 2008, but substantial disruptions can also be suspected in the weeks following the LTCM failure in August 1998 as well as in the weeks after September 11, 2001.

In this section we explore how the banks' behavior described in the previous sections is modified in periods with substantial shocks to the wholesale funding market when access to wholesale funding might be limited. To this end our intuition is closely related to the analysis presented by Ivashina and Scharfstein (2010) who argue that the inability of banks to roll over wholesale funding in the months after the Lehman failure leads to a substantial drop of lending of those banks which heavily rely on wholesale funding. We complement Ivashina and Scharfstein's (2010) analysis by exploring the effect of wholesale market disruptions on the composition of bank liabilities while controlling for loan volume dynamics. Our analysis is structured around testing the hypothesis that in periods with substantial wholesale market disruptions the negative relation between loan volume volatility and the use of retail deposits breaks apart. This is the case since in such periods the costs of adjusting wholesale liabilities, which are low in normal times, become prohibitively high.

We proceed in three steps. First, we re-estimate the dynamic model from Section 4 for subsamples of observations prior to and post August 2007. August 1, 2007 is chosen as a cut-off since it marks the period of time when wholesale markets started to show first signs of distress in the 2007-2009 financial crisis[18]. The results of the estimations are presented in Table 7.

Table 7

They illustrate that the negative effect of loan volume volatility on the speed of adjustment of deposits to loan volume shocks disappears in the post-2007 sample.

Second, we re-estimate the model including the full sample of observations but controlling for wholesale market disruptions by including dummy variables taking a value of 1 if the observation is within a 8-weeks period after the events listed above (LTCM failure, September 11 or Lehman Brothers failure) and 0, otherwise. In the estimated regressions the dummies concerning the post-LTCM and the post September 11 periods enter with statistically insignificant coefficients, that is why for the sake of brevity in Table 8 we only report the results concerning deposit volume adjustment in the post-Lehman failure period.

Table 8

These results confirm the presumption that in this period of severe wholesale market disruptions banks were more likely to adjust their retail deposit volumes in a positive direction. Generally, the observed positive effect of the Lehman failure dummy on the change of the volume of retail deposits can be due to both an increased supply of retail deposits and an increased demand for retail deposits. The raised supply of deposits potentially emerges since investors seek safe heavens in insured deposits after the collapse of the markets for alternative investment. The increased demand for retail deposits is generated by banks searching for retail funding sources in a situation when the

[18] In early August 2007 problems with the subprime market became evident after BNP Paribas announced that it was ceasing activity in three hedge funds that specialized in US mortgage debt.

alternative of wholesale funding is not accessible. The results concerning the interaction between the post-Lehman failure dummy and the volatility measures suggest that more volatile banks tend to increase their retail deposits faster in this particular time period. This finding indicates that it is unlikely that the shift to more retail funding is driven by deposit supply alone since there is no reason why depositors should systematically prefer banks with more volatile loan volumes to such with less volatile loans. This finding, therefore, suggests – consistently with earlier studies (e.g. Ivashina and Sharfstein 2010) - that during distress times banks with more volatile loans (which had prior to the wholesale market disruptions relied heavily on wholesale funding) demand more retail deposits in order to substitute wholesale with retail funds.

6. Conclusion

In this paper we explore the role of the volatility of bank assets as a determinant of the bank's choice of liability structure. We explicitly focus on loan volume volatility as a main determinant of the variability of bank funding needs. Our analysis traces the relation between loan volume volatility and liability structure both within static and dynamic econometric models. We identify the empirical relations taking advantage of unique high-frequency dataset, which allows us to solve the issues of adverse causality and mitigate selection issues. The results of both the static and the dynamic empirical approach show a robust positive link between a bank's use of wholesale liabilities and the volatility the bank faces on the asset side of its balance sheet. As suggested by the literature on the negative externalities of wholesale funding, however, this relation completely breaks down during the period of wholesale market distress in the onset of the 2007-2009 financial crisis.

One of the major implications of our results is that a bank's substantial dependence on wholesale liabilities can be a reaction to the volatility of the bank's loan demand and thus a reaction to a volatile economic environment. This result sheds new light in the discussion of the effects of proposed regulatory measures targeting a limit on wholesale liabilities, as a regulatory tool of limiting banks' exposure to financial system liquidity shocks. If banks use wholesale funding in order to reduce their exposure to loan market volatility, then a regulation imposing restrictions on the use of wholesale funding will potentially make banks more susceptible to asset-side shocks. In particular, at least two adverse effects can emerge from the restricted use of wholesale funding given the current inflexibility of retail deposits. First, banks can limit their loan supply in reaction to the loan volume volatility. This will be the case if banks following a real option "wait-and-see" policy decide not to adjust their retail deposit volumes to short-term loan shocks. A consequence of that behavior will be that aggregate lending only slowly recovers from recessions. Second, restricting wholesale liability volumes can lead to an overinvestment in deposit gathering capacity, which both lowers bank profitability and generates the incentives of the banks to invest the excess deposit volumes in very risky projects (Acharya and Naqvi, 2012). Both scenarios contain serious macroprudential risks which should be endogenized in the formulation of optimal liability structure regulation.

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Table 1: Number of sample banks and their average total assets: This Table shows the total number of banks included in the sample by year as well as the average size of the sample banks in billion USD.

year	number of banks in the sample	average bank total assets in USD bill
1997	118	23
1998	96	30
1999	88	34
2000	81	50
2001	47	71
2002	42	81
2003	37	98
2004	36	117
2005	31	145
2006	29	169
2007	33	187
2008	34	196
2009	31	222

Table 2: Summary statistics: This Table shows the summary statistics of the variables included in the empirical analysis. Deposits/total liabilities is the natural logarithm of the ratio of bank deposits to bank total liabilities. $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years.

VARIABLE	**number of observations**	**Mean**	**Standard deviation**	**Min**	**Max**
deposits/total liabilities (in logs)	33104	0.662	0.962	-3.076	4.578
$\Delta_{(t)-(t-1)}$DEPOSITS (in mill USD)	32858	62.637	2.435	-123049	128390
$\Delta_{(t)-(t-1)}$LOANS (in mill USD)	32858	57.470	1.473	-32036.	93638
LOANS SD (in logs)	33035	-4.219	0.977	-7.912	3.781
NEGATIVE SKEWNESS	33103	-0.215	2.243	-6.894	6.690
LOANS GARCH (in logs)	33104	-5.906	2.227	-9.390	3.715
BANKS SIZE (log of total assets)	33104	17.366	1.188	13.203	21.143
LOANS	33104	0.632	0.166	0.005	0.968
CAPITAL	33104	0.101	0.041	0.000	0.388
T-BILL RATE (in %)	33104	3.794	1.709	0.020	6.220
LIBOR SPREAD (in %)	33104	0.646	0.403	-0.055	4.002
RETAIL SPREAD (in %)	32413	2.524	1.777	-4.590	6.043
YIELD	32869	0.001	0.022	-0.165	0.080

Table 3: Loan volume volatility and liability structure: static panel estimations: This Table shows the regression results on the relation between bank liability structure and loan volume volatility. The models are estimated via a Panel Fixed Effects estimator which controls for unobserved bank heterogeneity. The dependent variable Deposits/total liabilities is the natural logarithm of the ratio of bank deposits to bank total liabilities. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

VARIABLES	(1) Deposits/ Total liabilities	(2) Deposits/ Total liabilities	(3) Deposits/ Total liabilities
LOANS SD	-0.081***		
	(0.004)		
NEGATIVE SKEWNESS		-0.003***	
		(0.001)	
LOANS GARCH			-0.014***
			(0.002)
BANKS SIZE	-2.335***	-2.445***	-2.514***
	(0.076)	(0.076)	(0.076)
BANKS SIZE SQUARED	0.062***	0.066***	0.069***
	(0.002)	(0.002)	(0.002)
LOANS	0.775***	0.886***	0.887***
	(0.035)	(0.032)	(0.032)
CAPITAL	5.332***	5.340***	5.332***
	(0.081)	(0.081)	(0.081)
T-BILL RATE	-0.003	-0.003	-0.001
	(0.003)	(0.003)	(0.003)
LIBOR SPREAD	-0.040***	-0.046***	-0.047***
	(0.006)	(0.006)	(0.006)
RETAIL SPREAD	-0.006**	-0.004	-0.006**
	(0.003)	(0.003)	(0.003)
YIELD	0.196**	0.191*	0.195**
	(0.097)	(0.098)	(0.098)
CONSTANT	20.991***	22.009***	22.431***
	(0.676)	(0.677)	(0.676)
Observations	32,122	32,189	32,189
R-squared	0.164	0.153	0.155
Number of banks	104	104	104

Table 4: Deposit volume reaction to loan volume changes: This Table shows the regression results on the adjustment of retail deposit volumes to changes in the loan volume. The models are estimated via a Vector Error Correction method for panel data. The dependent variable $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

VARIABLES	(1) $\Delta_{(t+1)-(t)}$ DEPOSITS	(2) $\Delta_{(t+1)-(t)}$ DEPOSITS	(3) $\Delta_{(t+1)-(t)}$ DEPOSITS
Δ(t)-(t-1) DEPOSITS	-0.346***	-0.351***	-0.348***
	(0.006)	(0.006)	(0.006)
Δ(t)-(t-1) LOANS	0.048***	0.045***	0.048***
	(0.006)	(0.006)	(0.006)
LOANS SD	-0.807		
	(2.255)		
NEGATIVE SKEWNESS		-3.444***	
		(0.779)	
LOANS GARCH			-4.633***
			(1.253)
TOTAL DEPOSITS	-0.003***	-0.003***	-0.003***
	(0.001)	(0.001)	(0.001)
TOTAL LOANS	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
BANKS SIZE	-464.076***	-475.074***	-535.452***
	(157.737)	(158.072)	(158.683)
BANKS SIZE SQUARED	14.679***	15.006***	16.993***
	(4.945)	(4.958)	(4.977)
LOANS	-103.522***	-101.182***	-105.550***
	(19.083)	(18.989)	(18.572)
CAPITAL	-292.479***	-293.757***	-260.812***
	(68.565)	(66.553)	(66.637)
T-BILL RATE	2.047	1.824	3.705
	(2.748)	(2.843)	(2.856)
LIBOR SPREAD	28.215***	28.169***	24.978***
	(6.653)	(6.752)	(6.763)
RETAIL SPREAD	-3.747*	-3.744*	-4.865**
	(2.019)	(2.113)	(2.103)
YIELD	-186.111**	-194.296***	-181.093**
	(73.111)	(74.216)	(73.914)
CONSTANT	3,743.164***	3,838.815***	4,256.900***
	(1,255.161)	(1,257.594)	(1,261.867)
Observations	31,900	31,966	31,966
R-squared	0.21	0.21	0.21
Number of banks	104	104	104

Table 5: Deposit volume reaction to loan volume changes: adjustment to positive and negative loan volume changes: This Table shows the regression results on the adjustment of retail deposit volumes to positive (negative) changes in the loan volume. The models are estimated via a Vector Error Correction method for panel data. The dependent variable $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

	Δ(t)-(t-1) LOANS≥0			Δ(t)-(t-1) LOANS<0		
VARIABLES	$\Delta_{(t+1)-(t)}$ DEPOSITS	$\Delta_{(t+1)-(t)}$ DEPOSITS	$\Delta_{(t+1)-(t)}$ DEPOSITS	$\Delta_{(t+1)-(t)}$ DEPOSITS	$\Delta_{(t+1)-(t)}$ DEPOSITS	$\Delta_{(t+1)-(t)}$ DEPOSITS
Δ(t)-(t-1) DEPOSITS	-0.281***	-0.292***	-0.278***	-0.295***	-0.291***	-0.296***
	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Δ(t)-(t-1) LOANS	0.105***	0.083***	0.122***	0.067***	0.051***	0.057***
	(0.010)	(0.010)	(0.011)	(0.009)	(0.008)	(0.009)
LOANS SD	-10.602***			-18.184***		
	(3.403)			(3.888)		
LOANS SD*Δ(t)-(t-1) LOANS	-0.142***			-0.014***		
	(0.003)			(0.003)		
NEGATIVE SKEWNESS		7.406***			-0.398	
		(1.461)			(0.846)	
NEGATIVE SKEWNESS*Δ(t)-(t-1) LOANS		-0.130***			0.002	
		(0.003)			(0.002)	
LOANS GARCH			-4.336*			-8.219***
			(2.226)			(2.023)
LOANS GARCH*Δ(t)-(t-1) LOANS			-0.120***			-0.010***
			(0.002)			(0.002)
TOTAL DEPOSITS	-0.000	-0.006***	0.000	-0.006***	-0.004***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
TOTAL LOANS	-0.002**	0.006***	0.002*	0.006***	0.003***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BANKS SIZE	-668.316***	-512.323*	-178.697	171.630	98.324	55.797
	(248.250)	(292.139)	(285.664)	(130.381)	(82.026)	(102.013)
BANKS SIZE SQUARED	20.607***	16.229*	4.240	-5.723	-3.311	-1.728
	(7.749)	(9.086)	(8.894)	(4.169)	(2.685)	(3.324)
LOANS	-158.351***	-221.825***	-195.172***	-158.786***	-77.125***	-124.799***
	(28.614)	(33.290)	(32.299)	(30.158)	(19.772)	(27.531)
CAPITAL	-517.000***	-456.072***	-738.784***	39.328	-44.023	5.521
	(105.291)	(117.305)	(121.727)	(99.192)	(74.394)	(96.149)
T-BILL RATE	-3.084	0.187	-5.051	2.954	0.572	3.845
	(4.026)	(4.666)	(4.788)	(4.394)	(3.288)	(4.281)
LIBOR SPREAD	34.112***	26.126**	30.580***	21.727**	16.428**	15.368
	(9.058)	(10.557)	(10.692)	(10.515)	(8.250)	(10.527)
RETAIL SPREAD	-1.231	-3.838	0.655	-7.434**	-4.128*	-6.743**
	(3.029)	(3.631)	(3.670)	(3.307)	(2.281)	(3.102)
YIELD	-146.027	-162.553	-115.748	-109.529	-104.965	-97.666
	(106.120)	(123.822)	(130.267)	(120.230)	(90.049)	(119.982)
CONSTANT	5,505.012***	4,230.278*	1,883.072	-1,265.375	-676.145	-440.153
	(1,983.711)	(2,344.441)	(2,289.136)	(1,016.674)	(625.716)	(779.750)
Observations	18,197	18,224	18,224	13,703	13,742	13,742
R-squared	0.25	0.27	0.23	0.24	0.22	0.24
Number of banks	104	104	104	104	104	104

Table 6: Deposit volume reaction to loan volume changes: adjustment within four weeks: This Table shows the regression results on the four-weeks adjustment of retail deposit volumes to changes in the loan volume. The models are estimated via a Vector Error Correction method for panel data. The dependent variable $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

	(1)	(2)	(3)
VARIABLES	$\Delta_{(t+4)-(t)}$ DEPOSITS	$\Delta_{(t+4)-(t)}$ DEPOSITS	$\Delta_{(t+4)-(t)}$ DEPOSITS
Δ(t)-(t-1) DEPOSITS	0.097***	0.098***	0.099***
	(0.007)	(0.007)	(0.007)
Δ(t)-(t-1) LOANS	-0.012	-0.009	-0.009
	(0.008)	(0.007)	(0.007)
LOANS SD	46.455***		
	(9.512)		
NEGATIVE SKEWNESS		-8.868***	
		(2.966)	
LOANS GARCH			-5.975
			(3.942)
TOTAL DEPOSITS	0.012***	0.009***	0.008***
	(0.002)	(0.002)	(0.002)
TOTAL LOANS	0.002	0.003	0.004
	(0.003)	(0.002)	(0.002)
BANKS SIZE	2,322.317***	1,651.258***	1,638.887***
	(499.644)	(362.311)	(385.029)
BANKS SIZE SQUARED	-75.036***	-54.238***	-53.549***
	(15.762)	(11.552)	(12.255)
LOANS	256.629***	113.520*	112.199*
	(72.861)	(60.323)	(59.741)
CAPITAL	772.775***	841.698***	826.438***
	(243.920)	(215.191)	(210.191)
T-BILL RATE	23.394**	17.133*	17.459*
	(10.630)	(9.714)	(9.609)
LIBOR SPREAD	54.867***	50.975**	47.870**
	(20.812)	(19.808)	(19.424)
RETAIL SPREAD	-48.257***	-41.655***	-40.985***
	(7.563)	(6.684)	(6.635)
YIELD	186.693*	201.555**	197.663**
	(105.003)	(98.917)	(96.792)
CONSTANT	-18,000.817***	-12,688.079***	-12,714.896***
	(3,945.035)	(2,835.035)	(3,014.884)
Observations	31,478	31,543	31,543
R-squared	0.05	0.05	0.04
Number of banks	104	104	104

Table 7: Deposit volume reaction to loan volume changes: pre- and post-August 2007 subperiods: This Table shows the regression results on the four-weeks adjustment of retail deposit volumes to changes in the loan volume. The models are estimated via a Vector Error Correction method for panel data. The dependent variable $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

	1997-July 2007			August 2007-2011		
VARIABLES	(1) $\Delta_{(t+1)-(t)}$ DEPOSITS	(2) $\Delta_{(t+1)-(t)}$ DEPOSITS	(3) $\Delta_{(t+1)-(t)}$ DEPOSITS	(4) $\Delta_{(t+1)-(t)}$ DEPOSITS	(5) $\Delta_{(t+1)-(t)}$ DEPOSITS	(6) $\Delta_{(t+1)-(t)}$ DEPOSITS
Δ(t)-(t-1) DEPOSITS	-0.362***	-0.367***	-0.365***	-0.286***	-0.294***	-0.287***
	(0.006)	(0.006)	(0.006)	(0.021)	(0.021)	(0.021)
Δ(t)-(t-1) LOANS	0.056***	0.053***	0.056***	0.054*	0.050*	0.053*
	(0.007)	(0.007)	(0.007)	(0.029)	(0.029)	(0.029)
LOANS SD	-1.711			-3.499		
	(2.268)			(32.130)		
NEGATIVE SKEWNESS		-3.182***			-4.453	
		(0.767)			(9.616)	
LOANS GARCH			-4.581***			-18.371
			(1.223)			(15.867)
TOTAL DEPOSITS	-0.003***	-0.003***	-0.003***	-0.006**	-0.006**	-0.007***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
TOTAL LOANS	0.003***	0.002***	0.003***	0.004	0.004	0.005
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
BANKS SIZE	-473.563***	-478.940***	-536.980***	-2,363.708	-2,540.490	-2,443.774
	(161.437)	(160.175)	(161.062)	(2,304.033)	(2,507.000)	(2,302.940)
BANKS SIZE SQUARED	15.059***	15.209***	17.128***	71.524	76.505	74.423
	(5.073)	(5.037)	(5.065)	(67.388)	(73.566)	(67.369)
LOANS	-97.097***	-91.728***	-95.361***	-609.329**	-581.036**	-669.520***
	(19.108)	(18.866)	(18.449)	(275.478)	(245.443)	(235.239)
CAPITAL	-236.350***	-245.601***	-214.119***	-1,579.474***	-1,649.753***	-1,565.506***
	(67.046)	(65.192)	(65.179)	(567.443)	(597.001)	(575.030)
T-BILL RATE	1.792	1.832	3.666	-73.168*	-75.135*	-73.905*
	(2.854)	(2.939)	(2.941)	(41.038)	(43.895)	(40.742)
LIBOR SPREAD	26.559***	25.836***	22.979***	27.618	27.557	24.328
	(7.572)	(7.641)	(7.625)	(28.075)	(29.998)	(28.079)
RETAIL SPREAD	-3.436*	-3.417	-4.645**	-7.626	-4.610	-4.469
	(1.999)	(2.079)	(2.065)	(32.673)	(34.682)	(32.810)
YIELD	-195.939***	-203.604***	-189.578**	135.333	166.127	128.696
	(73.959)	(74.451)	(73.957)	(480.687)	(499.774)	(480.458)
CONSTANT	3,786.859***	3,839.601***	4,238.174***	20,104.103	21,684.751	20,543.284
	(1,281.198)	(1,270.859)	(1,277.315)	(19,709.556)	(21,367.320)	(19,693.898)
Observations	29,408	29,474	29,474	2,492	2,492	2,492
R-squared	0.22	0.22	0.21	0.19	0.20	0.19
Number of banks	103	103	103	34	34	34

Table 8: Deposit volume reaction to loan volume changes: retail funding adjustment in the weeks following the failure of Lehman Brothers. This Table shows the regression results on the adjustment of retail deposit volumes to changes in the loan volume controlling for the period after the Lehman Brothers failure. The models are estimated via a Vector Error Correction method for panel data. The dependent variable $\Delta_{(t)-(t-1)}$DEPOSITS is the week-to-week change in retail deposit volumes. $\Delta_{(t)-(t-1)}$LOANS is the week-to-week change in loan volumes. LOANS SD is the natural logarithm of the banks standard deviation of loan volumes (scaled by the average loan volume of the bank). NEGATIVE SKEWNESS is the skewness of the loan volume distribution taken with a negative sign. LOANS GARCH is the natural logarithm of loan volumes' conditional volatility estimated by a GARCH (1,1) model. BANK SIZE is the log of total bank assets. LOANS is the share of loans in the total assets of the bank. CAPITAL is the ratio of the difference between bank assets and liabilities to bank assets. T-BILL RATE is the rate of 3-month treasury bills in percent. LIBOR SPREAD is the difference between the 3-month Libor rate and the 3-month treasury bills rate. RETAIL SPREAD is the difference between the 3-month treasury bills rate and the average rate a bank pays on its deposits. YIELD is the slope of the yield curve computed as the difference between the rates on treasury bonds with a maturity of ten and a maturity of two years. Standard errors are reported in round brackets in parentheses *** (**,*) indicates significance at the 1(5,10) percent level.

VARIABLES	(1) $\Delta_{(t+1)-(t)}$ DEPOSITS	(2) $\Delta_{(t+1)-(t)}$ DEPOSITS	(3) $\Delta_{(t+1)-(t)}$ DEPOSITS
Δ(t)-(t-1) DEPOSITS	-0.359***	-0.362***	-0.354***
	(0.006)	(0.006)	(0.006)
Δ(t)-(t-1) LOANS	0.048***	0.043***	0.046***
	(0.006)	(0.006)	(0.006)
LEHMAN	1,038.330***	9.595	1,064.856***
	(366.175)	(63.465)	(277.239)
LOANS SD	-0.870		
	(2.477)		
LOANS SD*LEHMAN	218.080***		
	(74.378)		
NEGATIVE SKEWNESS		-5.219***	
		(1.200)	
Δ(t)-(t-1) LOANS>0		58.397***	
		4.838	
NEGATIVE SKEWNESS*LEHMAN		0.002***	
		(0.001)	
LOANS GARCH			-5.146***
			(1.363)
LOANS GARCH*LEHMAN			161.653***
			(40.496)
TOTAL DEPOSITS	-0.003***	-0.003***	-0.004***
	(0.001)	(0.001)	(0.001)
TOTAL LOANS	0.003***	0.003***	0.003***
	(0.001)	(0.001)	(0.001)
BANKS SIZE	-511.340***	-528.746***	-583.065***
	(166.546)	(168.007)	(165.100)
BANKS SIZE SQUARED	16.190***	16.720***	18.543***
	(5.219)	(5.265)	(5.178)
LOANS	-114.238***	-112.092***	-111.938***
	(20.636)	(20.232)	(19.591)
CAPITAL	-368.891***	-355.329***	-304.768***
	(77.170)	(73.603)	(73.008)
T-BILL RATE	5.810*	5.763*	6.915**
	(2.973)	(3.049)	(3.019)
LIBOR SPREAD	29.467***	29.676***	26.552***
	(7.486)	(7.638)	(7.445)
RETAIL SPREAD	-8.198***	-8.317***	-8.827***
	(2.228)	(2.292)	(2.257)
YIELD	-184.206**	-189.560**	-168.399**
	(79.644)	(80.992)	(80.061)
CONSTANT	4,122.109***	4,267.556***	4,623.320***
	(1,325.248)	(1,337.369)	(1,312.683)
Observations	31,900	31,966	31,966
R-squared	0.204	0.206	0.201
Number of banks	104	104	104

Figure 1: Share of retail liabilities in total liabilities for the aggregate of US banks and for the sample banks, 1997-2009: This Figure shows the share of retail liabilities in the total bank liabilities for our sample and the US average taken from the Flow of Funds. Retail liabilities are defined as the sum of all bank deposits (line 2215 "*total transaction accounts*" and line 2385 "*total non-transaction accounts*").

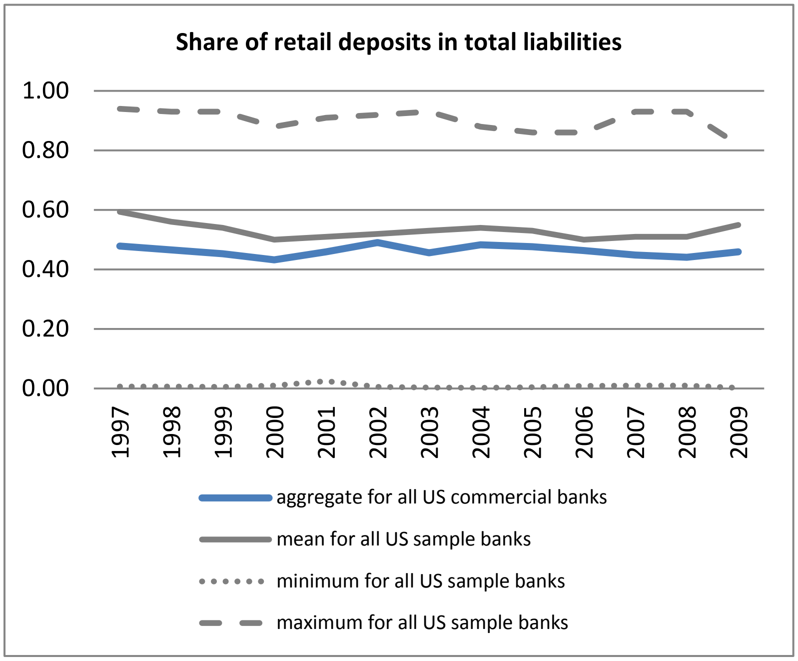

Figure 2: Loans and deposits of two of the sample banks (in million USD): This Figure shows the dynamics of deposit and loan volumes of two banks present in our sample. Graph is based on publicly available information about deposit and loan volumes with quarterly frequency.

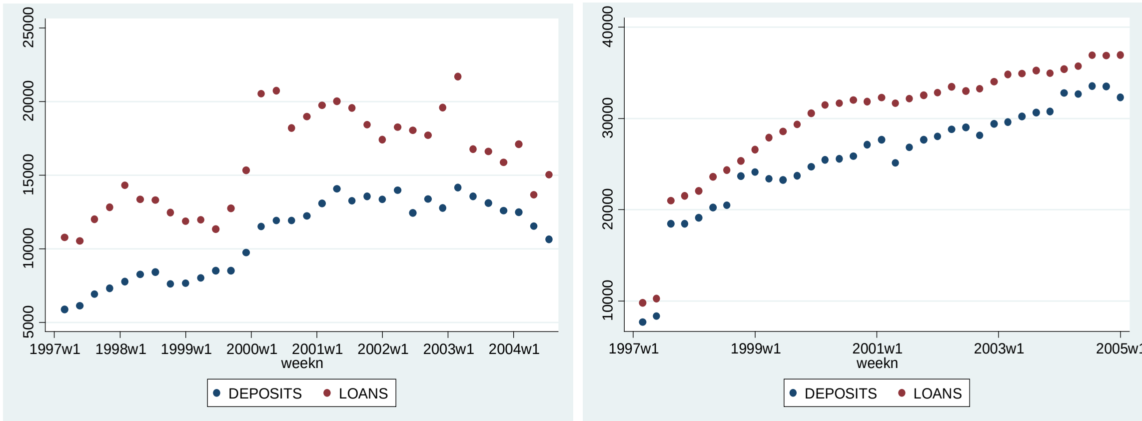

Figure 3: Impulse responses of DEPOSITS/LIABILITIES and LOANS to innovations in VOLATILITY: baseline ordering. This figure presents the impulse responses to a one SD shock in VOLATILITY derived from SVARS with 4 lags. VOLATILITY is ordered first, followed by LOANS and DEPOSITS/LIBILITIES. All confidence bands are at the 95% significance.

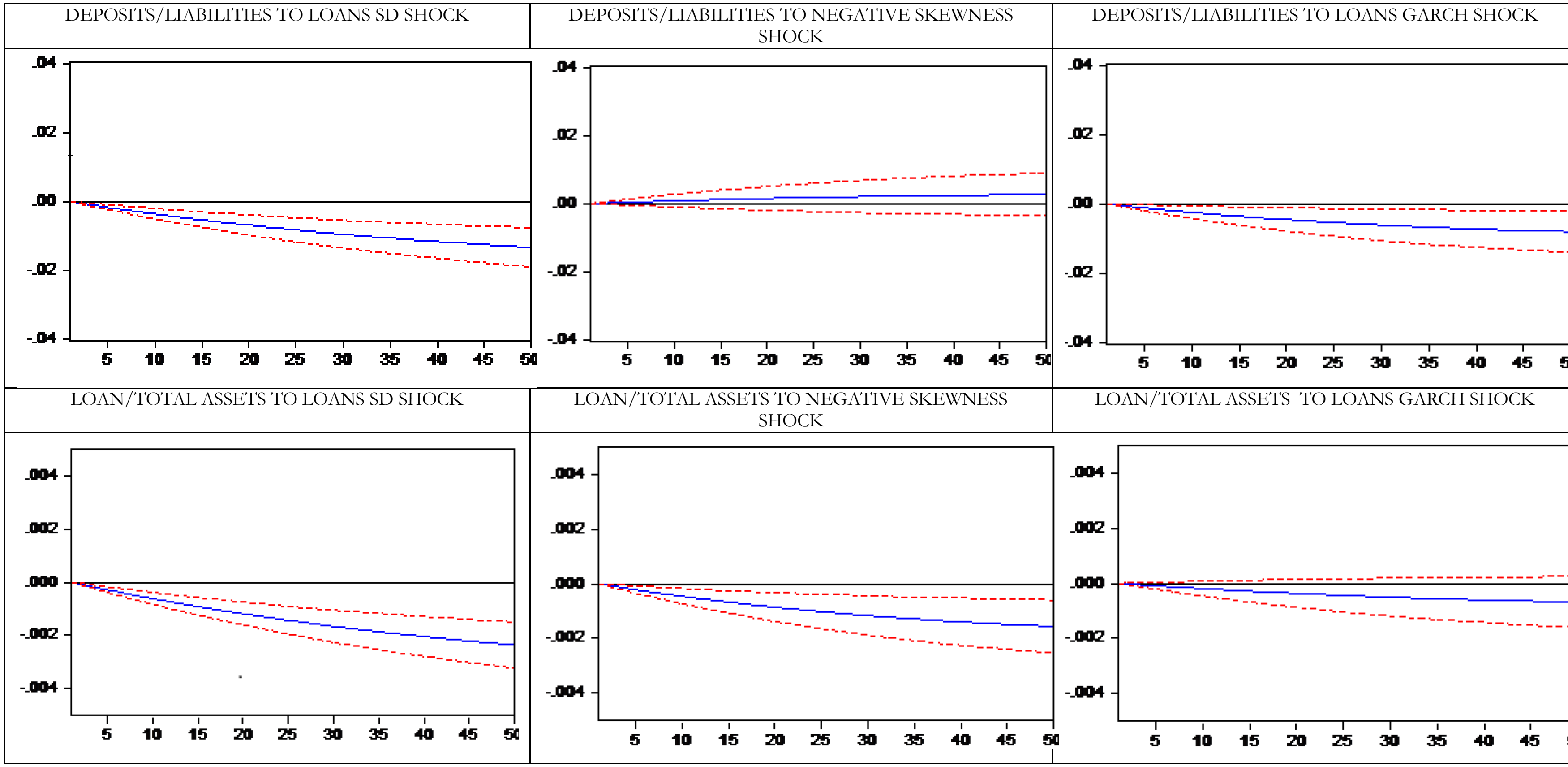

Figure 4: Impulse responses of DEPOSITS/LIABILITIES and LOANS to innovations in VOLATILITY: alternative ordering. This figure presents the impulse responses to a one SD shock in VOLATILITY derived from SVARS with 4 lags. DEPOSITS/LIBILITIES is ordered first, followed by LOANS and VOLATILITY. All confidence bands are at the 95% significance.