

Too Low for Too Long Interest Rates, Bank Risk Taking and Bank Capitalization: Evidence From the U.S. Commercial Banks

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Abstract: It has been argued that low level of policy rates could engender financial instability through an increase in bank risk taking. Using data from the quarterly call reports of the U.S. commercial banks over the period 2001/2007, this study investigates how the length of the period during which low interest rates are applied impact banks behaviour in term of the investment choices, the bank monitoring processes and banks asset expansion. The results show that in the pre-crisis period, a longer period of negative real rates is associated with bank asset expansion and with bank risk shifting toward riskier assets. For the post-crisis period, a longer period of low rates is associated with the materialization of risk reflected in higher non-performing loans. Furthermore, differentiating the undercapitalized, the adequately capitalized and the well capitalized banks, a longer period of low policy rates impact more intensely the risk taking for both adequately and undercapitalized banks during the period that preceded the breach of the capital regulation. Also, looking at the period that follow the event of breach of the capital regulation, undercapitalized banks do not retrench from risk taking, quite the opposite they gamble for resurrection and a longer period of low rates continue to be associated with an increase in risk taking. For the adequately capitalized banks, in the period that follows the breach of the capital regulation these banks also continue to take risk following a longer period of low policy rates but at a much lower trend compared to the other well-capitalized banks.

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1 Introduction

The issue of whether interest rates impact banks' behaviour is widely discussed in current literature. Many economists cited the low level of policy rates that has been applied for a long period of time as a main cause of abundant liquidity that exacerbated bank risk taking (Taylor, 2009; Adrian and Shin, 2009; Borio and Zhu, 2008). This new transmission channel of monetary policy known as risk-taking channel (Borio and Zhu, 2008) is defined as the possible impact of changes in policy rates on either risk perceptions or risk-tolerance. Accordingly, the degree of risk in the bank's portfolios, the pricing of assets and the price and non-price terms of the extension of funding, will be influenced by monetary conditions. The theoretical basis underlying the risk-taking channel could be resumed as follow: too low level of interest rates for too long specifically when applied during period of strong economic performance and price stability, may generate excessive optimism about economic prospects and asset prices may emerge. A benign economic environment associated with cheap liquidity increase the optimism of bankers translated into lax lending practices and into lower premium risk rates. Furthermore, falling interest rates might generate incentives to invest into risky activities according to two scenarios: first, in an environment of low rates, the profitability for a bank from investments in low risk assets such as securities and government bonds is low. Banks are thus more willing to invest in riskier assets, which generate higher return (search for yield). Second, in an environment of low level of rates, it becomes cheaper for banks to use leverage (short term funding) to fund their activities. Giving that bank incentives to lever and to take on asset risk are complementary, the more levered a bank, the greater its limited liability and the less it has to lose from risky loans. The empirical studies linking risk-taking measures to loose policy rates did present evidence in favour of the risk-taking channel. On a first hand, it has been showed that low level of policy rates is associated with less monitoring effort: banks were found to be less rigorous and more tolerant concerning lending practices when rates are set at a low level (Maddaloni and Peydro, 2011; Ziadeh-Mikati, 2012). On the second hand lower level of interest rates has been found to be associated with an increase in the riskiness of assets and a decrease in the pricing of risky loans (Ioannidou et al. (2009), Jimenez et al. (2010), Delis and Kouretas (2010), Altunbas et al. (2009) and Gambacorta (2009)).

If the theoretical basis of the RTC could be discussed with some easiness, the empirical evidence is more challenging. There are many reasons explaining the difficulty for empirical evidence of the RTC. First, this channel proposes that during a period of low policy rates, banks

incentives to screen borrowers decrease. The first difficulty is than the empirical detection of bank screening / monitoring specifically when using the data from financial statement. Second, according to the balance sheet channel of MP, a low level of rates produces a positive impact on the outstanding loans and borrowers' net worth. At the same time, the RTC suggest that during long period of expansive monetary policy, banks grant new credit for riskier profile without pricing the additional risk. Lack of loan level data makes it hard to disentangle the effect of a long period of low rates on the outstanding loans and the new loans. And third any attempt to examine the link between bank assets riskiness and the level of policy rates suffer from a potential myopic bias related to the evaluation of risky assets.

Taking in consideration these difficulties, we extend the research on the risk-taking channel by empirically investigating the impact of too low for too long interest rates on bank riskiness for the case of the U.S commercial banks. Using data from the quarterly call reports of the U.S. commercial bank's and using a variable reflecting the length of the monetary loosening period, this paper contributes to the risk taking channel literature mainly in two ways: We try to answer separately each one the theoretical hypothesis presented in related literature and we choose risk measures that respond to each one of the hypothesis underlying the RTC. We specifically study the impact of a too long period of low policy rates on the composition of the risk-weighted assets, the bank monitoring processes and bank asset expansion. On the second hand, we differentiate well-capitalized, adequately capitalized and undercapitalized bank and investigate whether bank specific capital characteristics influences banks behaviour following a long period of monetary expansion.

Our results propose that banks substitute risk free and low risk assets with high-risk assets specifically the 100% risk weighted assets and the commercial real estate loans following a long period of low rates. Concerning their impact on bank monitoring processes, the results in this study do not confirm the negative relation between the loosening of monetary policy and the monitoring processes, the results propose that a long period of low rates is favourable for the existing loans specifically for the pre crisis period. Also, banks expand their liquidity creation and their asset expansion during a long period of loose monetary policy.

Differentiating the undercapitalized, the adequately capitalized and the well capitalized banks, this paper present evidence that a longer period of low policy rates impact more intensely the risk taking for both adequately and undercapitalized banks during the period that preceded the breach of the capital regulation. Also, for the undercapitalized banks, looking at the period that follow the event of undercapitalization these banks do not retrench from risk taking, quite the

opposite they gamble for resurrection, and a longer period of low rates continue to be associated with an increase in risk taking. For the adequately capitalized banks, in the period that follows the breach of the capital constraint these banks continue to take risk following a longer period of low policy rates but at a much lower trend compared to the other well-capitalized banks.

The paper proceeds as follow, in section 2 we first present the hypothesis tested, in section 3 we present the dataset, the variables used and the models used, we discuss the results in section 4 we apply robustness checks in section 5 and finally we conclude in section 6.

2 The questions that the article tries to deal with and hypotheses tested

Hypothesis 1: a substitution effect toward riskier assets is produced following a period of low interest rates

The risk-taking channel first supposes that during environment of low policy rates, banks become less risk-averse and their appetite for risk increases. This is translated in a multitude changes in banks behaviour one of which is an increase in investments in risky assets. According to Rajan (2005) lower interest rates on risk free investments could push banks to invest more in higher yielding investment that are also riskier (assets substitution). We expect that a decrease in the policy rates will push banks to invest more in higher yielding but riskier assets, consequently banks will substitute the riskier assets for those less risky. We use the different categories of risk-weighted assets to test this hypothesis and we specifically expect a negative relation between a long period of low policy rates and low risk weighted assets and a positive relation between a long period of low policy rates and high risk weighted assets.

Hypothesis 2: too low for too long policy rates induce a reduction in monitoring processes translated into lower quality loans and higher credit risk ratios.

The risk-taking channel emphasizes the relation between the incentives of banks to screen borrowers and the level of rates. Specifically it has been argued that banks, lax lending practices and reduce the monitoring processes during period of low policy rates. Explanations of such impact have been justified by a decrease in the cost of funds (Dell’Ariccia and Marquez, 2006), a decrease in the bank’s gross return conditional on bank’s portfolio repaying (Dell’Driccia et al., 2010) and an increase in bankers’ optimism during a benign economic environment associated with cheap liquidity. Dell’Ariccia et al. (2010) argue that when a monetary easing produce a reduction of the interest rate on bank loans, the bank see its return from the loan repaying reduced, which in turn

decrease the incentives for the bank to monitor. These claims suggest that because monitoring is a costly action, banks faced to a reduction of return following a loose monetary policy, decide to decrease their costs by lowering the monitoring processes. As a result the riskiness of bank portfolio tends to increase. Also empirical evidence from loan level data show that when rates are low, banks grant more credit to riskier profile specifically to borrowers' with bad or no credit history, and banks do not seem to price the additional risk they take (Ioannidou et al., 2009; Jimenez et al., 2010)

By screening and sorting out applicant borrowers that do not meet satisfactory lending standards, banks perform an important role of limiting adverse selection problems in the economy. Failure to perform this function leads to riskier portfolios and weaker balance sheets, with potentially negative consequences for credit market stability. Accordingly we expect that monetary easing for an extended period of time to have a negative impact on the quality of bank's loan portfolio.

Hypothesis 3: Too low for too long policy rates induce an increase in asset expansion

When monetary policy is more expansive, banks' liquidity and net worth improve, allowing banks to relax their lending standards and to increase their money creation and their asset expansion. Valencia (2010) argues that a decrease in the risk free rate increases the profitability of lending and the lower the interest rate, the more attractive it is to lend more. Accordingly, we hypothesize that a longer period of low rates will influence the amount of liquidity created by a banking institution. In this area, Rauch et al. (2009) find strong negative relation between liquidity creation of German banks and monetary policy tightening. While they do not find any bank specific factors, such as financial performance or size, to have any influence on liquidity creation. Berger and Bouwman (2009) find for the U.S. case, that the effect of monetary policy on bank liquidity creation is significant only for small banks. While Berger and Bouwman (2009) use time series analysis to test this relation, we employ panel data analyses as complementary evidence on the impact of policy rates on bank level liquidity creation.

Hypothesis 4: The impact of a long period of low rates on bank risk behaviour differs according to the degree of bank leverage and bank capitalization.

If banks' incentives were at the centre of the workings of the risk-taking channel, it would be expected that individual bank characteristics would have a major impact on how the risk-taking channel operates (Dell'Ariccia, Laeven, Marquez, 2010). Dell'ariccia et al. propose a theoretical

model of the risk-taking channel that take in consideration banks' characterization. Specifically they hypothesise that the impact of monetary policy change on bank monitoring is related to the balance of three forces: interest rate pass-through risk shifting and leverage. The model differentiates the impact of interest rates on bank risk taking according to the degree of bank's capitalization. When capital is endogenously determined, and when banks can adjust their capital holdings in response to monetary policy changes, monetary easing lowers the cost of banks liabilities. Accordingly, when the rates on deposit decrease, the benefit from holding capital decrease and leverage becomes an optimal choice to increase profitability. If banks are unrestricted to adjust their level of capital, monetary policy easing affects bank monitoring through the additional channel of an increase in leverage. Once bank leverage is optimally chosen, to maximize profits, monitoring will always increase with the monetary policy rate: lower policy rate imply more leverage and more risk taking. However when bank capital structure is fixed exogenously, specifically in situations where banks face constraints for example when their desired capital ratios are below regulatory minimums for capital regulation, the effects of monetary policy changes on bank monitoring and, hence, portfolio risk critically depend on a bank's leverage: a monetary easing will lead highly capitalized banks to monitor less, while the opposite is true for poorly capitalized banks. Dell'ariccia et al. explains the difference in bank behaviour as follow: If we look at the bank liability side, under limited liability protection, a fully levered bank faces no losses in case of failure. By lowering the cost on bank deposit, a policy rate cut increases the expected return on a bank loans. Fully levered banks willing to increase this effect have incentives to decrease the riskiness of the portfolio choosing safer portfolios for which there is a higher probability the bank will have to repay depositors. In contrast, for a bank fully funded by capital, the effect of a decrease in the cost of its liabilities will, all other things equal, increase the expected net return uniformly across portfolios and have little or no effect on the bank's risk choices. Accordingly the model propose that risk-shifting problem could operate via the liability side of bank balance sheet and that this effect depends on the degree of limited liabilities protection afforded to the bank: a monetary easing will lead highly capitalized banks to monitor less, while the opposite is true for poorly capitalized banks. Borio and Zhu(2008) agree on this principle, they argue that in the case where the bank face a significant threat of a breach of the minimum capital requirement, a bank will tend to retrench from risk-taking. They present however an exception case where the bank gamble for resurrection in a context of lax supervisory standards.

3 Data, Variables and Econometric Specification

In this section we first describe the dataset used and the specification to construct the sample. We further present the dependent variables reflecting the different proxies of the bank risk measures, the explanatory variables reflecting the policy rate measure in addition to the control variables.

3.1 Data collection and definition of sample

We collect quarterly financial data from the quarterly consolidated report of condition and income that each insured commercial bank in the U.S. submits to the Federal Reserve. These data are available online via the Federal Reserve website. Therefore, we were able to construct a large unbalanced panel dataset, with quarterly income statement and balance sheet data over the period Q1-2001/Q2-2007 representing a total of 223,167 bank quarter observations for 10,259 U.S. commercial insured banks. To ensure that the dataset contain true viable commercial banks, we follow the methodology used by Berger and Bouwan (2009) and we keep a bank if it present all the following specifications: 1) the bank has loans outstanding, 2) the bank has commercial real estate and commercial and industrial loans outstanding, 3) the bank's total deposit is not null, 4) the bank has a positive equity capital, 5) the bank is not a very small bank specifically the bank's total assets exceed \$25 million, 6) the unused commitments do not exceed four times total assets, 7) and finally bank's total consumer loans do not exceed 50% of total assets. We also exclude the 2.5% highest and lowest values of the entire bank level variables used in the regressions. These exclusions let us with a final dataset of 197,473 bank quarter observations for 9,240 banks. **Bank risk measures.**

We use different measures to evaluate bank riskiness. We are specifically interested in variables reflecting the riskiness of banks assets, the quality of the monitoring processes applied by banks and the expansion of banks balance sheet. Accordingly we employ the three following measures:

Risk weighted assets

Quarterly Call reports provide information about the riskiness of banks' assets. Specifically, the quarterly reports include information on the assets grouped by risk-weighted categories (0%, 20%, 50% and 100%). Each bank when reporting the different composition of its balance sheet, should also provide information about the amount of assets that are 0% risk weighted (alternatively 20%, 50% and 100%) and which do not present any risk: 0% risk weighted assets specifically include all cash-on-hands securities issued by U.S. governments or the OECD in addition to other risk free assets. Appendix A shows composition details of each one of these variables as defined by the FED. Using these information we calculate the next ratios:

$$0\%RWA = \text{Total assets } 0\% \text{ risk weighted} / \text{total assets}$$

$$100\%RWA = \text{Total assets } 100\% \text{ risk weighted} / \text{total assets}$$

$$RWA = [0 * (\text{total assets } 0\% \text{ risk weighted}) + 20\% * (\text{total assets } 20\% \text{ risk weighted}) + 50\% * (\text{total assets } 50\% \text{ risk weighted}) + 100\% * (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$$

A higher percentage of 0% risk weighted assets (*0%RWA*) reveal a lower risk position, whereas a higher percentage of 100% risk weighted assets (*100%RWA*) and a higher percentage of risk-weighted assets (*RWA*) reveal a higher risk position. The use of such measures is helpful since they summarize an ex-ante risk measure and thus permit a forward looking on how the bank is managing the portfolio, specifically in term of risk position. Based on the search for yield hypothesis following a decrease in the policy rates, low return on risk free assets push banks to invest in higher yielding assets, which are at the same time riskier. If such a claim is operative, we expect that lower policy rates to be associated with less proportion of 0% risk weighted assets in a bank's balance sheets and higher proportion of 100% risk weighted assets.

In figure 1 we plot the aggregate mean of each one of these variables. According to the upper graph, the percentage of 0% risk weighted assets decreased significantly during the period 2001 till 2008. Specifically, during the first quarter 2001, on average 4.95% of a bank' total assets were 0% risk weighted. However this percentage has undergone a steady decrease and attended its minimum value (2.46%) during the first quarter 2008. Alternatively, the middle graph in figure 1 show an increase in the 100% risk weighted assets which constituted 50.11% of total assets during the first quarter 2001 and increased continuously till the third quarter 2008 during which 100%RWA attempted an average of 56.73%. Globally these graphs reflect the fact that banks were investing more in risky assets during the period preceding the crisis.

The categorization of assets depending on the level of risk could be assessed on irrelevant banks estimations, specifically it is good to know whether the weightings of 0%, 20%, 50% and 100% are completely objective and well precise by the law or whether these weightings are subject to banks choice and to internal bank rating. To address this issue, we perform robustness check using the ratio of commercial real estate loans to total loans as proxy of high-risk assets and the liquidity ratio as proxy of low risk assets.

The quality of the bank' loans portfolio

The performance and riskiness of bank' loans portfolio could be evaluated through a number of ratios commonly used in the bank risk literature such as the non-performing loans ratio, loan loss provision ratio and loan loss reserve ratio. Such ratio could also give an idea about the bank

monitoring processes since a large proportion of nonperforming loans may signal that a bank used fewer resources than usual in the initial credit evaluation and monitoring of its loans (Mester (1996)).

$$\text{Non performing loans} = (\text{loans past due 90 days} + \text{non accrual loans}) / \text{total loans and leases}$$

$$\text{Loan loss reserve} = \text{allowance for loan and lease losses} / \text{total loans and leases}$$

$$\text{Loan loss provision} = \text{provision for allowance for loan and lease losses} / \text{total loans and leases}$$

Figure 2 present the evolution of the aggregate mean of these variables during the whole period Q1-2001 till Q4-2010. The evolution of the three variables is to some extent similar. We notice that during the pre crisis period, the evolution of these variables were in some way stable and even decreased until 2007 when the consequence of the risk taking started to materialize. It is good to notice that compared to our previous measure of risk the information presented is to some extent differing: during the same period when 100% risk assets were increasing and 0% risk assets decreasing the riskiness of the banks' loans, proxied by the NPL, LLR and LLP, was decreasing.

Note that credit risk proxies are backward-looking indicators, the non performing loans include the amount of loans that are past due 90 days or more, accordingly such ratio reflect the riskiness of loans that have been granted in the past, and reflect the bank monitoring processes that has been applied during previous period. We take in consideration this lacuna when discussing our results.

Bank liquidity creation

Our third category of risk variable reflects the balance sheet expansions. In 2007 Berger and Bouwman proposed a comprehensive measure of liquidity created by financial institutions. After classifying assets, equity and off balance sheets items into liquid, semi liquid and illiquid items, liquidity creation occur when illiquid assets are transformed to liquid liabilities and liquidity is destroyed when liquid assets are transformed to illiquid liabilities or equity. The intuition is that banks financed in large part by liquid deposits and that holds mostly illiquid loans (and thus a small proportion of liquid assets) performs a significant amount of money creation. According to hypothesis 3 we expect that a longer period of low level of rates to be associated with an increase in the liquidity created by banks.

$$\text{On balance sheet liquidity creation} = 1/2 * (\text{illiquid assets} + \text{liquid liabilities}) + 0 * (\text{semiliquid assets} + \text{semiliquid liabilities}) - 1/2 * (\text{liquid assets} + \text{illiquid liabilities} + \text{equity})$$

$$\text{Off balance sheet liquidity creation} = 1/2 * (\text{illiquid guarantees and off balance items}) + 0 * (\text{semiliquid guarantees}) - 1/2 * (\text{liquid guarantees} + \text{liquid derivatives})$$

The composition of liquid, semi liquid and illiquid assets and liabilities is detailed in appendix B. Figure 3 shows the net decrease in liquid and semi liquid assets in favour of illiquid assets, which increases by 10% during the period that preceded the crisis. Consequently banks were investing less in liquid assets such as securities and government loans, and were financing long-term loans. In the liability side we remark a modest increase by almost 1.2% in illiquid liabilities. For the whole period we remark a net increase in the liquidity created by banks. For robustness issues we use alternatively the quarterly growth of bank total loans as measure of bank asset expansion.

3.2 Too low interest rates for too long measures

To examine empirically the hypothesis that a long period of low level of policy rates induces an increase in risk taking we need an indicator of “too low for too long” policy rates. A number of empirical studies have provided evidence that the impact of policy rates on bank riskiness have contradictory short and long term effect. For example, Altunbas et al. (2010) find that the effects of changes in the short-term monetary policy rate on banks’ risk are positive. The overall quality of a loan portfolio indeed increases (banks’ EDFs decrease) if interest rates are lowered. Delis and al. (2012) use simultaneously the lag 1, lag 5, lag 9 and the lag 13 of the change in the real federal rate. They found that low policy rates decrease the riskiness of banks’ (proxied by the Z-index and the change in the risk assets) overall loan portfolios in the short term (lag1 and lag5), and then significantly increase it in the medium term (lag9 and lag13). They conclude that holding policy rates low for a short period of time may improve the overall quality of banks’ loan portfolios, but holding interest rates low for a prolonged period of time could substantially increase loan default risk over the medium term. We take in consideration this issue by considering a variable that reflect the length of the period of monetary loosening. We specifically construct a quarterly variable reflecting the number of quarters in the previous three years during which the real policy rate is negative (see section 6 “robustness checks” for alternative measures). In figure 4 and 5, we plot the evolution of this variable in addition to the evolution of the real federal rate for the period 2001/2010.

3.3 Control variables

Bank riskiness depends on many variables specific to the individual bank characteristics and to macroeconomic conditions. In addition to the monetary policy indicator, we include the following control variables in our estimations: *SIZE*, *EQ_TA*, *ROA*, *INEFFICIENCY*, *NII*, and *GDP_growth*.

The natural logarithm of total assets is used as proxy for bank size. In bank risk literature the size of a financial institution play a significant role in the determination of the bank business model and bank risk strategy. The literature however, discusses a contradictory impact of bank size on bank riskiness. On a first hand, given that the failure of a big bank could trigger an economy-wide recession, larger banks have more probability to be bailed out when faced to failure risk. Accordingly, in failure model estimation based on effective bank failure, one could expect that the probability of bank failure to decrease with the size of bank (TBTF concept). Because of moral hazard problem, larger institutions may pursue acquisitions and growth and increase the riskiness of their assets; accordingly larger banks may be more engaged in higher risk assets. On the other hand, the bank literature discusses the diversification and the strategic advantages of the large size banks: larger banks profit from scale economy (Wheelock and Wilson, 2009; Feng and Serilitis, 2009; Hughes et al., 2001; McAllister and McManus, 1993), and they have better risk management and diversification strategies (Demsetz and Strahan, 1995) which associate larger banks with lower risk. We also control for bank capitalization using the ratio of total equity to total assets. Bank capital plays a critical role in the safety and soundness of individual banks and the banking system. Higher equity ratio represent a cushion against unexpected losses, accordingly banks with higher capital ratio face a lower probability of default. Concerning their impact on risk taking incentives: owners of a bank with high equity ratio have more to lose in case of a failure therefore they have more incentives to be prudent, to invest in safer assets (Calem and Rob, 1999; Repullo, 2004; and Morrison and White, 2005) and to screen borrowers (Holmstrom and Tirole, 1997; and Dell-Ariccia and Marquez, 2006, Barth, Caprio and Levine, 2004). Following Delis and Kouretas (2010) and Delis et al. (2011) we also include the ratio of the total expenses over total income as measure for managerial efficiency and the ratio of non-interest income to total income as measure of non-traditional activities. Technically efficient banks may be more capable in managing risks and in transforming bank inputs into bank profits. Accordingly a positive relation is expected between inefficiency and bank risk. Concerning the non-traditional activity ratio, on the one hand increasing income from non-interest activities could generate diversification benefits and accordingly reduce banks' risk. On the other hand, non-interest incomes are known to be highly volatile which could be translated into higher risk (Stiroh and Rumble, 2006). Finally at the macro level we control for the improvement in economic condition and the borrower's net worth using the GDP growth. We expect that higher growth to be associated with more risk taking and more liquidity creation.

3.4 Econometric model

To test our hypotheses, we estimate the following empirical model:

$$Risk_{it} = \alpha_1 + \alpha_2 LR_t + \alpha_3 C_{i,t-1} + \alpha_4 M_{t-1} + u_i + \varepsilon_{it}$$

Where $Risk_{it}$ is the level of risk for the bank i at quarter t . $C_{i,t-1}$ represents a set of bank level control variables, M_{t-1} is the macroeconomic variable which is common to all banks, LR_t is the number of quarters in the last 12 quarters during which the real federal rate is negative and u_i are the individual fixed effects. All equations are estimated using the fixed effect estimator. t-statistics are corrected for heteroskedasticity following White's methodology. Bank level variables are included with a lag of one quarter to avoid endogeneity bias.

4 Empirical results

4.1 The impact of too low for too long rates on bank asset riskiness

In table 1 we present the impact of too low for too long interest rates on bank risk taking for the period 2001Q1/2007Q2. Based on this table, the results show that an increase in the number of quarters during which the real federal rate is negative, is associated with higher risk positions. Specifically concerning our first hypothesis dealing with the categories of assets according to their risk weightings, we find that banks decrease their 0% risk weighted assets and increase their 100% risk weighted assets when real rates are too low for too long, generating a general increase in the total risk weighted assets RWA. Specifically an increase of one standard deviation of the low rates measure, increase the 100%RWA by 6% of its mean, and decrease the 0%RWA by 11% of its mean. Overall the RWA increase by 7.5% of its mean. For robustness issues, and to address specifically the possible bank subjectivity and moral hazard problem while categorizing assets in the different risk categories, we perform robustness check using the ratio of commercial real estate loans to total assets as proxy of high-risk assets and the ratio of liquid assets including cash, due from depository institutions and securities as proxy of risk free assets. The results propose a significant association between a long period of low real interest rates and the proportion of real estate loans in a bank balance sheet. The coefficient is more striking when taking the commercial real estate ratio as dependant variable than for the three previous measures of bank riskiness. In harmony with the risk shifting view, we find that an increase of one standard deviation of the low rates measure increase the commercial real estate loans by 7.9% from its mean. Furthermore, we find a negative significant relation between the liquid assets and the length of the period of monetary loosening. However the economic significance is lower: liquid assets decrease by 4.4%

from its mean following an increase in one standard deviation of the low rates measure.

Concerning the other control variables, we find that bank size is positively associated with assets' riskiness, specifically an increase in the size of banks increase significantly the proportion of 100% risk weighted assets and the proportion of real estate loans, and decrease the liquidity holding. These findings suggest that larger banks choose to invest into the higher risk assets. We also find that cost inefficiency is associated with less risk taking positions: lower 0%RWA and LIQUIDITY, higher 100%RWA, RWA and CRELOANS suggesting that banks with higher ratio of total expenses to total income (higher inefficiency) choose to increase their investments in safe assets and decrease their engagement in risky assets. We also find a positive association between the non-traditional income variable and low risk assets, and a negative significant relation between the non-traditional income variable and the high-risk assets: this suggest that banks engaging more in non-traditional activities tend to decrease their risk taking in their traditional activities. Finally we find that economic conditions impact the bank investment choices: specifically higher economic growth rate are associated with lower risk positions.

Overall this first set of results is consistent with our first hypothesis and show that a substitution effect toward riskier assets is produced following a long period of low interest rates.

Table 1: The effect of too low for too long real rates on banks assets' riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets ; $RWA = [0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20 \times (\text{total assets } 20\% \text{ risk weighted}) + 50 \times (\text{total assets } 50\% \text{ risk weighted}) + 100 \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQ_TA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS
C	16.6087 [28,69]***	-3.3247 [-1,59]	30.3942 [19,10]***	84.789 [36,50]***	-9.4479 [-6,43]***
QUARTER_NEGATIVE	-0.1149 [-55,93]***	0.2635 [44,88]***	0.2296 [49,50]***	-0.1853 [-32,90]***	0.2418 [70,36]***
SIZE(t-1)	-0.6794 [-23,22]***	3.1568 [29,62]***	2.1673 [27,10]***	-3.1201 [-27,36]***	1.2935 [17,40]***
EQ_TA(t-1)	-0.0347 [-8,63]***	0.043 [3,18]***	-0.0705 [-6,40]***	-0.1507 [-10,24]***	-0.045 [-4,97]***
INEFFICIENCY(t-1)	0.0004 [0,49]	-0.0348 [-13,49]***	-0.0303 [-13,01]***	0.0186 [4,23]***	-0.009 [-4,16]***
NNI(t-1)	0.002 [1,49]	-0.0851 [-7,69]***	-0.0724 [-7,65]***	0.0584 [7,63]***	-0.0078 [-2,80]***
GDP_GROWTH(t-1)	0.0986 [13,45]***	-0.5021 [-23,89]***	-0.4332 [-25,49]***	0.7136 [36,36]***	-0.0771 [-6,32]***
Observations:	171321	172759	163627	178612	178612
R-squared:	0.7	0.89	0.87	0.89	0.91

<i>F-statistic:</i>	44.1	147.12	118.52	151.16	190.48
<i>std dep var</i>	3.39	15.16	10.78	14.63	10.73

4.2 *The impact of too low for too long rates on bank monitoring processes*

In table 2, we extend the study and investigate whether a too long period of negative real rates impact bank monitoring processes and we investigate whether such a relation could be detected empirically using the different proxies of bank loans performance. One problem when studying the impact of loose monetary policy on the monitoring processes using the usual loan performance proxies is the time dimension problem: on a first hand the impact of monetary policy on bank loan riskiness is different for the outstanding loans and for the new loans. Accordingly disentangling the impact of policy rates on the two categories of loans is of concern: while a decrease in policy rates is suggested to impact negatively the selection of future borrowers (RTC), for the outstanding loans, a decrease in the policy rate translated into a decrease in the lending rate enhance the borrower's net worth by decreasing the debt burden. On the other hand, as argued in a previous section the proxies used for assessing loans quality are backward looking indicator; at a quarter q a level of non-performing loan do not reflect necessarily the level of risk taken by the bank and the quality of monitoring processes during the same quarter. In fact these loans have been granted during different past periods specifically many quarters before they became non-performing, the act of default if happened in quarter q , could be partly explained with variables related to the quarter of grant. If we take for example the level of the non-performing loan of a bank in the aftermath of the subprime crisis, it will be unfair to explain this level of risk with variables related only to the same year of the crisis. We analyse the results taking in consideration these two limitations. Our proxy of monetary looseness addresses partly the time dimension problem by taking in consideration the negative real rates over an extended period of time.

Overall, the results in table 2 show that an extended period of low policy rates is associated with an increase in the borrower net worth translated precisely into a decrease in the non-performing loans ratio. Specifically we find that an increase of one standard deviation of the low rates measure decrease the non-performing loan by 1% from its mean and decrease the LLP by 10.3% from its mean, overall the reserve for loan losses also decrease by 4.3%. These results are in harmony with the balance sheet channel of monetary policy: an extended period of negative real rates has a beneficial effect on the outstanding loans translated into lower non-performing loans

ratio. These results do not provide evidence of a decrease in the monitoring processes during expansionary monetary periods as argued by the risk taking channel and accordingly our results do not confirm hypothesis 2.

Concerning the other control variables, we find that larger banks present higher portfolios risk translated into higher NPL and LLP ratios. We also find that higher capitalized banks present lower NPL ratio, however they also constitute higher reserve for loan losses. Accordingly better capitalization implies more prudent bank behaviour. We also detect a positive significant relation between inefficiency and loans riskiness: higher cost to income ratio implies higher non-performing loans ratio but lower LLR. We also detect a positive significant association between the non-traditional income ratio and loans riskiness. Finally the results shows that better economic performance enhance the quality of loans portfolios.

Table 2: The effect of too low for too long real rates on banks loan quality, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. *T*-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep, Var:	NPL	LLR	LLP
C	-2.9021 [-14,67]***	2.8367 [36,61]***	0.0578 [1,71]*
QUARTER_NEGATIVE	-0.0306 [-38,98]***	-0.0058 [-21,45]***	-0.0041 [-31,81]***
SIZE(t-1)	0.206 [20,19]***	-0.0836 [-21,45]***	0.0023 [1,30]
EQ_TA(t-1)	-0.0047 [-3,45]***	0.0069 [12,71]***	0 [-0,02]
INEFFICIENCY(t-1)	0.0007 [4,63]***	-0.0005 [-5,04]***	0.0001 [1,50]
NNI(t-1)	0.0042 [4,89]***	0.0029 [5,39]***	-0.0002 [-1,71]*
GDP_GROWTH(t-1)	0.0153 [5,57]***	0.0167 [17,18]***	0.0009 [2,07]**
Observations:	177674	171501	178612
R-squared:	0.55	0.76	0.28
F-statistic:	23.64	60.9	7.72
std dep var	1.06	0.47	0.14

4.3 The impact of too low for too long rates on bank assets expansion

In table 3 we report the results of the impact of a loose monetary policy on bank liquidity creation and loan growth. In accordance with hypothesis 3, we find a positive significant association between a long period of loose monetary policy and bank asset expansion. Specifically we find that

an increase of one standard deviation of the too low for too long measure increase the on balance sheet liquidity creation by 7.5% from its means. Also the off balance sheet liquidity creation increase by 3.8%. Overall total liquidity creation increase by 7.6%. Alternatively, employing the growth rate of total loans as an indicator of asset expansion gives a similar result: we find that an expanded period of low real rates is associated with higher loans' growth rate.

Table 3: The effect of too low for too long real rates on banks liquidity creation over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. *T*-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except *SIZE* and *QUARTER_NEGATIVE*; *LC_ON*= bank on balance sheet liquidity creation/total assets; *LC_OFF*= bank' off balance liquidity creation/total assets; *LC_ALL*= Bank liquidity creation over total assets; *QUARTER_NEGATIVE*= number of quarters in the previous 3 years during which the real federal rate is negative; *SIZE* is the natural logarithm of total assets; *EQTA*= equity over total assets; *INEFFICIENCY*=Total expenses over total income; *NII*= non interest income over total income; *gdp_growth*= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

<i>Dep, Var:</i>	<i>LC_ON</i>	<i>LC_OFF</i>	<i>LC_ALL</i>	<i>LOANG</i>
<i>C</i>	48.5034 [20,42]***	6.4466 [4,30]***	54.95 [17,73]***	71.7118 [20,36]***
<i>QUARTER_NEGATIVE</i>	0.3922 [64,86]***	0.0789 [26,66]***	0.4712 [64,33]***	0.1966 [21,16]***
<i>SIZE(t-1)</i>	-0.8345 [-6,99]***	0.0066 [0,09]	-0.8278 [-5,23]***	-3.3864 [-18,59]***
<i>EQ_TA(t-1)</i>	-0.5243 [-33,80]***	0.0475 [4,41]***	-0.4769 [-24,15]***	-0.3288 [-13,43]***
<i>INEFFICIENCY(t-1)</i>	-0.0357 [-10,49]***	-0.0051 [-2,69]***	-0.0407 [-14,20]***	0.0243 [4,69]***
<i>NNI(t-1)</i>	0.0186 [1,73]*	0.0049 [1,22]	0.0235 [1,78]*	0.013 [1,43]
<i>GDP_GROWTH(t-1)</i>	0.002 [0,10]	-0.046 [-4,88]***	-0.0439 [-1,76]*	0.1086 [3,22]***
<i>Observations:</i>	178608	178608	178608	147807
<i>R-squared:</i>	0.91	0.88	0.92	0.46
<i>F-statistic:</i>	209.25	141.35	221.66	14.67
<i>std dep var</i>	18.26	7.19	21.92	10.57

4.4 Bank capitalization and the Risk taking channel

Our previous results show that a prolonged period of negative real rates is associated with an increase in bank asset riskiness and an increase in the asset expansion. We further investigate whether bank characteristics, specifically differences in banks capitalization, impact the relation between a long period of lax monetary policy and bank riskiness. Accordingly, in harmony with the FDIC classification, we differentiate three categories of banks: under-capitalized banks for which the total risk based capital ratio is lower than 8%, adequately capitalized banks for which the total risk based capital ratio is between 8% and 10%, and the well capitalized banks those for which the total risk based capital ratio is greater than 10%. We create two dummy variables *undercap* and

adcap that represent the first two categories of bank' capitalization. *Undercap* takes the value of 1 in the quarter during which the total risk based capital ratio is lower than 8%, and *adcap* takes the value of 1 in the quarter during which the total risk based capital ratio is greater than 8% but lower than 10%. According to this classification, 98% of the banks level observations have a total risk based capital ratio greater than 10% and accordingly are well capitalised. We first consider the impact of a long period of low policy rates on bank behaviour by differentiating bank level observations during which the total risk based capital ratio is under 8% or between 8% and 10%. Alternatively, we consider the behaviour of these banks for each the whole period that precede and the whole period that follow the event of the breach of the capital regulation (the breach is considered to be 8% for the case of undercapitalized banks and between 8% and 10% for the adequately capitalized banks).

We begin by the first objective and we run our equations by introducing to the baseline model the two dummy variables *undercap* and *adcap* that represent the first two categories of bank' capitalization. To measure the impact of the too low for too long interest rates on the risk taking for the three categories of banks, we introduce two interaction variables by multiplying the variable reflecting the loosening of monetary policy and each one of the dummy variables. According to hypothesis 4, it is expected that for banks facing capital constraints, this is specifically the case of the undercapitalized and the adequately capitalized banks, the effect of a long period of monetary easing should be less pronounced for those banks compared with the risk taking by highly capitalized banks.

Results are shown in table 4. The impact of a long period of low policy rates on the well-capitalized banks is similar to previous assumption: specifically well capitalized banks increase their investment in risky assets and increase their asset expansion following a longer period of low policy rates, and once again the results provide no evidence on a loosening in the monitoring processes. Concerning the undercapitalized and the adequately capitalized banks and looking at the sign and the significance attached to the monetary policy indicator, we find that the positive relation between a long period of low real rates and the risk taking reflected by the assets riskiness measures still operative for the different categories of banks. Also for both adequately capitalised and undercapitalized banks, the magnitude of the effect of a too long period of loose monetary policy specifically on the asset riskiness increase. We find that a one standard deviation increase of the number of quarters during which the real rate is negative increases the CRELOANS by 16% from its mean in the case of undercapitalized banks and by 9.5% in the case of adequately capitalized

banks and 8% for well capitalized banks. Also we find a same result concerning the RWA and the 100%RWA. In contradiction with hypothesis 4, there is a much higher impact of a long period of monetary loosening on bank risk taking specifically “risk shifting” in the case of undercapitalized banks than for the two other categories. Also if we look at the asset expansion measures, we notice that a one standard deviation increase of the number of quarters during which the real rate is negative increases the on balance sheet liquidity creation by 9% for the highly capitalized banks it also increases it by 8% from its mean for the adequately capitalized banks, however the liquidity creation by undercapitalized banks is decreased but the coefficient is not statistically significant. Also for poorly capitalized banks, a negative coefficient associated with the loan growth measure is detected following a long period of low real rates. All the results present evidence in favour of the following conclusion: Concerning the quality and the riskiness of assets there is a clear risk substitution effect toward higher risk assets following a long period of low rates for all types of banks. Specifically for banks facing capital constraints (undercapitalized banks) this impact is much more pronounced (economically). Concerning the impact of a long period of low rates on the asset expansion, we find that adequately capitalized banks increase their liquidity creation following a long period of low rates.

Table 4 The effect of too low for too long real rates for undercapitalized, adequately capitalized and well capitalized banks

Table 4: The effect of too low for too long real rates for different category of banks according to their capitalization over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. *T*-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except *SIZE* and *QUARTER_NEGATIVE* and the dummy variables; *ADCAP*= dummy variable takes the value of 1 if total risk based capital ratio is greater than 8% and lower than 10% and 0 otherwise; *UNDERCAP*: dummy variable that takes the value of 1 if the total risk based capital ratio is lower than 8% and 0 otherwise; *LC_ON*= bank on balance sheet liquidity creation/total assets; *LC_OFF*= bank' off balance liquidity creation/total assets; *LC_ALL*= Bank liquidity creation over total assets; *QUARTER_NEGATIVE*= number of quarters in the previous 3 years during which the real federal rate is negative; *SIZE* is the natural logarithm of total assets; *EQTA*= equity over total assets; *INEFFICIENCY*=Total expenses over total income; *NNI*= non interest income over total income; *gdp_growth*= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

<i>Dep. Var:</i>	<i>0%RWA</i>	<i>100%RWA</i>	<i>RWA</i>	<i>LIQUIDITY</i>	<i>CRELOANS</i>	<i>NPL</i>	<i>LLR</i>	<i>LLP</i>	<i>LC_ON</i>	<i>LC_OFF</i>	<i>LC_ALL</i>	<i>LOANG</i>
<i>C</i>	17.4553	12.8391	44.2957	87.4287	-3.8519	-1.6155	3.5734	0.153	59.1177	9.2322	68.35	2.4357
	[29,32]***	[5,96]***	[26,68]***	[37,22]***	[-2,57]**	[-8,02]***	[44,53]***	[4,41]***	[24,08]***	[6,49]***	[22,34]***	[0,69]
<i>QUARTER_NEGATIVE</i>	-0.1148	0.2978	0.2587	-0.1843	0.2528	-0.0282	-0.0046	-0.0039	0.4148	0.0843	0.4991	0.0963
	[-55,80]***	[50,54]***	[55,26]***	[-32,77]***	[73,81]***	[-35,83]***	[-17,11]***	[-30,00]***	[68,79]***	[30,07]***	[70,07]***	[10,44]***
<i>UNDERCAP</i>	0.1052	2.4992	1.1351	-0.9804	-1.7766	1.0325	-0.173	0.4065	4.1268	0.3159	4.4427	-0.6007
	[0,24]	[1,85]*	[1,14]	[-0,92]	[-1,20]	[2,72]***	[-1,59]	[5,18]***	[2,72]***	[0,29]	[2,26]**	[-0,18]
<i>ADCAP</i>	-0.6189	2.8863	2.259	-1.6484	-0.0418	-0.0965	-0.0788	0.0605	3.5237	0.3499	3.8735	7.059
	[-10,36]***	[12,82]***	[13,76]***	[-9,87]***	[-0,25]	[-3,33]***	[-6,96]***	[8,06]***	[16,09]***	[2,81]***	[14,77]***	[16,68]***
<i>UNDERCAP*QUARTER_NEGATIVE</i>	-0.1212	0.4093	0.2336	0.0874	0.2444	-0.0746	0.0457	-0.0071	-0.4457	-0.0051	-0.4508	-0.154
	[-1,56]	[1,47]	[1,12]	[0,48]	[1,03]	[-1,08]	[1,78]*	[-0,47]	[-1,89]*	[-0,03]	[-1,49]	[-0,28]
<i>ADCAP*QUARTER_NEGATIVE</i>	0.0485	0.0502	0.0005	-0.0837	0.037	0.0031	0.0057	-0.001	-0.0221	0.0148	-0.0073	-0.3956
	[4,84]***	[1,25]	[0,02]	[-2,83]***	[1,24]	[0,69]	[3,13]***	[-0,90]	[-0,58]	[0,65]	[-0,16]	[-6,58]***
<i>SIZE (t-1)</i>	-0.7244	2.3163	1.4442	-3.2625	1.0055	0.1397	-0.1221	-0.0029	-1.4005	-0.1398	-1.5403	0.2163
	[-23,95]***	[21,16]***	[17,32]***	[-28,16]***	[13,25]***	[13,35]***	[-30,17]***	[-1,62]	[-11,28]***	[-1,93]*	[-9,81]***	[1,18]
<i>EQ_TA (t-1)</i>	-0.0337	0.025	-0.0832	-0.143	-0.0583	-0.0075	0.0064	0.0002	-0.5138	0.0465	-0.4673	-0.2652
	[-8,35]***	[1,85]*	[-7,53]***	[-9,45]***	[-6,32]***	[-5,60]***	[11,68]***	[0,82]	[-32,82]***	[4,40]***	[-23,99]***	[-10,95]***
<i>INEFFICIENCY (t-1)</i>	0.0005	-0.0387	-0.0337	0.0192	-0.01	0.0005	-0.0006	0	-0.0373	-0.0055	-0.0428	0.0331
	[0,68]	[-13,88]***	[-13,12]***	[4,26]***	[-4,35]***	[3,98]***	[-5,30]***	[0,81]	[-10,38]***	[-2,97]***	[-14,01]***	[5,91]***
<i>NNI(t-1)</i>	0.002	-0.0927	-0.0788	0.0584	-0.0102	0.0036	0.0027	-0.0003	0.014	0.0037	0.0177	0.0467
	[1,50]	[-8,07]***	[-8,00]***	[7,75]***	[-3,62]***	[4,44]***	[5,20]***	[-2,08]**	[1,34]	[0,96]	[1,39]	[4,24]***

<i>GDP_GROWTH(t-1)</i>	0.0978	-0.5346	-0.4604	0.7135	-0.0886	0.0129	0.0155	0.0008	-0.0156	-0.051	-0.0666	0.2402
	[13,36]***	[-25,26]***	[-26,85]***	[36,47]***	[-7,25]***	[4,71]***	[16,09]***	[1,74]*	[-0,73]	[-5,47]***	[-2,70]***	[6,98]***
<i>Observations:</i>	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
<i>R-squared:</i>	0.7	0.88	0.86	0.89	0.91	0.55	0.76	0.29	0.92	0.88	0.92	0.46
<i>F-statistic:</i>	44.14	146.55	118.06	151.42	189.93	23.58	61.28	7.84	210.3	141.33	222.69	14.63
<i>C2+C5 undercap</i>	-0.236	0.7071	0.4923	-0.0969	0.4972	-0.1028	0.0411	-0.011	-0.0309	0.0792	0.0483	-0.0577
<i>wald test, t stat</i>	[-3,04]***	[2,54]**	[2,37]**	[-0,54]	[2,09]**	[-1,48]	[1,59]	[-0,73]	[-0,13]	[0,50]	[0,16]	[-0,10]
<i>C2+C6 adcap</i>	-0.0663	0.348	0.2592	-0.268	0.2898	-0.0251	0.0011	-0.0049	0.3927	0.0991	0.4918	-0.2993
<i>wald test, t stat</i>	[-6,55]***	[8,61]***	[9,06]***	[-8,88]***	[9,63]***	[-5,47]***	[0,58]	[-4,19]***	[10,22]***	[4,35]***	[10,44]***	[-4,94]***

We proceed with our second objective, specifically we want to see the impact of a too long period of low policy rates on undercapitalized and adequately capitalized banks behaviour during the whole period that precede and the whole period that follow the event of the breach of the capital regulation. Accordingly, we construct the following dummy variables:

- UNDERCAP_BEFORE takes the value of 1 in all the quarters that precede the quarter during which undercap=1 (total risk based capital ratio<8%).
- UNDERCAP_AFTER takes the value of 1 in all the quarters that follow the quarter during which undercap=1.
- ADCAP_BEFORE takes the value of 1 in all the quarters that precede the quarter during which adcap=1 ($8\% < \text{total risk based capital ratio} < 10\%$).
- ADCAP_AFTER takes the value of 1 in all the quarters that follow the quarter during which adcap=1.

We run our equations by introducing to the baseline model the two dummy variables UNDERCAP_BEFORE and UNDERCAP_AFTER (alternatively ADCAP_BEFORE and ADCAP_AFTER) that represent the banks in the period that precede the undercapitalization and the banks in the period that follow the undercapitalization. To measure the impact of the too low for too long interest rates on the risk taking for the undercapitalized banks (respectively the adequately capitalized banks) during the period that precede and follow the event of undercapitalization, we introduce two interaction variables by multiplying the variable reflecting the loosening of monetary policy and each one of the dummy variables UNDERCAP_BEFORE and UNDERCAP_AFTER (alternatively ADCAP_BEFORE and ADCAP_AFTER). Results are presented in table 4A and table 4B respectively.

The results in Table 4A show, that for undercapitalized banks, a long period of low interest rates is associated with an increase in their risk taking during both periods that precede and that follow the breach of capital regulations. Also this increase in the risk taking is much more pronounced when compared to the other banks (the absolute value of the coefficients is higher): Specifically for banks that face a breach of the capital regulation (total risk based K ratio<8%) in a specific quarter: during the period that precede the breach of capital constraint a 1% increase of the QUARTER_NEGATIVE increase by 0.39% the 100%RWA for those banks, also during the period that follow the breach of capital constrain these banks continue to increase their 100%RWA by 0.35% following a 1% increase of the QUARTER_NEGATIVE (same analysis and conclusions for RWA, CRELOANS, LC_ON, LC_ALL) the other banks increase only by 0.25% the 100%RWA following a 1% increase of the QUARTER_NEGATIVE.

In table 4B we present the results for the adequately capitalized banks. Specifically the results show that a long period of low interest rates is associated with an increase their risk taking during the period that precede the breach of capital regulations. Also during the period that follow the quarter of the regulation breach, a long period of low policy rates is always associated with an increase in the risk taking, however the absolute value of the coefficient clearly decreased (almost divided by 7 over other banks) this is specifically the case concerning the investments choice (0% RWA, RWA 100%, liquidity and CRELOANS) and the expansion of the asset (liquidity creation and growth loans)

Accordingly we conclude that an increase in the period of lax monetary policy increased the risk taking for both adequately capitalized banks and undercapitalized banks, more intensively than the other banks during the period that preceded their undercapitalization. However there is difference in behaviour between the undercapitalized banks and the adequately capitalized banks following the event of the breach of the capital constraint: for the undercapitalized banks once they become undercapitalized, and looking at the period that follow the event of undercapitalization these banks do not retrench from risk taking, quite the opposite they gamble for resurrection and a long period of low rates continue to be associated with an increase in risk taking. However for adequately capitalized banks, in the period that follows the breach of the capital constraint these banks will continue to take risk but at a much lower level compared to the other well-capitalized banks.

Table 4A The effect of too low for too long real rates for undercapitalized banks: during the whole period that precede and the whole period that follow the event of the breach of the capital regulation (total risk based capital ratio<8%)

*This table shows the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE and the dymmy variables; UNDERCAP_BEFORE takes the value of 1 in all the quarters that precede the quarter during which undercap=1 (total risk based capital ratio<8%); UNDERCAP_AFTER takes the value of 1 in all the quarters that follow the quarter during which undercap=1; 0%RWA is the total assets 0% risk weighted over total assets; 100%RWA is the total assets 100% risk weighted over total assets; RWA= [0*(total assets 0% risk weighted)+20%*(total assets 20% risk weighted)+50%*(total assets 50% risk weighted)+100%*(total assets 100% risk weighted)]/total assets; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year;; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;*

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	17.0669	-1.9137	31.5019	83.8081	-9.337	-3.1145	2.8335	0.039	48.3298	7.5639	55.8936	72.8969
	[29,28]***	[-0,92]	[19,81]***	[36,20]***	[-6,36]***	[-15,72]***	[36,46]***	[1,14]	[20,39]***	[4,96]***	[17,90]***	[20,57]***
QUARTER_NEGATIVE	-0.1165	0.2592	0.2259	-0.1816	0.2421	-0.0299	-0.0058	-0.0041	0.392	0.0759	0.4679	0.1894
	[-56,39]***	[43,89]***	[48,47]***	[-32,07]***	[70,31]***	[-38,11]***	[-21,23]***	[-31,39]***	[64,51]***	[26,05]***	[63,89]***	[20,37]***
UNDERCAP_BEFORE	1.5471	4.7649	2.0777	-2.2302	-2.7705	0.2277	-0.1497	0.2983	5.4829	-4.0086	1.4743	6.0733
	[3,68]***	[3,47]***	[2,07]**	[-2,38]**	[-3,01]***	[1,12]	[-2,01]**	[6,16]***	[4,50]***	[-2,91]***	[0,83]	[2,53]**
UNDERCAP_AFTER	0.4033	2.7126	0.8293	2.0613	1.5292	0.756	0.0539	0.2323	-0.341	-3.0101	-3.3511	0.0529
	[0,99]	[2,02]**	[0,83]	[2,40]**	[1,73]*	[3,58]***	[0,76]	[4,84]***	[-0,29]	[-2,22]**	[-1,92]*	[0,02]
QUARTER_NEGATIVE*UNDERCAP_BEFORE	0.0503	0.138	0.1071	-0.0951	-0.0304	-0.016	-0.0028	-0.0003	0.0375	0.0993	0.1368	0.2143
	[8,66]***	[7,86]***	[8,30]***	[-6,62]***	[-2,23]**	[-7,41]***	[-4,00]***	[-0,90]	[2,05]**	[9,00]***	[6,04]***	[6,95]***
QUARTER_NEGATIVE*UNDERCAP_AFTER	0.0182	0.0911	0.0762	-0.3491	-0.0257	-0.0725	0.0073	-0.0041	0.0769	-0.2134	-0.1365	0.0468
	[0,65]	[1,17]	[1,29]	[-3,30]***	[-0,46]	[-4,75]***	[1,32]	[-1,62]	[0,86]	[-2,71]***	[-1,11]	[0,30]
SIZE (t-1)	-0.7095	3.065	2.1008	-3.0603	1.2977	0.2165	-0.0828	0.0022	-0.8446	-0.0401	-0.8848	-3.4792
	[-24,11]***	[28,83]***	[26,24]***	[-26,95]***	[17,50]***	[21,18]***	[-21,17]***	[1,27]	[-7,08]***	[-0,52]	[-5,54]***	[-19,01]***
EQ_TA (t-1)	-0.0352	0.0415	-0.072	-0.1491	-0.0461	-0.0042	0.0068	0.0001	-0.5231	0.0467	-0.4764	-0.329
	[-8,75]***	[3,07]***	[-6,54]***	[-10,14]***	[-5,08]***	[-3,15]***	[12,56]***	[0,20]	[-33,71]***	[4,32]***	[-24,09]***	[-13,43]***
INEFFICIENCY (t-1)	0.0004	-0.0347	-0.0302	0.0185	-0.0091	0.0007	-0.0005	0	-0.0355	-0.005	-0.0405	0.0265

NNI (t-1)	[0,57]	[-13,52]***	[-13,05]***	[4,23]***	[-4,18]***	[4,63]***	[-5,04]***	[1,48]	[-10,53]***	[-2,59]***	[-14,28]***	[5,09]***
	0.0024	-0.0839	-0.0715	0.0574	-0.0079	0.004	0.0029	-0.0003	0.0187	0.0054	0.0241	0.0148
GDP_GROWTH (t-1)	[1,75]*	[-7,71]***	[-7,66]***	[7,62]***	[-2,79]***	[4,81]***	[5,36]***	[-1,75]*	[1,73]*	[1,34]	[1,81]*	[1,64]
	0.0973	-0.5057	-0.4359	0.7159	-0.0767	0.0157	0.0168	0.0009	0.0015	-0.0483	-0.0467	0.1061
	[13,28]***	[-24,12]***	[-25,72]***	[36,55]***	[-6,30]***	[5,73]***	[17,28]***	[2,09]**	[0,07]	[-5,12]***	[-1,87]*	[3,14]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.7	0.89	0.87	0.89	0.91	0.55	0.76	0.29	0.91	0.88	0.92	0.46
F-statistic:	44.14	147.2	118.56	151.18	190.63	23.67	60.95	7.78	209.32	141.66	221.82	14.69
C2+C5	-0.0662	0.3972	0.333	-0.2767	0.2117	-0.0459	-0.0086	-0.0044	0.4295	0.1752	0.6047	0.4037
Wald test, t stat	[-11,11]***	[22,21]***	[25,16]***	[-18,31]***	[15,44]***	[-20,47]***	[-11,86]***	[-11,34]***	[22,91]***	[15,11]***	[25,69]***	[12,81]***
C2+C6	-0.0983	0.3503	0.3021	-0.5307	0.2164	-0.1024	0.0015	-0.0082	0.4689	-0.1375	0.3314	0.2362
Wald test, t stat	[-3,49]***	[4,49]***	[5,09]***	[-5,05]***	[3,83]***	[-6,69]***	[0,27]	[-3,24]***	[5,25]***	[-1,75]*	[2,71]***	[1,51]

Table 4B The effect of too low for too long real rates for adequately capitalized banks: during the whole period that precede and the whole period that follow the event of the breach of the capital regulation (8%<total risk based capital ratio<10%)

This table shows the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE and the dymmy variables; ADCAP_BEFORE takes the value of 1 in all the quarters that precede the quarter during which adcap=1 (8%<total risk based capital ratio<10%); ADCAP_AFTER takes the value of 1 in all the quarters that follow the quarter during which adcap=1; 0%RWA is the total assets 0% risk weighted over total assets; 100%RWA is the total assets 100% risk weighted over total assets; RWA= [0*(total assets 0% risk weighted)+20%*(total assets 20% risk weighted)+50%*(total assets 50% risk weighted)+100%*(total assets 100% risk weighted)]/total assets; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year;; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC ON	LC OFF	LC ALL	LOANG
C	17.7161	0.2481	33.4253	79.7784	-5.8437	-2.6727	3.0304	0.0489	49.5376	7.3299	56.8675	61.9105
	[29,63]***	[0,12]	[20,49]***	[33,17]***	[-3,95]***	[-12,98]***	[37,82]***	[1,38]	[20,23]***	[4,62]***	[17,56]***	[17,10]***

<i>QUARTER_NEGATIVE</i>	-0.1209	0.2611	0.2279	-0.1784	0.2395	-0.0302	-0.0059	-0.004	0.4006	0.0748	0.4754	0.2032
	<i>[-57,37]***</i>	<i>[43,98]***</i>	<i>[48,30]***</i>	<i>[-31,33]***</i>	<i>[69,16]***</i>	<i>[-38,01]***</i>	<i>[-21,49]***</i>	<i>[-30,61]***</i>	<i>[65,91]***</i>	<i>[25,70]***</i>	<i>[65,25]***</i>	<i>[21,72]***</i>
<i>ADCAP_BEFORE</i>	-0.4444	1.0617	0.8255	-0.2978	-1.0269	-0.1425	-0.0834	0.0355	1.4402	0.2574	1.6976	4.5623
	<i>[-7,94]***</i>	<i>[5,53]***</i>	<i>[5,85]***</i>	<i>[-1,92]*</i>	<i>[-7,65]***</i>	<i>[-6,04]***</i>	<i>[-9,63]***</i>	<i>[7,01]***</i>	<i>[7,41]***</i>	<i>[3,32]***</i>	<i>[7,55]***</i>	<i>[14,35]***</i>
<i>ADCAP_AFTER</i>	-0.4845	3.1789	2.5914	-2.5533	1.0185	0.0632	-0.001	0.0421	3.7989	0.304	4.1029	1.4287
	<i>[-8,30]***</i>	<i>[16,08]***</i>	<i>[17,80]***</i>	<i>[-16,40]***</i>	<i>[7,03]***</i>	<i>[2,67]***</i>	<i>[-0,12]</i>	<i>[8,19]***</i>	<i>[19,52]***</i>	<i>[3,66]***</i>	<i>[18,20]***</i>	<i>[4,32]***</i>
<i>QUARTER_NEGATIVE*ADCAP_BEFORE</i>	0.039	0.1772	0.134	-0.154	0.0642	-0.0015	-0.0011	-0.0002	0.143	0.0552	0.1982	0.078
	<i>[10,02]***</i>	<i>[14,51]***</i>	<i>[14,56]***</i>	<i>[-14,98]***</i>	<i>[7,32]***</i>	<i>[-1,00]</i>	<i>[-2,20]**</i>	<i>[-0,78]</i>	<i>[11,51]***</i>	<i>[10,00]***</i>	<i>[13,68]***</i>	<i>[3,55]***</i>
<i>QUARTER_NEGATIVE*ADCAP_AFTER</i>	0.0374	-0.1919	-0.1498	0.1139	-0.0881	-0.0099	0.001	-0.0014	-0.319	-0.0003	-0.3193	-0.1234
	<i>[7,30]***</i>	<i>[-11,68]***</i>	<i>[-12,31]***</i>	<i>[8,49]***</i>	<i>[-7,84]***</i>	<i>[-4,60]***</i>	<i>[1,42]</i>	<i>[-3,53]***</i>	<i>[-19,98]***</i>	<i>[-0,04]</i>	<i>[-16,53]***</i>	<i>[-4,48]***</i>
<i>SIZE (t-1)</i>	-0.732	2.9422	1.9866	-2.8406	1.1086	0.1951	-0.0929	0.0022	-0.9222	-0.0447	-0.9669	-2.9215
	<i>[-24,19]***</i>	<i>[27,01]***</i>	<i>[24,20]***</i>	<i>[-23,97]***</i>	<i>[14,83]***</i>	<i>[18,34]***</i>	<i>[-22,97]***</i>	<i>[1,22]</i>	<i>[-7,48]***</i>	<i>[-0,56]</i>	<i>[-5,84]***</i>	<i>[-15,59]***</i>
<i>EQ_TA (t-1)</i>	-0.0389	0.0591	-0.0579	-0.1562	-0.0476	-0.0051	0.0062	0.0002	-0.4989	0.0491	-0.4498	-0.287
	<i>[-9,63]***</i>	<i>[4,36]***</i>	<i>[-5,24]***</i>	<i>[-10,51]***</i>	<i>[-5,21]***</i>	<i>[-3,75]***</i>	<i>[11,38]***</i>	<i>[0,89]</i>	<i>[-31,88]***</i>	<i>[4,49]***</i>	<i>[-22,55]***</i>	<i>[-11,71]***</i>
<i>INEFFICIENCY (t-1)</i>	0.0005	-0.0354	-0.0308	0.019	-0.0092	0.0007	-0.0005	0	-0.0363	-0.0051	-0.0415	0.0237
	<i>[0,59]</i>	<i>[-13,69]***</i>	<i>[-13,15]***</i>	<i>[4,29]***</i>	<i>[-4,22]***</i>	<i>[4,58]***</i>	<i>[-5,07]***</i>	<i>[1,37]</i>	<i>[-10,43]***</i>	<i>[-2,71]***</i>	<i>[-14,20]***</i>	<i>[4,60]***</i>
<i>NNI (t-1)</i>	0.0029	-0.0865	-0.0736	0.0587	-0.0083	0.004	0.0029	-0.0003	0.0155	0.0053	0.0208	0.0111
	<i>[2,04]**</i>	<i>[-7,74]***</i>	<i>[-7,69]***</i>	<i>[7,68]***</i>	<i>[-2,96]***</i>	<i>[4,82]***</i>	<i>[5,37]***</i>	<i>[-1,92]*</i>	<i>[1,48]</i>	<i>[1,31]</i>	<i>[1,60]</i>	<i>[1,24]</i>
<i>GDP_GROWTH (t-1)</i>	0.0961	-0.5181	-0.4457	0.727	-0.0827	0.0154	0.0168	0.0009	-0.0111	-0.0503	-0.0614	0.1036
	<i>[13,10]***</i>	<i>[-24,65]***</i>	<i>[-26,21]***</i>	<i>[37,06]***</i>	<i>[-6,79]***</i>	<i>[5,59]***</i>	<i>[17,21]***</i>	<i>[2,04]**</i>	<i>[-0,52]</i>	<i>[-5,32]***</i>	<i>[-2,47]**</i>	<i>[3,08]***</i>
<i>Observations:</i>	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
<i>R-squared:</i>	0.7	0.89	0.87	0.89	0.91	0.55	0.76	0.28	0.92	0.88	0.92	0.46
<i>F-statistic:</i>	44.18	147.85	119.15	151.68	190.86	23.65	61.03	7.74	210.52	141.46	222.93	14.8
<i>C2+C5</i>	-0.0819	0.4383	0.3619	-0.3324	0.3037	-0.0317	-0.007	-0.0042	0.5436	0.13	0.6736	0.2812
<i>Wald test, t stat</i>	<i>[-19,83]***</i>	<i>[33,47]***</i>	<i>[36,75]***</i>	<i>[-29,41]***</i>	<i>[33,53]***</i>	<i>[-19,62]***</i>	<i>[-12,77]***</i>	<i>[-14,76]***</i>	<i>[40,76]***</i>	<i>[20,70]***</i>	<i>[42,39]***</i>	<i>[12,19]***</i>
<i>C2+C6</i>	-0.0835	0.0692	0.0781	-0.0645	0.1514	-0.0401	-0.0049	-0.0054	0.0816	0.0745	0.1561	0.0798
<i>Wald test, t stat</i>	<i>[-15,76]***</i>	<i>[4,12]***</i>	<i>[6,29]***</i>	<i>[-4,62]***</i>	<i>[13,27]***</i>	<i>[-18,15]***</i>	<i>[-6,80]</i>	<i>[-13,62]***</i>	<i>[4,96]***</i>	<i>[8,42]***</i>	<i>[7,82]***</i>	<i>[2,83]***</i>

5 Robustness checks

To check the robustness of our results, we conduct several sensitivity analyses.

5.1 Too low interest rates for too long measures

First, we determine the variable reflecting the loosening of monetary policy on a basis of 4 years, 5 years and 6 years respectively: we calculate the number of quarters in the previous 16 quarters (respectively 20 and 24 quarters) during which the real federal rate is negative. We obtain similar results to previous assumptions (see appendix 4, table 4A, 4B).

Second, we calculate a similar measure of monetary loosening taking in consideration the rank of the quarters during which the interest rate is negative. Accordingly, on the basis of 12 quarters (respectively 16, 20 and 24 quarters) we calculate the number of quarters during which the real federal rate is negative however we give a weighting of 12 (respectively 16, 20 and 24 quarters) for the quarter (t-1) if the real interest rate is negative, a weighting of 11 for the quarter (t-2) if the real interest rate is negative... and a weighting of 1 for the quarter (t-12) if the real interest rate is negative. We calculate the *WEIGHTED_QUARTER_NEGATIVE12* according to the following formula:

$$WEIGHTED_QUARTER_NEGATIVE12_t = \frac{\sum_{n=1}^{12} (13-n) * Dummy_real_{(t-n)}}{\sum_{n=1}^{12} (13-n)}$$

Where t is a specific quarter, *Dummy_real* is a dummy variable equal 1 if the real interest rate is negative during a specific quarter and 0 otherwise. We estimate the equation using the *WEIGHTED_QUARTER_NEGATIVE12*, which we calculate alternatively on a basis of 16 quarters, 20 quarters and 24 quarters respectively. Our previous assumption still unchanged (see appendix 4, table 4C, 4D, 4E, 4F).

5.2 Pre crisis and post crisis sub period

The results are robust to different pre-crisis sub sample period and for larger sample period 2001Q1/2010Q4. However estimating our equations for the post-crisis period 2007Q3/2010Q4 we obtain contradictory results. Specifically, the statistical significant relation between the length of the period of monetary loosening and bank asset riskiness turns to negative for the post crisis period: the variable reflecting monetary loosening is associated with a decrease in the 100%RWA, RWA an increase in the risk free assets (0%RWA and LIQUIDITY) and a decrease in the bank assets expansion. Also this variable is associated with an increase in loans non-performance. These results

show that the increase in the risk taking (higher risk assets and asset expansion) during the whole pre-crisis period started to materialize from the beginning of the crisis. For the post-crisis period, a longer period of low rates is thus associated with the materialization of risk reflected in higher non performing loans, higher loan loss reserves and provisions ratio.

6 Conclusion

The main objective of this paper was to present the impact of a long period of low policy rate on U.S commercial bank risk behavior taking in consideration the different categories of banks capitalization. On the first hand, it has been argued that the low level of rates and the money easing that prevails the pre crisis period constitute one of the factor that increased bank risk taking specifically in the United States. On the other hand, a couple of theoretical papers proposed that banks behavior following a period of monetary easing could be quite different according to banks capitalization.

Using information from the quarterly call report of U.S. commercial banks and using a variable of monetary loosening reflecting the length of the monetary easing, we first investigate whether such association between monetary conditions and banks risk taking could be detected. Furthermore we differentiate the well capitalized, the adequately capitalized and the undercapitalized bank and investigate whether bank specific capital characteristics influences banks behaviour following a long period of low rates. Our results show that in the pre-crisis period, a longer period of negative real rates is associated with bank asset expansion translated into higher liquidity creation and higher loan growth ratio, and with bank risk shifting toward riskier assets translated into higher proportion of 100%RWA and commercial real estate loans and lower proportion of liquidity and risk free assets. For the post-crisis period, a longer period of low rates is no more associated with an increase in risk taking, however the materialization of risk reflected in higher non-performing loans, loan loss reserves and provisions is detected. Furthermore concerning bank specific capital characteristics, a longer period of low policy rates impact more intensely the risk taking for both adequately and undercapitalized banks during the period that preceded the breach of the capital regulation. However, for the undercapitalized banks, looking at the period that follow the event of undercapitalization these banks do not retrench from risk taking, quite the opposite they gamble for resurrection and a longer period of low rates continue to be associated with an increase in risk taking. For the adequately capitalized banks, in the period that follows the breach of the capital

constraint these banks also continue to take risk following a longer period of low policy rates but at a much lower trend compared to the other well-capitalized banks.

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Table 1 **Descriptive statistics over the period Q1 2001 – Q4 2010**

<i>Variable</i>	<i>Mean</i>	<i>Median</i>	<i>Maximum</i>	<i>Min</i>	<i>Std.Dev.</i>	<i>Observations</i>
<i>TA (th.\$)</i>	1,284,818	127,951	1,790,000,000	25,065	23,826,753	289,242
<i>Deposits/TA</i>	82.37	84.02	91.93	41.99	7.33	280,812
<i>TLTA</i>	64.44	66.74	89.48	11.05	14.78	286,167
<i>EQTA</i>	10.67	9.73	32.33	6.40	3.42	280,513
<i>ROA</i>	0.22	0.24	0.64	-0.68	0.19	274,624
<i>ROE</i>	5.52	4.94	19.68	-12.60	5.07	275,594
<i>TII</i>	88.89	90.18	99.13	52.50	6.79	280,613
<i>0%RWA</i>	3.42	2.01	21.39	0.00	3.76	275,977
<i>100%RWA</i>	53.57	54.52	84.94	15.17	15.32	278,747
<i>RWA</i>	67.72	68.71	97.46	17.62	10.92	262,030
<i>LIQUIDITY</i>	26.99	24.58	99.61	0.00	14.99	294,397
<i>CRELOANS</i>	15.34	13.40	89.51	0.00	11.10	290,395
<i>LLR</i>	1.38	1.26	3.50	0.53	0.52	274,958
<i>LLP</i>	0.12	0.05	1.03	-0.02	0.21	288,911
<i>NPL</i>	1.14	0.66	7.29	0.00	1.35	286,865
<i>LC_ON</i>	26.22	27.64	95.36	-96.58	17.83	289,235
<i>LC_OFF</i>	6.63	5.40	251.92	-10.12	7.05	289,235
<i>LC_ALL</i>	32.85	33.64	313.12	-94.49	21.18	289,235
<i>QUARTER_NEGATIVE</i>	4.97	4.00	12.00	0.00	3.52	294,500
<i>REAL</i>	-0.04	0.00	3.31	-3.36	1.53	294,500
<i>GDP_GROWTH</i>	1.71	2.26	4.14	-4.11	1.94	294,500

All variables are in % except for TA

TA= total assets in thousands of \$; Deposits/TA= deposits/total assets; TLTA= total loans and leases over total assets; EQTA= equity over total assets; ROA= net income over total assets; ROE= net income over total equity; TII= total interest income over total income; 0%RWA= total assets 0% risk weighted over total assets; 100%RWA= total assets 100% risk weighted over total assets; RWA= (0% total assets 0% risk weighted+20%* total assets 20% risk weighted+50%* total assets 50% risk weighted+100%* total assets 100% risk weighted) over total assets; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year*

Table 2 Correlation matrixes

Correlation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 0% <i>RWA</i>	1.00																	
2 100% <i>RWA</i>	-0.20	1.00																
3 <i>RWA</i>	-0.31	0.96	1.00															
4 <i>CRELOANS</i>	-0.06	0.52	0.51	1.00														
5 <i>LIQUIDITY</i>	0.25	-0.72	-0.81	-0.45	1.00													
6 <i>NPL</i>	0.09	0.06	0.05	0.04	-0.04	1.00												
7 <i>LLR</i>	0.10	0.00	-0.05	-0.03	0.14	0.34	1.00											
8 <i>LLP</i>	0.07	0.14	0.13	0.10	-0.11	0.40	0.30	1.00										
9 <i>LC_ON</i>	-0.14	0.80	0.79	0.55	-0.76	-0.03	-0.10	0.06	1.00									
10 <i>LC_OFF</i>	-0.06	0.38	0.34	0.18	-0.30	-0.13	-0.04	-0.01	0.45	1.00								
11 <i>LC_ALL</i>	-0.14	0.78	0.77	0.52	-0.73	-0.06	-0.10	0.05	0.97	0.66	1.00							
12 <i>LOANG</i>	-0.12	0.26	0.26	0.20	-0.24	-0.26	-0.25	-0.09	0.28	0.21	0.30	1.00						
13 <i>QUARTER_NEGATIVE</i>	-0.02	0.02	0.03	0.04	-0.01	-0.08	-0.01	-0.08	0.05	0.04	0.06	0.04	1.00					
14 <i>SIZE</i>	0.05	0.15	0.14	0.27	-0.14	0.01	-0.02	0.12	0.22	0.41	0.30	0.09	0.03	1.00				
15 <i>EQ_TA</i>	0.02	-0.16	-0.19	-0.13	0.21	0.04	0.16	-0.02	-0.33	-0.12	-0.31	-0.08	0.01	-0.14	1.00			
16 <i>INEFFICIENCY</i>	0.04	-0.01	0.00	0.05	-0.06	0.16	-0.01	0.09	-0.05	-0.08	-0.06	0.03	-0.12	-0.14	-0.10	1.00		
17 <i>NII</i>	0.09	-0.05	-0.07	-0.01	0.03	-0.02	0.02	0.02	0.08	0.20	0.12	-0.02	0.06	0.26	-0.08	-0.13	1.00	
18 <i>GDP_GROWTH</i>	-0.05	-0.03	-0.03	-0.02	0.02	-0.23	-0.06	-0.24	0.05	0.09	0.07	0.09	0.43	-0.03	-0.02	-0.17	0.05	1.00

0%*RWA*= total assets 0% risk weighted over total assets; 100%*RWA*= total assets 100% risk weighted over total assets; *RWA*= (0%* total assets 0% risk weighted+20%* total assets 20% risk weighted+50%* total assets 50% risk weighted+100%* total assets 100% risk weighted) over total assets; *CRELOANS*=Commercial real estate loans/total assets; *LIQUIDITY*= (Cash, due from depository institutions and securities)/ total assets; *NPL*= (loans past due 90 days + non accrual loans) / total loans and leases; *LLP*= provision for allowance for loan and lease losses / total loans and leases; *LLR*= allowance for loan and lease losses / total loans and leases; *LC_ON*= bank' on balance sheet liquidity creation/ total assets; *LC_OFF*= bank' off balance liquidity creation/ total assets; *LC_ALL*= bank' liquidity creation/ total ; *LOANG*=Quarterly growth rate of total loans; *QUARTER_NEGATIVE*= number of quarters in the previous 3 years during which the real federal rate is negative; *SIZE*= log of total assets; *EQ_TA*= equity over total assets; *INEFFICIENCY*=Total expenses over total income; *NII*= non interest income over total income; *gdp_growth*= Growth rate of the Gross Domestic Product compared to the same quarter of previous year.

Figure 1 Aggregate mean of risk weighted assets categories (respectively 0%RWA; 100%RWA and RWA)

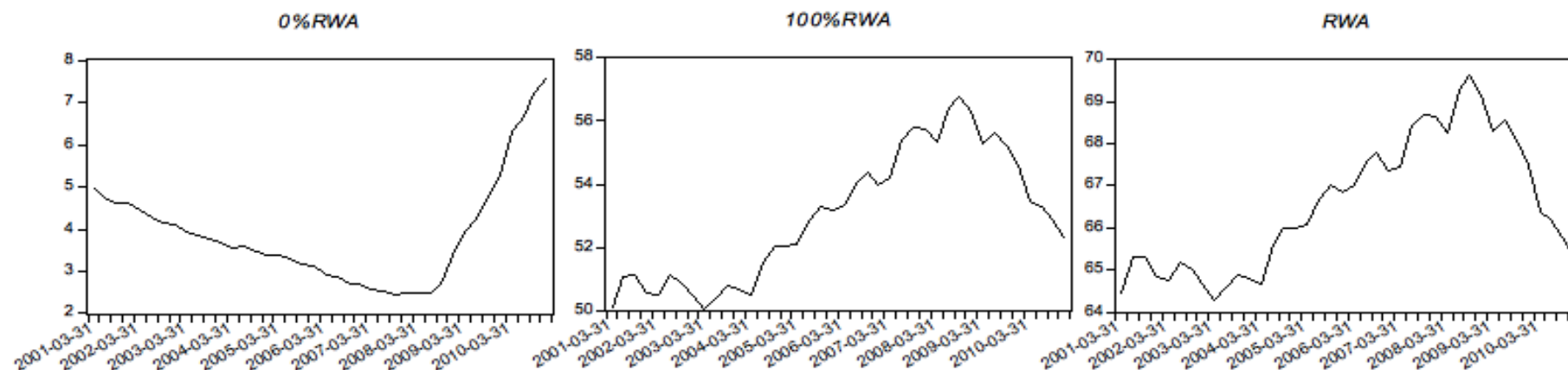


Figure 2 Aggregate mean of bank' loans portfolio riskiness respectively NPL, LLR and LLP

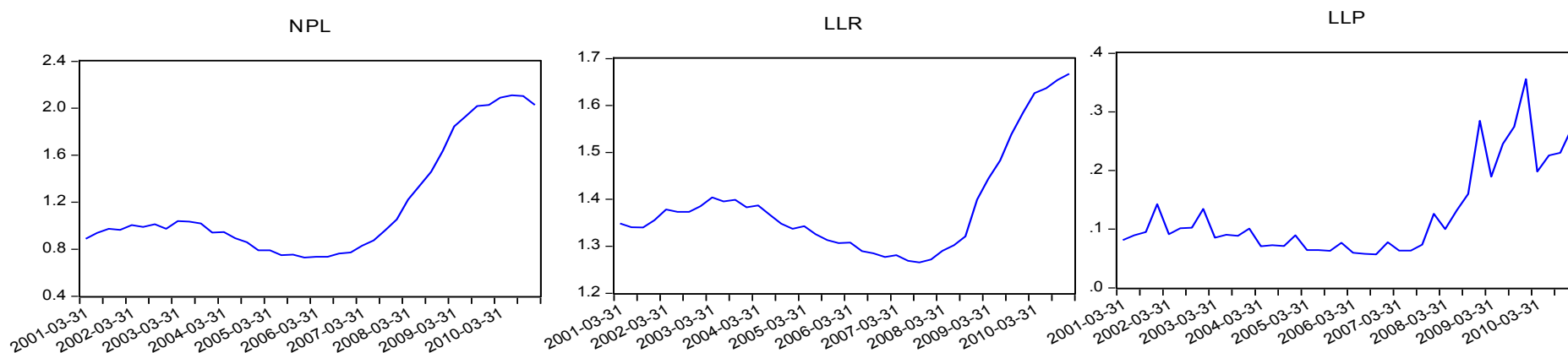


Figure 3 *Aggregate mean of liquid assets, semi liquid assets, illiquid assets and liquidity creation over total assets*

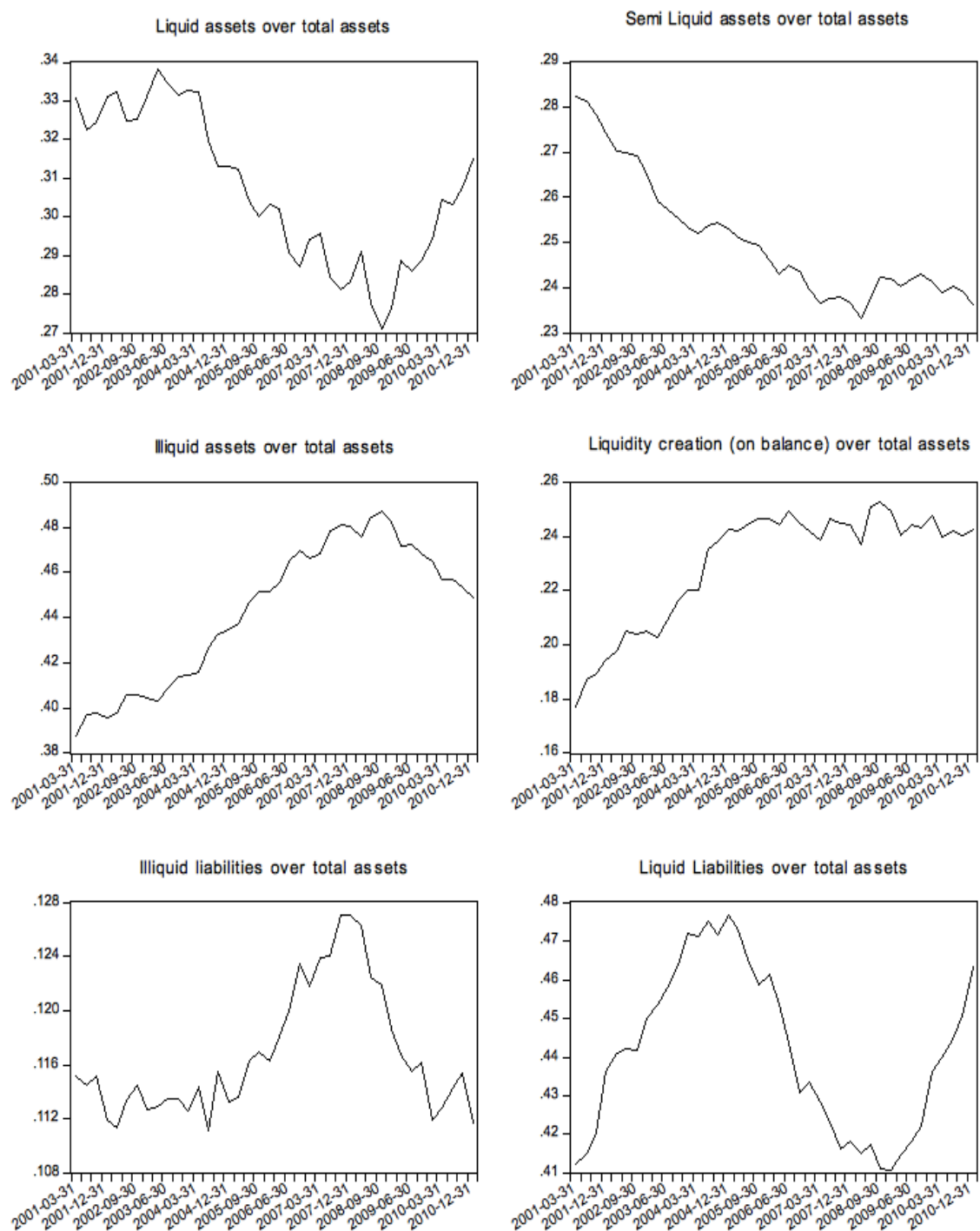


Figure 4 *The evolution of the real federal fund rate during the period 1990/2010*

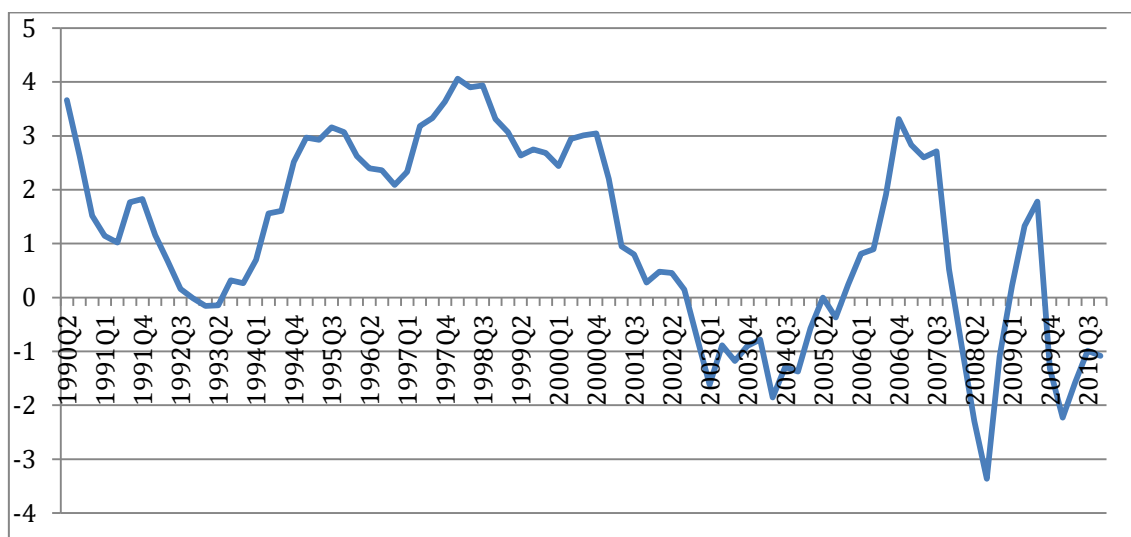
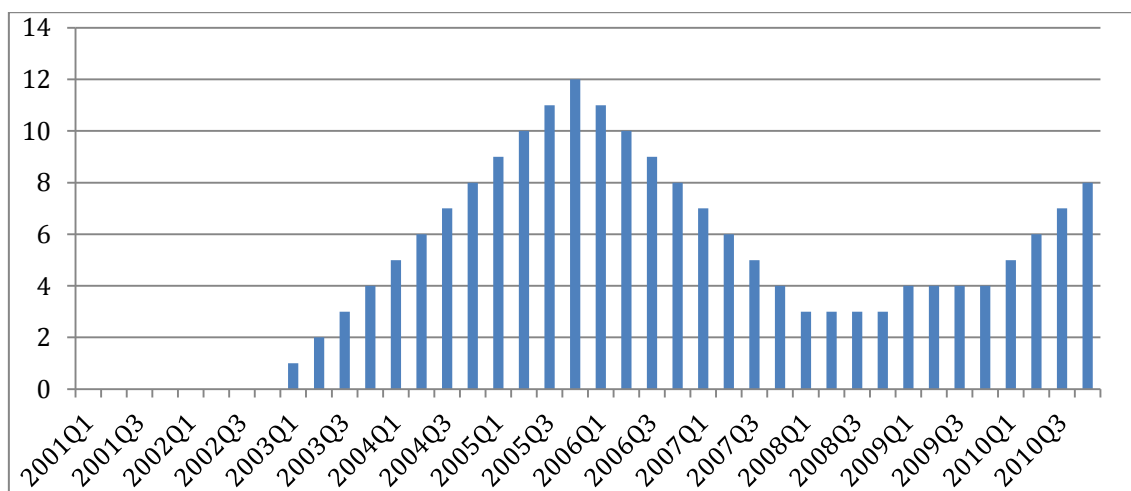


Figure 5 *The number of quarters in the last 3 years during which the real federal rate is negative*



Appendix 1 Composition of risk weighted assets by categories as presented in the bank' quarterly call reports according the FED law.

Total assets 0% risk weighted (rcfd5320)

- Risk weight categories: cash-on-hand, including the amount of domestic and foreign currency owned and held or in transit in all offices of the thrift.
- Securities backed by full faith and credit of U.S. government: includes the amount of securities issued by and other direct claims on: (1) the U.S. Government or its agencies to the extent such securities or claims are unconditionally backed by the full faith and credit of the U.S. Government; or (2) the central government of an Organization of Economic Cooperation and Development (OECD) country
- Notes and obligation of FDIC, including covered assets: Report notes and obligations of the FDIC that have the unconditional backing by the full faith and credit of the U.S. Government. Include the portion of assets fully covered against capital loss and/or yield maintenance agreements by the FDIC. Place that portion of assets without FDIC coverage (for example, those included in a deductible) in a risk-weight category according to the characteristics of the asset
- FSLIC covered assets: Also includes all investments in subsidiaries and/or equity investments that are covered by FSLIC
- Others: Includes all zero-percent risk-weight assets not included above. Also includes deposit reserves at, claims on, and balances due from Federal Reserve Banks, excluding interest rate contracts; the book value of paid-in Federal Reserve Bank stock; and that portion of assets not included elsewhere in the 0% risk-weight category directly and unconditionally guaranteed by the U.S. Government or its agencies, or the central government of an OECD country.

Total assets 20% risk weighted (rcfd5327)

- Interest-bearing balances due from depository institutions - 20%
- Held to maturity securities - 20%,
- Available for sale securities - 20%
- Federal fund sold and securities purchased under agreements to resell - 20%
- Loans and leases held for sale - 20%
- Loans and leases, net of unearned income - 20%
- Trading assets - 20%
- Other assets – 20%

Total assets 50% risk weighted (rcfd5334)

- Held to maturity securities - 50%
- Available for sale securities - 50%
- Loans and leases held for sale - 50%
- Loans and leases, net of unearned income - 50%
- Trading assets - 50%
- Other assets - 50%

Total assets 100% risk weighted (rcfd5340)

- Interest bearing balances due from depository institutions - 100%
- Held to maturity securities - 100%
- Available for sale securities - 100%
- Federal fund sold and securities purchased under agreements to resell - 100%
- Loans and leases held for sale - 100%
- Loans and leases, net of unearned income - 100%
- Trading assets - 100%
- Other assets - 100%

Appendix 2 Summary of the main empirical studies investigating the RTC

Study	Monetary policy measure	Risk measure proxy	Econometric methodology	Country	Period	Results
Delis and Kouretas (2010)	<ul style="list-style-type: none"> - Annual average of the three months interbank rate - Annual average of 10 years government bond yield - Bank level rate (interest income to total customer loans) 	<ul style="list-style-type: none"> - Risk assets to total assets (total assets except cash, government securities and balances due from other banks) - Non performing loans to total loans 	Panel regressions using instrumental variables and GMM estimators	16 euro area countries	annual data over the period 2001-2008	Negative relation between bank risk and interest rates
Delis, Hassan and Nikolaos (2012)	<ul style="list-style-type: none"> - Lag 1, lag5, lag9 and lag13 of Δ federal funds, Δ federal funds rate is the change over the previous quarter of the real federal funds rate (federal funds rate minus the CPI inflation rate) - Lag 1, lag5, lag9 and lag13 of Monetary policy shock The measure of unanticipated monetary policy shocks, constructed using the methodology proposed by Romer and Romer (2004) 	<ul style="list-style-type: none"> - The change over the previous year (four quarters) of the ratio of risky assets calculated as total assets minus cash and short-term securities) - The Z-index $(\text{roa} + \text{ea}) / \sigma(\text{roa})$, where roa is the ratio of the return on assets (i.e. profits before tax over total assets), ea is the ratio of total equity to total assets and $\sigma(\text{roa})$ is the variance of roa over 12 quarters - Spread over LIBOR: Describes the amount the borrower pays in basis points over LIBOR for each dollar drawn down. It adds the spread of the loan with any annual (or facility) fee paid to the bank group. The variable is calculated for each syndicated loan. Data are from Dealscan 	Panel regressions using fixed effects and OLS estimator with robust standard estimator	U.S. banks	Quarterly data over the period 1985q1-2010q2 Robustness for the period 2001Q3/2010Q2 And 2001q3-2005q4	Low policy rates decrease the riskiness of banks' overall loan portfolios in the short term (lag1 and lag5), and then significantly increase it in the medium term(lag9 and lag 13).
De Nicolò, Dell'Ariccia, Laeven and Valencia (2010)	The real federal funds rate	<ul style="list-style-type: none"> - Risk-weighted assets to total assets (from call reports) - The weighted average risk rating and (from the U.S. Terms of Business Lending Survey) - The weighted average relative spread over the effective federal funds rate (from the U.S. Terms 	Least squares (OLS) regressions	U.S. banks	Quarterly data over the period 1997–2008	Monetary policy easing will increase risk taking, but less so for poorly capitalized banks

Gambacorta (2009)	- Number of consecutive quarters with interest rate below both the natural rate and the rate implied by a Taylor rule in the six years prior to the crisis	of Business Lending Survey Δ EDF (variation of the expected default frequency) during the crisis period (Q2 2007–Q4 2008)	Cross section, OLS	600 listed banks operating in the European Union and the United States	The model relates the change in the riskiness of a given bank during the crisis period (Q2 2007–Q4 2008) to the macroeconomic conditions and bank-specific characteristics over the six years prior to the crisis (Q2 2001–Q2 2007)	- Positive and significant link between the number of consecutive quarters in which interest rates have been below the benchmark and changes in the EDF of individual banks
Ioannidou, Ongena and Peydrò (2009)	Simultaneously: - US federal funds rate in the month prior to loan origination - US federal funds rate during the life of the loan until default or repayment	Loan level information and detailed information, on a monthly basis on all outstanding loans granted by any bank operating in the country - Loan default normalized per unit of period (hazard rate, the time to default of an individual loan as a measure of its risk) - Internal credit ratings of past borrower non performance: the probability of initiating new loans to borrowers with a subprime rating and credit history problems 1. A dummy Current NPL τ –1 that equals one if any of the borrower's outstanding loans in the month prior to the loan initiation is nonperforming, and	Duration models, Probit and OLS estimations.	Bolivia (dollarized country)	Monthly loan level data over 1999/2003	- A decrease in the US federal funds rate prior to loan origination raises the hazard rate on the individual bank loans - In pointed contrast, a decrease in the federal funds rate over the life of the loan lowers the hazard rate). - Loans with a subprime credit rating or loans to riskier borrowers with current or past non-performance also becomes more likely when the federal funds rate is low, but banks do not seem to price this additional risk. In pointed contrast, a

		<p>equals zero otherwise,</p> <p>2. A dummy Past Default $\tau - 1$ that equals one if in the month prior to the loan initiation the borrower has a prior loan default (i.e., if it has ever defaulted on a loan in the past) and equals zero otherwise</p> <p>3. a dummy Subprime that equals one if the bank's own internal credit rating indicated that at the time of loan origination the borrower had financial weaknesses that rendered the loan repayment doubtful and, therefore, was subprime</p> <p>4. Time to default equals the actual time to default or in case of repayment set equal to 96, in months</p>				decrease in the federal funds rate over the life of the loan lowers the hazard rate.
Yener Altunbas, Leonardo Gambacorta and David MarquesIbanez (2010)	<p>- Simultaneously the change in the short-term nominal federal rate (ΔMP) and the deviation from the Taylor rule rate</p> <p>- In addition, one lag of the previous variables has been introduced</p>	- Quarterly changes in EDF (expected default frequency) an indicator of bank riskiness	Panel regressions using the GMM estimators	Quarterly balance sheet information for listed banks operating in the European Union and the United States	Q1 1999 – Q4 2008	- The effects of changes in the short-term monetary policy rate on banks' risk are positive. The overall quality of a loan portfolio indeed increases (banks' EDFs decrease) if interest rates are lowered.

Appendix 3 *Liquidity classification of bank activities according to Berger and Bouwman*

	Assets	Liabilities plus equity	Derivatives and off balance sheet items
Liquid	Cash and balances due from depository institutions	Transaction deposit	Net participation acquired
	Securities	Savings deposit	Interest rate derivatives
	Fed funds sold	Overnight federal funds purchased	Foreign exchange derivatives
	Trading Assets	Trading liabilities	Equity and commodity derivatives
	(weight = -1/2)	(weight = 1/2)	(weight = -1/2)
Semi liquid (weight=0)	Residential real estate loans	Time deposit	Net credit derivatives
	Consumer loans	Other borrowed money	Net securities lent
	Loans to depository institution		
	Loans to state and local government		
	Loans to foreign governments		
Illiquid	Loans to non-depository financial institutions		
	Other real estate owned	Subordinated debt	Unused commitments
	Premises and fixed assets	Other liability	Financial standby letter of credit
	Investment in unconsolidated subsidiaries	Equity	Performance standby letter of credit
	Intangible assets (Goodwill + other intangible assets)	(weight = -1/2)	Commercial and similar letter of credit
	Other assets		All other off balance sheet liabilities
	Other loans and lease financing receivables		(weight = 1/2)
	Loans to finance agriculture production		
	Loans to finance C&I loans		
	Construction land development and other loans		
	Real estate loans secured by farmland		
	Real estate loans secured by nonfarm non residential properties		
	(weight = 1/2)		

Appendix 4A Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4A: The effect of too low for too long real rates calculated on the basis of the previous 16 quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE16. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; $RWA = [0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20\% \times (\text{total assets } 20\% \text{ risk weighted}) + 50\% \times (\text{total assets } 50\% \text{ risk weighted}) + 100\% \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; QUARTER_NEGATIVE16= number of quarters in the previous 4 years (16 quarters) during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	4.6708 [7,07]***	30.3834 [13,37]***	60.1985 [33,88]***	51.4953 [18,57]***	6.3142 [3,80]***	-4.5421 [-20,10]***	1.9773 [23,96]***	-0.3034 [-7,83]***	63.7624 [23,36]***	10.3636 [6,08]***	74.1259 [21,00]***	71.9222 [17,97]***
QUARTER_NEGATIVE16	-0.1239 [-77,30]***	0.3138 [68,75]***	0.2728 [75,47]***	-0.2716 [-55,80]***	0.2143 [76,90]***	-0.0253 [-39,65]***	-0.0075 [-34,66]***	-0.0041 [-39,85]***	0.2954 [60,01]***	0.0637 [22,93]***	0.3591 [58,33]***	0.0991 [13,47]***
SIZE(t-1)	-0.0452 [-1,35]	1.3702 [11,88]***	0.5901 [6,65]***	-1.3603 [-9,99]***	0.4467 [5,37]***	0.2946 [25,20]***	-0.038 [-8,97]***	0.0215 [10,78]***	-1.6682 [-12,19]***	-0.2055 [-2,37]**	-1.8736 [-10,38]***	-3.3906 [-16,41]***
EQ_TA(t-1)	-0.0198 [-4,90]***	0.0042 [0,32]	-0.1035 [-9,46]***	-0.1067 [-7,05]***	-0.0645 [-6,95]***	-0.0027 [-1,98]**	0.0079 [15,03]***	0.0005 [1,76]*	-0.5418 [-34,22]***	0.0428 [3,96]***	-0.4991 [-24,85]***	-0.3313 [-13,49]***
INEFFICIENCY(t-1)	0.0022 [2,49]**	-0.04 [-13,86]***	-0.0354 [-13,06]***	0.0225 [4,48]***	-0.0115 [-4,45]***	0.001 [5,00]***	-0.0004 [-4,84]***	0.0001 [2,62]***	-0.0387 [-9,80]***	-0.0058 [-3,18]***	-0.0445 [-13,15]***	0.0185 [3,51]***
NNI(t-1)	-0.0023 [-1,62]	-0.0764 [-8,82]***	-0.0648 [-9,06]***	0.0528 [8,35]***	0.0024 [0,64]	0.0028 [4,33]***	0.0027 [5,59]***	-0.0004 [-3,31]***	0.0362 [2,59]***	0.0083 [1,89]*	0.0446 [2,61]***	0.02 [2,00]**
GDP_GROWTH(t-1)	0.0512 [8,53]***	-0.4521 [-24,40]***	-0.3871 [-25,74]***	0.778 [45,31]***	0.1115 [10,22]***	-0.0121 [-5,21]***	0.0166 [18,34]***	-0.0014 [-3,72]***	0.4093 [18,11]***	0.0276 [3,14]***	0.4369 [16,39]***	0.4144 [14,05]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.71	0.89	0.87	0.89	0.91	0.55	0.76	0.29	0.91	0.88	0.92	0.46
F-statistic:	45.53	150.82	122.33	154.95	193.05	23.73	61.42	7.86	209.36	141.49	221.97	14.61
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 4B Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4B: The effect of too low for too long real rates calculated on the basis of the previous 20 quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE20. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; $RWA = [0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20\% \times (\text{total assets } 20\% \text{ risk weighted}) + 50\% \times (\text{total assets } 50\% \text{ risk weighted}) + 100\% \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; QUARTER_NEGATIVE20= number of quarters in the previous 5 years (20 quarters) during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep, Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	3.2018 [4,75]***	34.2658 [14,89]***	63.4102 [35,06]***	48.4002 [17,05]***	8.2807 [4,90]***	-4.5453 [-19,84]***	1.9142 [22,95]***	-0.3509 [-8,89]***	65.7382 [23,66]***	10.5636 [6,10]***	76.3017 [21,27]***	69.7477 [17,20]***
QUARTER_NEGATIVE20	-0.1227 [-78,70]***	0.3112 [69,88]***	0.2695 [76,25]***	-0.2683 [-55,86]***	0.2095 [76,66]***	-0.0237 [-37,88]***	-0.0073 [-34,45]***	-0.0041 [-40,78]***	0.2853 [59,11]***	0.0605 [21,92]***	0.3458 [57,15]***	0.0844 [11,80]***
SIZE(t-1)	0.0337 [0,99]	1.1621 [9,96]***	0.4182 [4,63]***	-1.1937 [-8,57]***	0.3402 [4,03]***	0.2952 [24,90]***	-0.0346 [-8,06]***	0.0241 [11,84]***	-1.7765 [-12,76]***	-0.2169 [-2,46]**	-1.9934 [-10,87]***	-3.2775 [-15,67]***
EQ_TA(t-1)	-0.018 [-4,44]***	-0.0004 [-0,03]	-0.1072 [-9,80]***	-0.1026 [-6,76]***	-0.067 [-7,20]***	-0.0027 [-1,99]**	0.008 [15,20]***	0.0005 [1,99]**	-0.5443 [-34,32]***	0.0426 [3,94]***	-0.5018 [-24,94]***	-0.3299 [-13,42]***
INEFFICIENCY(t-1)	0.0024 [2,74]***	-0.0408 [-13,88]***	-0.0361 [-13,02]***	0.023 [4,51]***	-0.0118 [-4,49]***	0.001 [5,01]***	-0.0004 [-4,80]***	0.0001 [2,75]***	-0.0392 [-9,74]***	-0.0058 [-3,23]***	-0.045 [-13,05]***	0.0187 [3,53]***
NNI(t-1)	-0.0022 [-1,55]	-0.0766 [-8,94]***	-0.065 [-9,21]***	0.0529 [8,41]***	0.0023 [0,63]	0.0028 [4,32]***	0.0027 [5,61]***	-0.0004 [-3,31]***	0.0363 [2,58]***	0.0084 [1,89]*	0.0446 [2,60]***	0.02 [2,01]**
GDP_GROWTH(t-1)	0.0321 [5,48]***	-0.4055 [-22,28]***	-0.3444 [-23,33]***	0.7356 [43,66]***	0.149 [13,83]***	-0.0185 [-8,10]***	0.0152 [17,05]***	-0.002 [-5,56]***	0.4674 [20,83]***	0.0421 [4,83]***	0.5095 [19,22]***	0.4553 [15,74]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.71	0.89	0.87	0.89	0.91	0.55	0.76	0.29	0.91	0.88	0.92	0.46
F-statistic:	45.7	151.22	122.69	155.25	193.37	23.71	61.44	7.88	209.43	141.47	222	14.6
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 4C Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4C: The effect of too low for too long real rates calculated on the basis of the previous 12 weighted quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; $RWA = [0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20\% \times (\text{total assets } 20\% \text{ risk weighted}) + 50\% \times (\text{total assets } 50\% \text{ risk weighted}) + 100\% \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; **WEIGHTED_QUARTER_NEGATIVE12= Weighted number of quarters during which the real federal rate is negative in the previous 3 years (12 quarters)**; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC ON	LC OFF	LC ALL	LOANG
C	23.4431 [42,91]***	-21.3647 [-10,70]***	14.5004 [9,62]***	100.7097 [46,81]***	-21.4804 [-15,38]***	-1.4212 [-7,77]***	3.2703 [44,56]***	0.2754 [8,80]***	32.24 [14,70]***	2.9497 [2,11]**	35.1896 [12,30]***	60.9443 [18,63]***
WEIGHTED_QUARTER_NEGATIVE12	-0.8706 [-37,11]***	1.6863 [24,33]***	1.4765 [26,66]***	-0.6658 [-10,59]***	2.1771 [54,91]***	-0.2829 [-31,66]***	-0.0323 [-10,15]***	-0.0355 [-23,02]***	4.0175 [57,90]***	0.7748 [24,89]***	4.7923 [58,33]***	2.0782 [19,68]***
SIZE (t-1)	-1.038 [-37,68]***	4.0998 [40,43]***	2.9977 [39,58]***	-3.946 [-37,50]***	1.9303 [27,26]***	0.1275 [13,55]***	-0.1062 [-29,02]***	-0.0092 [-5,77]***	0.0343 [0,31]	0.1928 [2,75]***	0.2271 [1,55]	-2.8235 [-16,74]***
EQ_TA (t-1)	-0.0446 [-11,09]***	0.0675 [4,99]***	-0.0493 [-4,46]***	-0.1739 [-11,89]***	-0.0274 [-3,04]***	-0.0068 [-5,06]***	0.0063 [11,54]***	-0.0003 [-1,26]	-0.5005 [-32,64]***	0.0526 [4,89]***	-0.4479 [-22,89]***	-0.3159 [-12,94]***
INEFFICIENCY (t-1)	-0.0002 [-0,22]	-0.0332 [-13,30]***	-0.0288 [-12,89]***	0.0177 [4,12]***	-0.0079 [-3,94]***	0.0006 [4,21]***	-0.0005 [-5,13]***	0 [1,00]	-0.0341 [-10,79]***	-0.0048 [-2,47]**	-0.0388 [-14,49]***	0.0286 [5,48]***
NNI(t-1)	0.0014 [1,04]	-0.0812 [-7,44]***	-0.0691 [-7,38]***	0.052 [7,39]***	-0.0091 [-3,22]***	0.0044 [4,79]***	0.0028 [5,21]***	-0.0002 [-1,59]	0.0129 [1,33]	0.004 [1,02]	0.0169 [1,41]	0.0097 [1,12]
GDP_GROWTH (t-1)	0.0343 [4,21]***	-0.2758 [-12,56]***	-0.2393 [-13,65]***	0.4201 [20,20]***	-0.0291 [-2,18]**	0.0111 [3,74]***	0.0105 [10,49]***	-0.0004 [-0,71]	-0.0448 [-2,00]**	-0.0468 [-4,70]***	-0.0916 [-3,54]***	0.0558 [1,52]
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.7	0.88	0.86	0.88	0.91	0.55	0.76	0.28	0.91	0.88	0.92	0.46
F-statistic:	43.37	145.51	116.85	149.99	188.07	23.49	60.7	7.64	207.83	141.11	220	14.66
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 4D Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4D: The effect of too low for too long real rates calculated on the basis of the previous 16 weighted quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; RWA= $[0*(\text{total assets } 0\% \text{ risk weighted}) + 20%*(\text{total assets } 20\% \text{ risk weighted}) + 50%*(\text{total assets } 50\% \text{ risk weighted}) + 100%*(\text{total assets } 100\% \text{ risk weighted})]/\text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; **WEIGHTED_QUARTER_NEGATIVE16= Weighted number of quarter during which the real federal rate is negative in the previous 4 years (16 quarters)**; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	15.9417 [27,33]***	-1.6025 [-0,76]	31.9416 [19,89]***	83.6058 [35,55]***	-8.5858 [-5,79]***	-3.0063 [-15,05]***	2.7903 [35,80]***	0.0225 [0,65]	50.0319 [20,82]***	6.8996 [4,56]***	56.9315 [18,20]***	70.7393 [19,86]***
WEIGHTED_QUARTER_NEGATIVE16	-1.4696 [-57,21]***	3.3878 [46,09]***	2.9536 [50,91]***	-2.3826 [-33,57]***	3.034 [70,53]***	-0.3838 [-38,95]***	-0.0757 [-22,28]***	-0.0542 [-32,31]***	4.9353 [65,03]***	1.0091 [27,04]***	5.9444 [64,62]***	2.2533 [19,35]***
SIZE(t-1)	-0.6461 [-21,93]***	3.0706 [28,64]***	2.0899 [25,94]***	-3.0608 [-26,53]***	1.2512 [16,70]***	0.2111 [20,50]***	-0.0812 [-20,72]***	0.004 [2,29]**	-0.9097 [-7,54]***	-0.016 [-0,21]	-0.9257 [-5,80]***	-3.3301 [-18,10]***
EQ_TA(t-1)	-0.0345 [-8,58]***	0.0425 [3,15]***	-0.0708 [-6,43]***	-0.1502 [-10,19]***	-0.0448 [-4,93]***	-0.0047 [-3,47]***	0.0069 [12,79]***	0 [0,08]	-0.5242 [-33,72]***	0.0473 [4,39]***	-0.4769 [-24,13]***	-0.3266 [-13,34]***
INEFFICIENCY(t-1)	0.0005 [0,69]	-0.0352 [-13,51]***	-0.0307 [-12,98]***	0.0189 [4,25]***	-0.0092 [-4,21]***	0.0007 [4,68]***	-0.0005 [-5,02]***	0.0001 [1,65]*	-0.0361 [-10,42]***	-0.0052 [-2,75]***	-0.0413 [-14,10]***	0.0235 [4,53]***
NNI(t-1)	0.0023 [1,69]*	-0.0859 [-7,74]***	-0.0731 [-7,69]***	0.0589 [7,65]***	-0.0081 [-2,89]***	0.0042 [4,93]***	0.003 [5,41]***	-0.0002 [-1,59]	0.0181 [1,67]*	0.0047 [1,18]	0.0228 [1,72]*	0.0127 [1,39]
GDP_GROWTH(t-1)	0.116 [15,47]***	-0.5458 [-25,44]***	-0.4717 [-27,22]***	0.7444 [36,92]***	-0.1017 [-8,14]***	0.0183 [6,53]***	0.0179 [18,01]***	0.0018 [3,92]***	-0.0409 [-1,87]*	-0.058 [-5,99]***	-0.0989 [-3,88]***	0.1282 [3,70]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.7	0.89	0.87	0.89	0.91	0.55	0.76	0.28	0.91	0.88	0.92	0.46
F-statistic:	44.19	147.3	118.71	151.26	190.62	23.65	60.93	7.74	209.44	141.4	221.92	14.66
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 4E Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4E: The effect of too low for too long real rates calculated on the basis of the previous 20 weighted quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and WEIGHTED_QUARTER_NEGATIVE20. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; RWA= $[0*(\text{total assets } 0\% \text{ risk weighted}) + 20*(\text{total assets } 20\% \text{ risk weighted}) + 50*(\text{total assets } 50\% \text{ risk weighted}) + 100*(\text{total assets } 100\% \text{ risk weighted})]/\text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; **WEIGHTED_QUARTER_NEGATIVE20= Weighted number of quarter during which the real federal rate is negative in the previous 5 years (20 quarters)**; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	10.7741 [17,55]***	12.2956 [5,63]***	44.1429 [26,36]***	70.8488 [28,17]***	-0.7333 [-0,47]	-3.8295 [-18,12]***	2.4562 [30,53]***	-0.1393 [-3,82]***	59.2865 [23,24]***	8.9391 [5,60]***	68.2256 [20,59]***	73.6193 [19,58]***
WEIGHTED_QUARTER_NEGATIVE20	-1.8692 [-66,98]***	4.4892 [56,86]***	3.9016 [62,75]***	-3.4786 [-43,70]***	3.5789 [76,32]***	-0.4353 [-40,22]***	-0.1025 [-27,80]***	-0.0661 [-36,44]***	5.4648 [65,75]***	1.1323 [26,00]***	6.5971 [64,46]***	2.22 [17,51]***
SIZE(t-1)	-0.3733 [-12,03]***	2.3383 [21,10]***	1.4477 [17,25]***	-2.3908 [-19,37]***	0.8333 [10,66]***	0.2552 [23,39]***	-0.0636 [-15,61]***	0.0126 [6,74]***	-1.4071 [-11,00]***	-0.1253 [-1,55]	-1.5324 [-9,06]***	-3.4783 [-17,91]***
EQ_TA(t-1)	-0.0276 [-6,87]***	0.0254 [1,89]*	-0.0854 [-7,78]***	-0.1327 [-8,93]***	-0.0554 [-6,04]***	-0.0036 [-2,65]***	0.0073 [13,70]***	0.0002 [0,93]	-0.5365 [-34,21]***	0.0446 [4,14]***	-0.4919 [-24,71]***	-0.3311 [-13,50]***
INEFFICIENCY(t-1)	0.0012 [1,45]	-0.037 [-13,67]***	-0.0325 [-13,04]***	0.0201 [4,35]***	-0.0102 [-4,35]***	0.0008 [4,88]***	-0.0005 [-4,95]***	0.0001 [2,10]**	-0.0374 [-10,16]***	-0.0055 [-2,95]***	-0.0429 [-13,73]***	0.0207 [3,98]***
NNI(t-1)	0.0018 [1,40]	-0.0856 [-8,05]***	-0.0728 [-8,06]***	0.0596 [7,89]***	-0.006 [-2,09]**	0.0039 [4,91]***	0.0029 [5,51]***	-0.0003 [-1,86]*	0.0227 [1,94]*	0.0056 [1,37]	0.0283 [1,98]**	0.015 [1,58]
GDP_GROWTH(t-1)	0.1269 [18,16]***	-0.6016 [-28,79]***	-0.5175 [-30,48]***	0.8385 [42,83]***	-0.0775 [-6,48]***	0.0123 [4,60]***	0.0195 [19,89]***	0.0018 [4,03]***	0.0589 [2,69]***	-0.0401 [-4,20]***	0.0189 [0,74]	0.226 [6,87]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.7	0.89	0.87	0.89	0.91	0.55	0.76	0.29	0.92	0.88	0.92	0.46
F-statistic:	44.77	148.69	120.13	152.49	192.07	23.71	61.11	7.8	209.99	141.5	222.57	14.64
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 4F Robustness checks: regressions using alternative variable reflecting the loosening of monetary policy

Table 4F: The effect of too low for too long real rates calculated on the basis of the previous 24 weighted quarters on banks riskiness, over the period 2001Q1/2007Q2 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; RWA= [0*(total assets 0% risk weighted)+20%*(total assets 20% risk weighted)+50%*(total assets 50% risk weighted)+100%*(total assets 100% risk weighted)]/total assets; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; **WEIGHTED_QUARTER_NEGATIVE24= Weighted number of quarter during which the real federal rate is negative in the previous 6 years (24 quarters)**; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	8.3016 [13,16]***	19.1661 [8,64]***	50.1758 [29,31]***	64.2482 [24,67]***	2.6799 [1,68]*	-4.1541 [-19,14]***	2.2894 [28,08]***	-0.2132 [-5,70]***	62.7444 [23,91]***	9.7246 [5,94]***	72.469 [21,30]***	73.8866 [19,17]***
WEIGHTED_QUARTER_NEGATIVE24	-2.1485 [-71,04]***	5.2462 [61,41]***	4.5545 [67,65]***	-4.2069 [-47,82]***	3.9809 [77,81]***	-0.4748 [-40,17]***	-0.1207 [-30,10]***	-0.0746 [-38,08]***	5.8983 [65,02]***	1.2292 [25,11]***	7.1275 [63,39]***	2.2377 [16,25]***
SIZE(t-1)	-0.2418 [-7,58]***	1.9737 [17,53]***	1.128 [13,16]***	-2.0416 [-15,97]***	0.6498 [8,13]***	0.2728 [24,33]***	-0.0548 [-13,20]***	0.0166 [8,61]***	-1.596 [-12,13]***	-0.1681 [-2,02]**	-1.7641 [-10,15]***	-3.4918 [-17,54]***
EQ_TA(t-1)	-0.0244 [-6,06]***	0.0171 [1,27]	-0.0924 [-8,43]***	-0.1238 [-8,28]***	-0.0599 [-6,51]***	-0.0032 [-2,34]**	0.0076 [14,16]***	0.0003 [1,31]	-0.541 [-34,36]***	0.0436 [4,04]***	-0.4974 [-24,90]***	-0.3322 [-13,54]***
INEFFICIENCY(t-1)	0.0015 [1,83]*	-0.038 [-13,74]***	-0.0335 [-13,05]***	0.0209 [4,40]***	-0.0107 [-4,41]***	0.0009 [4,94]***	-0.0004 [-4,91]***	0.0001 [2,31]**	-0.038 [-10,03]***	-0.0056 [-3,04]***	-0.0436 [-13,53]***	0.0196 [3,77]***
NNI(t-1)	0.0011 [0,89]	-0.0843 [-8,25]***	-0.0717 [-8,31]***	0.0589 [8,03]***	-0.0043 [-1,44]	0.0036 [4,84]***	0.0029 [5,55]***	-0.0003 [-2,13]**	0.0259 [2,10]**	0.0062 [1,49]	0.0321 [2,13]**	0.0163 [1,69]*
GDP_GROWTH(t-1)	0.1168 [17,48]***	-0.5899 [-28,92]***	-0.5062 [-30,49]***	0.8497 [44,56]***	-0.0395 [-3,39]***	0.0063 [2,45]**	0.0193 [20,03]***	0.0012 [2,90]***	0.1427 [6,49]***	-0.0237 [-2,53]**	0.1189 [4,62]***	0.2852 [8,94]***
Observations:	171321	172759	163627	178612	178612	177674	171501	178612	178608	178608	178608	147807
R-squared:	0.7	0.89	0.87	0.89	0.91	0.55	0.76	0.29	0.92	0.88	0.92	0.46
F-statistic:	45.06	149.42	120.87	153.21	192.65	23.72	61.2	7.83	210.07	141.52	222.68	14.63
std dep var	3.39	15.16	10.78	14.63	10.73	1.06	0.47	0.14	18.26	7.19	21.92	10.57

Appendix 5A

Robustness checks: the period 2001Q1/2010Q4

Table 5A: The effect of too low for too long real rates on banks riskiness, over the period 2001Q1/2010Q4 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; $RWA = [0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20\% \times (\text{total assets } 20\% \text{ risk weighted}) + 50\% \times (\text{total assets } 50\% \text{ risk weighted}) + 100\% \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS= Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC ON	LC OFF	LC ALL	LOANG
C	-6.5803	-11.2022	29.3031	72.8047	-37.2284	-17.729	-0.9969	-2.1253	48.7693	34.0009	82.7702	145.2084
	[-12,05]***	[-8,25]***	[25,11]***	[52,78]***	[-42,40]***	[-74,79]***	[-14,13]***	[-56,59]***	[35,75]***	[39,53]***	[46,78]***	[64,76]***
QUARTER_NEGATIVE	-0.0338	0.1027	0.0901	0.0146	0.2138	-0.0148	0.0021	-0.0013	0.339	0.0575	0.3965	0.0851
	[-18,76]***	[20,77]***	[18,94]***	[3,34]***	[78,51]***	[-20,52]***	[8,73]***	[-10,19]***	[73,70]***	[22,81]***	[69,00]***	[11,60]***
SIZE (t-1)	0.5546	3.5549	2.2016	-2.4333	2.8165	0.9956	0.1211	0.1176	-0.8121	-1.4569	-2.269	-6.947
	[20,51]***	[51,90]***	[38,60]***	[-36,65]***	[62,43]***	[89,70]***	[34,93]***	[65,35]***	[-11,73]***	[-34,73]***	[-25,21]***	[-59,34]***
EQ_TA (t-1)	-0.0965	0.0646	-0.0377	-0.211	-0.0503	-0.0078	0.0011	0.0002	-0.5135	0.0433	-0.4702	-0.1772
	[-23,65]***	[6,62]***	[-4,62]***	[-20,39]***	[-7,99]***	[-4,50]***	[2,07]**	[0,79]	[-49,01]***	[5,37]***	[-34,44]***	[-10,07]***
INEFFICIENCY (t-1)	0.008	-0.0274	-0.0257	0.0208	-0.005	0.005	0.0009	0.0007	-0.0344	-0.0102	-0.0446	-0.0722
	[7,73]***	[-16,14]***	[-16,78]***	[6,33]***	[-4,75]***	[7,69]***	[6,14]***	[7,63]***	[-14,42]***	[-5,71]***	[-16,28]***	[-17,37]***
NNI (t-1)	0.0118	-0.0536	-0.0534	0.0345	-0.0076	0.0064	0.0022	0.0007	-0.0224	-0.0074	-0.0298	-0.0492
	[6,29]***	[-6,00]***	[-4,44]***	[5,32]***	[-3,50]***	[7,12]***	[9,01]***	[3,95]***	[-3,72]***	[-1,28]	[-3,04]***	[-4,24]***
GDP_GROWTH (t-1)	-0.0568	-0.2654	-0.215	0.0973	-0.2626	-0.1027	-0.0145	-0.0189	-0.0471	0.1124	0.0652	0.2218
	[-13,87]***	[-32,06]***	[-30,74]***	[10,91]***	[-52,48]***	[-59,21]***	[-26,84]***	[-61,53]***	[-5,66]***	[26,08]***	[6,59]***	[18,82]***
Observations:	259427	262072	247284	271365	271365	265731	259149	271365	271360	271360	271360	235115
R-squared:	0.48	0.85	0.81	0.84	0.88	0.41	0.57	0.27	0.88	0.8	0.88	0.34
F-statistic:	25.6	153.48	116.45	144.83	212.45	19.42	36.07	10.35	204.56	114.32	206.12	13.04
std of dep	3.694046	15.25946	10.88496	14.71143	11.07012	1.345272	0.510362	0.204458	17.43076	6.646215	20.76385	10.66018

Appendix 5B

Robustness checks: regressions on post-crisis period

Table 5B: The effect of too low for too long real rates on banks riskiness, over the period 2007Q3/2010Q4 This table show the results of panel fixed effect regressions. ***, ** and * indicate levels of significance at 10%, 5% and 1%, respectively. T-statistics are corrected for heteroskedasticity following White's methodology. All variables are in % except SIZE and QUARTER_NEGATIVE. 0%RWA is the total assets 0% risk weighted over total assets, 100%RWA is the total assets 100% risk weighted over total assets; RWA= $[0 \times (\text{total assets } 0\% \text{ risk weighted}) + 20\% \times (\text{total assets } 20\% \text{ risk weighted}) + 50\% \times (\text{total assets } 50\% \text{ risk weighted}) + 100\% \times (\text{total assets } 100\% \text{ risk weighted})] / \text{total assets}$; LIQUIDITY=The Ratio of liquid assets over total assets, liquid assets include Cash, due from depository institutions and securities; CRELOANS=Commercial real estate loans over total assets; NPL= (loans past due 90 days + non accrual loans) / total loans and leases; LLP= provision for allowance for loan and lease losses / total loans and leases; LLR= allowance for loan and lease losses / total loans and leases; LC_ON= bank on balance sheet liquidity creation/total assets; LC_OFF= bank' off balance liquidity creation/total assets; LC_ALL= Bank liquidity creation over total assets; LOANG= Growth rate of the total loans compared to the same quarter of previous year; QUARTER_NEGATIVE= number of quarters in the previous 3 years during which the real federal rate is negative; SIZE is the natural logarithm of total assets; EQTA= equity over total assets; INEFFICIENCY=Total expenses over total income; NII= non interest income over total income; gdp_growth= Growth rate of the Gross Domestic Product compared to the same quarter of previous year;

Dep. Var:	0%RWA	100%RWA	RWA	LIQUIDITY	CRELOANS	NPL	LLR	LLP	LC_ON	LC_OFF	LC_ALL	LOANG
C	-22.9423 [-9.58]***	207.1175 [36.59]***	204.9801 [40.46]***	-54.6746 [-10.78]***	50.7019 [17.07]***	-4.9498 [-5.45]***	5.2434 [15.97]***	-0.2595 [-1.63]	120.3651 [22.02]***	36.5211 [13.54]***	156.8862 [23.85]***	-266.5576 [-28.28]***
QUARTER_NEGATIVE	0.8120 [112.79]***	-0.3977 [-33.49]***	-0.4509 [-41.68]***	0.7801 [67.25]***	0.2695 [43.16]***	0.2267 [81.80]***	0.0971 [108.30]***	0.0317 [63.07]***	-0.1560 [-13.99]***	-0.3316 [-55.63]***	-0.4876 [-36.24]***	-2.1289 [-106.32]***
SIZE (t-1)	1.2212 [9.94]***	-7.6535 [-26.23]***	-6.8342 [-26.20]***	3.9806 [15.27]***	-1.6721 [-10.84]***	0.3027 [6.47]***	-0.2177 [-12.93]***	0.0155 [1.87]*	-4.4980 [-16.07]***	-1.5604 [-11.20]***	-6.0585 [-17.98]***	14.5353 [29.76]***
EQ_TA (t-1)	-0.1393 [-15.84]***	-0.1371 [-7.39]***	-0.1335 [-8.19]***	-0.1365 [-7.77]***	-0.2298 [-20.01]***	-0.0463 [-13.75]***	-0.0218 [-19.67]***	-0.0019 [-3.02]***	-0.4256 [-22.87]***	0.1029 [11.16]***	-0.3227 [-14.46]***	0.6442 [18.53]***
INEFFICIENCY (t-1)	0.0122 [7.86]***	-0.0286 [-8.75]***	-0.0253 [-7.92]***	0.0296 [8.56]***	-0.0062 [-6.11]***	0.0039 [7.05]***	0.0014 [6.21]***	0.0004 [5.23]***	-0.0337 [-8.63]***	-0.0071 [-4.49]***	-0.0408 [-8.66]***	-0.0242 [-5.55]***
NNI(t-1)	0.0165 [5.93]***	-0.0372 [-5.45]***	-0.0351 [-3.56]***	0.0379 [4.90]***	-0.0082 [-4.03]***	0.0052 [4.36]***	0.0018 [4.78]***	0.0006 [3.33]***	-0.0415 [-5.98]***	-0.0107 [-1.95]*	-0.0522 [-5.73]***	-0.0100 [-0.75]
GDP_GROWTH(t-1)	-0.1428 [-35.86]***	-0.0627 [-9.08]***	-0.0495 [-8.11]***	-0.1292 [-18.55]***	-0.1332 [-37.67]***	-0.1167 [-72.33]***	-0.0293 [-58.10]***	-0.0221 [-68.28]***	0.0730 [10.83]***	0.1328 [37.60]***	0.2058 [25.41]***	0.5405 [46.64]***
Observations:	88106	89313	83657	92753	92753	88057	87648	92753	92752	92752	92752	87308
R-squared:	0.60	0.92	0.90	0.91	0.96	0.61	0.69	0.41	0.93	0.82	0.93	0.53
F-statistic:	16.49	132.38	94.60	121.01	244.12	16.61	23.77	8.03	156.76	51.70	144.27	12.05