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U.S. Banks' lending behaviour, financial stability, and investor sentiment: A textual analysis

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ABSTRACT

We examine the impact of investor sentiment on bank credit and financial stability. We also investigate how loan growth may affect bank stability. We use an unbalanced panel data set of 6,886 U.S. commercial banks over the period 1990-2015, using bank-level data. Investor sentiment is proxied by two novel but alternative measures based on textual analysis. First, we employ the measure constructed by Garcia (2003) based on the fraction of positive and negative words in two columns of financial news from the New York Times. Second, we employ the text-based measure of uncertainty constructed by Manela and Moreira (2017) called News Implied Volatility, which uses front-page articles of the Wall Street Journal. The results show that banks' lending falls when investor sentiment is low, while this effect is more pronounced when banks hold a higher level of credit risk. These effects are more pronounced during recessions, and in these periods loan growth also responds negatively to the anxiety of investors. Finally, during the 2007-2009 financial crisis the negative effect on bank stability was weaker since any increase in bank lending provoked by investor sentiment was counteracted by the events that took place during and after the crisis.

Keywords: U.S. banks; textual sentiment analysis; anxious periods; loan growth; risk taking; bank stability

JEL: G10; G14; G21; G28; G39

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1. Introduction

The Great Financial Crisis (GFC) of 2007-2009 led to a prolonged recession period reaching in most countries the year 2015. Besides the length of the recession an additional characteristic was also the severity of the recession that hit both advanced and emerging economies. Fratzscher et al., (2016) argue that two of the main challenges that most countries face since the end of the GFC are related, first, the new direction that the banking industry is required to take to provide the necessary credit supply to support both advanced and emerging economies and second, the re-assessment and management of bank risks. Furthermore, as Delis et al. (2014) argue, the recession followed the financial turmoil of 2007-2009 highlighted the importance of banks' lending behaviour for economic fluctuations. Delis et al. (2014) also underline that it is of importance to investigate changes in banks' lending during periods when expectations of economic agents worsen, but the economy is not in recession. Delis et al. (2014) also analyzed how investor perception may influence U.S. banks' behaviour during anxious periods, which they characterize as periods in which expectations worsen. Delis et al. (2014) identify *anxious periods* based on how CEO (firms), consumers, and analysts perceive the prospects of the economy. Furthermore, although in their analysis there is no direct investigation of the influence of uncertainty on U.S. banks' lending behaviour.[1]

Banks are different from non-financial companies as they are idiosyncratic organizations bearing distinctive characteristics and calling for exceptional treatment. The main objective of banks is the efficient processing of risk and information (Greenbaum and Thakor, 2007), while their crucial role is highlighted by the number

[1]Irresberger et al., (2015) and Kadilli (2015) have examined the effect of changes in investor sentiment and expectations about the prospects of the economy on banks' stock returns.

of other services that are indispensable for the functioning of the economy; the need to safeguard depositors' funds and finally, the comparatively higher risk of contagion. There is an extensive literature on the determinants of loan growth of banks over the last two decades in both advanced and emerging economies, which includes measures of market structure, ownership structure, many bank characteristics and variables of regulatory reforms. However, there is a much smaller literature which investigates the banks' lending behaviour and banks' risk-taking within a behavioural framework, meaning whether investor sentiment, CEO and consumer confidence play a crucial role in determining banks' loan growth. Recently, Cubillas et al. (2021) analyze the impact of investor sentiment on bank credit and whether changes in lending behaviour may affect bank stability using a panel data set for banks operating in 130 countries. Investor sentiment can be defined as the investors' opinion, usually influenced by emotion, on future cash flows and the risk of investments, Specifically, they consider investor sentiment as a potential explanatory factor of both the provision of financing by banks and the level of risk associated with their practices during and after the GFC. In their analysis Cubillas et al. (2021) find that periods of high investor sentiment positively affect bank lending and leads to increased bank risk-taking appetite through a substantial credit expansion. However, such a credit expansion could also lead to increased instability of the banking system through the lowering of credit standards and the increase of the number of non-performing loans. However, this negative effect on financial stability is not the same across the banking systems of the sample but it depends on the stringency of creditor rights regulation.

Our study relates to several strands of literature. First, our paper relates to several studies that identify the impact of certain events or periods on banks' lending. These include such papers that study the effect of the recent financial crisis on credit

(e.g., Ivashina and Scharfstein, 2010); papers that investigate the liquidity shock experienced during the crisis on bank lending (Cornett et al., 2011); and papers that examine monetary and non-monetary shocks on bank loan portfolios (Den Haan et al., 2007). The second strand of literature stresses the essential role that banks play as liquidity providers and transmitters of monetary policy shocks (e.g., Bernanke and Gertler, 1995). The third strand of literature highlights the strong impact of expectations over the business cycle for leverage and, thus, credit. This literature shows that changes in expectations can cause credit cycles; namely, fluctuations in leverage and credit can affect the path of the economy. These fluctuations range from expansions, in which banks' lending increases and risk aversion decreases, to contractions or even crises, in which lending deteriorates and risk preferences shift to safer assets (e.g., Bhattacharya et al., 2011; Fostel and Geanakoplos, 2008; Delis et al., 2014).

Fourth, our paper relates to the theoretical propositions of Keeley (1990) and Dell' Ariccia and Marquez (2006). These studies suggest that certain exogenous shocks that lead to lower informational asymmetries, trigger intensified competition, and credit expansion, and create incentives for banks to search for higher yield in more risky projects. If, thereby, lending standards are relaxed and risk assets of banks as a share of their total assets are substantially increased, this will probably cause a deterioration of banks' charter value and an increase in the likelihood of crises. Finally, our analysis is related to strand of literature which investigates the link between bank risk and financial stability (Bernanke, 1983; Keeley, 1990; Kalomiris and Manson, 1997, 2003; Foos et al. 2010).

Here, we essentially borrow elements from these strands of the literature by focusing, however, on both optimistic periods and periods of diminishing expectations. Therefore, we contend that bank lending should be studied, not only in relation with the

monetary policy transmission mechanism or during crises periods, but also in relation to expectations of the agents involved in the lending process and during periods of optimist investor sentiment as well as diminishing such expectations that might or might not evolve to a crisis.

Our empirical framework has several notable characteristics. First, by following a well-established literature on the bank lending channel (e.g., Kashyap and Stein, 2000; Cetorelli and Goldberg, 2012) we identify the effect of investor sentiment on loan growth through the heterogeneous characteristics of bank balance sheets. These bank characteristics refer to heterogeneity in bank risk, capitalization, liquidity, size, and efficiency, which allow banks with healthier such indicators to respond differently than those with inferior indicators. That is, loan supply responds during periods of investor optimism and/or negative expectations differently between banks with different levels in the health of their balance sheets. Second, the fact that in periods of diminishing expectations do not follow all declines in agents' expectations, may suggest a special role for banks' lending in shaping future real developments. In this way, we aim to shed some light to the possible asymmetries in banks' lending activity during periods of investor sentiment from an optimistic perspective and/or negative investor expectations. Third, we examine whether the most important banks follow different strategies due to moral-hazard issues associated with too-big-to-fail concerns of governments, regulators, and the public. Finally, we offer some insights to the effect on loan growth of U.S. banks during and after the GFC.

Given, the above discussion, it is of great importance to further investigate the impact of investor sentiment on bank credit. Coupled with this, we examine the channel through which loan growth affects banking stability due to the eventual increase in non-performing loans, and this could decrease financial stability. Thus, extending the works

of Delis et al. (2014), Caglayan and Xu (2016) and Cubillas et al. (2021) we analyse the effect of investor sentiment on U.S. banks' lending behaviour.

Our paper contributes to the literature on the effects of investor sentiment on banks' lending behaviour by using different sentiment variables from those used by Cubillas et al. (2021), Delis et al. (2014) and Caglayan and Xu (2016). Cubillas et al. (2021) used two main proxies capturing the sentiment and confidence level of investors based on the propositions developed by Baker and Wurgler (2006) and Baker et al. (2012). Delis et al. (2014) consider the notion of anxious periods which are identified according to the perception about the state of the economy consumers, CEOs and financial analysts develop. Caglayan and Xu (2016) use the investor sentiment volatility of economic agents. In the present paper we First, we employ the measure constructed by Garcia (2003) based on the fraction of positive and negative words in two columns of financial news from the New York Times. Second, we employ a novel text-based measure of uncertainty constructed by Manela and Moreira (2017) using front-page articles of the *Wall Street Journal* for the period 1889-2009. Another way of looking into the investor sentiment on the anxious phases of the economy is to identify periods of high uncertainty. These periods are characterized by high informational asymmetry and intensified adverse selection and moral hazard problems in the functions of the financial markets. The authors set out their analysis on the idea that time variation in the topics covered by the business press is a good proxy for the evolution of investors' concerns regarding these topics. Manela and Moreira (2017) estimate their news-based measure of uncertainty (called the NVIX) derived from the co-movement between the front-page coverage of the Wall Street Journal and options implied volatility (VIX) by a support vector machine algorithm (SVM). This measure is well suited for our analysis

because it is an ex-ante measure that essentially captures investors' assessment of future uncertainty.

We develop a model of two equations in which we consider the quarterly variation in loans provided by U.S. banks and the stability of the U.S. banking industry to be the dependent variables with the investor sentiment and a set of bank characteristics being the explanatory variables. An important advantage of the proposed econometric approach is that we control for potential endogeneity and simultaneity bias as well as the joint influence of investor sentiment on U.S. banks' lending behaviour. The 2SLS-IV approach is coupled by new developments on this subject matter introduced by Norkute et al. (2021) and Kripfganz and Sarafidis (2021). We employ a panel quarterly data that covers the period from the first quarter 1999 to the fourth quarter of 2015 for 4,725 U.S. commercial banks when using the NVIX index and therefore we are also able to examine the effects on the credit supply with the use of U.S. banks' data during and after the GFC (our sample covers 6,886 U.S. banks for the period 1999Q1-2005Q4 when employing the García sentiment index). Therefore, to summarize we are interested to investigate the following three significant research issues. First, we ask the question whether investor sentiment affects U.S. banks' lending behaviour. Second, we explore whether investor sentiment has an impact on the stability of the U.S. banking industry, either directly or indirectly because of the credit expansion and the potential increase in the non-performing loans. Finally, we explore the potential impact of the GFC as well as in the post-crisis period on the U.S. banks' lending behaviour in relation to the above research questions.

In a nutshell, we find that during periods of high investor sentiment there is a positive effect on the U.S. banks' credit supply as a response to higher demand for funds by investors for the implementation of investment projects. Furthermore, we show that

investor sentiment has a significant effect on the U.S. banking industry stability since optimistic expectations by investors will lead to an increased appetite by U.S. banks to undertake more risk (see also Delis and Kouretas, 2011) leading to a credit expansion but also to increased financial instability. Finally, we find substantial evidence that diminishing expectations by investors during the financial crisis of 2007-2009 led to a slow down of credit supply by U.S. banks but this position was overturned in the post-crisis period 2009-2015. Several robustness checks provide strong support to these results.

The rest of the paper is organized as follows. Section 2 presents and discusses the relevant literature; Section 3 develops our hypotheses and presents our econometric methodology; Section 4 identifies the data sources, describes the sample selection, and analyzes the empirical results whereas the summary and concluding remarks are given in the final section.

2. Literature review

Several papers have recently discussed the way loan growth is shaped in times of anxiety and increased uncertainty by implicitly and/or explicitly taking into consideration investor sentiment. Agents' sentiment is considered to play a crucial role in the bank lending behaviour and it has entered in the analysis of the determinants of banks' loan growth in different ways. Keynes in his *General Theory* (1936) recognizes that investors "animal spirits" influence market prices in a way that leads in deviations from the fundamentals. De Long et al. (1990) and Lee et al. (1991) are among the studies that argue that the efficient market hypothesis does not hold, and investors are subject to these "animal spirits". Most of the studies on the examination of investor sentiment on market prices focused on both advanced and emerging stock markets. Within this framework, investor sentiment captures beliefs about asset price deviations

from present value of future cash flows. It is also considered to reflect investor's opinion, often influenced by emotion on future cash flows and the risk of investment. Early studies on investor sentiment focused on its use to improve forecasting performance of stock price models. Furthermore, behavioral factors (i.e. investor sentiment) has been used to explain the futures and the option markets (Wang, 2003; Ahn et al., 2002) as well as to explain the emergence of stock market crises (Zouaoui et al., 2011). Hwang et al., (2018) consider investor's sentiment to analyze herding behaviour, whereas Qian (2009) and Hribar and McInnis (2012) also investigate the effects of sentiment on the performance of analysts. Furthermore, Baker and Wurgler (2006) find that when investor sentiment is low, future returns are relatively high for small stocks, high volatility stocks, and distressed stocks. Finally, Shen et al. (2017) and Gao et al. (2020) provide further evidence on the relationship between stock market sentiment and expected equity returns.

Recently, several works have documented that there is a spillover of the effect of sentiment on stock prices to the bond prices, implying that behavioural factors should also be considered as potential determinants in explaining bond returns. Thus, Barberis et al. (2005) and Bethke et al. (2017) found that there is a co-movement between bond returns and world stock markets based on news and fundamentals and investor sentiment. Baker and Wurgler (2012) find that bonds and stocks which have bond characteristics have relatively high returns when sentiment is high. There are several papers which examine whether there exists a relationship between sentiment and US bond markets. Thus, Baker and Wurgler (2012) and Laborda and Olmo (2014) show that there exists a positive relationship between bond risk premia and sentiment. Cepni et al. (2020) construct an investor sentiment index to predict the excess returns of US government bonds. Other studies like Chiu et al. (2018) examine the relationship

between sentiment and US stock and bond volatility, while Li and Galvani (2018) study the effect of sentiment on corporate bond markets. Both studies argue that investor sentiment do play a significant role in determining bonds' pricing. Finally, Li (2021) finds that sentiment is negatively related to future bond returns on average across emerging markets. Furthermore, it is shown that investor's sentiment effect is relatively stronger when liquidity frictions are higher, and this result is consistent with illiquid bonds being generally harder to arbitrage.

However, there is only a small number of works that have studied the relationship between investor sentiment and its influence on banking lending behaviour. Delis et al. (2014) is one of the first studies that examines the lending behaviour of US banks during anxious periods. They define anxious periods as those periods during which perception and expectations worsen for economic agents even though the economy is not in recession. They identify distinct periods of anxiety for consumers, CEOs (firms) and analysts. The main finding is that banks' lending falls when consumers and analysts are anxious, and this effect is more pronounced when banks hold a higher level of credit risk. Additionally, when anxious periods are followed by recessions, loan growth also responds negatively to the anxiety of CEOs.

Furthermore, Caglayan and Xu (2016) focused on the supply of banks. They employ a panel of commercial, cooperative and savings banks operated in the G7 countries. They show that there is a negative relationship between economic agents' sentiment volatility and bank lending. In a related study, Raunig et al. (2017) explore how the development of bank lending in the US has reacted after four large jumps in uncertainty, using an event study approach. Raunig et al. (2017) find that more liquid banks slow down and lend less after an increase in uncertainty. Moreover, they argue that the lending behaviour of smaller banks reacts less dramatically when uncertainty

increases, and they consider this finding to an increased significance of the bank-customer relationship when credit supply contracts. Their study is related to the one by Delis et al. (2014) since it appears conceivable that anxious periods are also characterized by higher uncertainty. Finally, Cubillas at al. (2021) study the impact of investor sentiment on bank credit and how changes in lending may affect bank stability. They employ a panel analysis with bank-level data taken from 130 developed and developing countries for the 1997-2016 period. They rely on Baker and Wugler (2006) and Baker at al. (2012) approach to construct a global investor sentiment index.

Berger et al. (2020) analyze the comparative advantages of small and large U.S. banks in improving household financial sentiment. They employ the University of Michigan Surveys of Consumers household sentiment data and local banking market data from 2000-2014. They find that large banks have significant comparative advantages in boosting household's sentiment. However, this global investor index does not actually include characteristics of the banking industry in each county in their sample. The composite sentiment index captures the six sentiment indicator variables used in Baker and Wugler (2006). Then, as a measure of global sentiment, they form a composite index that captures the common component in the six local indices. They find that bank lending is affected in a positive way during periods of high investor and in addition increase bank risk-taking appetite through the increase in the amount of loans provided. However, Cubillas et al. (2021) also argue that this increase in bank credit supply leads to a reduction of the stability of the banking sector.

3. Methodology

3.1. Hypothesis testing

We now move on to the development of the testable hypotheses. A stylized fact of the relevant literature underlines the role of investor sentiment either directly or

indirectly, depending on the definition given and the proxy measure used on the lending behaviour of banks. Given that banks could be affected by increasing or diminishing investor's expectations this could lead to a change in the business model and overall lending activities. In this paper we study two hypotheses that link investor sentiment with U.S. banks' lending behaviour and risk-taking behaviour. Based on the analysis given in Delis et al. (2014) and Caglayan and Xu (2016) bank credit decreases during anxious periods and when investor sentiment exhibits high volatility. By contrast, when the U.S. economy goes through periods of economic boom and investor perception is optimistic, then it is expected that lending by U.S. bank will rise to meet a higher demand for financing consumer and investment projects. In addition, Raunig et al. (2017) show that bank lending by the U.S. banks is affected during periods of increasing uncertainty in the financial markets and in addition, they also find that more liquid banks slow down and lend less after a rise in uncertainty. These studies used either data for the U.S. banks or the G-7 countries. Cubillas et al. (2021) examine these issues using a panel of banks from 130 countries with the construction of a global composite investor sentiment index based on the approach developed by Baker and Wurgler (2006). In the present analysis, we examine the three research questions using a textual analysis perspective which we believe is a more appropriate approach to study the effect of investor sentiment on bank lending. Therefore, our first hypothesis is stated as follows:

H1: There is a positive relationship between higher investor sentiment and lending by U.S. banks.

The second important issue we address is whether higher lending by U.S. banks leads to increased instability in the banking system and to overall higher financial instability. This issue is related to the notion of bank risk-taking that could be the result

of a lower interest rate environment (Dell' Ariccia and Marquez, 2006; Oruga, 2006; Delis and Kouretas, 2011) and/or of greater investor optimism in the financial markets. As a result, banks to increase their lending they relax their screening standards by offering new loans to customers that they were refused in previous cases (Delis et al. 2014). Therefore, loan growth may have negative effects on bank stability since by increasing the risk-taking appetite of the U.S. banks we could observe an increase in the number of non-performing loans. This negative relationship is further explained by a potential trade-off between higher interest rates asked by depositors and improvement in the investors' economic perception which will lead the banks to take less risk and adopt more prudent behaviour; this takes us to the second testable hypothesis:

H2: There is a negative relationship between loan growth due to higher investment sentiment and bank instability.

3.2. Econometric methodology

Given the considerations of the literature described above, we specify a framework to examine the effect of the impact of investor sentiment on U.S. banks' risk-taking and their lending behaviour. This framework also includes bank-specific control variables. Due to the dynamic nature of the loan growth, impediments to informational opacity and/or sensitivity to regional/macroeconomic shocks, a dynamic specification model has been adopted, which includes a lagged dependent variable. Thus, we employ the following specification:

$$r_{i,t} = \alpha_i + \phi r_{i,t-1} + \beta_1 INV\_SENT_t + \beta_2 \Delta Loans_{i,t} + \beta_3 GFC_t + \delta b_{i,t} + \vartheta c_t + \varepsilon_{i,t} \quad (1)$$

where $r_{i,t}$ indicates the risk level of bank i at time t, INV_SENT_t is a time-variant measure of investor sentiment common to all banks, $\Delta Loans_{i,t}$ is the observed loan growth quarter-to-quarter bank lending for bank i at quarter t, GFC_t is a Global Financial Crisis dummy variable taking the value of 1 during 2007Q2-2009Q4 and zero otherwise, and $b_{i,t}$ is a set of bank-level control variables, namely, size, liquidity and ROA. The term α_i captures heterogeneity across banks through bank-specific effects, while $\varepsilon_{i,t}$ is a purely indiosyncratic error. Since we employ dynamic panel models we also include the lagged dependent an the right hand side of specification (1). In addition, we consider alternative specifications in which we split the sample based on the size of the banks (small vs. large) and on the bank equity ratio (low vs. high). To further investigate the effect of the Global Financial Crisis, we also add the interaction term of the sentiment with the crisis dummy as well as the interaction term of the loan growth with the crisis dummy. For the period post-crisis we also add dummies and interaction terms. Finally, we capture all time-specific events that might affect the lending behavior of banks with the use of quarter dummy variables (time effects).

Specification (1) provides the baseline framework for our empirical analysis. To estimate our baseline model as well as all subsequent econometric specifications, we employ a Two-Stage Least Squares – Instrumental Variables (2SLS-IV) estimation technique for dynamic panel models (Wooldridge, 2003). We complement the standard 2SLS-IV with a new instrumental variable (IV) estimation technique for dynamic linear panel models with defactored regressors and a multifactor error developed by Norkute et al. (2021). Specifically, Norkute et al. (2021) propose two IV estimators for dynamic panel data models with exogenous covariates and a multifactor error structure when both the cross-sectional and time dimensions are large. The proposed estimators can be used in models with homogeneous or with heterogeneous slope coefficients and they

possess the following advantages: First, the estimators do not need to search for instrumental variables outside the model. Second, these estimators are linear, and therefore computationally robust and inexpensive. Finally, they require no bias correction. The application of the 2SLS mitigates any potential problems due to endogeneity. In addition, the 2SLS-IV approach also allows us to disentangle the direct and indirect effects of investor sentiment in the model specification which analyzes bank stability. Therefore, we argue that coefficient β_1 captures the direct effect of investor sentiment on the level of bank stability and this effect is independent of the level of credit supply given by the U.S. banks. Moreover, coefficient β_2 is taken to reflect the indirect effect of investor sentiment to bank stability through the bank lending channel.

We proxy the dependent variable by taking three alternative measures of the risk level of banks that are widely used in the relevant literature that studies loan growth, bank risk-taking, and financial stability. These measures are the bank Z-score (denoted as *ZSCORE*), the ratio of risk assets to total assets (denoted as *risk assets*) and the non-performing loans to total gross loans ratio (denoted as *non-performing loans*).

Furthermore, the growth in bank loans, $\Delta Loans_{i,t}$, is treated as an endogenous variable with instruments in the first-stage regression being the annual growth in customer deposits, $\Delta deposits$, defined as the quarterly growth rate in customer deposits and the change in total gross loans to total assets ratio, $\Delta(\frac{Loans}{Assets})_{i,t}$, plus all explanatory variables in specification (1). We expect that $\Delta deposits$ will have a positive impact on U.S. banks' loan growth whereas the Δ(Loans/Assets) is expected to affect loan growth negatively. The implementation of this approach requires to determine whether our instruments are valid. First, we apply the Sargan test, a test of over-identifying restrictions, to examine the overall validity of the instruments. Second,

we test whether the differenced error term is second order serially correlated. Thus, failure to reject the null hypothesis could provide evidence that valid orthogonality conditions and instruments are used. In our models, this hypothesis of second-order serial correlation is always rejected. The model seems to fit the panel data reasonably well, having obtained stable coefficients, while the Wald test indicates fine goodness of fit whereas the Sargan test shows no evidence of over-identifying restrictions.

4. Empirical analysis

4.1. Data description and sample selection

To examine the way loan growth is shaped during the periods in which these agents are anxious, we employ quarterly data on banks from the Federal Deposit Insurance Corporation (FDIC) call reports over the 1999Q1–2015Q4 period. Given the theoretical considerations of our study, we focus only on the anxious periods identified from each of the two agent's perspective.

We employ an unbalanced panel quarterly data of 6,886 U.S. banks for the period 1999Q1-2005Q4 when employing the García sentiment index, while our sample of U.S. banks reduces to 4,725 when we use the NVIX index over the period 1999Q4-2015Q4. These data yield an initial unbalanced panel of 609,752 bank-quarter observations. Individual bank data is retrieved from the Federal Deposit Insurance Corporation (FDIC) call reports. We have also used the Bureau van Dijk Fitch–IBCA *Bankscope* database' the Fitch-Orbis Bank Focus database and the Eikon *Datastream* to obtain further bank-level data. Therefore, our panel contains balance sheet and income statement figures on commercial and savings banks that operate in the U.S. We excluded investment banks, micro-finance banks and development banks which have different bank characteristics. We delete any unconsolidated entries to avoid double counting and only include the consolidated bank balance data and income statement

data. Data Appendix lists the variables employed, in addition to their definition and sources.

From this dataset, we calculate for each bank the total loan growth as the change in the natural logarithm of total loans over the previous quarter to measure the quarterly variation in bank credit supply. Given that we are interested in the lending and risk-taking behavior of banks following shocks in the investor's sentiment, we conduct additional tests using three different variables that measure the risk level of each bank at a specific period.

We proxy the risk-taking behavior of banks using three different measures, namely *risk assets*, the bank's (log) *z-score* (henceforth *z-score*) and the non-performing loans. *Risk assets* is defined as the ratio of total assets minus loans and advances to banks, government securities at market values, and cash to total assets, with higher values indicating a higher level of bank risk-taking. *z-score* is defined as the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA). We calculate the standard deviation of ROA with a rolling 3-year window. Lower values of this measure indicate a higher probability of default, i.e., higher bank insolvency risk. Finally, *non-performing* loans is the ratio of non-performing loans to total loans.

A notable difference between *risk assets* and *non-performing* loans of bank risk must be underlined. *Risk assets* aim to capture the level of risk a bank assumes from its current operations, given the monetary and macroeconomic conditions the bank faces and its strategic response to these conditions, i.e., the bank's choice for the level of its risky investments. As such, this measure directly proxies, although imperfectly, for the current risk-taking behavior of the bank. On the other hand, the *z-score* is, by construction, affected by the bank's past investment choices, originating from its reaction to the prevailing *past* monetary conditions. Thus, this measure encompasses

not only the current bank risk-taking behavior, but also the risk accumulated from past period's bank operations. The relationship between these two measures of bank risk is not straightforward. For example, a higher level of *risk assets* could be related to a lower value of *z-score*, that is, a higher probability of insolvency, if these risk assets are associated with lower bank capitalization, due to the increased bank's risk-taking appetite, and/or increased volatility of ROA due to increased risk of the bank's investments. On the other hand, a higher value of *risk assets* could also be related to a higher value of *z-score*, i.e., a lower probability of insolvency, in the case of e.g. better bank risk management practices, advanced screening and monitoring capabilities, and/or lower capitalization constraints. Moreover, the relationship between these two bank risk measures may depend on the country's macroeconomic and monetary conditions, especially when major and abrupt economic changes, or even crises, happen as is the case in some of the countries included in our analysis during the sample period.

Furthermore, *non-performing loans*, reflects the quality of bank assets, i.e., the potential adverse exposure to earnings and asset market values due to deteriorating loan quality. In other words, *non-performing loans* is a proxy for credit risk. Since a portion of non-performing loans will result in losses for the bank, a high value for this ratio is associated with higher credit risk (see also Delis and Kouretas, 2011).

Bank balance sheet and income characteristics also determine bank lending and risk-taking behavior. In the present analysis we employ *size*, *liquidity*, and *ROA*. *SIZE* is defined by the logarithm of total assets. It captures the effect of bank size for the presence of potential economies or diseconomies of scale in the banking sector. This variable controls for cost differences as well as product and risk diversification according to the size of the credit institution. Scale economies in banking may arise

from a variety of sources. *Liquidity* is proxied by the liquid to total assets ratio. *ROA* is a proxy for the performance of each bank.

The risk-taking and the lending equation is identified at the bank level, and thus we need to control for several individual bank characteristics. In addition, the role of these variables is important to the empirical identification of the equation. The possible association between bank characteristics and risk depicts the endogenous nature of these characteristics. We expect that higher sentiment periods affect the balance structure of banks, causing changes in both the supply and demand for bank loans. We adopt *National Bureau of Economic Research* (NBER) paradigm to identify recession periods of the U.S. economy.

In contrast to previous studies that analyzed the effect of investor sentiment of confidence indices on banks' lending behaviour in the present study we take a textual analysis approach to make inference. We employ two measures of sentiment which are fully based on textual sentiment analysis. First, we employ the sentiment index constructed by Garcia (2013). Garcia (2013) builds on Shiller (2000) who argues that the news media play an important role in setting the stage for market moves and provoking them. Garcia (2013) constructs the proxy for market sentiment by counting the number of positive and negative words from two financial columns from the *New York Times* covering the period 1905 to 2005. The bulk of the sample is constructed using two columns, labelled for most of the 20th century by "Financial Markets" and "Topics in Wall Street". Both columns were published daily and covered general financial news -from stock market performance to industry news and macroeconomic events. Garcia (2003) emphasizes that these columns contain the type of news that Shiller (2000) and Tetlock (2007) have brought in surface. From García's daily index we compute a quarterly sentiment proxy by averaging the daily data over the quarter.

Second, we adopt a novel text-based measure of uncertainty constructed by Manela and Moreira (2017) using front-page articles of the *Wall Street Journal* for the period 1889-2009. Another way of looking into the investor sentiment on the anxious phases of the economy is to identify periods of high uncertainty. These periods are characterized by high informational asymmetry and intensified adverse selection and moral hazard problems in the functions of the financial markets. The authors set out their analysis on the idea that time variation in the topics covered by the business press is a good proxy for the evolution of investors' concerns about future more often and in particularly severe for rare events. Manela and Moreira (2017) estimate a news-based measure of uncertainty derived from the co-movement between the front-page coverage of the Wall Street Journal and options implied volatility (VIX) and therefore this uncertainty index is the new VIX (NVIX). The data frequency of the NVIX is monthly, consequently we compute a quarterly NVIX by averaging the data over the quarter.

4.2. Empirical results

Table 1 reports the summary statistics, i.e. the mean, standard deviation and the minimum and maximum values for the dependent variable, in addition to the explanatory and control variables employed in the analysis and described above. Panel A provides the descriptive statistics for the case of the first textual investor sentiment due to Garcia (2013) and Panel B provides the corresponding descriptive statistics when the second measure of textual investor sentiment, Manela and Moreira (2017) is employed. Loan growth has an average value of 0.023 and 0.015 for each investor sentiment measure.

[Insert Table 2 about here]

Table 2 provides the correlations among the variables included in our specification (1) and we observe that most correlations are statistically significant. Specifically, there is a positive correlation between loan growth and investor sentiment which is in line with our basic intuition that positive expectations formed by investors will lead to an increase on quarterly growth in U.S. banks' loans. Furthermore, our correlation matrix shows that there is a positive correlation between both measures of investor sentiment and Z-score, implying that we should observe an increase in U.S. banking sector stability. Moreover, we obtain negative correlation coefficient between investor sentiment and non-performing loans implying that when investor sentiment is high U.S. banks may consider that as a signal to increase credit supply, which however, will lead to an increase in the number of non-performing loans. We also observe that loan growth and Z-score have a negative correlation, which is consistent with our argument that an increase in U.S. banks' credit supply will result to a relax in credit standards and reduction of financial stability. Finally, we show that the correlation between the two investor sentiment measures is quite high, equal to 0.80.

Table 3 reports estimates obtained from the 2SLS-IV estimation procedure to provide evidence of the direct and indirect channels through which investor sentiment affects U.S. banks' stability. As we explained in the methodology section we use two instruments, namely, growth of deposits and the ratio of total gross loans to total assets. Columns (1)-(4) provide the estimated coefficients when we use the textual investor sentiment constructed by Garcia (2013) and columns (5)-(8) the corresponding results when we use the measure of investor sentiment NVIX. Focusing on the first stage estimation results, we observe that the coefficient of investor sentiment is statically significant at standard levels of significance, irrespectively of the measure we employ. Therefore, based on this outcome, we argue that an optimistic investor expectation of

the economic situation leads, on average, an increase of quarterly growth in U.S. bank loans. This result provides strong evidence for Hypothesis 1. Furthermore, these findings are in line with those of Delis et al. (2014), Caglayan and Xu (2016) and Cubillas et al. (2021).[2] In summary, as it expected, credit supply by U.S. banks increases to satisfy a higher demand when investor sentiment increases.

Turning now our attention to the two instruments, we observe that the coefficient of the quarterly growth in deposits at U.S. banks (*Δdeposits*) has a positive sign and is statistically significant using both proxies for investor sentiment. Therefore, in the case that deposits to U.S. banks increase, this implies an increase of the available funds for lending by these banks. With respect to the ratio of the total gross loans-to-total assets ratio (Loans/Assets) we obtained a negative and statistically significant coefficient under both measures of investor sentiment. Intuitively, this implies that the greater is the portfolio of loans that a U.S. bank possess in the previous quarter the more difficult is to increase its credit supply in the current quarter. Moreover, the application of the Sargan-Hansen test for overidentifying restrictions leads to the conclusion that we are unable to reject the null hypothesis that the instruments are valid.

Finally, with respect to the bank specific variables, *SIZE* obtains a negative and statistically significant coefficient in both specifications. This finding implies that size matters and thus, larger U.S. banks' portfolio of loans and credits could be a smaller share of its total business of credit and deposits. The coefficient of *LIQUIDITY* is negative and statistically significant in both proxies of investor sentiment which means that in periods of high investor sentiment, less liquid U.S. banks will strive to provide more loans. With respect to *ROA*, we obtain in all specifications a negative and

[2] Delis et al. (2014) employ similar unbalanced panel data only for the U.S. banks which we have also extended to 2015Q4. Our extended analysis confirms the main findings of the original study that used data up to 2010Q4. To save space the results are available upon request.

statistically significant sign, which implies that the performance of the U.S. banks deteriorates when there is credit expansion, which could lead to an increase in non-performing loans.

In column (2) – (4) of Table 3, we report results of the second stage equations for the case of the investor sentiment measure (Garcia) and in columns (5)-(8) we report results for the case of the second measure (NVIX). The results shed evidence on the relationship between investor sentiment and financial stability. *ΔLoans* enters with a negative and statistically significant coefficient in columns (2) and (6) where the dependent variable is *Z-SCORE*, which is considered to be a proxy of financial stability. When we consider as dependent variable *RISK ASSETS* and *NON-PERFORMING LOANS* then the coefficient of *ΔLoans* is positive and statistically significant for the former case but non-significant for the latter dependent variable when the investor sentiment proxy is the one developed by Garcia (2013). When we take the case of the NVIX measure the *ΔLoans* obtain a positive and statistically significant coefficient in all conventional levels. This evidence indicates that in periods that we detect increase in investor sentiment this will lead to an increase in the quarterly growth of loans provided by U.S. banks and that could lead to a decline in bank stability because of the increase of the bank risk-taking appetite. This finding could be more pronounced for banks with more problem loans and more provisions accumulated in previous quarters. These findings confirm our second hypothesis (H2) that an increase in investor sentiment leads to an increase in banks' lending and given the future increase of the non-performing loans we expect a lowering of banks' stability. In addition, following Dell' Ariccia and Marquez (2006) and Delis et al., (2014) that during the periods of high investor sentiment banks relax collateral requirements and relax credit standards to boost credit expansion. As Delis et al. (2014) argue, in periods of investor optimism

banks tend to relax credit standards and they provide loans to customers whose loan application was declined in previous quarters. This credit availability to sub-prime customers will eventually lead to an increase of risk that banks are willing to undertake.[3]

With respect to the investor sentiment proxies, we observe that in most cases they are positive and statistically significant in all specifications. This finding is in line that greater investor optimism in financial markets may lead U.S. banks to increase credit supply and to relax credit requirements which in addition implies an increase in non-performing loans given that the coefficient when NPL is the dependent variable has a positive sign. The bank-level control variables have the expected sign, and they are statistically significant in most specifications. Finally, in the second specification which ends in 2015Q4 and therefore includes the GFC we add a dummy variable that takes the value of 1 during 2007Q2 to 2009Q4 and zero otherwise is statistically significant and is negative for the case of *ΔLOANS* which implies that during the financial crisis we detected a negative impact on loan supply as expected.[4]

[Insert Table 3 about here]

A frequent issue arising with studies that investigate bank-level data and when we examine determinants of loan growth either directly or indirectly is the potential existence of reverse causality. This means that the causality direction goes from a greater bank risk taking to greater credit expansion during periods of increasing investor expectations. To this end, we consider the case that the relationship between the growth in loans and the three alternative measures of bank stability should be more relevant in

[3]This increase in bank risk-taking was evident during the period 2000-2007 characterized by high optimism and historically low interest rates.

[4] For robustness purposes we have also conducted the same analysis using annual data for the same period. The data was retrieved from Bloomberg and Eikon/Datastream and we obtained similar results. To save space the results are available upon request.

the case of larger versus smaller banks (Bank size effect) and in the case of banks with a higher-to-total assets ratio (Bank equity ratio effect).

Table 4 reports our estimations for the case of the bank size effect for each of the two investor sentiment measures and the *Z-SCORE* variable as the proxy of financial stability. As in our baseline model, we examine again the potential effects of investor sentiment on financial stability through changes in credit supply of the U.S. banks. The estimated coefficient of the *ΔLOANS* is negative and statistically significant for both small and large banks as well as for either investor sentiment proxy. These findings suggest that the negative effect of a credit expansion on bank stability during periods of high investor sentiment is independent of the bank size, indicating that the argument on too-big-to-fail is maintained. Table 5 also examines the case of distinguishing the U.S. banks including in the sample between low and high. Again, we obtain a negative and statistically significant coefficient for *ΔLOANS* and this holds for both groups of banks, namely Low and High Bank equity ratio leads. Therefore, we provide strong evidence of a negative effect of loan growth due to increased investor optimism on U.S. banks' stability, and this negative effect is independent of banks' equity ratio. In summary, based on the overall evidence we argue that the role of bank lending on the increase in bank risk high investor sentiment periods is independent of the type of U.S. bank in the sample which means that there is no evidence of reverse causality.

[Insert Table 4 about here]

[Insert Table 5 about here]

In the final part of our analysis, we examine whether the relationship between investor sentiment and bank stability through changes in bank loans has been affected during the GFC and the post-crisis. Controlling for the crisis period and the post-crisis we will be able to exclude the possibility that the significant effect of investor sentiment

on bank stability is due to the crisis rather than to a relationship between the investor sentiment and financial stability. Thus, to examine the possible effect of the GFC, we include a Global Financial Crisis dummy variable taking the value of 1 during 2007Q2-2009Q4 and zero otherwise. We also enter in our baseline specification an interaction term to capture the possible effect of the GFC on the investor sentiment using only the NVIX measure which is available until 2015Q4 to capture whether the GFC had an impact on investor sentiment. The first two columns of Table 6 report the results from the first stage estimations. We observe that the estimated coefficient of the GFC dummy that captures the individual effect of the crisis dummy variable is negative but not statistically significant, which implies that loan growth by U.S. banks remain unchanged and thus the relationship between investor sentiment and loan growth. Furthermore, when we examine the regression that includes both the crisis dummy and the interaction between the crisis dummy and investor sentiment then we obtain a negative and statistically significant coefficient, implying that when we consider the joint effect then any positive effect on banks' lending behaviour due to increasing investors' expectation which could be offset by the negative effect that the GFC had on loan growth. Columns (3)-(5) of Table 6 provide the results from the estimation of the second stage. The coefficient of $\Delta LOANS$ is negative and statistically significant at conventional levels when *ZSCORE* is the dependent variable confirming our baseline results, suggesting that the positive investor sentiment affects negative bank stability via the loan growth. Looking on the coefficient of the crisis dummy, it has a negative sign and is statistically significant, implying that the stability of the U.S. banking sectors was reduced during the Great Financial Crisis. Furthermore, the coefficient of the interaction term is negative but not statistically significant which means that the indirect effect of investor sentiment on U.S. banks' stability through changes in the

growth rate of bank loans is weaker and/or insignificant. In addition, the coefficients of *ΔLOANS* on *Risk Assets and non-performing loans* is maintained positive, and the interaction terms between these variables are negative and statistically significant. Finally, the coefficient of the crisis dummy is negative in the case of *RISKY ASSETS* and positive in the case of NPL and statistically significant, which implies that during the financial crisis the non-performing loans of the U.S. banks increased. The coefficients of the remaining explanatory variables are like those reported in Table 3.

[Insert Table 6 about here]

Table 7 concludes our analysis by examining the relationship between investor sentiment and loan growth and via this variable to bank stability in the post-crisis period. In the first stage regression the coefficient of investor sentiment is positive and statistically significant and therefore the effects on investors' optimism leads to an increase in credit supply by U.S. banks, whereas the two instruments have a positive sign, and they are statistically significant. Hence, the baseline specification results are maintained. In columns (3)-(5), we also report the results of the second stage regressions. The corresponding coefficient of investor sentiment on each of the proxies of bank's risk-taking has the correct negative sign and is statistically significant implying that the direct effect of investor sentiment on bank stability is maintained. Additionally, the coefficient of the post-crisis dummy is positive and statistically significant, which implies that in the aftermath of the GFC loan growth increased because of an improvement in the investor sentiment that led to a gradual increase in the lending offered by U.S. banks. Finally, the coefficient of the post-crisis dummy is positive and statistically significant when we consider the *ZSCORE* variable. This finding implies that when the financial crisis was over along with the economic policies

adopted by the U.S. government and the FED to stimulate the U.S. economy, we observed an improvement of the balance sheets of the U.S. banks.

[Insert Table 7 about here]

5. Summary and concluding remarks

In this paper we examine empirically the lending behaviour of U.S. banks during periods of changes in investor sentiment both in good and bad times using quarterly data from 1999-2015. Furthermore, in this paper we investigate the effect of investor sentiment on both loan growth and bank stability of U.S. commercial banks. Investor sentiment is proxied by two novel but alternative measures based on textual analysis. First, we employ the measure constructed by Garcia (2003) based on the fraction of positive and negative words in two columns of financial news from the New York Times. Second, we employ the text-based measure of uncertainty constructed by Manela and Moreira (2017) called News Implied Volatility, which uses front-page articles of the Wall Street Journal.

The results show that banks' lending falls when investor sentiment is low, while this effect is more pronounced when banks hold a higher level of credit risk. These effects are more pronounced during recessions, and in these periods loan growth also responds negatively to the anxiety of investors. Finally, during the 2007-2009 financial crisis the negative effect on bank stability was weaker since any increase in bank lending provoked by investor sentiment was counteracted by the events that took place during and after the crisis.

We employ a Two-Stage Least Squares – Instrumental Variables (2SLS-IV) estimation technique for dynamic panel models (Wooldridge, 2003). We complement the standard 2SLS-IV with a new instrumental variable (IV) estimation technique for dynamic linear panel models with defactored regressors and a multifactor error developed by Norkute

et al. (2021). The application of the 2SLS mitigates any potential problems due to endogeneity. In addition, the 2SLS-IV approach also allows us to disentangle the direct and indirect effects of investor sentiment in the model specification which analyzes bank stability. Therefore, we can study the direct impact of investor sentiment on bank risk-taking as well as the indirect effect that operates through changes in the amount that U.S. banks are willing to lend.

All in all it is evident that the lending behaviour of U.S. banks is primarily affected by investor sentiment both in good and bad times of the U.S. economy. We provide evidence that optimistic investor expectations lead to an increase in quarterly growth in loans provided by U.S. banks. However, we also document that such increase in credit supply of the U.S. could lead to an increase instability of the U.S. banking industry. Furthermore, we show that the Great Financial Crisis had a negative effect on investor sentiment leading to a decline in U.S. lending behaviour and an increase of bank instability mainly due to the increase of the non-performing loans. These negative results are shown to be overturned in the post-crisis period. Other bank characteristics such as liquidity, size and ROA do not appear to be driving forces of the lending decisions of banks in periods of significant changes of investor sentiment.

These findings have important implications for bank prudential regulation. The finding that banks shape their lending behaviour differently when changes in investor sentiment in financial markets are evident (either positive expectations or diminishing expectations) suggests that regulators should place emphasis on periods of changes in investor sentiment. Additionally, the development of bank-risk control mechanisms seems important during periods of high investor sentiment, given our evidence that during such periods credit expansion by U.S. banks was identified. Therefore, the

primary focus of the regulator needs to be placed on the combined presence of the higher credit provision during these periods and relatively high exposure on credit risk.

References

Ahn, C., Lee, E.B., Suh, E.H., 2002. Noise trading in the Korean foreign exchange market: Some questionnaire evidence. Bank of Korea Economic Papers, 5, 133-155.

Baker, M., Wugler, J., 2006. Investor sentiment and the cross-section of stock returns. Journal of Finance, 61, 1645-1680.

Baker, M., Wugler, J., Yuan, Y., 2012. Global, local, and contagious investor sentiment. Journal of Financial Economics, 104, 272-287.

Barberis, N., Schleifer, A., Wurgler, J., 2005. Comovement. Journal of Financial Economics, 75, 283-317.

Bernanke, B.S., 1983. Nonmonetary effects of the financial crisis in the propagation of the Great Depression. American Economic Review, 73, 257-276.

Bernanke, B., Gertler, M., 1995. Inside the black box: The credit channel of monetary policy transmission. Journal of Economic Perspectives, 9, 27-48.

Bethke, S., Gehde-Trapp, M., Kempf, A., 2017. Investor sentiment, flight -to-quality, and corporate bond comovement. Journal of Banking and Finance, 82, 113-132.

Bhattacharya, S., Goodhart, C., D. Tsomocos, D., Vardoulakis, A., 2011. Minsky's financial instability hypothesis and the leverage cycle. London School of Economics FMG Special Paper.

Berger, A.N., Irresberger, F., Roman, R.A., 2020. Bank size and household financial sentiment: surprising evidence from University of Michigan surveys of consumers. Journal of Money, Credit and Banking, Supplement, 52. No. S1, 149-121.

Caglayan, M., Xu, B., 2016. Sentiment volatility and bank lending behavior. International Review of Financial Analysis, 45, 107-120.

Calomiris, C., W., Mason, J.R., 1997. Contagion and bank failures during the Great Depression: The June 1932 Chicago Banking Panic. American Economic Review, 87, 863-883.

Calomiris, C., W., Mason, J.R., 2003. Consequences of bank distress during the Great Depression: American Economic Review, 93, 937-947.

Cepni, O. Ethem, G.I., Gupta, R., Wohar, M.E., 2020, The role of an aligned investor sentiment index in predicting bond risk premia of the US. Journal of Financial Markets, 100541.

Cetorelli, N., and L. Goldberg, 2012. Banking globalization and monetary transmission. Journal of Finance, 67, 1811-1843.

Chang, C., Faff, R.W., Hwang, C.-Y., 2012. Local and global sentiment effects, and the role of legal, information and trading environments. Available at:

Chiu, C-W. J., Harris, RDF, Stoja, E., Chin, M., 2018. Financial market volatility, macroeconomic fundamentals and investor sentiment. Journal of Banking and Finance, 92, 130-145.

Cornett, M., McNutt, J., Strahan, P., Tehranian, H., 2011. Liquidity risk management and credit supply in the financial crisis. Journal of Financial Economics, 101, 297-312.

Cubillas, E., Ferrer, E., Suarez, N., 2021, Does investor sentiment affect bank stability? International evidence from lending behavior. Journal of International Money and Finance, 113, 102351.

Delis, M.D., Kouretas, G.P., 2011. Interest rates and bank lending. Journal of Banking and Finance, 31

Delis, M.D., Kouretas, G.P., Tsoumas, Ch., 2014. Anxious periods and bank lending. Journal of Banking and Finance, 38, 1-13.

Dell' Ariccia, G., Marquez, R., 2006. Lending booms and lending standards. Journal of Finance, 61, 2511-2546.

De Long, J., Bradford, Shleifer, A., Summers, L. H., Waldmann, R.J., 1990, Noise trader risk in financial markets. Journal of Political Economy, 98, 703-738.

Den Haan, W.J., Sumner, S.W., Yamashiro, G.M., 2007. Bank loan portfolios and the monetary transmission mechanism. Journal of Monetary Economics, 54, 904-924.

Foos, D., Norden L., Weber, M., 2010, Loan growth and riskness of banks. Journal of Banking and Finance, 34, 2929-2940.

Fostel, A., Geanakoplos, J., 2008. Leverage cycles and the anxious economy. American Economic Review, 98, 1211-1244.

Fratzscher, M., Konig, P.J., Lambert, C., 2016, Credit provision and banking stability after the Great Financial Crisis: The role of bank regulation and the quality of governance. Journal of International Money and Finance, 29, 1153-1184

Gao, X., Chen, G., Koedjik, K., 2020. Institutional investor sentiment and aggregate stock returns. European Financial Management, forthcoming.

García D., 2013. Sentiment during recessions. Journal of Finance, 68, 1267-1300. text-based measure of sentiment starting in 1905 using the *New York Times:* daily data up to 2005*)*

Greenbaum, S.I. and Thakor, A.V., 2007. Contemporary Financial Intermediation. Second Edition, Academic Press.

Hribar, P., McInnis, J., 2012, Investor sentiment and analysts' earnings forecast errors. Management Science, 58, 293-307.

Hwang, S., Rubesam, A., Salmon, M., 2021. Overconfidence, sentiment and beta herding: A behavioral explanation of the low-beta anomaly. Journal of International Money and Finance, forthcoming.

Irresberger, F., Muhlnickel, J., Weib, G.N.F., 2015. Explaining bank stock performance with crisis sentiment. Journal of Banking and Finance, 59, 311-329.

Ivashina, V., Scharfstein, D.S., 2010. Bank lending during the financial crisis of 2008. Journal of Financial Economics, 97, 319-338.

Kadilli, A., 2015. Predictability of stock returns of financial companies and the role of investor sentiment: A multi-country analysis. Journal of Financial Stability, 21, 26-45.

Kashyap, A.K., Stein, J.C., 2000. What do a million observations on banks say about the transmission of monetary policy? American Economic Review, 90, 407-428.

Keeley, M.C., 1990. Deposit insurance, risk, and market power in banking. American Economic Review, 5, 1183-1200.

Keynes, J.M., 1936. *The general theory of employment, interest and money*. London: MacMillan and Co.

Kripfganz, S., Sarafidis, V., 2021. Instrumental variable estimation of Large-T panel data models with common factors. MRPA paper No. 105563

Laborda, R., Olmo, J., 2014. Investor sentiment and bond risk premia. Journal of Financial Markets, 18, 206-233.

Lee, C.M.C., Shleifer, A., Thaler, R.H., 1991, Investor sentiment and the close-end fund puzzle. Journal of Finance, 46, 75-109.

Li, Y., 2021. Investment sentiment and sovereign debt. Journal of International Money and Finance, 115, 102388.

Manela A. and Moreira, A. 2017. News Implied Volatility and Disaster Concerns, Journal of Financial Economics, 123, 137–162.

Norkute, M., Sarafidis, V., Yamagata, T., Cui, G., 2021. Instrumental variable estimation of dynamic linera panel data models with defactored regressors and a multifactor error structure. Journal of Econometrics, forthcoming.

Oruga, Y., 2006. Learning from a rival bank and lending boom. Journal of Financial Intermediation, 15, 523-535.

Qian, H., 2009. Time variation in analyst optimism: An investor sentiment explanation. Journal of Behavior Finance, 10, 182-193.

Raunig, B., Schapler, J., Sindermann, F., 2017. Do banks lend less in uncertain times?. Economica, 84, 682-711.

Shen, J., Jiangfeng, Yu., Zhao, S., 2017. Investor sentiment and economic forces, Journal of Monetary Economics, 86, 1-21.

Shiller, R.J., 2000, *Irrational Exuberance*, Princeton: Princeton University Press.

Tetlock, P.C., 2007. Giving content to investor sentiment: The role of media in the stock market. Journal of Finance, 62, 1139-1168.

Wang, C., 2003. The behavior and performance of major types of futures traders. Journal of Futures Markets, 23, 1-31.

Wooldridge, J.M., 2002. *Econometric analysis of cross section and panel data*. Cambridge: MIT Press.

Zouaoui, M., Nouyrigat, G., Beer, F., 2011. How does investor sentiment affect stock market crises? Evidence from panel data. The Financial Review, 46, 723-747.

Table 1. Definitions and sources of variables

Variable	Definition	Source
Dependent variables		
Δ in Total loans	Change in the natural logarithm of total loans over the previous quarter	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
z-score	The natural logarithm of the ratio (ROA-Equity/Total assets)/Standard deviation (ROA)	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Risk assets	The ratio of total assets minus loans and advances to banks, government securities at market values, and cash to total assets	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Non-performing loans	The ratio of non-performing loans to total assets	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA

		Bankscope database; Eikon *Datastream* and own calculations
Explanatory variables		
A) Bank level variables		
Liquidity	The ratio of liquid assets (cash and short-term securities) to total assets	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
ROA	The ratio of profits to total assets	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Δ loans/assets	The change in total gross loans assets ratio	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Size	The natural logarithm of total assets	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA

		Bankscope database; Eikon *Datastream* and own calculations
Δ deposits	The change over the previous quarter in customer deposits	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Crisis Dummy	Binary indicator that equals 1 for 2007Q2 to 2009Q4, and 0 otherwise.	Federal Deposit Insurance Corporation (FDIC) call reports; Bureau van Dijk Fitch–IBCA Bankscope database; Eikon *Datastream* and own calculations
Variables characterizing the investor sentiment		
Sentiment index	Proxy for market sentiment by counting the number of positive and negative words from two financial columns from the New York Times covering the period 1905 to 2005	Garcia (2003)
Sentiment index NVIX	A text-based articles of the Wall Street measure of investor sentiment using front-page articles of the Wall Street Journal for the period 1999-2009	Manela and Moreira (2017)

Table 1: Descriptive Statistics

This table presents summary statistics for the variables used in the analysis. Sentiment denotes the investor sentiment measure based on textual analysis developed by Garcia (2003) given in Panel A and the investor sentiment measure based on textual analysis developed by Manela and Moreira (2017, NVIX). Loans/Assets is the ratio of total loans to assets; *Δdeposits* denoted changes in deposits; *ΔLOANS* is the natural logarithm of the ratio of gross bank loans over their value in the previous quarter; *ZSCORE* is the natural logarithm of the *ZSCORE* which is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns; *RISK ASSETS* is defined as the ratio of total assets minus loans and advances to banks, government securities at market values, and cash to total assets; NPL denotes non-performing loans and is the ratio of non-performing loans to total loans; *Size* is defined by the logarithm of total assets; *Liquidity* is the ratio of liquid assets to total assets; *ROA* is the ratio of profits to total assets, a proxy for the performance of each bank. Crisis is the crisis dummy that takes the value of 1 during 2007Q2 to 2009Q4.

Panel A: Estimation Period: 1999Q1-2005Q4

	Sentiment	*Loans/Assets*	*Δdeposits*	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*	*Size*	*Liquidity*	*ROA*	*Crisis*
Mean	35.95	0.618	0.014	0.023	3.127	0.660	0.006	11.58	0.056	0.009	
Std. Dev.	6.240	0.156	0.097	0.095	0.438	0.139	0.013	1.295	0.058	0.037	
Maximum	48.70	1.207	7.213	7.360	6.521	6.395	1	20.73	0.991	10.78	
Minimum	26.41	0	-6.280	-7.373	-2.979	0.008	0	7.137	0	-0.713	

Panel B: Estimation Period: 1999Q1-2015Q4

	Sentiment	*Loans/Assets*	*Δdeposits*	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*	*Size*	*Liquidity*	*ROA*	*Crisis*
Mean	25.76	0.613	0.013	0.015	3.226	0.658	0.011	11.85	0.069	0.008	0.132
Std. Dev.	6.557	0.327	0.103	0.087	0.517	0.135	0.021	1.330	0.184	0.056	0.338
Maximum	50.38	163.5	10.84	7.360	8.359	4.101	2.603	21.46	91.22	16.28	1
Minimum	14.15	0	-7.154	-7.835	-4.353	0	0	3.332	0	-21.50	0

Table 2: Correlations

This table presents correlations among the variables of our specification. Sentiment denotes the investor sentiment measure based on textual analysis developed by Garcia (2003) given in Panel A and the investor sentiment measure based on textual analysis developed by Manela and Moreira (2017, NVIX). Loans/Assets is the ratio of total loans to assets; *Δdeposits* denoted changes in deposits; *ΔLOANS* is the natural logarithm of the ratio of gross bank loans over their value in the previous quarter; *ZSCORE* is the natural logarithm of the *ZSCORE* which is the return on assets plus the capital asset ratio divided by the standard deviation of asset returns; *RISK ASSETS* is defined as the ratio of total assets minus loans and advances to banks, government securities at market values, and cash to total assets; NPL denotes non-performing loans and is the ratio of non-performing loans to total loans; *Size* is defined by the logarithm of total assets; *Liquidity* is the ratio of liquid assets to total assets; *ROA* is the ratio of profits to total assets, a proxy for the performance of each bank. Crisis is the crisis dummy that takes the value of 1 during 2007Q2 to 2009Q4. (***), (**), (*) indicate statistical significance at 1, 5 and 10 percent, respectively.

Panel A: Estimation Period: 1999Q1-2005Q4

	Sentiment	*Loans/Assets*	*Δdeposits*	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*	*Size*	*Liquidity*	*ROA*
Sentiment	1									
Loans/Assets	-0.027***	1								
Δdeposits	- 0.018***	- 0.040***	1							
ΔLOANS	0.0638	0.117***	0.390***	1						
ZSCORE	0.037***	-0.218***	-0.047***	-0.045***	1					
RISK ASSETS	-0.024***	-0.732***	0.037***	0.101***	-0.234***	1				
NPL	-0.009***	-0.036***	-0.043***	-0.077***	-0.081***	-0.004*	1			
Size	-0.050	0.173***	0.047***	0.055***	-0.223***	0.217***	-0.032***	1		
Liquidity	0.012	-0.268***	-0.007***	-0.045***	0.070***	-0.242***	0.064***	-0.211***	1	
ROA	-0.016	-0.015***	0.003	-0.035***	-0.094***	0.023***	-0.115***	0.019***	0.042***	1

Panel B: Estimation Period: 1999Q1-2015Q4

	Sentiment	*Loans/Assets*	*Δdeposits*	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*	*Size*	*Liquidity*	*ROA*	*Crisis*
Sentiment	1										
Loans/Assets	-0.011***	1									
Δdeposits	-0.017***	-0.018***	1								
ΔLOANS	0.047***	0.041***	0.092***	1							
ZSCORE	0.017***	-0.199***	-0.025***	-0.006***	1						
RISK ASSETS	-0.027***	- 0.359***	0.016***	0.079***	-0.223***	1					
NPL	0.150***	-0.001	0.044***	-0.191***	-0.162***	0.012***	1				
Size	0.059***	0.079***	0.030***	0.036***	-0.149***	0.219***	0.087***	1			
Liquidity	0.050***	-0.137***	0.134***	-0.157***	0.053***	-0.141***	0.164***	-0.071***	1		
ROA	-0.015***	-0.593***	0.063***	0.079***	-0.029***	0.003*	-0.031***	-0.003***	0.084***	1	
Crisis	0.372***	0.034***	0.066***	-0.009***	-0.030***	0.090***	0.050***	0.035***	-0.021***	-0.010***	1

Table 3: Investor sentiment and risk-taking behavior

Notes: This table displays results examining the effect of investor sentiment on quarterly loan growth and through this on U.S. banks' stability. Sentiment denotes the investor sentiment measure based on textual analysis developed by Garcia (2003) given in Panel A and the investor sentiment measure based on textual analysis developed by Manela and Moreira (2017, NVIX). The dependent variable of the first stage columns (1) and (5) is *ΔLOANS*: % annual change in total gross loans; The dependent variable in the second stage of the econometric analysis is *RISK ASSETS*: the ratio of total assets minus loans and advances to banks, government securities at market values, and cash, to total assets; *ZSCORE*: the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA); NPL is the non-performing loans, and is the ratio of non-performing loans to total loans; *Size*: the logarithm of total assets; *Liquidity*: the ratio of liquid to total assets; *GFC:* takes the value of 1 during 2007Q2-2009Q4; *Lag dependent*: the lagged value of dependent variable; Heterogeneity test: is an F-test on testing if bank-specific intercepts are different from each other; The table reports coefficients and t-statistics in parentheses (based on robust Huber/White standard errors). (***), (**), and (*) indicate 1%, 5% and 10% significance levels, respectively.

	Sentiment (*García*)				*Sentiment* (*NVIX*)			
Dependent Variable	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*
Sentiment	0.0002*** (3.66)	-0.0001 (-1.54)	0.0001*** (10.82)	-0.0002*** (-10.07)	0.0001*** (2.82)	-0.0007*** (-8.69)	0.0002*** (13.33)	-0.0013*** (-3.67)
Δdeposits	0.3739*** (9.40)				0.1029** (2.08)			
Loans/Assets	-0.2102*** (-13.10)				-0.0803*** (-8.81)			
ΔLOANS		-0.2532*** (-9.38)	0.0663*** (6.74)	00.0011 (-0.71)		-1.098*** (-10.76)	0.1981*** (4.35)	0.1975*** (3.12)
Size	-0.0069** (-2.12)	-0.0051 (-1.20)	-0.0004 (-0.49)	0.0005*** (7.18)	0.0005 (0.37)	0.0202*** (9.32)	0.0005 (1.12)	0.00006 (0.28)
Liquidity	-0.0641*** (-3.71)	-0.1576*** (-2.98)	-0.1513*** (-14.50)	0.0045** (2.35)	-0.2600*** (-6.31)	-0.4279*** (-10.25)	-0.0475*** (-2.96)	0.0938*** (3.46)
ROA	-0.5162** (-2.13)	4.6151*** (7.07)	0.0376*** (6.74)	-0.0501*** (-3.82)	-0.7147*** (-3.33)	3.4205*** (5.23)	0.1527*** (4.48)	0.1657* (1.95)
GFC					-0.0103*** (-10.58)	-0.0337*** (-20.31)	0.0056*** (11.00)	0.0028*** (5.85)
Lag Dependent Variable		- 0.8161*** (-206.6)	-0.7356*** (-57.64)	-0.7415** (-9.80)		-0.9044*** (-362.0)	-0.8323*** (-144.2)	-0.7201*** (-12.63)
R^2	0.1235	0.8851	0.9064	0.7415	0.0394	0.8957	0.9237	0.6599
Heterogeneity test (p-value)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Sargan-Hansen test (p.value)	-	0.2935	0.6877	0.1122	_	0.3044	0.6522	0.0988
# Obs	185,301	183,582	185,898	185,299	315,822	315,252	316,490	315,817
# Banks	6,869	6,886	6,886	6,869	4,720	4,725	4,725	4,720
Estimation Period	1999Q1-2005Q4	1999Q1-2005Q4	1999Q1-2005Q4	1999Q1-2005Q4	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4

Table 4: Investor sentiment and risk-taking behavior: Bank size effect

Notes: This table displays results examining the possible existence of reverse causality between investor sentiment and U.S. banks' stability. We classify banks according to their size. We run the regression for each of the investor sentiment measures. Sentiment denotes the investor sentiment measure based on textual analysis developed by Garcia (2003) given in Panel A and the investor sentiment measure based on textual analysis developed by Manela and Moreira (2017, NVIX). The dependent variable is the *ZSCORE*: the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA); *Size*: the logarithm of total assets; *Liquidity*: the ratio of liquid to total assets; *GFC:* takes the value of 1 during 2007Q2-2009Q4; *Lag dependent*: the lagged value of dependent variable; Heterogeneity test: is an F-test on testing if bank-specific intercepts are different from each other; The table reports coefficients and t-statistics in parentheses (based on robust Huber/White standard errors). (***), (**), and (*) indicate 1%, 5% and 10% significance levels, respectively.

	Sentiment (*García*)		*Sentiment* (*NVIX*)	
	Small	Large	Small	Large
Dependent Variable	*ZSCORE*	*ZSCORE*	*ZSCORE*	*ZSCORE*
Sentiment	-0.0002** (-2.04)	-0.0006*** (-5.06)	-0.0003*** (-3.35)	-0.0013*** (-8.19)
ΔLOANS	-0.4520*** (-6.93)	-0.2152*** (-4.05)	-1.1005*** (-8.07)	-1.1638*** (-3.63)
Size	-0.0507*** (-5.07)	0.0247*** (5.86)	0.0161*** (3.40)	0.0525*** (12.43)
Liquidity	-0.2067*** (-3.26)	-0.0830 (-1.37)	-0.1664*** (-3.39)	-0.6335*** (-4.33)
ROA	4.7215*** (3.67)	5.5972*** (7.51)	3.2633*** (3.01)	6.4471*** (6.83)
GFC			-0.0243*** (-10.09)	-0.0472*** (-11.60)
Lag Dependent Variable	-0.8341*** (-163.5)	-0.7986*** (-113.3)	-0.9120*** -(248.9)	-0.8942*** (-181.4)
R^2	0.8889	0.8719	0.9044	0.8843
Heterogeneity test (p-value)	0.0000	0.0000	0.0000	0.0000
Sargan-Hansen test (p-value)	0.6721	0.7734	0.8321	0.6977
# Obs	82,515	62,649	120,748	78,849
# Banks	3,081	2,330	1,806	1,180
Estimation Period	1999Q1-2005Q4	1999Q1-2005Q4	1999Q1-2015Q4	1999Q1-2015Q4

Table 5: Investor sentiment and risk-taking behavior: Bank equity ratio effect

Notes: This table displays results examining the possible existence of reverse causality between investor sentiment and U.S. banks' stability. We split the sample of U.S. banks according to the equity-to-assets ratio. We run the regression for each of the investor sentiment measures. Sentiment denotes the investor sentiment measure based on textual analysis developed by Garcia (2003) given in Panel A and the investor sentiment measure based on textual analysis developed by Manela and Moreira (2017, NVIX). The dependent variable is the *ZSCORE*: the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA); *Size*: the logarithm of total assets; *Liquidity*: the ratio of liquid to total assets; *GFC:* takes the value of 1 during 2007Q2-2009Q4; *Lag dependent*: the lagged value of dependent variable; Heterogeneity test: is an F-test on testing if bank-specific intercepts are different from each other; The table reports coefficients and t-statistics in parentheses (based on robust Huber/White standard errors). (***), (**), and (*) indicate 1%, 5% and 10% significance levels, respectively.

	Sentiment (*García*)		*Sentiment* (*NVIX*)	
	Low	High	Low	High
Dependent Variable	*ZSCORE*	*ZSCORE*	*ZSCORE*	*ZSCORE*
Sentiment	0.0010*** (10.61)	0.0007*** (4.70)	0.0017*** (14.56)	0.0005*** (3.97)
ΔLOANS	-0.2166*** (-5.07)	-0.1820*** (-3.45)	- 0.9639*** (-3.19)	-0.2971** (-2.04)
Size	-0.0013 (-0.35)	-0.0359** (-1.97)	0.0377*** (11.51)	0.0164*** (2.78)
Liquidity	-0.0676 (-1.56)	-0.1059** (-2.08)	-0.0399 (-0.17)	-0.0076 (-0.23)
ROA	10.64*** (32.49)	1.7087*** (4.02)	8.4615*** (4.91)	1.1613*** (3.41)
GFC			-0.0201*** (-3.32)	-0.0203*** (-5.96)
Lag	-0.7855*** (-110.5)	-0.8464*** (-120.6)	-0.8950*** (-121.3)	- 0.9295*** (-204.5)
R^2	0.8499	0.9108	0.8704	0.9314
Heterogeneity test (p-value)	0.0000	0.0000	0.0000	0.0000
Sargan-Hansen test (p-value)	0.7891	0.7703	0.8112	0.8022
# Obs	75,367	32,673	76,292	32,017
# Banks	2,806	1,218	1,141	479
Estimation Period	1999Q1-2005Q4	1999Q1-2005Q4	1999Q1-2015Q4	1999Q1-2015Q4

Table 6: Investor sentiment and risk-taking behavior: Global Financial Crisis effect

Notes: This table displays results examining the effect of the global financial crisis on the relationship between investor sentiment on quarterly loan growth and through this on U.S. banks' stability. We conduct the analysis only for News VIX measure on investor sentiment (Manela and Moreira (2017). The dependent variable of the first stage columns (1) and (5) is *ΔLOANS*: % annual change in total gross loans; The dependent variable in the second stage of the econometric analysis is *RISK ASSETS*: the ratio of total assets minus loans and advances to banks, government securities at market values, and cash, to total assets; *ZSCORE*: the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA); NPL is the non-performing loans, and is the ratio of non-performing loans to total loans; *Size*: the logarithm of total assets; *Liquidity*: the ratio of liquid to total assets; *GFC:* takes the value of 1 during 2007Q2-2009Q4; *Lag dependent*: the lagged value of dependent variable; Heterogeneity test: is an F-test on testing if bank-specific intercepts are different from each other; The table reports coefficients and t-statistics in parentheses (based on robust Huber/White standard errors). (***), (**), and (*) indicate 1%, 5% and 10% significance levels, respectively.

	Sentiment (*NVIX*)			
Dependent Variable	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*
Sentiment	0.0001 (1.63)	0.0007*** (8.70)	0.0003*** (13.28)	-0.0001*** (-3.67)
Δdeposits	0.1029** (2.08)			
Loans/Assets	-0.0805*** (-8.96)			
ΔLOANS		-1.0894*** (-10.71)	0.1982*** (4.27)	0.1950*** (3.04)
GFC		-0.0330*** (-13.82)	0.0056*** (9.82)	0.0027*** (5.19)
*GFC *ΔLOANS*		-0.0512 (-0.41)	-0.0003 (-0.02)	0.0123 (1.04)
Size	0.0004 (0.33)	0.0203*** (9.07)	0.0005 (1.13)	0.00005 (0.22)
Liquidity	-0.2604*** (-6.28)	-0.4262*** (-10.54)	-0.0474*** (-2.95)	0.0933*** (3.44)
ROA	-0.7142*** (-3.33)	3.4171*** (5.25)	0.1527*** (4.42)	0.1660** (1.96)
GFC	-0.0071** (-2.25)			
GFC Sentiment*	-0.0001** (-3.02)**			
Lag Dependent		-0.9044*** (-362.3)	-0.8323*** (-144.1)	-0.7198*** (-12.63)
R^2	0.0394	0.8957	0.9237	0.6600
Heterogeneity test (p-value)	0.0000	0.0000	0.0000	0.0000
Sargan-Hansen test (p-value)	-	0.6534	0.6809	0.6755
# Obs	315,822	315,252	316,490	315,817
# Banks	4,720	4,725	4,725	4,720
Estimation Period	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4

Table 7: Investor sentiment and risk-taking behavior: Global Financial Crisis and post-crisis effects

Notes: This table displays results examining the effect of the global financial crisis on the relationship between investor sentiment on quarterly loan growth and through this on U.S. banks' stability. We conduct the analysis only for News VIX measure on investor sentiment (Manela and Moreira (2017). The dependent variable of the first stage columns (1) and (5) is *ΔLOANS*: % annual change in total gross loans; The dependent variable in the second stage of the econometric analysis is *RISK ASSETS*: the ratio of total assets minus loans and advances to banks, government securities at market values, and cash, to total assets; *ZSCORE*: the natural logarithm of the ratio (ROA + Equity/Total assets)/Standard deviation (ROA); NPL is the non-performing loans, and is the ratio of non-performing loans to total loans; *Size*: the logarithm of total assets; *Liquidity*: the ratio of liquid to total assets; *GFC:* takes the value of 1 during 2007Q2-2009Q4; *Lag dependent*: the lagged value of dependent variable; Heterogeneity test: is an F-test on testing if bank-specific intercepts are different from each other; The table reports coefficients and t-statistics in parentheses (based on robust Huber/White standard errors). (***), (**), and (*) indicate 1%, 5% and 10% significance levels, respectively.

	Sentiment (*NVIX*)			
Dependent Variable	*ΔLOANS*	*ZSCORE*	*RISK ASSETS*	*NPL*
Sentiment	0.0002*** (2.56)	-0.0007*** (-10.15)	0.0003*** (22.78)	-0.0001 (-7.44)
Δdeposits	0.1026** (2.07)			
Loans/Assets	-0.0811*** (-9.25)			
ΔLOANS		-0.8597*** (-8.61)	0.2447*** (6.26)	0.1483*** (2.98)
GFC		0.0068** (1.96)	0.0090*** (12.76)	0.0031*** (3.79)
*GFC *ΔLOANS*		-0.0681 (-0.68)	-0.0492*** (-4.23)	0.0497*** (4.13)
POST-GFC		0.0559*** (15.70)	0.0050*** (8.98)	0.0008 (1.27)
*POST-GFC * ΔLOANS*		0.0124 (0.09)	-0.0925*** (-4.70)	0.0565** (2.23)
Size	0.0017 (0.76)	-0.0172*** (-7.93)	-0.0015*** (-2.30)	-0.0012 (-1.69)
Liquidity	-0.2586*** (-6.08)	-0.4334*** (-11.34)	-0.0604** (-3.79)	0.0915*** (3.40)
ROA	-0.7261*** (-3.33)	3.7960*** (5.41)	0.1882*** (6.28)	0.1643* (1.88)
GFC	-0.0006 (-0.18)			
GFC Sentiment*	-0.0004*** (-3.65)			
Post-GFC	0.0564 (14.08)			
Post-GFC Sentiment*	-0.0020 (-16.11)			
Lag Dependent		-0.8988*** (-337.9)	-0.8333*** (-148.1)	-0.7159*** (-12.25)
R^2	0.0402	0.8986	0.9235	0.6524
Heterogeneity test (p-value)	0.0000	0.0000	0.0000	0.0000
Sargan-Hansen Test (p-value)		0.7703	0.6882	0.7005
# Obs	315,822	315,252	316,490	315,817
# Banks	4,720	4,725	4,725	4,720
Estimation Period	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4	1999Q1-2015Q4