Anxious periods and bank lending

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Abstract

We examine the lending behavior of banks during anxious periods. The main characteristic of anxious periods is that the perceptions and expectations about economic conditions worsen for economic agents even though the economy is not in a recession. We identify distinct periods of anxiety for consumers and CEOs (firms). Subsequently, we study the lending behavior of US banks during the two distinct pools of anxious quarters from 1985 to 2010, using bank-level data. The results show that banks' lending falls when consumers are anxious, and this effect is more pronounced when banks hold a higher level of credit risk. Yet, in anxious periods that were followed by recessions, the negative impact of anxiety on loan growth is significantly weaker for banks with higher credit risk. Notably, anxiety of firms plays only a minimal role in shaping bank lending.

JEL classification: G21; E44; E32; D22
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1. Introduction

The financial turmoil that started in 2007 and the severity of the recession that followed highlights the importance of banks' lending behavior for economic fluctuations. In this paper, we explore changes in banks' lending during periods when expectations of economic agents worsen, but the economy is not in a recession. We characterize these periods as "anxious". These anxious states might be followed by a recession or the economy moves back to a "good" state. This subject is of great interest because banks' lending behavior during such periods can either ease anxiety or impose further strain on the economy. Further, anxious periods are ideal for examining banks' lending policies and risk perceptions in a framework of diminishing expectations. Clearly, it is important to know how banks' lending policies are shaped during such periods. This study aims to provide, to our knowledge for the first time in the literature, explicit answer to this question.

Banks may observe anxious periods directly: through news, their own macroeconomic analyses, or even potential pressures on the asset and liability sides of their balance sheets. In addition, banks may identify such periods indirectly, through the screening of loan applicants, the monitoring of their existing loans' deteriorating credit risk profile, or both. The above might result to a change in banks' lending policies through changes in loan supply and/or changes in banks' perception of risk and, thus, the allocation of credit across loan categories. Bank characteristics reflecting the quality of their portfolios and managerial practices can play a key role in the lending decisions of banks during anxious periods. For example, a bank with a relatively risky portfolio might act more aggressively in cutting its loans during anxious periods, and a systemic such behavior across the industry increases the probability of a credit crunch. In contrast, a more conservative bank behavior during good times might result in lessened fluctuations in loan growth during anxious periods and may help the economy escape abrupt economic downturns.

We identify anxious periods from the households and firms' expectations on future economic outcomes. Even though the anxieties of these agents might be interrelated and contemporaneous, households and firms can still be anxious during different times on the basis of their imperfect information about shocks in the economy (see, among others, Kydland and Prescott, 1982; Collard et al., 2009), rational inattention (Carroll, 2003; Sims, 2003, 2010), or even their own asymmetric goals and strategies. Hence, rather than employing measures that encompass aggregate expectations about future economic conditions, such as analysts' forecasts or stock market movements, we rely on a distinct measure of anxiety for households and firms. To this end, we use two indices, namely consumers' and CEOs' (firms') falling confidence. These indices encompass by definition diminishing expectations on economic prospects. First, consumers' confidence, employed by Lorenzoni (2009) as a measure of consumers' short-run expectations, has information content about future economic activity rather than causes economic outcomes (Barsky and Sims, 2011); second, CEOs' confidence responds earlier and more to policy shocks than consumers' confidence (Bachmann and Sims, 2010). We term the falling confidence of consumers and CEOs as consumers' and CEOs' anxiety, respectively.

To examine the way loan growth is shaped during these anxious periods, we employ quarterly data on banks from the Federal Deposit Insurance Corporation (FDIC) call reports over the 1985Q1–2010Q2 period. Given the theoretical considerations of our study, we focus only on the anxious periods identified from each of the two agent's perspective.

Our empirical framework has a number of notable characteristics. First, by following a well-established literature on the bank lending channel (e.g., Kashyap and Stein, 2000; Cetorelli and Goldberg, 2011) we identify the effect of increased anxiety 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 anxious periods differently between banks with different levels in the health of their balance sheets. Second, the fact that recessions 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 similarities in banks' lending activity during anxious periods and recessions. Third, we examine whether the more important banks follow different strategies due to moral-hazard issues associated with too-big-to-fail concerns of governments, regulators, and the public. Last but not least, we offer some insights on the competitive conduct of banks during periods characterized by anxiety about future economic outcomes. The importance of competitive conduct of banks in loan growth has recently been established by Olivero et al. (2011).

Our main results indicate that consumers' anxiety negatively affect loan supply. This response is primarily distributed through higher credit risk, indicating a heterogeneous impact of anxiety on the banking sector. Other bank characteristics, such as capitalization and liquidity, do not seem to drive banks' lending decisions in anxious periods. In contrast, total loan growth is less sensitive to CEOs' anxiety even though the growth of certain loan categories passes through the provisioning decisions of banks. Notably, the findings are different, if not opposite, in anxious periods that actually lead to a recession. This difference potentially suggests a special role for banks in exacerbating the economic downturn. In addition, our evidence suggests that large banks tend to react more than smaller ones to the signs of anxiety; however, their reaction involves a higher loan growth relative to the average bank during anxious periods. The findings remain unaffected when we identify the impact of anxiety on banks' loan supply through quarters following a major regulatory event that represents a loan supply shock, or when we control for demand variation across geographical

areas. This eases concerns about identification problems owing to simultaneous shifts in loan supply and loan demand. Several robustness checks provide strong support to these results.

Our study relates to at least three strands of literature. The first identifies the impact of certain events or periods on banks' lending, such as the effect of the recent financial crisis on credit (e.g., Ivashina and Scharfstein, 2010); the liquidity shock experienced during the crisis on bank lending (Cornett et al., 2011); monetary and non-monetary shocks on bank loan portfolios (Den Haan et al., 2007); and exogenous shocks to banks' loan supply, providing evidence on its importance to firms' activity (e.g. Peek and Rosengren, 2000). Unlike the present paper, the focus of this literature is primarily crises periods. The second stresses the essential role that banks play as liquidity providers and transmitters of monetary policy shocks (e.g., Bernanke and Gertler, 1989, 1995; Diamond and Rajan, 2001), while paying special attention to this role during or at the onset of recessions (e.g., Bernanke et al., 1996). The third highlights the strong impact of expectations over the business cycle for leverage and, thus, credit (e.g., Bhattacharya et al., 2011; Fostel and Geanakoplos, 2008). 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.

Here, we essentially borrow elements from these strands of the literature by focusing, however, on periods of diminishing expectations. In other words, 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 diminishing such expectations that might or might not evolve to a crisis.

The rest of the paper is organized as follows: Section 2 analyzes the reasons behind the importance of anxious periods in shaping bank lending. This section also places our study within the literature on consumers' and CEOs' expectations. Section 3 describes the data and the identification strategy of the anxious periods, while Section 4 discusses the empirical method. Section 5 presents and discusses the empirical results and Section 6 concludes the paper.

2. Anxious periods

We borrow the discussion of an anxious economy from Fostel and Geanakoplos (2008) who define anxious periods as intermediate states of the economy related to bad news in the market. Here, we place the concept of anxiety within a real-economy framework with incomplete information and bring financial intermediaries explicitly into the picture (see Shin, 2009). The rest of this section (i) highlights why anxious periods are important and banks' lending might be shaped differently during these periods, and (iii) suggests why anxiety is potentially different between the major agents involved into the lending process.

2.1. Anxious periods and bank behavior

As already mentioned, the main characteristic of anxious periods is that the perceptions and expectations about economic conditions worsen, even though the economy is not in a recession. These anxious periods might be followed by a recession or, as in most cases, the economy moves back to a good state. In other words, anxious periods are characterized by diminishing expectations about future economic conditions. The importance of these periods for the lending behavior of banks and the composition of their loan portfolios is large, since it is during such periods that deleverage may start and, under certain circumstances, might lead to a banking crisis. Moreover, the reallocation of credit during periods of heightened

uncertainty and diminishing expectations allows us to observe the perceptions of banks about risk.

According to Ruckes (2004), the collection and the processing of information by banks, as well as the degree of competition among them, varies with the business cycle resulting in changing bank credit standards. Put it differently, it is not only the change in the credit quality of borrowers i.e., the demand side, but also changes in bank risk preferences in lending, i.e., the supply side, that shape the amount of total credit across different phases of the business cycle. Rajan (1994) documents the existence of the latter force and puts forth the role of the short-term interest of banks and reputational considerations as the driving mechanism of changes in loan supply during non-recession times. In a similar spirit to the above studies, Gorton and He (2008) attribute periodic credit crunches and endogenous credit cycles to banks' strategic competition for borrowers through lending standards rather than loan prices.

Rajan (1994) and Ruckes (2004) also stress that banking problems and financial instability originate in boom times. Bank total loan portfolios are not easily restructured and bank characteristics that reflect past bank behavior in asset management can play a key role during anxious periods. For example, as the economy moves to anxious periods, easiness in lending behavior by banks during good times in the economy can put a considerable burden on banks' credit risk and thus affect their contemporary lending decisions. A low liquidity position or capitalization of banks can also put additional weight on institutions. If banks deleverage their balance sheets during anxious periods, and in the case they do so simultaneously and aggressively, this strategy might cause systemic stress through liquidity crunch and threaten financial stability (Adrian and Shin, 2008). As the economy moves to anxious periods all the above point to a reduction in lending that might be caused by (i) tighter terms of credits on new and past loan customers alike, (ii) changing lending decisions by

banks towards different loan categories, and (iii) increased collateral requirements for new loans. Clearly, a study of the response of loan growth during anxious states of the economy involves both new and old contracts.

2.2. Why are anxious periods potentially different among economic agents?

The closest study to ours is that of Bhattacharya et al. (2011), who examine theoretically the impact of expectations on leverage and risk. However, in their model every agent has the same information set. We relax this assumption and examine the impact of anxiety on the economy from the perspective of two different economic agents, i.e., households and firms. This choice allows us to focus on more "noisy" states of anxiety owing to imperfect information among agents, rational inattention (Sims, 2010), or the asymmetric goals and strategies of different agents, rather than on aggregate expectations, such as professional forecasters' views or stock market's movements.

More specifically, during anxious phases the different economic agents involved in the lending process can view different economic outcomes or perceive policy shocks and/or news about the economy in a rather different way. For example, a restructuring of the tax system towards higher personal income and lower corporate taxation might improve firms' appraisal of future economic conditions and worsen consumers' perception about their own future income. In addition, households or consumers might be more concerned with fluctuations in employment or prices. Moreover, the presence of informational asymmetries between CEOs and consumers can add to this heterogeneity in perceptions and expectations. It is natural to assume that firms' managers are generally better informed about the prospects of the economy than consumers, because they focus on investment prospects and future profitability that are being affected by a large number of factors. To this end, CEOs have better access to information and possibly a better understanding of economic news and analyses. Bachmann

and Sims (2010) verify the advantage of CEOs over consumers in reacting more quickly to economic signals and point out that CEOs' confidence responds earlier and by more to a policy shock than consumers' confidence does.

Given the above, we employ two distinct measures to capture consumers' and CEOs' anxieties regarding the state of the economy. We represent these anxieties as falling consumers' and CEOs' confidences. Details on the two measures used to specify anxious periods for each agent's perspective and on the rules employed for the identification of anxious periods are provided in the following section. Clearly, to identify the role of agents' anxiety in bank lending, one needs to isolate the periods in which households and/or firms become anxious and examine the lending behavior of banks during these periods, using a strategy similar to that of papers that examine the lending behavior of banks during crises or recessions. To our knowledge, our study is the first that focuses on how banks' lending is shaped during anxious periods, in the sense that these periods are described above.

3. Data description and identification of anxious periods

3.1. Data and variables

Table 1 reports how the variables employed in the empirical analysis are measured and their data sources. Data on the bank-level variables come from the FDIC call reports. We use data on all available commercial banks for the period 1985Q1-2010Q2. These data yield an initial unbalanced panel of 1,116,397 bank-quarter observations. 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. This is the main dependent variable of our study.[1]

[Insert Table 1 here]

[1] We conduct a number of additional tests using the growth in the main individual loan categories as the dependent variable. Due to space considerations we do not report these results.

To observe anxiety for consumers and firms we need variables with predictive ability for the economy. Confidence is widely recognized by academics and policy makers as being a key element in the transmission of shocks into the economy and is an ideal candidate as a proxy for economic agents' expectations. The role of confidence in the economy ranges from causing economic outcomes, the 'animal spirits view' (Keynes, 1936; Blanchard, 1993; Akerlof and Shiller, 2009), to just being an information provider for the future state of the economy, the 'information view' (Cochrane, 1994; Bachmann and Sims, 2010). In line with this second view, confidence can also be viewed as a time-varying discount factor for the future state of the economy (Bachman and Sims, 2010). Very recently, Barsky and Sims (2011) provide evidence in favor of the information content of consumers' confidence about future economic activity rather than the 'animal spirits view.' Further, Bachmann and Sims (2010) find that both consumers' and CEOs' confidence play a modest role in the transmission of policy shocks into the economy, although CEOs' confidence plays a more essential role to this propagation than consumers' confidence in that it responds earlier and by more to these shocks.

Given these theoretical arguments, we measure the anxieties of consumers and firms with the falling confidences of consumers and CEOs. For consumers' confidence we use the Conference Board's consumers' confidence survey that is conducted monthly on a representative sample of 5,000 consumers. In this survey, there are five questions that measure the following: current (i) business and (ii) employment conditions; six-month expectations on (iii) business and (iv) employment conditions, as well as (v) total family income. There are three available responses to each of these questions: positive, negative, and neutral. After a seasonal adjustment for the response rate, a single sub-index value is calculated for each question as the ratio of positive answers to the sum of neutral and negative ones, relatively to the relevant ratio for the calendar year 1985. The consumers' confidence index is then

calculated as the average of all five sub-indices. Lower values in this index reflect higher consumers' anxiety.

In turn, for CEOs' confidence we use the Conference Board's CEO survey. This survey is conducted quarterly using a sample of 100 CEOs from ten industrial sectors that span the economic activity of the country. The sectors include manufacturing of durable and non-durables goods, as sell as services. The survey has four questions that measure the following: current (i) economic conditions, (ii) conditions in the specific industry each CEO belongs to compared to that six months ago, and expectations about (iii) the economy, and (iv) the specific industry in a six-month horizon. The available answers are classified as substantially better, moderately better, same, not substantially better and substantially worse; each taking the numerical value of 100, 75, 50, 25, and 0 respectively. Then, the value of the CEO-confidence index is calculated as the average of the values of the answers that results in a number in the [0, 100] interval. Lower values of this index reflect higher CEOs' anxiety.

The lending equation is identified at the bank level, and thus we need to control for a number of individual bank characteristics. In addition, the role of these variables is important to the empirical identification of the equation; we discuss this issue below. Following the bank-lending channel literature (e.g., Ashcraft, 2006; Altunbas et al. 2010) we employ variables such as bank capitalization, size, non-performing loans, provisions, liquidity, and the banks' lending rate.[2] Formal definitions for these variables are provided in Table 1.

In forming the banks' lending equations, we also control for the general macroeconomic conditions that affect all banks in the sample, using the change in the natural logarithm of the industrial production volume. In our robustness checks, we also use the Federal Funds rate. Finally, we control for the regulatory changes that took place in the U.S. banking industry during the period examined by constructing two dummy variables. The first

[2] We also experiment with other variables such as the cost to income ratio, the loans to deposits ratio, the loans to assets ratio, etc. These variables do not add to the empirical framework.

takes a value one from 1989Q3 onwards to capture the effect of the "Financial Institutions Reform and Recovery Act" enacted on August 9, 1989. The second takes a value one from 1994Q4 onwards to capture the effect of the "Riegle-Neal Interstate Banking and Branching Efficiency Act" enacted on September 29, 1994. Although a number of other regulatory changes took place during the period examined (Sherman, 2009), our preliminary results point to the inclusion of just these two dummies.

Table 2 reports the descriptive statistics for the variables employed. We report the number of observations available for each variable along with the mean, standard deviation, and the minimum and maximum values. Also, Table 3 shows that correlation coefficients between the main variables of our study are not high enough to suggest multicollinearity issues.

[Insert Tables 2 and 3 here]

Interestingly, the correlation coefficient between consumers' and CEOs' confidence takes a value of -0.11 that suggests CEOs and consumers do not react contemporaneously and/or in the same direction to the arrival of news. This is in line with the discussion in Section 2 about the heterogeneity of perceptions and expectations about the economy between CEOs and consumers. Moreover, this pattern is consistent with the finding of Bachmann and Sims (2010) on the earlier response to shocks of CEOs' confidence relatively to consumers' confidence.

Figure 1 shows the time evolution of the consumers' and CEOs' confidences over our sample period together with the industrial production growth (y-o-y) and total loan growth (y-o-y). Consumers' confidence clearly exhibits a pro-cyclical behavior. In contrast, CEOs' confidence increases substantially in periods shortly after a recession end or even when expectations suggest that the recession is ending. Moreover, periods in which consumers' confidence falls (consumers' anxiety rises) do not generally coincide with periods when

CEOs' confidence falls. Another point worth mentioning is that consumers' confidence has larger swings than CEOs' confidence, but the latter exhibits a greater number of small fluctuations around its short-run trend.

[Insert Figure 1 here]

3.2. Identification of anxious periods

Apart from the measure of the size of anxiety from each economic agent's perspective, we need to identify the periods for which such an anxiety holds and for which we perform our empirical analysis. For this, we use a number of approaches. Since, and given our discussion in Section 2, this paper is primarily concerned about banks' lending behavior within anxious periods, we favor a heuristic approach and obtain two distinct pools of quarters characterized by anxieties for consumers and CEOs, respectively. In particular, and in line with the NBER's paradigm on the definition of recession periods, we define anxious periods from each agent's perspective those quarters with a consecutive two-quarter decline in consumers' and CEOs confidence while the economy is not in a recession. This approach yields 18 quarters of anxiety for consumers and CEOs out of which only 4 quarters are common between the two. These are 1993Q3, 2005Q3, 2007Q3, and 2007Q4. These figures justify our approach of examining anxieties from the two different economic agents' perspective and confirm the heterogeneity in agents' perceptions and expectations about the worsening of economic conditions.

To examine the sensitivity of our results, we also employ a second rule. According to this, we define as anxious periods those quarters in which each agent's confidence (i) has been falling for one quarter and (ii) is lower than its sample mean, while the economy is not in a recession. This second rule yields 19 quarters of anxiety for consumers and 13 for CEOs. From these, in only two quarters are consumers and CEOs both anxious, 1996Q1 and 2007Q4.

Figures 2 and 3 illustrate the anxious periods for consumers and CEOs under the first rule along with the GDP growth rate (y-o-y) respectively. Anxious periods are in blue, and recession periods are in grey. Evidently, periods of consumers' anxiety always precede recession periods (see Figure 2). In contrast, Figure 3 shows that CEOs were anxious only before the 2008 recession. Finally, banks were anxious before both the 2001 and 2008 recessions.

[Insert Figures 2 and 3 here]

4. Empirical methodology

Our empirical strategy builds on the literature relying on banks' lending equations. Kashyap and Stein (2000), and many others since (recent examples are Ivashina and Scharfstein, 2010; Cetorelli and Goldberg, 2011; Cornett et al., 2011), show how to overcome a number of identification problems when estimating lending equations. Their strategy involves disentangling the effect of macroeconomic variables on loan supply from the respective effect of these variables on loan demand (simultaneity problem).[3] To this end, this literature proposes using bank-level data and interaction effects between certain individual bank characteristics and the variable of interest, thus providing a reduced-form loan supply equation. The caveat in disentangling loan supply from loan demand in the bank lending channel literature lies, as Becker and Ivashina (2011) readily argue, in that clients' demand for credit must be uncorrelated with banks' access to credit. Yet, under this identification strategy, for the coefficients of the interaction terms to be interpreted as driven by the demand side, two conditions must hold. First, the impact of each agent's anxiety on loan demand must

[3] Certainly, it may well be the case that anxious periods represent shocks to both supply and demand for credit. For example, firms may face diminishing expected returns for their projects during anxious periods and cut lending contemporaneously, i.e., demand effect, while at the same time changing the informational characteristics of the pool of borrowers and giving rise to adverse selection problems, i.e., supply effect. The same may hold for consumers as, at anxious times, they may limit borrowing while the perceived, from the banks point of view, ability to repay their loans is hurt due to concerns about e.g. rising future unemployment.

not be uniform across banks with differential characteristics and, second, loan demand should fall more for banks with higher risk. In our view, and also in line with the aforementioned literature, these assumptions are rather strong. Further, and to ensure that possible omitted demand factors are not driving our results, we include in our base regression banks' state dummies along with their interaction terms with our anxiety measures (see also Cornett et al., 2011).

As a further robustness check on the simultaneity problem, we proceed a step further and conduct a semi-natural experiment, using information for quarters characterized by a clear loan supply shock. In particular, we examine the response of banks' lending to agents' anxieties during anxious or recession quarters, while at the same time an institutional reform in the financial industry was implemented. Clearly, such institutional reforms can be interpreted as supply shocks during these quarters, thus providing us with an ideal semi-natural experiment to examine the response of banks' lending behavior to anxiety.

The same literature also suggests a solution to the so-called endogeneity problem. In particular, the use of relatively high-frequency data, such as quarterly data, allows for examining the lending behavior of banks when these banks view the state of the economy and elements of their own portfolio as predetermined.[4] In other words, banks make lending decisions on the basis, inter alia, of the behavior of other economic agents, the state of the economy, and the strength of their balance sheet in the previous quarter. Therefore, this strategy substantially eases concerns on reverse causality issues. We conduct additional sensitivity analysis on this issue, by using a purely exogenous shock related to a cross-sectional study for the 2001Q4 after the attack on the World Trade Center.

The actual empirical model to be estimated for the two distinct pools of anxious quarters is the following:

[4] The study of Foos et al. (2010) is a recent example of such reverse causality between loan growth and other bank characteristics, such as bank risk and performance.

$$\Delta \ln(loans)_{it} = a_0 + a_1 \Delta \ln(loans)_{it-1} + \sum_k a_{2ki} B_{kit-4} + a_3 \Delta A_{t-1}$$
$$+ \sum_k a_{4ki} B_{kit-4} * \Delta A_{t-1} + a_5 \Delta \ln IND_{t-1} + \sum_j a_{ji} DUM_j + u_{it} \quad , \qquad (1)$$

where the loan growth of bank *i* over the previous quarter is regressed on its lag, a number *k* of bank characteristics *B* observed over the previous year, the change in the relevant anxiety variable *A* for the respective agent between time *t*-1 and *t*-2, the interaction of these anxiety indices with bank characteristics,[5] the change in industrial production volume *IND* between time *t*-1 and *t*-2, and the two regulatory dummies DUM_j defined in subsection 3.1.[6]

In equation (1), the parameter a_3 captures both demand and supply-side effects. Hence, the choice of the bank characteristics to be interacted with *A* is crucial to the solution of the simultaneity problem. In general, identification is guaranteed as long as the impact of each agent's anxiety is not uniform across banks with differential characteristics. Kashyap and Stein (2000) suggest using bank size and liquidity. The concept is that larger and more liquid banks can better protect their loan portfolio by lowering their larger stock of securities. Kishan and Opiela (2000) suggest that more capitalized banks are also able to insulate their loans from the effects of an adverse development by using the excess buffer of capital stock. Finally, Altunbas et al. (2010) suggest that financial innovation and the wider use of new ways of transferring credit risk have tended to diminish the informational content of the above standard bank-balance-sheet indicators. They show that indicators of credit risk should be used along with size, capitalization, and liquidity to identify the transmission of macro variables on banks' lending. We also follow this strategy to identify the impact of anxiety on loan growth and use two measures of credit risk based on loan-loss provisions and problem loans along with the usual capitalization, liquidity, and size variables.

[5] Given that the correlation between the level and the interaction terms is very high (i.e., an indication of multicollinearity), we mean-center the variables (i.e., generate new variables by subtracting their means). Mean-centering also allows interpreting the coefficient of anxiety variables at the average level of bank characteristics rather than at the point where each bank characteristic is zero.

[6] The model is estimated in differences and this cancels out any bank effects.

In the present analysis, we deviate from the literature on the banks' lending channel of monetary policy in a number of ways. First and foremost, the anxiety variables from each agent's perspective enter the estimated model in alternative equations, and these equations are estimated using only (unless otherwise specified) the pool of quarters during which the relevant agent is anxious. This choice provides a direct answer on how banks' loan behavior is shaped during anxious periods.

Second, as evident from Eq. (1), we only include the first lags on the dependent and the explanatory variables common to all banks and, thus, only the first lag of A (the literature using quarterly data tends to include four time lags). The main reason for this choice is that, at least in our sample, multicollinearity of the lags tends to affect inference substantially. Instead, we assume that banks observe the developments captured by the macro variables in the previous quarter; and, in conjunction with the strength of their balance sheets relative to the same quarter of the previous year, they decide whether and by how much they will expand lending.

Third, and related to the second, we include only the fourth lag of the variables B that indicate the strength of banks' balance sheets. The reason is that data on bank characteristics, such as liquidity and capitalization, are highly seasonal because of the accounting practices used by banks. A correction for this type of seasonality in terms of sophisticated econometric methods finds no consensus in the literature. Thus, it seems safer to assume that banks decide to expand their lending based on the information they have on the position of their balance-sheet strength over the same quarter of the previous year.[7] Note that for the lags we do use information from the periods prior to the anxiety periods, so as not to reduce the time length of the pools of quarters. For example, if an anxiety period occurs at time t-1, we use B at time t-4 observed in a non-anxiety period.

[7] In fact, this is exactly what bank managers tend to do when carrying out the so-called CAMEL (Capital Adequacy, Assets, Management Quality, Earnings and Liability measurement) analysis.

Fourth, we do not focus on the identification of a banks' lending channel of monetary policy; and, thus, we do not include a policy interest rate among the regressors in the baseline specifications. This choice provides additional flexibility to our model because there is no consensus on what the proper monetary policy instrument should be. In contrast, we include a proxy for the bank-level lending rate among the explanatory variables that makes equation (1) a *de facto* bank loan-supply equation. This choice further eases concerns on other identification problems stemming from misspecification of the lending rate, because this variable is observed at the bank level. However, we do provide some sensitivity analysis of the results by including the Federal Funds rate among the regressors in other specifications later on. Overall, we feel that these assumptions represent an accurate approximation of banks' behavior.

Regarding the estimation method employed, the literature proposes using either an endogenous panel data estimation method or GMM for dynamic panels. The latter method seems to be the most favored in recent studies (see, e.g., Gambacorta, 2008; Altunbas et al., 2010). Yet, in large panels, as in our case, the number of instruments under GMM gets very large. The quality of these instruments is often poor because they tend to be only weakly correlated with first-differenced endogenous variables that appear in the equation. This weak correlation leads to a large bias under GMM estimation. Therefore, based on recent developments in the econometrics for dynamic panels, we estimate our equations by employing the limited information maximum likelihood method (see Baltagi, 2005, pp. 153, and references therein). For robustness of our results, we also conduct a sensitivity analysis with GMM.

5. Empirical results

This section reports and discusses the empirical results of the paper. First, we present the findings on the response of total loan growth of banks during anxious periods for consumers or CEOs. For comparison purposes, we also present the results on the response of total loan growth during recessions. Second, we examine the same effect for those anxious periods that actually led to a recession[8] and for the anxious periods that only occurred after 2001Q4. Third, we examine the lending behavior of only large and very large banks. Fourth, we conduct several other robustness exercises to ensure that the results are not driven by the key assumptions made on the empirical strategy and the set of variables employed.

Note that the definition for anxieties for consumers and CEOs is falling confidence; that is the change in confidence is always negative. For illustrative convenience, we convert the sign of changes in confidence for consumers and CEOs from negative to positive so that a higher value on the respective index reflects higher anxiety. Thus, the interpretation of a, say, negative coefficient on the interaction term between the anxiety variable and banks' capitalization is "banks with higher capital reducing their supply of loans by more than the average bank when anxiety increases."

For expositional brevity, and because we are interested in the interaction (partial) effects that characterize loan supply, the estimation results of the main terms are not reported for all estimated equations. For the baseline regressions, we report and discuss the results of the main effects in the Appendix. The impact of the main effect of an explanatory variable, in models with interaction effects, is sometimes misinterpreted as the "direct effect" of this variable on the dependent variable. Unless the respective variables are demeaned, which is what we do here, this is clearly incorrect and further calculations should be carried out to identify the true direct effect (see Wooldridge, 2002, pp. 190-191, and discussion in the

[8] These are the quarters that just preceded the three recession periods in our sample, i.e., 1990Q3-1991Q1, 2001Q2-2001Q4, and 2008Q1-2009Q2 where consumers and CEOs were anxious.

Appendix). In general, the results on the main effects are consistent with expectations, suggesting that higher anxiety reflects lower loan growth rates. This effect holds irrespective of which of the two agents is considered. As discussed in the previous section, this main effect is driven by both loan supply and loan demand forces, and this is why we focus on partial effects of anxiety with the inclusion of bank characteristics.

Briefly, one of the most notable results is that banks' lending responds differently to the anxieties of consumers and CEOs during anxious periods. Yet, this is not the case during recessions. During anxious periods, the response of banks' lending to consumers' anxiety has a common denominator: credit risk. Moreover, the results are very similar across the two different rules we use to define anxious periods. In particular, an increase in consumers' anxiety during anxious periods yields a drop in loan growth for banks with a higher level of problem loans. Other bank characteristics, such as capitalization and liquidity do not drive the lending decisions of banks in anxious periods. In addition, banks' lending behavior is affected primarily by the anxiety of consumers, which is clearly procyclical. In contrast, total loan growth is not sensitive to CEOs' anxiety. In addition, evidence exists that large banks tend to react more than smaller ones to the signs of anxiety. Several robustness checks provide strong support for these results. More details follow.

5.1. Loan supply during anxious periods and recessions

Table 4 reports the results of the equations for total loan growth. Columns I through IV report the results when the two economic agents are anxious, while columns V through VI report the results for the recession periods for comparison purposes.[9] Columns I and III show the results with anxious periods defined with our first rule; that is, two consecutive quarters show a

[9] The sample period examined, 1985Q1–2010Q2, encompasses three recession periods: 1990Q3–1991Q1, 2001Q2–2001Q4, and 2008Q1–2009Q2.

decline in the confidence of consumers and CEOs, respectively, while the economy is not in a recession. Columns II and IV report the respective results with anxious periods defined with our second rule; that is, one quarter decline in confidence, the respective variable being below its sample mean, and the economy not in a recession.

[Insert Table 4 here]

In columns I and II the coefficients of the interaction terms between the change in consumers' anxiety and problem loans and provisions are negative and significant, the former being much larger in absolute terms than the latter (coefficients/t-statistics: -1.226/-3.256 and -0.112/-2.685, respectively, in column I). This finding shows that an increase in consumers' anxiety yields a drop in loan growth, which is more pronounced for banks with more problem loans and more provisions. An explanation for this finding is that banks with bad loan portfolios are more exposed to credit risk and, thus, they take more pronounced measures in light of the worsening economic conditions, a result in line with the recent findings of Louzis et al. (2012). The rest of the multiplicative terms come out non-significant, which indicates that capitalization, liquidity, and size are not driving the lending decisions of banks when consumers are anxious. Notably, in contrast to the findings for consumers' anxiety, the results reported in columns III and IV show that banks do not significantly alter their lending given a change in CEOs' anxiety.

In a nutshell, and given the fact that consumers' confidence is more or less procyclical while CEOs' confidence is not so, it seems that banks' lending behavior is affected by those agents' anxieties and expectations that more closely follow the business cycle. This is a rational behavior, as banks respond only when they expect that they will be facing problems in the near future. This reasoning is consistent with Rajan's (1994) argument about banks' short-term interest. However, the fact that banks do not alter their lending behavior when their bigger customers, i.e. firms, are anxious shows that in this respect they neglect an indicator –

CEOs' confidence – that responds earlier and more profoundly than consumers' confidence to shocks (Bachmann and Sims, 2010). This neglect can have a serious effect on the health of bank portfolios in the medium term.

Columns V to VI report the results for the recession periods. A notable difference from the results for anxious periods is that now the interaction term of bank liquidity turns out significant with a negative sign in all cases. This finding stresses the importance of injecting liquidity into the financial system during recessions. High problem loans still impact banks' lending behavior negatively. However, the relevant coefficient is much smaller in absolute terms than during anxious periods for consumers. This result might reflect that some banks prepare for the more stressful economic conditions of a recession during the precedent anxious times. Alternatively, it might be that the worst case scenario has materialized and banks look forward to better upcoming economic conditions. Lastly, the coefficients on the interaction between anxiety and bank size are positive and significant in all cases. This result clearly implies that during recessions the supply of loans and thus the funding of the economy originates primarily from larger banks.

We also check whether demand variation in different geographical areas of the country drive our results. Thus, we include in our main specification state dummies and their interaction terms with the anxiety measures. For each bank a state dummy equals 1 if the bank is located in this state. The results remain essentially the same.[10]

As discussed in the second paragraph of Section 4, we provide one more test to back up our analysis against the potential criticism on the simultaneity issue. Specifically, we examine the response of banks' lending to agents' anxieties during anxious or recession quarters, while at the same time an institutional reform in the financial industry was

[10] Due to space considerations, these results are available on request.

implemented.[11] Clearly, such institutional reforms can be interpreted as exogenous positive supply shocks during these quarters, thus providing us with an ideal semi-natural experiment to examine the response of banks' lending behavior to anxiety. Given that the main effects presumably now reflect pure supply shocks we do not include interaction terms with bank characteristics.[12] Estimations are carried out with OLS and the results, reported in Table 5, show that each agent's anxiety is significant and enters with a negative sign, as expected. The results are in line with those presented in Table 4; that is, stronger for consumers' anxiety, while the impact of CEO anxiety is only marginally statistically significant. This shows that a study with multiplicative terms on bank characteristics is able to capture the shifts in loan supply, with the additional ability to identify the sources of shifts, which here are related to credit risk.

[Insert Table 5 here]

5.2. Loan supply during specific anxious periods

To examine whether the response of the lending behavior of banks to agents' anxieties plays a role in the unfolding of a recession or in the recent financial crisis, we repeat the analysis for the following specific anxious periods: (i) those that precede the three recession periods in our sample, i.e., 1990Q3–1991Q1, 2001Q2–2001Q4 and 2008Q1–2009Q2; and (ii) those that occurred after the end of the 2001Q2–2001Q4 recession. The choice for the latter period is dictated by the credit expansion that took place in a low interest rates environment during the 2000s and its possible effect on the financial crisis of 2007-2009. Furthermore, the main

[11] These quarters are: (i) for anxious consumers—1998Q4 (Citigroup was formed on October 8, 1998 following the $140 billion merger of Citicorp and Travelers Group, on the expectation that Glass-Steagall would be repealed), and 2001Q1 (the Commodity Futures Modernization Act was fully implemented, enacted on December 21, 2000); (ii) for anxious CEOs—1994Q4 (the Riegle-Neal Interstate Banking and Branching Efficiency Act was enacted on September 29, 1994).

[12] We repeat this analysis by including the interaction terms with bank characteristics. The estimated coefficients of the interaction terms remain essentially the same as our main results. These estimates are available on request.

institutional reforms in the U.S. financial system had already been implemented by that time, resulting in a more homogeneous period. Due to space considerations and because the findings are very similar, we report only the results obtained from using our first rule for the identification of anxious periods.

The results are reported in Table 6. It is clear that the average banks' behavior appears to be different in anxiety periods that lead to a recession as compared to the average behavior for all anxiety periods. Specifically, regarding the anxious periods that precede a recession, column I shows a *positive* impact of consumers' anxiety on loan growth and only affects banks with more problem loans, while other bank characteristics don't play any significant role. This behavior may be interpreted as either due to moral-hazard or due to the fact that the signs of increased consumers' anxiety and the associated higher risk for a recession are not properly considered by these banks. When CEOs' anxiety is employed, the results in Column II show that the impact of falling CEOs' confidence on loan growth is greater for larger banks.

[Insert Table 6 here]

This bank behavior might be explained by the expansionary monetary policy that usually prevails before recessions in an effort to avoid the recession or to ease its severity and the resultant behavior of banks to protect the growth rates of their earnings. Moreover, these findings could be related to a moral hazard mechanism that reinforced the 2007–2009 financial turmoil. Banks, and especially large and/or very risky ones, continued to lend more than the average bank even just before the beginning of the financial turmoil in the summer of 2007. These banks' lending policies may accelerated the events and exacerbated the crisis, which eventually found many banks with low levels of liquid assets and portfolios consisting of very risky loans. Of course, these explanations should be treated with caution, since our analysis does not examine whether banks' lending behavior actually increases the probability of a recession. These results only suggest that the lending behavior of banks during anxious

phases that precede recessions is different on average than the equivalent behavior during anxious phases that do not lead to a recession.

Even more interesting are the results for the anxious periods observed after 2001Q4, especially when we use consumers' anxiety. The negative effect of anxiety on loan growth reverses for larger banks (column III), while the same is true for banks with more provisions when CEOs' anxiety is employed (column IV). Overall, it seems that in this period banks were behaving as if they were protected from credit risk, even though the developments in 2007–2008 showed that this was not true for the majority of banks. These results are consistent with the findings of Maddaloni and Peydró (2011) and Delis et al. (2011) about the impact of low short-term interest rates on bank risk. The underlying mechanism of this so-called risk-taking channel of monetary policy is further amplified by the impact of securitization and weak supervision – all notable characteristics of this period – on the softening of banks' lending standards for consumer, real estate and corporate loans.

5.3. Loan supply for large and very large banks during anxious periods

The role of large and very large banks deserves special attention during anxious phases of the economy. Thus, we perform an analysis on total loan growth for large banks (those in the top 25% in terms of total assets) and very large banks (those in the top 5%). The results are reported in Table 7. An interesting finding here is that very large banks react more to the anxieties of consumers and CEOs compared to the large ones.

[Insert Table 7 here]

In particular, the results in columns III and IV show that for very large banks with more problem loans the negative impact of consumers' and CEOs' anxieties on loan growth is greater. This effect is in line with the theory of the short-term interest of banks. In addition, this effect is larger than that observed for the full sample (see columns I and III in Table 4) or

than the one observed for the top 25% of banks (see columns I and II of Table 7). Also, the fact that the interaction term between CEOs' anxiety and problem loans is an important determinant of loan supply growth for very large banks shows that these banks are the only ones that seem to look for earlier signals of shocks when shaping their lending decisions.

5.4. Further insights and robustness checks

In this subsection, we examine the robustness of our main results and provide some additional insights. A first potential criticism of the analysis above is that the anxiety variables essentially identify the banks' lending channel of monetary policy. Note that all estimated equations already include a bank-level lending rate and, thus, part of the effect of monetary policy on lending that passes through to each bank. However, since monetary policy is forward looking, the policy interest rate might also reflect expectations about the future state of the economy.

We tackle this potential criticism by including the Federal Funds rate in equation (1) along with the interaction terms of this variable with the bank characteristics that potentially affect loan supply. We use the full time span of the panel, 19985Q1–2010Q2, since here we are concerned with the identification of the channel of expectations of agents versus the channel of monetary policy. The results are reported in Columns I and II of Table 8. The multiplicative terms of variables that measure the confidence of consumers and CEOs with bank characteristics remain significant.[13] Further, rerunning the regressions of Table 4 (i.e., for the distinct pools of quarters) and including the Federal Funds rate and the relevant multiplicative terms among the regressors, gives very similar results. These results are available on request.

[13] In fact, the findings show that the banks' lending channel is not particularly potent. Even though much more sensitivity analysis is needed to reach such a conclusion, this finding is in line with relatively recent studies of the banks' lending channel in the USA (e.g., Ashcraft, 2006). Also, the fact that a banks' lending channel seems to operate primarily through bank credit risk is in line with the findings of Altunbas et al. (2010) for the European banking industry.

[Insert Table 8 here]

A second criticism might be that the results are driven by the estimation method. Column III of Table 8 reports the results when we re-estimate the equation presented in column I of Table 4 with the Blundell and Bond (1998) GMM method for dynamic panels. As discussed above, this method is favored by the recent literature on the banks' lending channel but is sometimes criticized because of the large variability of the results to only small changes in the set of instruments used, especially in panels with relatively large time frames. Here we use, as instruments, the second and third lags of our dependent and explanatory variables, which yield acceptable values on the Sargan test for over-identifying restrictions. The results are very similar with those obtained with the limited information maximum likelihood estimator. Also, similar results emerge from estimating the rest of the baseline specifications of Table 4 (these results are available on request). In general, this finding is in line with the econometric literature suggesting that for very large panels the results of different methods should converge (see Baltagi, 2005).

A third potential drawback is that, despite the fact that the change in each agent's anxiety enters the estimated equations lagged, it might still be endogenous to banks' lending behavior and/or to the macroeconomic environment. In column IV, we conduct an additional sensitivity analysis to ease concerns on this issue. Specifically, we examine whether the results remain intact when the shock to agents' anxieties is purely exogenous. Clearly, the most prominent example of such a shock is the 9/11 terrorist attack in New York. As expected, during the fourth quarter of 2001 all agents were anxious, while the economy was already in a recession. We re-run the main specifications of Table 4 (again we only report the one equivalent to column I of Table 4), using OLS on data for 2001Q4. The results are qualitatively similar to those of Table 4.

Finally, to ensure that our results are not driven by the appraisal of current economic conditions but indeed by diminishing expectations about future economic outcomes, we employ the Aruoba et al. (2009) business conditions index.[14] In this respect, we deviate from our framework on the heterogeneous agents' anxieties. We identify anxious quarters from this index based on the classification of the index's values over the 1985Q1–2010Q2 period into 8 quintiles and choose for our empirical exercise those quarters that have values of the index in the bottom four quintiles, that is, with values below -0.18. From this, we end up with 36 quarters out of which 12 are the quarters that correspond to the recession periods in our sample and the rest 24 are defined as anxiety quarters. Using these 24 quarters we re-estimate equation (1). The results, not reported here due to space considerations but available on request, show that the coefficients of all the interaction terms between the change in the index and bank characteristics are non-significant. Thus, it seems that the current economic situation does not drive bank's lending behavior but the expectations channel highlighted above does.

6. Conclusions

In this paper, we examine empirically the lending behavior of banks during anxious periods. We define anxious periods from the perspective of consumers and firms (CEOs) according to their perceptions and expectations on future economic conditions. Our results indicate that banks' lending responds differently to the anxieties of different agents. During all anxious periods identified in the period 1985–2010 in the US, the response of banks' lending to consumers' anxiety has a common denominator, namely credit risk.

All in all, it seems that the lending behavior of banks is primarily affected by consumers' anxiety, which is procyclical. Banks respond only when they expect that they will

[14] The business conditions index is a real-time index, provided by the Federal Reserve Bank of Philadelphia and encompasses stock and flow information on several economic activity variables. This index is available on line at http://www.philadelphiafed.org/research-and-data/real-time-center/business-conditions-index. Here we use the quarterly averages for this index calculated in the middle of each quarter

be facing problems in the near future, a finding consistent with the theoretical prediction for banks' short-term interest. More specifically, an increase in consumers' anxiety results in a drop in the supply of total loans, which is more significant for banks with more problem loans (primarily) and more provisions. On the other hand, banks do not seem to alter their lending decisions significantly with CEOs' anxiety. Other bank characteristics, such as capitalization and liquidity are not driving the lending decisions of banks in anxious periods. Another notable finding is that there is considerable asymmetry between the impact of anxiety in periods that do not lead to recessions vs. those that preceded recessions. Along with the evidence presented for the period after 2001, this finding provides evidence that the role of banks in the actual occurrence of a recession may be important.

These findings have important implications for bank prudential regulation. The finding that banks shape their lending decisions differently during anxious periods suggests that regulators should place the spotlight on these periods, and identify and try to cope with the developments that might lead to worsened economic outcomes before these emerge. Further, our findings on asymmetries in the lending behavior of banks between anxious periods that led to recessions and those that did not, show that this is not an easy task, as regulators need to be able to understand the forces that shape these asymmetries. Then, as we show here, the primary focus of the regulator needs to be placed on the combined presence of anxious periods and relatively high exposure on credit risk. In collaboration with the findings of other recent studies (e.g., Aysun and Hepp, 2011) that banks behave asymmetrically owing to their level of securitization, it seems that the only way to proceed is through intensified auditing of the banking sector. To this end, future research needs to highlight the risk-taking behavior of banks during anxious phases and how the "actual" risky behavior of banks is reflected into regulatory measures of bank risk. We leave this for future research.

Appendix. Results on the main effects

The findings on the main effects of the regressions presented in Section 4 are consistent with expectations. In Table A1 we report the results on the main effects of the regressions I, III and V of Table 4, which are the baseline results of the paper. The main effects of the rest of the estimated equations are available on request.

[Insert Table A1 here]

A first interesting finding is that the coefficient on the lagged dependent variable turns out negative and statistically significant. The negative sign is intuitive, since the dependent variable is in differences. However, the value of the coefficient is not particularly high, showing that loan growth persists only to a moderate extent.

The coefficients on the bank-level and macroeconomic variables included in interaction terms should be interpreted with caution. Remember that we have mean-centered all variables included in interaction effects. Consider for example the coefficient on *Δ in consumers' anxiety* = -0.067 (t-statistic = -4.58) in column I. This coefficient measures the effect of a change in consumers' anxiety at time t-1 on loan growth at time t, at the mean value of *capitalization*, *liquidity*, *problem loans*, *provisions* and *size*.

The results show that banks with higher levels of capital today will increase their lending activity in the following year. This is expected as very high capital levels are expensive to hold and banks will use excess capital of the previous period to expand, *inter alia*, their lending. The same holds for liquidity only when consumers are anxious. A high level of provisions and non-performing loans imply lower loan growth. This shows that both these credit risk measures are needed into the empirical model and that a high level of credit risk today will signal a very risky position, so that banks will find it optimal to decrease lending in the future. The impact of a change in the lending rate on loan growth is negative

and significant at the 1% level. This shows that our choice for a price variable (lending rate) in the reduced-form equation is sensible.

More importantly, the main effects on the anxiety variables obtain values -0.067 (t-statistic = -4.58) and -0.087 (t-statistic = -3.84) for regressions I and II of Table A1, respectively. Note that by themselves these coefficients contain both demand- and supply-side effects. As discussed above only the multiplicative terms of these variables with bank characteristics can be interpreted as supply-side effects. However, this finding verifies the quality of the two variables as indices capturing the anxiety of economic agents, and shows that the model is well-specified. Also, given the negative and significant effect of anxiety on loan growth, stemming from demand- and supply-side effects, the results are in-line with expectations.

Concerning the rest of the macroeconomic and regulatory control variables, we find that a positive change in industrial production in the previous quarter, affects positively the contemporaneous loan growth. In turn, the impact of the regulatory dummies shows that the introduction of a deposit insurance scheme in 1989 (regulatory dummy 1) increased loan growth. In the literature (e.g., Demirguc-Kunt and Detragiache, 2002), this is attributed to the increased security felt by banks due to the deposit insurance scheme or to the associated moral hazard mechanism, leading banks to expand lending or risk-taking. Further, the enactment of the "Interstate Banking and Branching Efficiency Act" in 1994, also exerted a strong positive effect on lending, through the abolition of geographic requirements and associated exploitation of economies of scale.

Table A1
Supplement to Table 4: Main effects of regressions

	I	II	III
Period type:	Anxious		Recessions
Agent type:	Consumers	CEOs	
Lagged dependent	-0.084*	-0.068**	-0.096**
	(-1.81)	(-2.11)	(-2.33)
Capitalization	0.221***	0.241***	0.215***
	(8.07)	(6.93)	(7.88)
Liquidity	0.096***	0.045*	0.145***
	(3.87)	(1.88)	(5.13)
Problem loans	-0.422***	-0.144	-0.519***
	(-7.46)	(-0.64)	(9.48)
Provisions	-0.006**	0.004*	-0.019***
	(-2.36)	(1.71)	(-3.28)
Size	-0.026***	-0.023***	-0.028***
	(-15.49)	(-18.33)	(-17.92)
Δ in lending rate	-0.029***	-0.014**	-0.030***
	(-3.14)	(-2.36)	(-3.61)
Δ in industrial production	0.655***	0.397	0.728***
	(12.57)	(7.97)	(13.55)
Regulatory dummy 1	0.022***	0.008***	0.026***
	(18.43)	(5.05)	(16.47)
Regulatory dummy 2	0.009***	0.020***	0.008***
	(6.64)	(17.73)	(6.28)
Δ in consumers' anxiety	-0.067***		-0.094***
	(-4.58)		(-8.10)
Δ in CEOs' anxiety		-0.087***	
		(-3.84)	
Constant	0.010***	0.008***	0.010***
	(7.84)	(6.20)	(7.45)

Notes: The table reports the main effects of the regressions I, III and V of Table 4. The rest of the notes remain as in Table 4.

References

Adrian, T., and H.S. Shin, 2008. Financial intermediary leverage and Value-at-Risk. Federal Reserve Bank of New York, Staff Report No. 338.

Akerlof, G., and R. Shiller, 2009. *Animal Spirits: How Human Psychology drives the economy and why it matters for global capitalism*. Princeton: Princeton University Press.

Altunbas, Y., L. Gambacorta, and D. Marques-Ibanez, 2010. Bank risk and monetary policy. Journal of Financial Stability 6, 121-129.

Ashcraft, A.B., 2006. New evidence on the lending channel. Journal of Money, Credit, and Banking 38, 751-775.

Aruoba, S.B., F.X. Diebold, and C. Scotti, 2009. Real-time measurement of business conditions. Journal of Business and Economic Statistics 27, 417-427.

Aysun, U., Hepp, R., 2011. Securitization and the balance sheet channel of monetary transmission. Journal of Banking and Finance 35, 2111-2122.

Bachmann, R., and E. Sims, 2010. Confidence and the transmission of policy shocks. Working Paper, Department of Economics, The University of Michigan.

Baltagi, B., 2005. *Econometric analysis of panel data*. New York: John Wiley & Sons.

Barsky, R.B., and E. Sims, 2011. Information, animal spirits, and the meaning of innovations in consumer confidence. American Economic Review, forthcoming.

Becker, B., and V. Ivashina, 2011. Cyclicality of credit supply: Firm-level evidence. NBER Working Papers 17392, National Bureau of Economic Research.

Bernanke, B., and M. Gertler, 1989. Agency costs, net worth and business fluctuations. American Economic Review 79, 14-31.

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

Bernanke B., M. Gertler, and S. Gilchrist, 1996. The financial accelerator and the flight to quality. Review of Economics and Statistics 78, 1-15.

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

Blanchard, O., 1993, Consumption and the recession of 1990-1991. American Economic Review 83, 270-274.

Blundell, R.W., and S.R. Bond, 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87, 115-143.

Carroll, D.C., 2003. Macroeconomic expectations of households and professional forecasters. Quarterly Journal of Economics 118, 269-298.

Cetorelli, N., and L. Goldberg, 2011. Banking globalization and monetary transmission. Journal of Finance, forthcoming.

Cochrane, J., 1994. Shocks. Carnegie-Rochester Conference Series on Public Policy, 295-364.

Collard, F., H. Dellas, and F. Smets, 2009. Imperfect information and the business cycle. Journal of Monetary Economics 56, S38-S56.

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

Delis, M.D., I. Hasan, and N. Mylonidis, 2011. The risk-taking channel of monetary policy in the USA: Evidence from micro-level data. MPRA Paper 34084, University Library of Munich, Germany.

Demirguc-Kunt, A., and E. Detragiache, 2002. Does deposit insurance increase banking system stability? An empirical investigation. Journal of Monetary Economics 49, 1373-1406.

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

Diamond, D., and R. Rajan, 2001. Liquidity risk, liquidity creation and financial fragility: A theory of banking. Journal of Political Economy 109, 287-327.

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

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

Gambacorta, L., 2008. How do banks set interest rates? European Economic Review 52, 792-819.

Gorton, G., and P. He, 2008. Bank credit cycles. Review of Economic Studies 75, 1181-1214.

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

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

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

Kishan, R.P., and T.P. Opiela, 2000. Bank size, bank capital, and the bank lending channel. Journal of Money, Credit and Banking 32, 121-141.

Kydland, F., and E. Prescott, 1982. Time-to-build and aggregate fluctuations. Econometrica 50, 1345-1370.

Lorenzoni, G., 2009. A theory of demand shocks. American Economic Review 99, 2050-2084.

Louzis, D.P., Vouldis A.T., Metaxas, V.L., 2012. Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. Journal of Banking and Finance 36, 1012-1027.

Maddaloni, A., and J.L. Peydró, 2011. Bank risk-taking, securitization, supervision, and low interest rates: Evidence from the Euro-area and the U.S. lending standards. Review of Financial Studies 24, 2121-2165.

Olivero, M.P., Li, Y., Jeon, B.N., 2011. Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America. Journal of Banking and Finance 35, 560-571.

Peek, J., and E. Rosengren, 2000. Collateral damage: Effects of the Japanese bank crisis on real activity in the United States. American Economic Review 90, 30-45.

Rajan, R., 1994. Why bank credit policies fluctuate: A theory and some evidence. Quarterly Journal of Economics 109, 399-441.

Ruckes, M., 2004. Bank competition and credit standards. Review of Financial Studies 17, 1073-1102.

Shin, H.S., 2009. Discussion of "The Leverage Cycle" by John Geanakoplos. Discussion prepared for the 2009 NBER Macro Annual.

Sims, C.A., 2003. Implications of rational inattention. Journal of Monetary Economics 50, 665-690.

Sims, C.A., 2010. Rational inattention and monetary economics. In: Handbook of Monetary Economics, edited by Benjamin Friedman and Michael Woodford, Elsevier, North Holland.

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

Table 1
Variable definitions and sources

Notation	Measure	Data source
A. Dependent variables		
Δ in total loans	Change in the natural logarithm of total loans over the previous quarter	FDIC Call Reports and own calculations
Δ in loans to individuals	Change in the natural logarithm of loans to individuals and households over the previous quarter	
Δ in commercial and industrial loans	Change in the natural logarithm of commercial and industrial loans over the previous quarter	
Δ in loans secured by real estate	Change in the natural logarithm of loans secured by real estate over the previous quarter	
B. Explanatory variables		
*a) Bank-level variables**		
Capitalization	The ratio of total equity capital to total assets	FDIC Call Reports and own calculations
Liquidity	The ratio of liquid assets (cash and short-term securities) to total assets	
Problem loans	The ratio of non-performing or problem loans to total loans	
Provisions	The ratio of provision for loan and lease losses to total loans	
Size	The natural logarithm of real total assets	
Δ in lending rate	The change over the previous quarter of the ratio of interest and fee income on loans to total loans	
b) Variables characterizing the state of the economy		
Δ in industrial production volume	Change in the natural logarithm of the US industrial production volume over the previous quarter (data is seasonally adjusted)	Datastream
Δ in the Federal Funds rate	Change in the Federal funds rate over the previous quarter	
c) Variables characterizing the anxiety of agents		
Δ in consumers' anxiety	Change in the natural logarithm of US consumer confidence over the previous quarter for: a) Anxious periods, i.e. periods when the value of consumer confidence: (i) declines for two consecutive quarters and the economy not being in a recession, or (alternatively) (ii) declines in one quarter, its value in that quarter is below its mean value across the full sample and the economy not being in a recession. b) Recessions, according to NBER dating	Datastream (The Conference Board) NBER
Δ in CEOs' anxiety	Change in the natural logarithm of US CEO confidence over the previous quarter for: a) Anxious periods, i.e. periods when the value of CEO confidence: (i) declines for two consecutive quarters and the economy not being in a recession, or (alternatively) (ii) declines in one quarter, its value in that quarter is below its mean value across the full sample and the economy not being in a recession. b) Recessions, according to NBER dating	

Table 1 (continued)

d) Regulatory variables		
Regulatory dummy 1	Dummy variable obtaining a value 1 from 1989q3 onwards to capture the effect of the "Financial Institutions Reform and Recovery Act", enacted on August 9, 1989	Sherman, M. (2009)
Regulatory dummy 2	Dummy variable obtaining a value 1 from 1994q4 onwards to capture the effect of the "Riegle-Neal Interstate Banking and Branching Efficiency Act", enacted on September 29, 1994	

Table 2
Summary statistics

Variable	Obs.	Mean	Std. dev.	Min.	Max.
Total loans	1,111,849	334,169.1	5,210,546	3	7.16e+08
Loans to individuals	1,059,077	52,690.4	937,991.4	0	1.37e+08
Commercial and Industrial loans	1,103,425	80,156.2	1,090,417	0	1.42e+08
Loans secured by real estate	1,104,071	166,295.1	2,983,432	0	4.75e+08
Capitalization	1,070,791	0.11	15.69	-1.47	0.73
Liquidity	1,106,024	0.07	0.08	0.00	0.99
Problem loans	1,067,112	0.007	1.01	0.00	0.86
Provisions	1,058,097	0.005	0.44	-10.08	1.09
Size	1,112,213	11.27	2.46	5.65	21.29
Lending rate	1,052,338	0.06	1.23	0.01	0.23
Industrial production volume	1,116,397	74.35	15.10	54.39	100.45
Consumer confidence	1,116,397	97.00	23.98	29.87	142.10
CEO confidence	1,116,397	53.04	8.60	24.00	73.00

Notes: Sample period is 1985Q1-2010Q2. The table presents the number of observations (obs.), the mean, the standard deviation (std. dev.), the minimum (min.) and the maximum (max.) of the unformatted (i.e. before taking logarithms) variables used in the empirical analysis. The variables are defined in Table 1 and values are in thousands USD.

Table 3
Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Capitalization	1.00									
(2) Liquidity	0.08	1.00								
(3) Problem loans	0.02	0.04	1.00							
(4) Provisions	0.01	0.00	0.01	1.00						
(5) Size	-0.18	-0.16	-0.09	0.00	1.00					
(6) Lending rate	0.02	0.02	0.03	0.66	-0.00	1.00				
(7) Industrial production	0.14	-0.10	-0.11	0.00	0.23	-0.00	1.00			
(8) Consumer confidence	0.06	-0.11	-0.04	-0.00	-0.00	-0.00	0.35	1.00		
(9) CEO confidence	-0.03	0.03	-0.00	-0.00	-0.02	-0.00	-0.18	-0.11	1.00	
(10) Federal funds rate	-0.04	-0.03	0.05	0.00	-0.15	0.00	-0.35	0.52	-0.40	1.00

Notes: The table presents correlation coefficients for the full sample between the main explanatory variables of the study. The variables are defined in Table 1.

Table 4
The response of total loan supply growth to agents' anxiety during anxious periods and recessions

Period type:	Anxious Periods				Recessions	
Agent's anxiety type:	Consumers		CEOs		Consumers	CEOs
	I	II	III	IV	V	VI
Δ in agents' anxiety* capitalization	-0.628 (-1.067)	-0.615 (-1.269)	-0.148 (-0.420)	0.102 (0.802)	0.065 (1.513)	-0.003 (-0.073)
Δ in agents' anxiety* liquidity	0.007 (0.050)	0.091 (0.936)	-0.103 (-0.338)	-0.007 (-0.032)	-0.068** (-2.008)	-0.058* (-1.730)
Δ in agents' anxiety* problem loans	-1.226*** (-3.256)	-1.832* (-1.890)	-0.315 (-1.286)	-0.616 (-1.157)	-0.426** (-2.303)	-0.460*** (-2.643)
Δ in agents' anxiety* provisions	-0.112*** (-2.685)	-0.180*** (-2.735)	0.030 (0.804)	0.031 (0.948)	-0.126 (-0.257)	0.336 (0.938)
Δ in agents' anxiety* size	0.0005 (0.026)	-0.006* (-1.706)	-0.004 (-0.488)	0.005 (0.016)	0.012*** (10.448)	0.013*** (11.262)
Constant	0.265*** (15.913)	0.292*** (18.341)	0.241*** (11.513)	0.383*** (16.381)	0.220*** (8.877)	0.201*** (8.205)
Observations	195,165	204,307	172,279	124,387	106,615	106,615
Number of quarters	18	19	18	13	12	12
R-squared	0.141	0.140	0.134	0.133	0.203	0.221

Notes: The table reports coefficients of the interaction terms from equation (1) and their t-statistics (in parentheses). Dependent variable is the change in the natural logarithm of total loans over the previous quarter. The explanatory variables are defined in Table 1. The sample for each equation includes pools of quarters over the period 1985Q1-2010Q2 according to whether each agent considered is anxious. For all agents higher values on the respective indices reflect higher anxiety. Columns I and III report the results with anxious periods defined as "two consecutive quarters decline in the value of the variable measuring the confidence of the respective agent, while the economy is not in a recession". Columns II and IV report the results with anxious periods defined as "one quarter decline in the value of the variable measuring the confidence of the respective agent, this variable being below its sample mean and the economy not being in a recession". Estimation method is limited information maximum likelihood. ***, ** and * denote statistical significance at the 1, 5 and 10% level, respectively.

Table 5
Anxious periods and bank lending during a loan supply shock

Agent's anxiety type:	Consumers	CEOs
	I	II
Δ in consumers' anxiety	-0.006***	
	(-6.594)	
Δ in CEOs' anxiety		-0.001*
		(-1.657)
Constant	0.253***	0.256***
	(-31.169)	(-31.428)
Observations	14,342	8,021
Number of Quarters	2	1
R-squared	0.144	0.168

Notes: The table reports coefficients of the main effects of the anxiety variables from equation (1) and their t-statistics (in parentheses). Interaction effects are not employed in these regressions. Dependent variable is the change in the natural logarithm of total loans over the previous quarter. The explanatory variables are defined in Table 1. The sample for each equation includes anxious or recession quarters while at the same time a regulatory change occurred in the US banking industry. These quarters are: (i) for anxious consumers—1998Q4 (Citigroup was formed on October 8, 1998 following the $140 billion merger of Citicorp and Travelers Group, on the expectation that Glass-Steagall would be repealed), and 2001Q1 (the Commodity Futures Modernization Act was fully implemented, enacted on December 21, 2000); (ii) for anxious CEOs—1994Q4 (the Riegle-Neal Interstate Banking and Branching Efficiency Act was enacted on September 29, 1994); For both agents higher values on the respective indices reflect higher anxiety. Anxious periods defined as "two consecutive quarters decline in the value of the variable measuring the confidence of the respective agent, while the economy is not in a recession". Estimation method is OLS. ***, ** and * denote statistical significance at the 1, 5 and 10% level, respectively.

Table 6
The response of total loan supply growth during specific anxious periods

	Anxious periods that led to recessions		Anxious periods after 2001Q4	
Agent's anxiety type:	Consumers	CEOs	Consumers	CEOs
	I	II	III	IV
Δ in agents' anxiety* capitalization	0.035	0.023	0.376	-0.227
	(1.422)	(1.492)	(1.301)	(-0.683)
Δ in agents' anxiety* liquidity	0.005	0.012	0.418	0.010
	(0.298)	(1.291)	(1.419)	(0.031)
Δ in agents' anxiety* problem loans	0.195**	-0.065	0.677	16.416
	(2.547)	(-0.920)	(0.544)	(1.125)
Δ in agents' anxiety* provisions	0.000	0.000	-2.794	7.845***
	(0.092)	(0.060)	(-0.832)	(2.972)
Δ in agents' anxiety* size	0.0005	-0.0005**	0.027***	0.013
	(0.275)	(-2.368)	(4.687)	(0.861)
Constant	0.265***	0.253***	0.602***	0.566***
	(31.712)	(31.478)	(7.173)	(7.978)
Observations	17,032	10,498	55,046	62,579
Number of quarters	5	2	6	7
R-squared	0.149	0.145	0.169	0.172

Notes: The table reports coefficients of the interaction terms from equation (1) and their t-statistics (in parentheses). Dependent variable is the change in the natural logarithm of total loans over the previous quarter. The explanatory variables are defined in Table 1. The sample for each equation includes pools of quarters over the period 1985Q1-2010Q2 according to whether each agent considered is anxious. For all agents higher values on the respective indices reflect higher anxiety. Anxious periods are defined as "two consecutive quarters decline in the value of the variable measuring the confidence of the respective agent and the economy is not in a recession". Estimation method is limited information maximum likelihood. ***, ** and * denote statistical significance at the 1, 5 and 10% level, respectively.

Table 7
The response of total loan supply growth during anxious periods for large and very large banks

	Top 25% banks		Top 5% banks	
Agent's anxiety type:	Consumers	CEOs	Consumers	CEOs
	I	II	III	IV
Δ in agents' anxiety* capitalization	-1.155	0.663	0.541	2.362
	(-1.535)	(0.629)	(0.657)	(1.248)
Δ in agents' anxiety* liquidity	-0.203	-0.203	0.173	-0.925
	(-0.789)	(-0.318)	(0.316)	(-0.592)
Δ in agents' anxiety* problem loans	-2.737*	-24.769	-7.756**	-89.367***
	(-1.880)	(-0.985)	(-2.052)	(-2.906)
Δ in agents' anxiety* provisions	0.312	3.612***	0.214	3.566
	(0.957)	(4.845)	(0.073)	(0.281)
Δ in agents' anxiety* size	0.010	0.003	-0.014	0.025
	(1.423)	(0.247)	(-0.531)	(0.340)
Constant	0.631***	0.464***	1.053***	1.046***
	(8.240)	(8.581)	(5.358)	(5.542)
Observations	44,931	44,644	7,938	7,753
Number of quarters	18	18	18	18
R-squared	0.192	0.202	0.195	0.209

Notes: The table reports coefficients of the interaction terms from equation (1) and their t-statistics (in parentheses). Dependent variable is the change in the natural logarithm of total loans over the previous quarter. The explanatory variables are defined in Table 1. The sample for each equation includes pools of quarters over the period 1985Q1-2010Q2 according to whether each agent considered is anxious. For all agents higher values on the respective indices reflect higher anxiety. Anxious periods are defined as "two consecutive quarters decline in the value of the variable measuring the confidence of the respective agent and the economy is not in a recession". Estimation method is limited information maximum likelihood. ***, ** and * denote statistical significance at the 1, 5 and 10% level, respectively.

Table 8
Sensitivity analysis I

Confidence type:	Whole sample period Consumers I	 CEOs II	GMM estimates Consumers III	Only 2001Q4 Consumers IV
Δ in agents' confidence* capitalization	-0.048 (-0.646)	-0.095** (-2.007)	-0.622 (-1.497)	-0.560 (-0.808)
Δ in agents' confidence* liquidity	0.009 (0.203)	0.020 (0.374)	0.006 (0.056)	0.037 (0.277)
Δ in agents' confidence* problem loans	-1.489 (-1.402)	-0.329** (-1.967)	-1.223*** (-3.120)	-1.336*** (-3.394)
Δ in agents' confidence* provisions	0.168* (1.781)	0.026** (2.391)	-0.111** (-2.465)	-0.189*** (-2..788)
Δ in agents' confidence* size	0.013*** (11.315)	0.012*** (11.649)	0.000 (0.027)	0.002 (0.458)
Federal funds rate* capitalization	-0.023 (1.326)	-0.017 (-1.040)		
Federal funds rate * liquidity	-0.001 (-0.131)	-0.007 (-0.704)		
Federal funds rate* problem loans	-0.185** (-2.068)	-0.180** (-2.248)		
Federal funds rate* provisions	-0.010 (-0.255)	-0.011 (-0.266)		
Federal funds rate* size	-0.001** (-2.376)	-0.000 (-1.125)		
Constant	0.264*** (31.848)	0.261*** (31.629)	0.284*** (19.333)	0.290*** (14.646)
Observations	974,194	974,194	195,165	8,670
Number of Quarters	102	102	18	1
R-squared	0.188	0.184	0.142	0.284

Notes: The table reports coefficients of the interaction terms from equation (1) and their t-statistics (in parentheses). Dependent variable is the change in the natural logarithm of total loans over the previous quarter. The explanatory variables are defined in Table 1. In Columns I and II the federal funds rate and its interaction terms with bank characteristics also enter equation (1) and the regressions are run on the full sample period (1985Q1-2010Q2). For Column III the sample includes pools of quarters over the period 1985Q1-2010Q2 in which consumers are anxious. For Column IV only 2001Q4 is used. For Columns III and IV the consumers' anxiety variable is employed instead of consumers' confidence. For all agents higher values on the respective indices reflect higher anxiety. Anxious periods are defined as "two consecutive quarters decline in the value of the variable measuring the confidence of the respective agent and the economy is not in a recession" For Columns I and II estimation method is limited information maximum likelihood, for column III the GMM of Blundell and Bond and for Column IV OLS. ***, ** and * denote statistical significance at the 1, 5 and 10% level, respectively.

Figure 1

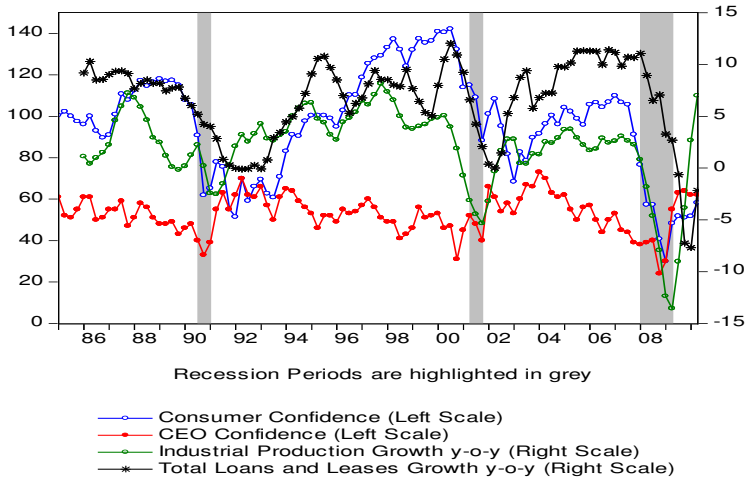
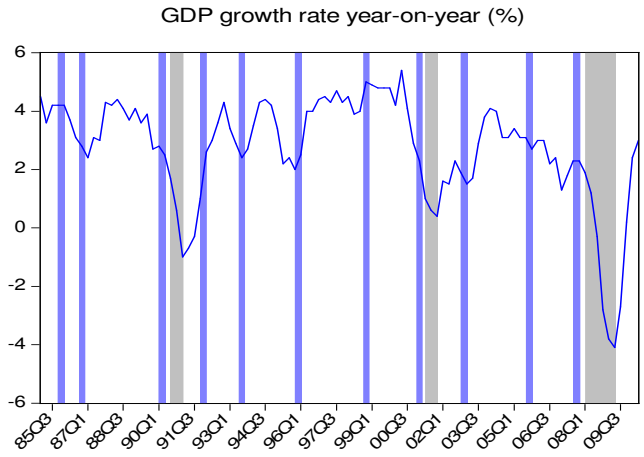
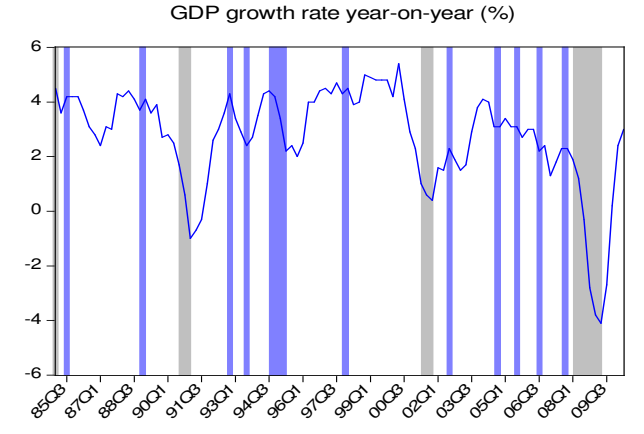


Figure 2



Anxious Periods Based on Two Consequtive Quarters Falling Consumers' Confidence
Recession Periods are Highlighted in Grey

Figure 3



Anxious Periods Based on Two Consequtive Quarters Falling CEOs' Confidence
Recession Periods are Highlighted in Grey