BANK RISK-TAKING, SECURITIZATION, SUPERVISION AND LOW INTEREST RATES

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by Angela Maddaloni
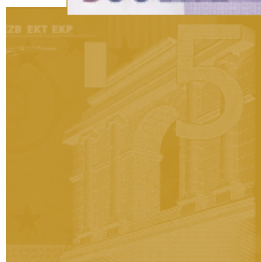and José-Luis Peydró

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CONTENTS

Abstract

Using a unique dataset of the Euro area and the U.S. bank lending standards, we find that low (monetary policy) short-term interest rates soften standards, for household and corporate loans. This softening – especially for mortgages – is amplified by securitization activity, weak supervision for bank capital and too low for too long monetary policy rates. Conversely, low long-term interest rates do not soften lending standards. Finally, countries with softer lending standards before the crisis related to negative Taylor-rule residuals experienced a worse economic performance afterwards. These results help shed light on the origins of the crisis and have important policy implications.

Keywords: lending standards, monetary policy, securitization, bank capital, financial stability.

JEL classification: G01, G21, G28, E44, E5.

Non-technical summary

This paper investigates the fundamental causes of the recent financial crisis and in particular the role played by a number of contributing factors highlighted by many commentators. Several, among researchers and policy makers alike, have suggested that levels of interest rates that were too low (both short- and long-term), coupled with a widespread use of financial innovation and weak supervision standards, led to an excessive softening of lending standards.

Using data on Euro area and U.S. lending standards from bank lending surveys, this paper reports robust evidence that lending standards to firms and households are softened when short-term interest rates (monetary policy rates) are low. The softening is even amplified when, at the same time, securitization activity is high, supervision for bank capital is weak and monetary policy rates have been too low for too long, especially for mortgage loans.

When comparing the impact of short-term and long-term interest rates, the analysis shows that the softening impact of low short-term rates is statistically and economically more significant than the effect of long-term rates, directly and in conjunction with securitization and supervision standards. In fact, we do not find robust evidence that low long-term rates soften lending standards, somewhat in contrast with the hypotheses of many commentators who argued that the financial crisis was caused by an excessive risk-taking stemming from low levels of long-term interest rates, linked to current account imbalances.

The recent financial crisis was also followed by a severe economic recession in most countries. The last part of the paper provides some suggestive evidence on the linkages between the excessive softening of lending standards and the costs of the crisis. Countries that prior to the financial crisis had softer lending standards related to comparatively low monetary policy rates (measured by

negative Taylor-rule residuals) experienced a worse economic performance afterwards, measured by real, fiscal and banking variables.

Historically many financial crises have been preceded by low levels of short-term interest rates. In the recent crisis, the impact of low monetary policy rates may have been even greater given the concurrence of three elements: a strong reliance of banks on short-term liabilities to leverage up, a weak supervision for bank capital, and a widespread use of financial innovation (notably securitization). The results shown in the paper indicate that the softening impact on lending standards of these elements taken in isolation was amplified by their interaction prior to the crisis. Banks fund mainly through short-term liabilities and the presence of significant bank agency problems may have turned the abundant liquidity into an excessive softening of lending standards.

These findings shed light on the origins of the recent crisis and have important policy implications. In particular, results suggest that monetary policy rates affect financial stability. Hence, monetary policy decisions should pay more attention to financial stability issues, while banking supervision and regulation should take into account monetary policy effects. This conclusion, therefore, supports the new responsibilities of the European Central Bank and of the Federal Reserve on macroprudential supervision to monitor systemic risk.

"One (error) was that monetary policy around the world was too loose too long. And that created this just huge boom in asset prices, money chasing risk. People trying to get a higher return. That was just overwhelmingly powerful... We all bear a responsibility for that"…

"The supervisory system was just way behind the curve. You had huge pockets of risk built up outside the regulatory framework and not enough effort to try to contain that. But even in the core of the system, banks got to be too big and overleveraged. Now again, here's an important contrast. Banks in the United States, even with investment banks now banks, bank assets are about one times GDP of the United States. In many other mature countries - in Europe, for example – they're a multiple of that. So again, around the world, banks got to just be too big, took on too much risk relative to the size of their economies."

<div align="right">Timothy Geithner, United States Secretary of the Treasury, "Charlie Rose Show" on PBS, May 2009</div>

I.   Introduction

Europe and the U.S. have experienced the worst financial crisis since the Great Depression (the banking sector in particular), followed by a severe economic recession. What were the causes of the financial crisis? Acharya and Richardson (2010), Allen and Carletti (2009), Rajan (2010) and Taylor (2008) suggest that the key contributing factors were an excessive softening of lending standards due to too low levels of short-term (monetary policy) and long-term (government bond) interest rates, a concurrent widespread use of financial innovation resulting in high securitization activity, and weak supervision standards, especially for bank capital.[1] In this paper, we test these hypotheses.

Low interest rates may entail more risk-taking in lending by banks, directly and in conjunction with weak banking supervision standards and high securitization. Because of severe agency problems in banking (due to bail-outs and liquidity assistance), low interest rates may induce banks to soften their lending standards by improving banks' liquidity (Allen and Gale, 2007; Diamond and Rajan, 2009a; Acharya and Naqvi, 2010) and net worth (Adrian and Shin, 2010; Stiglitz and Greenwald, 2003). Since banks rely mostly on short-term funding, low short-term rates may spur risk-taking more than low long-term rates (Diamond and Rajan, 2006; Adrian and Shin, 2009). Moreover, low interest rates make riskless assets less attractive and may lead to a search-for-yield by financial intermediaries (Rajan, 2005). Securitization of loans indeed results in assets yielding attractive returns for investors and also enhances bank lending capacity, especially when the capacity constraint is binding (in times of high credit growth, partially stemming from low monetary policy rates).

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[1] See also Besley and Hennessy (2009), Blanchard (2008, 2009), Brunnemeier (2009), Calomiris (2008), Diamond and Rajan (2009b), Reinhardt and Rogoff (2009), and numerous editorial and op-ed articles since summer 2007 in The Financial Times, The Wall Street Journal, and The Economist. Nominal monetary policy rates in most developed countries were the lowest in almost four decades and, in many countries, they were below rates implied by a Taylor-rule and/or negative in real terms (Taylor, 2007; and Ahrend et al., 2008).

As a consequence, the impact of low interest rates on the softening of lending standards may be stronger with securitization. Finally, in this environment, strong banking supervision standards, by limiting the effects of bank agency problems, should reduce the softening impact of low interest rates on lending standards.[2]

We empirically analyze the following questions: Do low levels of short- and long-term interest rates soften bank lending standards? Is this softening more pronounced when securitization activity is high or banking supervision standards are weak? Is there a *too low for too long* effect of monetary policy rates? Finally, did countries with softer lending standards before the financial crisis due to softer monetary conditions have a worse economic performance afterwards?

There are two major sets of identification challenges. First, it is very difficult to obtain data on the lending standards applied to the pool of potential borrowers (including households and firms that were rejected), and to know whether, how and why banks change their lending standards. Second, monetary policy is endogenous, as it depends on the local economic conditions. In addition, banking supervision is often a responsibility of the same central bank that decides monetary policy rates, and securitization activity depends on lending activity, and hence on monetary policy conditions.

Concerning the data, we use the detailed answers of the confidential Bank Lending Survey (BLS) for the Euro area countries and of the Senior Loan Officer (SLO) Survey for the U.S. Euro area national central banks and regional Feds request banks to provide quarterly information on the lending standards that they apply to firms and households. The detailed information reported in the surveys is very reliable, not least because the surveys are

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[2] Low levels of interest rates also affect bank risk-taking through other channels. First, low (risk-less) rates increase the attractiveness of risky assets. This is the case in a mean-variance portfolio framework, but also in habit formation models (Campbell and Cochrane, 1999), where agents become less risk-averse during economic booms because their consumption increases relative to their status-quo; thus, by increasing real economic activity, lower monetary policy rates may reduce investors' risk aversion (Manganelli and Wolswijk, 2009). Second, there could be monetary illusion associated to low levels of interest rates, thus inducing higher risk-taking to boost returns (Shiller, 2000; and Akerlof and Shiller 2009). Third, since banks finance themselves at short maturity and lend at longer maturities, low short-term rates by increasing the yield curve slope (as opposed to low long-term rates) may induce banks to soften lending standards (Adrian, Estrella and Shin, 2010). Fourth, low rates may reduce adverse selection problems in credit markets and consequently decrease screening by banks (Dell'Ariccia and Marquez, 2006). Fifth, an environment where central banks focus only on price stability may result in too low monetary policy rates, fostering in turn bubbles in asset prices and credit (Borio and Lowe, 2002; Borio and Zhu, 2008). For the recent crisis, Acharya and Richardson (2010) argue that the fundamental causes of the crisis were the credit boom and the housing bubble. For Taylor (2007), these were largely spurred by too low monetary policy rates.

carried out by central banks, which are in most cases the bank supervisors and can cross-check the information received with exhaustive hard banking data.[3] It should also be noted that we analyze the lending standards in the most relevant countries for the recent financial crisis, as the crisis has mainly affected the U.S. and European countries.

To address the endogeneity of monetary policy, we exploit the exogenous cross-sectional variation of monetary policy conditions in the Euro area (e.g. measured by Taylor-rule residuals, see Taylor, 2008). In the Euro area, monetary policy rates are identical across countries, but there are significant differences in terms of GDP and inflation. Moreover, banking supervision is a responsibility of the national authorities, whereas monetary policy is set by the Governing Council of the European Central Bank (ECB). There is also significant cross-country variation in securitization activity, partly stemming from legal differences. Furthermore, through time fixed effects we can control for unobservable time-varying common shocks that affect the monetary policy decisions of the ECB. In this case, the identification is largely cross-sectional. By contrast, when we analyze only the U.S. the identification relies exclusively on the time series dimension.

We find robust evidence that low (monetary policy) short-term interest rates soften lending standards, for both firms and households. This softening, especially for mortgages, is amplified by high securitization activity, weak supervision for bank capital, and too low for too long monetary policy rates. Moreover, the impact of low short-term rates on the softening of standards is statistically and economically more significant than the effect of low long-term interest rates, directly and in conjunction with securitization and supervision standards.[4] In fact, we do not find robust evidence that low long-term rates soften lending standards.

We also provide suggestive evidence on the costs of the softening of lending standards. We find that countries with softer lending standards related to negative Taylor-rule residuals

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[3] See Del Giovane et al. (2010) for an example of publicly available cross-checking using detailed supervisory data on bank lending from Italy. It should be noted that the lending standards from the surveys are not only correlated with actual credit spreads and volume (see online Appendix and Ciccarelli et al., 2010) but are also good predictors of credit and output growth (see Lown and Morgan, 2006, for the U.S. evidence, and De Bondt et al, 2010, for the Euro area).

[4] A key contributing factor to the recent crisis may have been the "saving glut and the existence of current account imbalances" implying that savers (mainly in emerging economies) were looking for investment opportunities abroad (see Bernanke, 2005; Besley and Hennessy, 2009; Rajan, 2010). The type of investment often mentioned was U.S. long-term government bonds. However, there is evidence that investors were also seeking to buy short-term assets (Gros, 2009); in fact, Brender and Pisani (2009) report that about one third of all foreign exchange reserves are in the form of bank deposits.

(low monetary policy rates) prior to the financial crisis had a worse economic performance afterwards, measured by real, fiscal and banking variables. All in all, according to the findings, low short-term rates – in particular too low for too long monetary policy rates – were a key determinant of the last financial and economic crisis. They led to a softening of lending standards and the consequent accumulation of risk on banks' assets. High securitization activity and weak supervision for bank capital, moreover, amplified the impact of low monetary policy rates.

We contribute to the literature in two dimensions, on the origins of the recent crisis and on monetary policy transmission through the banking sector. First, we analyze in the two largest economic areas – the Euro area and the U.S. – the potential key contributing factors to the recent crisis put forward by many commentators and academics.[5] The special setting of the Euro area (for monetary policy, securitization activity and banking supervision) provides an excellent platform, almost a natural experiment, for identification of these drivers. Second, as far as we are aware, this paper is also the first to analyze whether monetary policy and long-term rates affect bank lending standards for firms and households in conjunction with securitization and banking supervision, providing empirical support to recent theories by Allen and Gale (2007), Diamond and Rajan (2009a), and Adrian and Shin (2010).[6]

The rest of the paper proceeds as follows. Section II describes the data and the empirical strategy. Section III discusses the results, and Section IV presents the conclusions.

II.   Data and Empirical Strategy

A. Lending standards

The main datasets used in the paper are the answers from the bank lending surveys for the Euro area (the BLS) and for the United States (the SLO). National central banks and

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[5] We thank Tobias Adrian for showing in his discussion (at the RFS-Yale conference on The Financial Crisis) that our main results using Euro area data also held for the U.S. We also thank the editor and an anonymous referee for suggesting to include the U.S. data in the paper.

[6] For the effects of monetary policy through financial intermediaries and the risk-taking channel of monetary policy, see Adrian and Shin (2010). For direct evidence on monetary policy rates and risk-taking, see Jiménez et al. (2010a) and Ionannidou et al. (2010) who respectively analyze corporate loans from Spain and Bolivia. For indirect evidence, see Bernanke and Kuttner (2005), Axelson, et al. (2007), Den Haan et al. (2007) and Manganelli and Wolswijk (2009). Lown and Morgan (2006) also analyze the effects of monetary policy on lending standards, but their main focus is to assess the predictive power of U.S. corporate lending standards for GDP and credit growth.

regional Feds request banks (senior loan officers, such as the chairperson of the bank's credit committee) to provide quarterly information on the lending standards they apply to customers and on the loan demand they receive, distinguishing between business, mortgage and consumer loans. Concerning the supply of credit, attention is given to changes in lending standards, to the factors responsible for these changes, and to the different credit conditions and terms applied to customers – i.e. whether, why, and how lending standards are changed.

The Euro area results of the survey – a weighted average of the answers received by banks in each Euro area country – are published every quarter on the website of the European Central Bank (ECB). In a few countries the aggregate answers of the domestic samples are published by the respective national central banks. However, the overall sample including all the answers at the country and bank level is confidential. For the U.S. we use the publicly available data published quarterly on the website of the Federal Reserve Board.[7]

Data from the Euro area BLS are available since 2002:Q4. The main set of questions did not change since the start of the survey. While the current sample covers the banking sector in the 16 countries comprising the Euro area, we restrict the analysis to the 12 countries in the monetary union as of 2002:Q4, thus we work with a balanced panel. Over this period we consistently have data for Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain. The sample of banks is representative of the banking sector in each country.[8] This implies that it may comprise banks of different size, although some preference was given to the inclusion of large banks. Data from the U.S. survey are available for a longer time period. When including the U.S. in the panel analysis we use the same time span as for the Euro area. We also run some regressions using only data for the U.S. to exploit the longer time series dimension. In this case we start the analysis in 1991:Q2. As we aim at analyzing banks' lending decisions before the financial crisis, we stop the analysis in 2008:Q3.

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[7] Lending standards are the internal guidelines or criteria for a bank's loan policy (see Lown and Morgan, 2006, and Freixas and Rochet, 2008). For the Euro area survey, Berg et al. (2005) describe in detail the setup. For the aggregate data, see http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html. The response rate is 100%. There are eight central banks partially reporting the answers of their sample (Austria, Belgium, France, Germany, Ireland, Italy, Netherlands, and Portugal). However, there are some differences in how data are reported. For example, some central banks report net percentages, others diffusion indexes or only charts. For the U.S. survey, see http://www.federalreserve.gov/boarddocs/snloansurvey, and Lown et al. (2000).

[8] When foreign banks are part of the sample, the lending standards refer to the credit policy in the domestic market.

Since we are interested in the actual lending decisions by banks we use the answers related to changes in lending standards over the previous three months (see Appendix A for the specific questions). The questions imply only qualitative answers and no figures are required: banks indicate softening, tightening or no change of standards. Following for instance Lown and Morgan (2006), we quantify the different answers on standards by using *the net percentage of banks that have tightened* their lending standards over the previous quarter, which is defined as follows: the difference between the percentage of banks reporting a tightening of lending standards and the percentage of banks reporting a softening of standards. Therefore, a positive figure indicates a net tightening of lending standards.[9] We use this variable for corporate, mortgage and consumer loans.

A main distinction between the surveys in the Euro area and in the U.S. is that in the SLO the questions on the factors affecting lending standards are asked only for corporate loans and no comparable information is available for loans to households; in addition, the factors mentioned in the SLO are somewhat different from those in the BLS. Therefore, to use both Euro area and U.S. data, we focus on whether (how much) lending standards change, and control for borrowers' quality using macro-variables proxing for general economic conditions (as in Lown and Morgan, 2006).[10] We use the answers related to the factors when we analyze supervision standards for bank capital. In this case, since we use an indicator of the stringency of bank capital requirements, for consistency we use the answers from the BLS related to restrictions to banks' capital and liquidity constraints. Given the lack of similar data for the U.S., we only do this exercise for the Euro area.

B. Macroeconomic and financial variables

The macro and financial variables included in the main analysis are short-term (monetary policy) rates, long-term (government bond) interest rates, GDP growth, inflation,

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[9] The use of this statistic implies that no distinction is made for the degree of tightening (softening) of lending standards in the replies. The results obtained using diffusion indexes, using weights for the degrees of tightening (softening), do not differ from the ones obtained with net percentages, hence, we do not report them as they also imply discretion when choosing the weights.

[10] The Euro area BLS also collects information on why the lending standards change, for both firms and households. Banks assess how specific factors affected their lending standards decisions. In particular, whether the changes in standards were due to changes in bank balance-sheet strength (bank liquidity, capital, or access to market finance), to changes in competitive pressures (from other banks, from non-banks and from access to market finance), or to changes in borrowers' creditworthiness (collateral risk, value or outlook, including general economic conditions). See also Appendix A and D and the online Appendix.

securitization, and supervision standards for bank capital (see Appendix B for a detailed description of these variables).

For monetary policy we use the quarterly average of overnight interest rates, the EONIA rate for the Euro area (as published by the ECB) and the fed funds rate (as published by the Fed). Monetary conditions are also proxied by the Taylor-rule residuals obtained by regressing the overnight rates on GDP growth and inflation.[11] We estimate the residuals for the Euro area with panel least squares (LS) regressions, imposing common coefficients for all 12 countries, given the common monetary policy. For the U.S., the residuals are estimated with an OLS regression. A positive residual indicates relatively high monetary policy rates (tight monetary conditions), while negative residuals proxy for low rates (soft conditions). To measure whether monetary policy rates have been too low (high) for too long, we count the number of consecutive quarters in which the residuals have been negative (positive). For the Euro area, we start counting in 1999:Q1 (when the euro was introduced).

To assess the impact of long-term rates, we use the 10-year government bond interest rates for each Euro area country and for the U.S. The main macroeconomic controls are the annual real GDP growth rate and the inflation rate, defined as the quarterly average of monthly inflation rates expressed in annual terms.[12]

To measure securitization activity, we use for the Euro area the ratio between the volume of all the deals involving asset-backed and mortgage-backed securities in each quarter and country (as reported by Dealogic) normalized by GDP.[13] For the U.S., data on asset-backed securities issuance are available and, hence, we use these in the regressions. Since

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[11] Bernanke and Blinder (1992) and Christiano et al. (1996), among others, use the overnight interest rate as the indicator of the U.S. stance of monetary policy. In the Euro area, the Governing Council of the ECB determines the corridor within which the overnight money market rate (EONIA) can fluctuate. Therefore, the overnight rate is also a sensible measure of the monetary policy stance in the Euro area. For robustness, we have also used different Taylor-rule specifications, both for the overnight and the 3-month EURIBOR (e.g. the rate implied by a standard Taylor-rule with coefficients 0.5 for both inflation and output gap, see Taylor, 1993).

[12] We also use term spread and credit spread for robustness purposes (see the results in Appendix D). In non-reported regressions we have also used expectations of GDP growth and inflation from the ECB, but these variables are not available for all Euro area countries and with quarterly frequency. We have also controlled for house price growth, credit growth, and country risk (e.g. the difference of the long-term interest rate between each country and Germany). Results are similar.

[13] The securitization variable is country-specific since we have information about the nationality of the securitized collateral. We only take into account securitization deals for which the underlying collateral resides in one of the Euro Area countries. Data availability does not allow us to precisely distinguish between retained and non-retained securitization since 2002, nevertheless, before the crisis, the bulk of securitized assets were not retained in the balance-sheets of the banks.

securitization activity is endogenous to the level of short-term interest rates, for robustness we instrument it with a time invariant indicator based on the legal environment for securitization in each Euro area country.[14] The view taken is that a more regulated environment can be conducive to a framework of "legal certainty" which may be more attractive for investors. Indeed the indicator shows a strong positive correlation with securitization activity. In addition, it results in ample cross-country variation in the Euro area.

Given that regulatory arbitrage for bank capital seems to have been key in precipitating the financial crisis (Acharya and Richardson, 2010), we use a measure of supervision standards for bank capital, a bank capital stringency index. *Capital stringency* is an index of regulatory oversight of bank capital (see Appendix B for details), it does not measure statutory capital requirements but the supervisory approach to assessing and verifying the degree of bank capital at risk (Laeven and Levine, 2009; Barth et al., 2006).

C. Summary statistics

Figure 1 shows how (the net percentage of) lending standards for both corporate and mortgage loans and the Taylor-rule residuals evolved over time ahead of the financial crisis.[15] For the Euro area we plot the weighted average using the outstanding amount of loans in each country as weights.

For the Euro area (Figure 1 Panel A), the residuals were negative most of the time pointing to accommodative monetary conditions between 2003 and 2006. There is also ample cross-country variation as one can see from Appendix C (where the summary statistics are shown). Figure 1 also shows that lending standards for corporate and mortgage loans followed a similar time series pattern as monetary policy rates. In fact the correlation between the lending standards and monetary policy rates is 77% (71%) for corporate (mortgage) loans (before the crisis).[16] It is interesting to note that the average net percentage

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[14] The indicator is constructed with country-level information contained in the report "Legal Obstacles to Cross-Border Securitization in the EU" (European Financial Markets Lawyers Group, 2007) and, therefore, we use it only for the Euro area analysis. See Appendix B for details.

[15] For the sake of simplicity, we omitted from the Figures the standards for consumer credit. Note that this type of credit represents less than 10% of total bank loans outstanding in the Euro area and around 15% in the U.S.

[16] Similarly the coefficient of the regression for the weighted Euro area of lending standards on Taylor-rule residuals over the same time period was 26.55 for corporate loans and 13.21 for mortgage loans, in both cases statistically significant at 1%. See also Appendix D and footnote 23.

change of standards for mortgage loans was lower than for business loans. Interestingly, when monetary conditions started to tighten, lending standards were tightened with a lag, suggesting a lasting effect of rates *too low for too long*. From Appendix C, we can see that there is a lot of cross-sectional variation on the number of periods with consecutive low (high) Taylor-rule residuals: a maximum of 20 quarters of relatively low monetary policy rates and a maximum of 13 quarters of relatively high rates.

For the U.S. (Figure 1 Panel B), the chart and the summary statistics show similar developments. Interestingly, monetary policy rates remained low for 19 consecutive quarters between mid-2001 and mid-2006. During this period standards for both corporate and mortgage loans were significantly softened. The tightening of standards followed the tightening of monetary policy and standards for mortgage loans were tightened earlier than for business loans. The correlation between lending standards for business loans and Taylor-rule residuals is around 27% when starting in 1991 (32% starting in mid-2001).

Figure 2 shows how lending standards and Taylor-rule residuals are cross-sectionally related. Lower Taylor-rule residuals are related to softer lending standards, for both business and mortgage loans. For the Euro area countries, where overnight rates are the same but business cycles and economic policies are different, the R-squared for mortgages is 13% and for corporate loans is 28%.

Appendix C shows the summary statistics of the main variables used in the analysis. Panel A shows that the average overnight rate for the Euro area is 2.80 (4.14 for the U.S. since 1991) and the standard deviation is 0.79 (1.65 for the U.S.). Average Taylor-rule residuals for *all* the countries were -0.11, indicating that on average monetary conditions were accommodative, with a standard deviation of 0.85, a minimum value of -1.77 and a maximum of 2.73. The long-term rates had an average of 4.05 and a standard deviation of 0.45. Average GDP growth was 2.72% while its standard deviation was 1.81, showing ample cross-section and time series variability since the values ranged from a minimum of -1.96 to a maximum of 8.40. Average inflation was 2.48 with a standard deviation of 0.95.

In the Euro area, securitization volume as a ratio of GDP had an average of 2.19 and a standard deviation of 2.35. In the U.S., where we use the rate of growth of asset-backed securities, securitization has an average of 9.01 and a standard deviation of 34.97. For the

Euro area, the securitization instrument based on regulation varied from 1.5 to 14, and capital stringency index ranged from 3 to 7, reflecting mainly cross-country variation.

Panel B shows the average statistics for lending standards in the Euro area and in the U.S. As already indicated, there is ample variation of lending standards applied to non-financial firms and to households over the sample period and across countries. The average measure of lending standards was positive across type of loans, which implies average tightening over the period. This may signal a bias towards tightening. Hence, in our baseline regressions we analyze deviations over the mean values by introducing country fixed effects, reflecting also the fact that the number and the structure of banks as well as the regulatory and supervisory banking environment differ across countries.

D. Empirical strategy

We want to empirically analyze the effects of short-term (monetary policy) and long-term interest rates on the softening of lending standards directly and also indirectly in conjunction with securitization activity, banking supervision standards, and too low for too long monetary policy rates.

As we explained in detail in the Introduction, the identification strategy for the Euro area is better since the BLS data are fully consistent and the monetary policy rate is the same across countries, despite significant differences in business cycles and economic policies.[17] Therefore, we first run the analysis for the 12 Euro area countries reporting the BLS answers since 2002:Q4. Because the role of the U.S. financial sector was crucial in the current crisis and data on lending standards in the U.S. are available for a longer time series, we also analyze the U.S. alone (1991:Q2 to 2008:Q3). However, when it is possible and sensible, we run panel regressions including both Euro area countries and the U.S. (a panel of 13 countries) from 2002:Q4 to 2008:Q3.

The empirical strategy relies on a series of panel regressions where the baseline has the following functional form:

$$LS_{t,i} = \alpha_i + \beta \times STrate_{t-1,i} + \gamma \times LTrate_{t-1,i} + \delta \times CONTROLS_{t-1,i} + \varepsilon_{t,i}$$

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[17] For example, Spain and Ireland grew at a much higher rate and with a higher inflation rate than Germany and France, the two largest Euro area countries, over the period 2002-2006 (Taylor, 2008). In fact, Camacho et al. (2008) find evidence showing that the length, deep and shape of business cycles differ across European countries and that these differences are not decreasing over time.

where $LS_{t,i}$ is the net percentage of banks which have tightened credit standards in quarter t and country i (data from the bank lending surveys).[18] $STrate_{t-1,i}$ is the short-term interest rate at time $t-1$ in country i (either the nominal overnight rate or the Taylor-rule residual) and $LTrate_{t-1,i}$ is the long-term (government bond) interest rate. $CONTROLS_{t-1,i}$ are the other macroeconomic and financial variables used, mainly GDP growth and inflation. In the benchmark specification, we introduce country fixed effects since banking structure, regulation and supervision differ in each country and, as shown e.g. by Laeven and Levine (2009), these factors affect bank (loan) risk-taking. Whenever possible, we also introduce time fixed effects to control for unobservable time-varying common shocks that affect monetary policy decisions and lending standards. Moreover, to assess the impact of short-term and long-term interest rates on lending standards in conjunction with too low for too long monetary policy rates, securitization activity and banking supervision standards, we introduce interaction terms in our baseline regression.

Given the questions we address (on monetary policy and lending standards) and the empirical specification we use, we face problems of correlation both over time (due to the lending standards) and across countries (due to the Euro area common monetary policy). This implies that the residuals of the regressions are correlated both between and within panels. Since we have 24 quarters of data but only 12 (13) countries, double clustering of standard errors is not sensible; thus we run GLS panel regressions with country (and when possible time) fixed-effects where parametrically we allow the residuals to be correlated *both* cross-sectionally and over time.[19] When we only analyze the U.S., we use LS with robust standard errors.

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[18] In an online Appendix, we also analyze the change in lending standards related to specific factors, and the different loan conditions such as lending spreads, volume, maturity, covenants and collateral.

[19] This is a common approach adopted to address two sources of correlation of residuals (see Petersen, 2009). If the time effect were fixed (non-random), time dummies would completely remove the correlation between countries and LS estimation with clustering by country would yield unbiased standards errors. However, (purely) time fixed effects may not be capturing fully all the unobserved information affecting monetary policy decisions and lending standards (across the different Euro area countries). Therefore, double clustering (time and country) would be needed. But, due to the limited number of countries (12 or 13 in our case), clustering both by country and time is likely to produce biased estimates (see Petersen, 2009). GLS instead allows to impose a parametric structure to take into account the time-varying variance-covariance matrix of error terms to correct the residuals for the correlation both within and between countries. We implement a test for serial correlation of order one following Wooldridge (2002) and Drukker (2003) and check for autocorrelation of higher order and, due to the evidence, especially for mortgages and consumer credit, we model the residuals as an auto-correlated process of order one (see online Appendix for the results of the tests). For robustness, we report the main results using either a dynamic panel with one lag or, to control for correlation of higher degree, a LS panel with standard errors clustered by country, finding similar results (see Appendix D).

III.   Results

The results are reported as follows. We first analyze the impact of short-term interest rates on lending standards (Table 1). Then, we analyze the impact of both short-term and long-term rates on lending standards directly (Table 2, our baseline regression), and indirectly through the interaction with too low for too long monetary policy rates (Table 3), securitization (Table 4), and banking supervision (Table 5). Finally, we analyze the relation between short-term rates and lending standards prior to the financial crisis and the economic, banking, and fiscal performance afterwards (Table 6).

Short-term interest rates

Table 1 analyzes in depth the impact of monetary conditions on lending standards applied to business, mortgage and consumer loans in the Euro area (Questions 1 and 8 of the BLS, see Appendix A). As an introductory step to the main analysis of the paper we look at the impact of monetary conditions on lending standards only in the Euro area data where identification is strong.[20] Monetary conditions are first measured using overnight rates (EONIA) and then Taylor-rule residuals.

From Columns 1 to 6, the dependent variable *total lending standards* (*LS*) is the net percentage of banks reporting a tightening of standards for loans to non-financial corporations over the previous quarter. We proceed in steps including country fixed effects and macro controls. Column 1 shows the results when regressing lending standards on EONIA with no country fixed effects and no macro controls. In column 2 we introduce country fixed effects and in column 3 both country fixed effects and macro controls. The coefficient of overnight rates is similar across the different specifications, statistically significant at 1%, and it decreases slightly with the inclusion of additional controls, either country fixed effects or macro, becoming 22.828*** in the most demanding specification (Column 3).[21]

In Columns 3 to 6, we replace EONIA with Taylor-rule residuals. Results are similar. Moreover, with Taylor-rule residuals we can introduce time fixed effects (Column 6).

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[20] Given the similarities of the tables reported in the paper (particularly Tables 1 to 5), we describe in detail only the first table. However, as pointed out in the empirical strategy, results from Table 2 to 5 are crucial.

[21] *** denote statistically significant at 1% level, ** at 5%, and * at 10%.

Therefore, the identification is (mainly) cross-sectional since we control for time-varying common shocks.[22] Column 6 shows that softer monetary conditions soften standards for corporate loans (18.006***), controlling for both time and country fixed effects, GDP and inflation.

It is interesting to note that the coefficient is negative for GDP growth and positive for inflation (in fact, throughout the different specifications of the paper, these coefficients in general remain statistically significant and with the same sign). The results suggest that higher GDP growth softens lending standards – i.e. lending standards are pro-cyclical – and that a higher inflation rate implies a tightening of lending standards, maybe as a consequence of expected increases in monetary policy rates in the near future.

In Columns 7 to 12 we report the results of the same regressions for lending standards to households for house purchase and in columns 13 to 18 for standards for consumer credit. The direction of the impact is similar for all type of loans and regressions. However, the size of the coefficient of overnight rates indicates that the impact of short-term rates on lending standards is higher for loans to non-financial corporations than for loans to households: in the most demanding specification, with all controls and fixed effects, the coefficients are 18.006*** for business loans (column 6), 15.106*** for mortgages (column 12), and 6.686*** for consumer credit (column 18).

Results are also highly economically significant: the softening of standards for business loans due to the impact of a one standard deviation decrease of Taylor-rule residuals is more than five times higher than the softening due to a comparable increase of real GDP growth (for the most demanding specification, the effects are -13.68 and -2.618 respectively). Similarly, our results suggest that monetary policy rates have an impact on lending standards for mortgage loans that is almost double the impact of GDP growth (approximately -11.48 and -6.101 respectively), while the impact of GDP growth is not significant for consumer credit (Column 18).

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[22] It should be noted that with time fixed effects we control for unobservable time-varying common shocks that affect the monetary policy decisions by the Governing Council of the ECB. Note also that this provides exogenous cross-sectional differences of monetary conditions since the deviation from the Euro area average for a country at a given point in time is due to the common monetary policy rate and the imperfect synchronization of business cycles within the Euro area.

Short-term and long-term interest rates

Table 2 shows the results of our baseline regression where we include both short- and long-term interest rates, country fixed effects and macro controls (GDP growth and inflation). In Panel A we use Taylor-rule residuals and in Panel B we use *nominal* short-term (and long-term) interest rates. First, we analyze the results for the Euro Area, then we introduce the U.S. in the panel and, finally, we analyze the U.S. alone.

For the Euro area (column 1 to 6), results for short-term rates are the same as in Table 1 (and still significant at 1% for all type of loans and controls). Without time fixed effects, the coefficients of long-term rates are positive and significant for corporate and mortgage loans. However, once we introduce time fixed effects, long-term rates are significant only for business loans and, moreover, with a negative impact. This suggests that, if anything, higher long-term rates soften lending standards for firms, whereas low short-term rates soften standards for all type of loans (and the results are robust to the different controls). These results are confirmed when introducing U.S. data, either pooled with Euro area data (Columns 7 to 12) or alone (Columns 13 to 15), or in other alternative specifications (see Appendix D).[23] In addition, Panel B, using overnight nominal rates also confirms these results.

Comparing the results of the Euro area vis-à-vis the U.S alone, we find that short-term rates are economically more important in the Euro area. This is consistent with the fact that banks in the Euro area have always financed themselves significantly through short-term interbank debt (Upper 2006; Allen et al., 2004). Thus, short-term rates may be economically more important in the Euro area than in the U.S. in affecting lending conditions. However, in the last decade U.S. banks have also significantly financed through short-term (wholesale) claims. Another difference in the results is that in the Euro area the coefficient of long-term

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[23] In one specification in Appendix D, where we weight the countries by their GDP level, we find very similar results as the main, un-weighted regressions, thus suggesting that our findings are not driven by small countries. Another interesting result shown in Appendix D (confirmed in the online Appendix) is that low short-term interest rates soften lending standards by improving bank balance sheets, thus suggesting that monetary policy affects bank loan risk-taking by increasing liquidity and capital. See Bernanke and Gertler (1995) and Kashyap and Stein (2000) for the credit channel of monetary policy.

interest rates loses the statistical significance depending on the type of loans and controls, whereas in the U.S. it is always negative and significant.[24]

All in all, the results in Table 2 do not confirm the hypotheses of many commentators who argued that mainly the *low* levels of *long-term* interest rates prior to the financial crisis caused an excessive softening of lending standards and risk-taking (see e.g. Besley and Hennessy, 2009). However, there is robust evidence that low monetary policy (short-term) rates softened lending standards for loans to firms and households.

Too low for too long levels of monetary policy rates

Table 3 analyzes whether the persistence of very accommodative monetary conditions – rates (too) low for (too) long – matters for the softening of lending standards. For the sake of brevity, we concentrate on the whole sample of Euro area countries and U.S. We first introduce the number of periods of relatively low monetary policy rates (# periods of low monetary policy) in the baseline regression. As we can see from Columns 1, 3 and 5, for all type of loans, the length of periods of relatively low monetary policy rates contributes to the softening of lending standards. This effect is over and above the direct effect of current Taylor-rule residuals, which is still positive and significant.

We then introduce the variable *# periods of low monetary policy* in levels and interacted with current Taylor-rule residuals (see Columns 2, 4, 6). Especially for mortgage loans, the results suggest that the impact of (current) low monetary policy rates on the softening of lending standards is amplified by too low for too long monetary policy rates. Evidence for the U.S. alone, with longer time series, confirms these results.

Securitization, short-term and long-term interest rates

In Table 4 we analyze the impact of short- and long-term interest rates on lending standards via securitization activity, introducing this variable in the baseline regression. Panel A shows the results for the Euro area and Panel B for the U.S., where we use data on

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[24] Comparing our U.S. results with those from Lown and Morgan (2006), we find that monetary policy rates affect lending standards, but mainly when we control for long-term interest rates (see the results in the online Appendix and in Table 2). Since in the U.S. the effects of short and long-term interest rates on lending standards have opposite signs and short and long-term rates are correlated, not including long-term rates biases the results (an omitted-variables problem). Our results suggest that controlling for long-term rates may be crucial to study monetary policy effects. See also the online Appendix for the results discussed but not shown in the paper.

the net issuance of securitized assets. For identification purposes, we use Taylor-rule residuals, macro controls and both country and time fixed effects.

For the Euro area (Panel A), when we introduce our measure of securitization activity, results on the level effect of short-term rates are not altered and, as expected, the impact of securitization is negative and significant at 1% for mortgage loans, thus indicating that higher securitization leads to softer lending standards for mortgages (see Columns 1, 4 and 7). Most importantly, the coefficient of the interaction between securitization and short-term rates is positive and statistically significant (at 1% or 5%), implying that the impact of low short-term rates on the softening of lending standards is amplified by securitization activity. The results are similar for *all* type of loans and robust to the inclusion of other controls, in particular to the interaction of long-term rates and securitization.[25] Interestingly, the coefficient of the interaction with long-term rates is not significant.

For the U.S. (Panel B), results are similar to the Euro area but there are some differences. First, when we introduce the measure of securitization activity, results on short-term rates are not altered and the impact of securitization is negative and significant at 1% for all loans (except in column 7 for consumer credit which is only at 10%), thus indicating that higher securitization leads to softer lending standards across the board.[26] Second, the coefficient of the interaction between securitization and short-term rates is positive and statistically significant (at 1%) for all type of loans, but it is not robust to the inclusion of the interaction between long-term rates and securitization.[27]

Monetary policy affects credit growth, thereby possibly impacting securitization activity. To address this endogeneity, we instrument securitization with an indicator of the relevant regulatory environment in each country of the Euro area (see Section II). As shown in Table 4, bottom of Panel A, the securitization instrument is highly significant in explaining securitization activity (the t-statistic in the first stage regression is 5.87***), thus the

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[25] It is interesting to note that the softening impact of low levels of monetary policy rates, but not the length of loose monetary policy, is amplified by securitization (non-reported result). This may also be due to the lack of statistical power when three or more interactions are presented in the regressions.

[26] For evidence on the softening of lending standards due to securitization, see Keys et al. (2009) and Mian and Sufi (2009). For an exhaustive analysis of recent financial innovations in banking, see Gorton and Souleles (2005), Gorton (2008, 2009), and Gorton and Metrick (2009).

[27] The interaction between long-term rates and securitization is positive for mortgage and consumer loans, thus indicating that securitization reduces the impact of high long-term rates on the softening of lending standards. This may be because lending profits are less dependent on lending yields if banks can securitize (sell) the loans.

instrument does not suffer from weak instrument concerns (Staiger and Stock, 1997). Moreover, the estimates from the second-stage regression suggest that the impact of low short-term rates on the softening of standards is higher when the component of actual securitization activity predicted by the regulation instrument is larger. Results are similar across all type of loans, but the strongest effects are for mortgage loans.

All in all, the analysis suggests that the impact of low short-term rates on the softening of lending standards is amplified by securitization – i.e., high securitization activity and low monetary policy rates complement each other in the softening of standards. On the other hand, the results for long-term rates, if anything, suggest that securitization may reduce (not enhance) the effect of long-term interest rates on lending standards.

Supervision standards for bank capital, short-term and long-term interest rates

In Table 5 we introduce in the baseline regression the capital stringency index which is a measure of regulatory oversight (supervision) of bank capital (see Laeven and Levine, 2009). This measure has some cross-sectional variation, but almost no time variation (see Section II); hence, to fully exploit the cross-sectional variation, we use Taylor-rule residuals. Given that the measure of supervision refers to bank capital, for consistency we use the answers from the survey related to bank balance-sheet constraints (bank capital and liquidity). These changes are not related to borrower's quality and risk, and thus they may be a better proxy for changes in (loan) risk-taking. Unfortunately, this information is not available in the SLO for mortgage and consumer loans and, therefore, we restrict this analysis to the Euro area.

Results in Table 5 show that, independently of the macro and long-term rate controls and of time fixed effects, the impact of low monetary rates on the softening of standards (due to bank balance-sheet constraints) for mortgage loans is amplified when supervision standards for bank capital are weak (Columns 4 to 7).[28] This result is consistent with the idea that both the softening of lending standards for mortgages and bank capital regulatory arbitrage have been crucial in leading the banking system to the recent financial crisis (Acharya and Richardson, 2010).

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[28] Results for business and consumer loans are not significant. See Appendix D for the baseline results using the softening of standards due to bank balance-sheet constraints and competition. See online Appendix for all the factors affecting lending standards.

All in all, these results suggest that low levels of monetary policy rates increase bank loan risk-taking especially when banking supervision is weak. This is consistent with theories suggesting that agency problems in the banking sector are crucial to explain the risk-taking channel associated to low monetary policy rates (Allen and Gale, 2004 and 2007; Rajan, 2010; Adrian and Shin, 2010).

Lending standards prior to the financial crisis and real implications afterwards

The results so far suggest that low (monetary policy) short-term – rather than low long-term – interest rates soften lending standards, for both firms and households. We now analyze whether the softening of lending standards stemming from low monetary policy rates in the period preceding the financial crisis had significant costs. In Table 6 we display the correlations between monetary policy rates and lending standards before the crisis and measures of economic, fiscal and banking performance afterwards.[29]

The results suggest that countries with lower Taylor-rule residuals (expansive monetary conditions) had a worse economic performance afterwards. Moreover, countries with softer lending standards prior to the crisis related to negative Taylor-rule residuals also experienced higher costs.[30] The economic performance after the start of the crisis is measured by lower bank credit growth, more tightening of lending standards due to bank balance-sheet weakness (capital and liquidity),[31] lower aggregate private consumption, higher unemployment rate, higher fiscal deficit and CDS spreads on government debt. Interestingly, the results on GDP growth are mixed, suggesting that governments tried to reduce the real costs of the crisis through expansive fiscal policy. However, other key variables – aggregate consumption and unemployment – unambiguously point to significant real effects. Importantly, softer lending

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[29] Bank risk problems may transmit through the system through interbank contagion and other mechanisms (see Iyer and Peydró, 2010, and Bandt, et al., 2009). Once the banking system is in trouble, a credit crunch is more likely to happen (see Jiménez et al., 2010b) in turn affecting the real economy (see Ciccarelli et al., 2010). For real effects induced by bank failures, see Ashcraft (2005). See Gan (2007) for loan and firm level data evidence. For the effects of credit as an autonomous source of macroeconomic fluctuations, see Gorton and He (2008).

[30] We analyze this by looking at the correlations either with the part of lending standards predicted by Taylor-rule residuals or with the average of standards when Taylor residuals were negative prior to the crisis. The correlation between measures of economic performance and the part of lending standards predicted by Taylor residuals is identical, by construction, to the correlation with the Taylor residuals; therefore, we do not report it.

[31] As explained in Section 2, information on changes in lending standards due to bank balance-sheet capacity is not available in the U.S. SLO, therefore this indicator is analyzed only for the Euro area.

standards not associated to monetary policy conditions (i.e. the residual of standards on Taylor-rule residuals) are *not* related to higher costs during the crisis.

All in all, the suggestive evidence is consistent with a significant softening of lending standards due to low monetary policy rates leading to an accumulation of risk prior to the crisis. When the risk materialized and the capacity of bank balance-sheets was impaired, banks started to reduce lending, thereby inducing a real and fiscal crisis.

IV.   Conclusions

Many commentators have suggested that low levels of short- and long-term interest rates induced an excessive softening of lending standards in the run-up to the financial crisis. This view is summarized for example in the letter to Her Majesty the Queen on the origins of the current crisis written by the British Academy (see Besley and Hennessy, 2009).[32] In this paper we have analyzed empirically this issue.

Analyzing both the Euro area and the U.S. lending standards, we find robust evidence that low short-term (monetary policy) rates soften lending standards rather than low long-term interest rates. High securitization activity, weak supervision for bank capital and too low for too long monetary policy rates amplified, especially for mortgages, the softening impact of low monetary policy rates. Moreover, we provide suggestive evidence that too low for too long monetary policy rates, by inducing a softening of lending standards and a consequent buildup of risk on banks' assets, were a key factor leading to the financial crisis and possibly triggering, through the subsequent bank credit reduction, a real and fiscal crisis.

A low level of short-term interest rates indeed has historically preceded many financial crises (Calomiris, 2008). In the recent crisis, the impact of low monetary policy rates may have been even greater given the concurrence of three elements: the strong reliance on short-term liabilities to leverage up, a weak supervision for bank capital, and the high level of financial innovation (notably securitization). Our results indicate that the softening impact on

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[32] "*The 'global savings glut' led to very low returns on safer long-term investments which, in turn, led many investors to seek higher returns at the expense of greater risk...(Monetary policy) interest rates were low by historical standards. And some said that policy was therefore not sufficiently geared towards heading off the risks. Some countries did raise interest rates to 'lean against the wind'. But on the whole, the prevailing view was that monetary policy was best used to prevent inflation and not to control wider imbalances in the economy.*"

lending standards of these elements taken in isolation was amplified by their interaction prior to the recent crisis. Moreover, low monetary policy rates may be a crucial factor for risk-taking as funding liquidity for banks is mostly short-term (and thus depends on monetary policy) and the presence of significant bank agency problems may have turned the abundant liquidity into an excessive softening of lending standards. In this sense it is interesting to note what Chuck Prince, former Citigroup Chairman, said when describing why his bank continued financing loans despite mounting risks: "*When the music stops, in terms of liquidity, things will be complicated. But, as long as the music is playing, you've got to get up and dance. We're still dancing.*" (Financial Times, July 2007).[33]

All in all, our findings help shed light on the origins of the recent crisis and have important policy implications. In particular, results suggest that monetary policy rates affect financial stability. Hence, monetary policy decisions should pay more attention to financial stability issues, while banking supervision and regulation should take into account monetary policy effects. Our results, therefore, support the new responsibilities of the European Central Bank and of the Federal Reserve on macroprudential supervision to monitor systemic risk.

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[33] Underlying is ours. See also Emilio Botín, Chairman of Bank Santander: "*I believe the causes cannot be found in any one market, such as the US. Nor are they limited to a particular business, such as subprime mortgages. These triggered the crisis, but they did not cause it. The causes are the same as in any previous financial crisis: excesses and losing the plot in an extraordinarily favourable environment. Indeed, some fundamental realities of banking were forgotten: cycles exist; lending cannot grow indefinitely; liquidity is not always abundant and cheap; financial innovation involves risk that cannot be ignored*" (Financial Times, October 2008).

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Figure 1: Taylor-rule residuals and lending standards

Panel A: Euro area
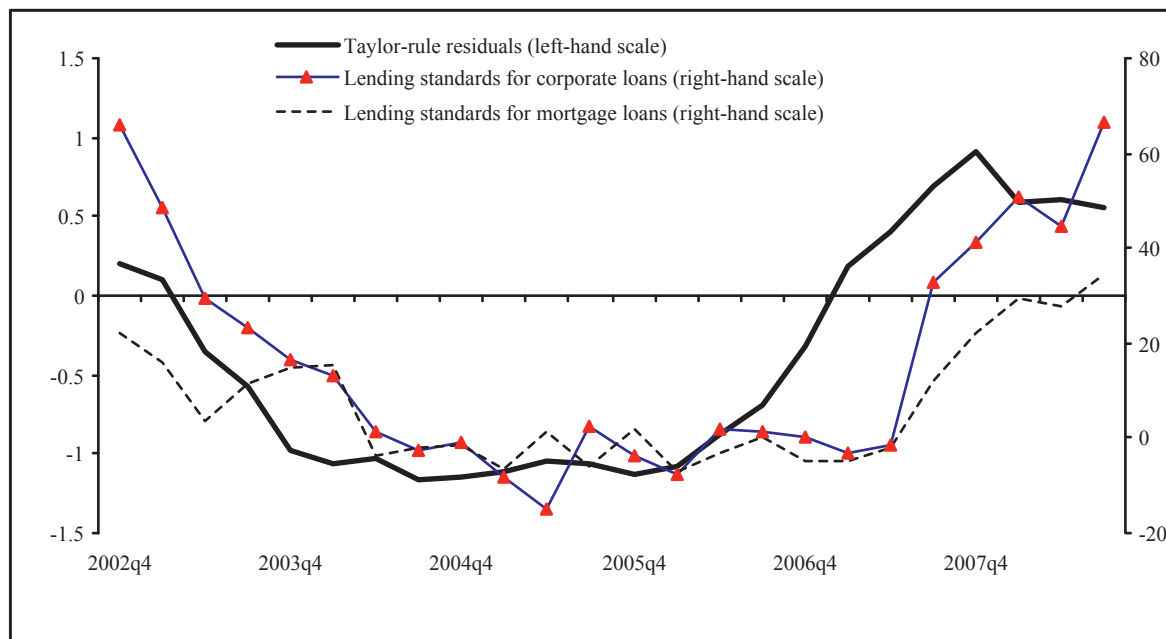
Panel B: US
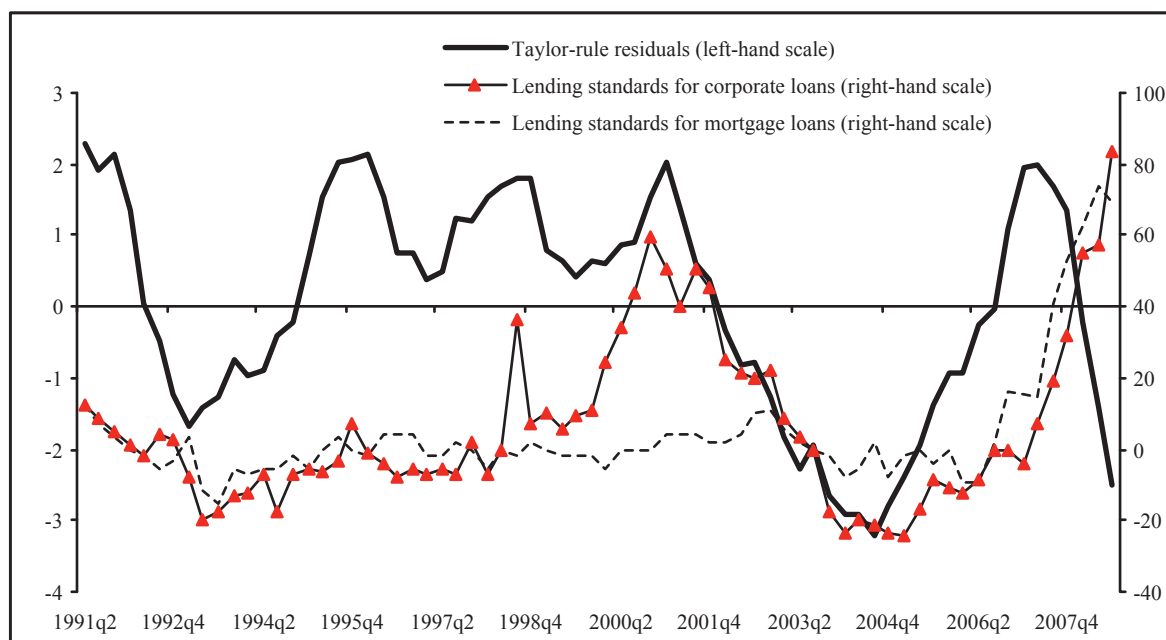
Figure 1, Panel A, shows the Taylor-rule residuals and the lending standards for corporate loans and mortgage loans in the Euro area. Taylor-rule residuals are the residuals of the regressions of EONIA rates on GDP growth and inflation over the period 2002q3-2008q2. The residuals are estimated separately for each country in the Euro area and a weighted average is then calculated using the outstanding amount of loans in each country. Data for 12 Euro area countries are included (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain). Lending standards for corporate and mortgage loans are the net percentages of banks reporting a tightening of credit standards for loans to enterprises and households in the Bank Lending Survey (BLS). The Euro area figure is calculated using the same weights as for the Taylor-rule residuals over the period 2002q4-2008q3. Panel B shows Taylor-rule residuals and lending standards for corporate and mortgage loans for the US. Taylor-rule residuals are the residuals of the regressions of fed funds rates on GDP growth and inflation over the period 1991q1-2008q2. The lending standards are the net percentages of banks reporting a tightening of credit standards for corporate and mortgage loans in the Senior Loan Officer Survey (SLO) from 1991q2 to 2008q3. See Section II, Appendix A and B for a detailed description of the variables and the data sources.

Figure 2: Taylor-rule residuals and lending standards in the Euro area and in the US

Panel A: corporate loans
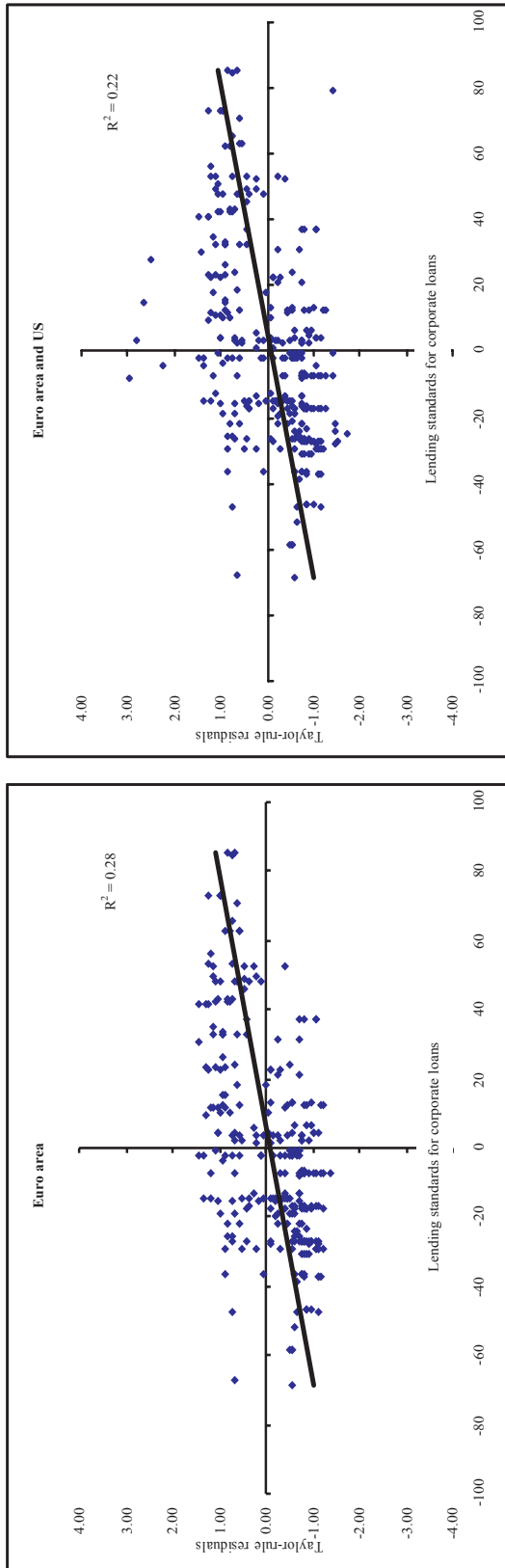
Panel B: mortgage loans
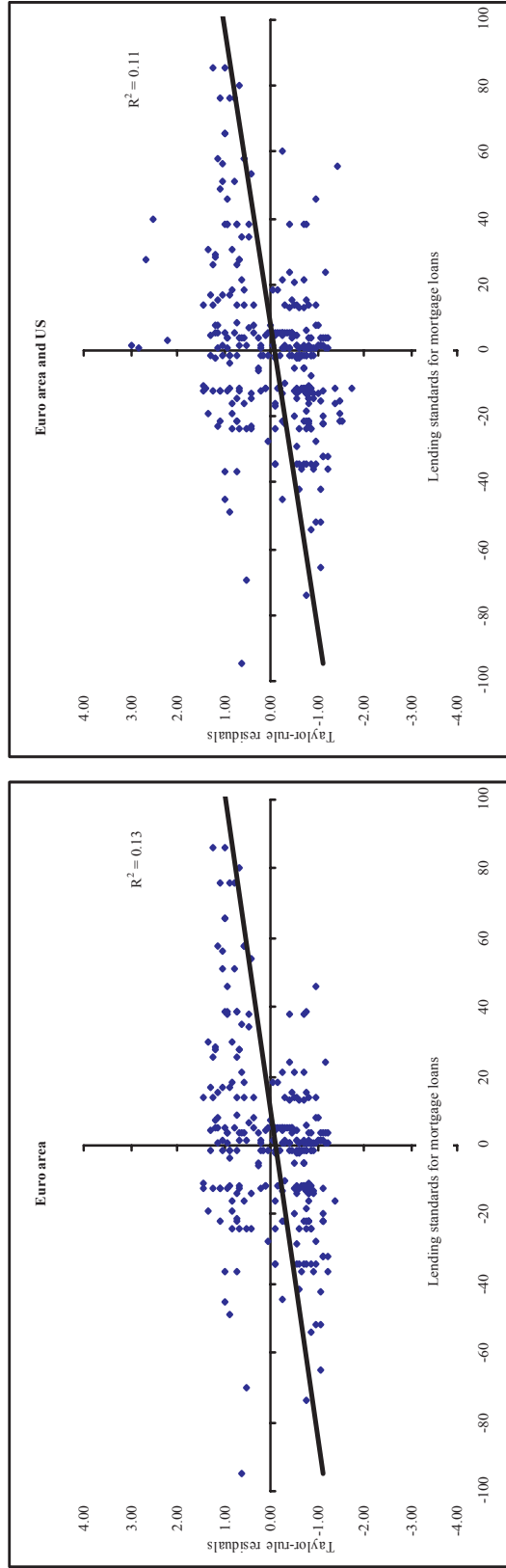
Figure 2 plots the Taylor-rule residuals and the lending standards for corporate loans (Panel A) and for mortgage loans (Panel B) in the Euro area and in the US. The plots on the left side include data only on Euro area countries, while the plots on the right side include data on both the Euro area countries and the US. Data for 12 Euro area countries are included (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain). Taylor-rule residuals are the residuals of the regressions of EONIA rates (for the Euro area) and fed funds rates (for the US) on GDP growth and inflation over the period 2002q3-2008q2. Lending standards for corporate and mortgage loans are from the Bank Lending Survey (BLS), country by country data, and from the Senior Loan Officer Survey (SLO) over the period 2002q4-2008q3. See Section II, Appendix A and B for a detailed description of the variables and the data sources.

Table 1: Short-term (monetary policy) rates and lending standards

	_____ Euro area _____																	
	corporate loans						mortgage loans						consumer loans					
							total lending standards											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Overnight rate t-1	26.196 [6.26]***	24.499 [6.67]***	22.828 [9.17]***				11.357 [4.87]***	12.177 [5.84]***	12.244 [7.37]***				7.404 [3.05]***	6.622 [3.77]***	7.421 [6.16]***			
Taylor-rule residuals i,t-1				23.061 [7.87]***	22.828 [9.17]***	18.006 [24.38]***				11.24 [6.71]***	12.244 [7.37]***	15.106 [19.17]***				6.64 [3.45]***	7.421 [6.16]***	6.686 [12.05]***
GDP growth i,t-1			-3.59 [4.78]***	-1.889 [2.90]***	-3.378 [4.49]***	-1.397 [1.75]*			-4.509 [5.23]***	-3.25 [4.26]***	-4.395 [5.11]***	-3.263 [3.02]***			-2.909 [4.73]***	-1.087 [1.90]*	-2.84 [4.63]***	0.269 [0.41]
Inflation i,t-1			4.516 [2.77]***	12.078 [8.09]***	10.982 [6.91]***	4.246 [2.15]**			1.575 [1.06]	7.648 [5.54]***	5.043 [3.36]***	0.588 [0.25]			1.686 [1.52]	5.385 [4.25]***	3.788 [3.50]***	-1.35 [0.77]
country fixed effects	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes
time fixed effects	no	no	no	no	no	yes	no	no	no	no	no	yes	no	no	no	no	no	yes
# of observations	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288	288
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Wald statistic	39.14***	65.52***	180.12***	106.95***	180.12***	8234***	23.73***	115.03***	156.76***	75.73***	156.76***	3753***	9.31**	71.02***	140.94***	26.75***	140.94***	3450***

Table 1 shows the results of GLS (country-quarter) panel regressions where the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS (see Appendix A). The Taylor-rule residuals are the residuals of the regression of EONIA rates on GDP growth and inflation over the period 2002q3-2008q2. The overnight rate is the quarterly average of the daily overnight rate (EONIA). GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002q4-2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the panel regressions include standard errors corrected for autocorrelation and correlation across countries.

Table 2, Panel A (Taylor-rule residuals): short- and long-term rates and lending standards

| | Euro area | | | | | | Euro area + US | | | | | | US | | |
| | corporate loans | | mortgage loans | | consumer loans | | corporate loans | | mortgage loans | | consumer loans | | corporate loans | mortgage loans | consumer loans |
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
							total lending standards								
Taylor-rule residuals i,t-1	19.785 [7.15]***	21.451 [20.86]***	8.432 [6.06]***	15.665 [13.47]***	6.359 [4.16]***	5.408 [6.18]***	12.519 [5.32]***	6.005 [2.38]**	5.953 [5.34]***	29.904 [3.26]***	3.723 [3.31]***	0.542 [0.21]	7.235 [4.00]***	2.843 [2.28]**	2.532 [2.63]**
10 -year rate i,t-1	9.618 [2.47]**	-32.773 [2.59]***	12.362 [5.68]***	2.944 [0.21]	2.637 [1.15]	7.043 [0.70]	8.681 [2.57]**	-12.533 [2.48]**	11.725 [6.89]***	-9.882 [0.73]	3.013 [1.55]	-1.701 [0.34]	-8.772 [3.68]***	-7.072 [3.02]***	-4.009 [2.04]**
GDP growth i,t-1	-3.238 [4.32]***	-1.136 [1.46]	-4.44 [5.79]***	-3.304 [3.03]***	-2.791 [4.57]***	0.064 [0.09]	-2.846 [4.04]***	-1.398 [1.78]*	-3.962 [6.07]***	-2.618 [2.69]***	-2.452 [4.44]***	-0.33 [0.51]	-1 [0.49]	-1.431 [1.69]*	0.474 [0.48]
Inflation i,t-1	9.503 [5.69]***	5.542 [2.66]***	4.638 [3.91]***	0.632 [0.26]	3.211 [2.82]***	-1.903 [1.03]	9.097 [6.00]***	2.193 [1.17]	4.676 [4.71]***	3.259 [0.97]	4.517 [4.38]***	-0.828 [0.51]	7.777 [1.54]	6.844 [1.78]*	3.395 [0.96]
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes			
time fixed effects	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes			
# of observations	288	288	288	288	288	288	312	312	312	312	312	312	70	70	70
# of countries	12	12	12	12	12	12	13	13	13	13	13	13			
Wald statistic	202.24***	8492.4***	286.07***	3883.08***	138.22***	3707.57***	239.46***	26209***	360.34***	10671***	148.04***	9923.92***			
R-squared													0.28	0.29	0.1

Table 2, Panel A, columns 1 to 12, shows the results of GLS (country-quarter) panel regressions where the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards. The net percentages are reported in the Euro area Bank Lending Survey (BLS) and in the US Senior Loan Officer Survey (SLO) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS and to Questions 1, 8 and 9 of the SLO (see Appendix A). The Taylor-rule residuals are the residuals of the regression of EONIA rates (for the Euro area) and fed funds rates (for the US) on GDP growth and inflation over the period 2002q3-2008q2. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The Euro area panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The Euro area + US panel includes the 12 Euro area countries and the US. The panel regressions are estimated over the period 2002q4-2008q3. All the panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries. The last three columns of the table report the results of a one-country regression for the US only estimated with OLS and robust standard errors over the period 1991q2-2008q3. Taylor-rule residuals are estimated over the period 1991q1-2008q2. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively.

Table 2, Panel B (nominal overnight monetary policy rates): short- and long-term rates and lending standards

	Euro area			Euro area + US						US		
	corporate loans	mortgage loans	consumer loans	corporate loans		mortgage loans		consumer loans		corporate loans	mortgage loans	consumer loans
				total lending standards								
	1	2	3	4	5	6	7	8	9	10	11	12
Overnight rate i,t-1	19.785	8.432	6.359	12.318	8.449	6.008	5.097	4.162	1.941	7.235	2.843	2.532
	[7.15]***	[6.06]***	[4.16]***	[5.16]***	[3.36]***	[5.32]***	[1.80]*	[3.74]***	[0.73]	[4.00]***	[2.28]**	[2.63]**
10-year rate i,t-1	9.618	12.362	2.637	8.838	-16.25	11.69	-7.564	2.67	-4.212	-8.772	-7.072	-4.009
	[2.47]**	[5.68]***	[1.15]	[2.56]**	[3.23]***	[6.73]***	[1.35]	[1.38]	[0.81]	[3.68]***	[3.02]***	[2.04]**
GDP growth i,t-1	-3.421	-4.518	-2.85	-3.061	-1.385	-4.03	-2.658	-2.565	0.288	-3.819	-2.539	-0.513
	[4.57]***	[5.88]***	[4.65]***	[4.33]***	[1.79]*	[6.12]***	[2.74]***	[4.71]***	[0.45]	[1.98]*	[2.77]***	[0.50]
Inflation i,t-1	3.899	2.249	1.41	5.045	-0.128	2.837	-2.508	3.214	-0.861	2.991	4.963	1.72
	[2.36]**	[1.95]*	[1.24]	[3.21]***	[0.07]	[2.82]***	[1.17]	[3.16]***	[0.55]	[0.58]	[1.24]	[0.46]
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes			
time fixed effects	no	no	no	no	yes	no	yes	no	yes			
# of observations	288	288	288	312	312	312	312	312	312	70	70	70
# of countries	12	12	12	13	13	13	13	13	13			
Wald statistic	202.24***	286.07***	138.22***	227.13***	26552***	353.41***	8895.09***	155.47***	3998.23***			
R-squared										0.28	0.29	0.1

Table 2, Panel B, columns 1 to 9, shows the results of GLS (country-quarter) panel regressions where the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards. The net percentages are reported in the Euro area Bank Lending Survey (BLS) and in the US Senior Loan Officer Survey (SLO) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS and to Questions 1, 8 and 9 of the SLO (see Appendix A). The overnight rate is the quarterly average of the daily overnight rate (EONIA) for the Euro area and the fed funds rate for the US. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The Euro area panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The Euro area + US panel includes the 12 Euro area countries and the US. The panel regressions are estimated over the period 2002q4:2008q3. All the panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries. The last three columns of the table report the results of a one-country regression for the US only estimated with OLS and robust standard errors over the period 1991q2-2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively.

Table 3: Too low for too long short-term (monetary policy) interest rates and lending standards

	Euro area + US						US					
	corporate loans		mortgage loans		consumer loans		corporate loans		mortgage loans		consumer loans	
	total lending standards											
	1	2	3	4	5	6	7	8	9	10	11	12
Taylor-rule residuals i,t-1 (TR)	7.327	6.427	4.04	2.638	2.307	0.783	-1.26	-1.73	2.262	1.568	-0.183	-0.705
	[3.53]***	[3.09]***	[2.90]***	[1.79]*	[1.82]*	[0.57]	[0.66]	[0.91]	[1.10]	[0.78]	[0.12]	[0.44]
10 -year rate i,t-1	1.717	1.053	10.634	10.119	2.006	1.375	-7.016	-9.052	-6.952	-9.959	-3.447	-5.708
	[0.50]	[0.31]	[5.91]***	[5.18]***	[1.02]	[0.66]	[3.61]***	[4.30]***	[2.95]***	[3.86]***	[1.91]*	[2.71]***
# of periods of low monetary policy i,t-1	-1.002	-0.981	-0.351	-0.281	-0.245	-0.14	-1.506	-1.683	-0.103	-0.366	-0.481	-0.679
	[5.17]***	[4.96]***	[2.52]**	[1.91]*	[1.84]*	[1.01]	[7.70]***	[7.43]***	[0.46]	[1.42]	[2.92]***	[3.29]***
(# of periods of low monetary policy*TR) i,t-1		0.266		0.451		0.62		0.495		0.731		0.55
		[1.15]		[2.50]**		[3.60]***		[2.03]**		[3.41]***		[2.76]***
GDP growth i,t-1	-2.055	-2.027	-3.064	-2.729	-1.968	-1.58	-3.96	-2.848	-1.633	0.009	-0.472	0.762
	[2.65]***	[2.59]***	[4.40]***	[3.85]***	[3.48]***	[2.74]***	[2.55]**	[1.94]*	[1.47]	[0.01]	[0.46]	[0.69]
Inflation i,t-1	8.855	8.838	4.405	4.692	4.247	3.692	9.479	10.522	6.961	8.502	3.939	5.098
	[6.20]***	[6.27]***	[4.42]***	[4.48]***	[4.18]***	[3.54]***	[2.37]**	[2.79]***	[1.80]*	[2.48]**	[1.18]	[1.65]
country fixed effects	yes	yes	yes	yes	yes	yes						
time fixed effects	no	no	no	no	no	no						
# of observations	312	312	312	312	312	312	70	70	70	70	70	70
# of countries	13	13	13	13	13	13						
Wald statistic	255.36***	246.05***	358.39***	321.74***	138.28***	125.86***						
R-squared							0.6	0.64	0.3	0.45	0.19	0.31

Table 3, columns 1 to 6, shows the results of GLS (country-quarter) panel regressions where the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards. The net percentages are reported in the Euro area Bank Lending Survey (BLS) and in the US Senior Loan Officer Survey (SLO) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS and to questions 1, 8 and 9 of the SLO (see Appendix A). Taylor-rule residuals (TR) are the residuals of the regression of EONIA rates (for the Euro area) and fed funds rates (for the US) on GDP growth and inflation over the period 2002q3-2008q2. The 10-year rate is the long-term government bond interest rate in each country. The # of periods of low monetary policy is the number of consecutive quarters in which Taylor-rule residuals were negative starting in 1999q1. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain) and for the US. The panel regressions are estimated over the period 2002q4: 2008q3. All the panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries. Columns 7 to 12 of the table report the results of a one-country regression for the US only estimated with OLS and robust standard errors over the period 1991q2-2008q3. Taylor-rule residuals are estimated over the period 1991q1-2008q2. The # of periods of low monetary policy starts in 1991q1. The test statistics are in brackets. * , ** and *** denote statistical significance at the 10%, 5% and 1% level respectively.

Table 4, Panel A (Euro area): Securitization, short-(monetary policy), long-term interest rates and lending standards

	Euro area								
	corporate loans			mortgage loans			consumer loans		
	total lending standards								
	1	2	3	4	5	6	7	8	9
Taylor-rule residuals i,t-1 (TR)	22.845 [8.01]***	8.486 [5.75]***	11.532 [5.85]***	13.607 [7.90]***	11.63 [5.14]***	11.35 [4.19]***	7.245 [5.80]***	-1.022 [0.58]	-1.194 [0.61]
Securitization i,t-1	-0.216 [0.34]	0.025 [0.03]	2.901 [0.80]	-2.494 [2.65]***	-2.804 [2.39]**	1.004 [0.14]	0.076 [0.11]	-0.689 [0.95]	-4.605 [1.06]
10-year rate i,t-1			-20.924 [1.78]*			-1.292 [0.09]			7.515 [0.72]
(TR* Securitization) i,t-1		3.715 [6.14]***	3.449 [5.48]***		1.992 [2.10]**	2.397 [2.07]**		2.87 [4.19]***	2.496 [3.20]***
(10-year rate* Securitization) i,t-1			-0.687 [0.84]			-0.932 [0.55]			0.948 [0.94]
GDP growth i,t-1	-3.379 [4.45]***	-0.94 [1.18]	-1.202 [1.62]	-4.099 [4.81]***	-3.411 [3.29]***	-3.515 [3.33]***	-2.821 [4.59]***	-0.236 [0.37]	-0.445 [0.67]
Inflation i,t-1	10.98 [6.86]***	3.647 [2.29]**	4.84 [2.63]***	5.1 [3.41]***	0.199 [0.09]	-0.088 [0.04]	3.855 [3.54]***	-1.513 [0.98]	-1.674 [1.01]
Instrumental variables regressions									
1st stage									
Securitization regulation index i		0.209 [5.87]***	0.209 [5.87]***		0.209 [5.87]***	0.209 [5.87]***		0.209 [5.87]***	0.209 [5.87]***
2nd stage									
(TR* Securitization) i,t-1		6.436 [3.07]***	3.908 [1.77]*		8.804 [3.73]***	9.021 [3.21]***		6.986 [3.22]***	8.544 [3.48]***
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	yes	yes	no	yes	yes	no	yes	yes
# of observations	288	288	288	288	288	288	288	288	288
# of countries	12	12	12	12	12	12	12	12	12
Wald statistic	179.56***	35348***	8911***	165.55***	5217***	5327***	141.21***	4002***	3743***

Table 4, Panel A., shows the results of GLS (country-quarter) panel regressions where the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards in the Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households in the Euro area. They are the answers to Questions 1 and 8 of the BLS (see Appendix A). The Taylor-rule residuals (TR) are the residuals of the regression of EONIA rates on GDP growth and inflation over the period 2002q3-2008q2. Securitization is the ratio between the volume of securitization activity and GDP in each country (country of collateral). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. The results of the IV regression are shown in the last rows of the Table (the control variables of the 1st and 2nd stage regressions are not reported). Securitization regulation is a country indicator constructed using the regulation surrounding the market for securitization. Only the coefficient of the 1st stage regression of securitization activity on the securitization instrument is shown. The next row reports the (2nd stage) coefficients of the interaction of Taylor-rule residuals and securitization when the securitization is instrumented. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002q4:2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.

Table 4, Panel B (U.S.): Securitization, short- (monetary policy), long-term interest rates and lending standards

	US								
	corporate loans			mortgage loans			consumer loans		
	total lending standards								
	1	2	3	4	5	6	7	8	9
Taylor-rule residuals i,t-1 (TR)	12.918 [6.09]***	12.119 [5.65]***	13.63 [5.50]***	6.344 [3.19]***	5.561 [2.81]***	8.078 [3.79]***	4.034 [3.37]***	3.367 [2.75]***	5.784 [3.97]***
Securitization i,t-1	-0.714 [4.16]***	-0.997 [6.67]***	-1.419 [3.02]***	-0.49 [3.07]***	-0.767 [4.92]***	-1.825 [4.67]***	-0.24 [1.93]*	-0.476 [3.23]***	-1.695 [4.02]***
10 -year rate i,t-1			-5.811 [1.93]*			-8.113 [3.79]***			-6.899 [3.00]***
(TR* Securitization) i,t-1		0.248 [3.01]***	0.167 [1.35]		0.243 [4.61]***	0.108 [1.53]		0.207 [3.30]***	0.077 [0.90]
(10-year rate* Securitization) i,t-1			0.102 [1.10]			0.222 [3.32]***			0.244 [2.86]***
GDP growth i,t-1	1.685 [0.89]	4.352 [2.00]**	4.671 [2.20]**	0.214 [0.18]	2.824 [2.05]**	3.625 [2.77]***	1.174 [1.12]	3.4 [2.40]**	4.325 [2.93]***
Inflation i,t-1	3.993 [1.06]	4.656 [1.45]	4.787 [1.28]	3.783 [1.35]	4.432 [2.20]**	2.816 [1.31]	1.655 [0.62]	2.209 [1.00]	-0.391 [0.17]
# of observations	70	70	70	70	70	70	70	70	70
R-squared	0.4	0.52	0.54	0.35	0.56	0.64	0.1	0.31	0.42

Table 4, Panel B, shows the results of an OLS regression where the dependent variable *total lending standards* is the net percentage of banks reporting a tightening of credit standards in the Senior Loan Officer Survey (SLO) for the approval of loans or credit lines to enterprises and households in the US. They are the answers to Questions 1, 8 and 9 of the SLO (see Appendix A). The Taylor-rule residuals (TR) are the residuals of the regression of fed funds rates on GDP growth and inflation over the period 1991q1-2008q2. Securitization is the growth rate of asset-backed commercial papers. The 10-year rate is the long-term government bond interest rate. GDP growth is the annual growth rate of real GDP. Inflation is the quarterly average of inflation rates. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The regression is estimated over the period 1991q2-2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust.

Table 5: Bank capital stringency regulation/supervision, short-(monetary policy) and long-term interest rates, lending standards and risk-taking

	Euro area								
	corporate loans		mortgage loans					consumer loans	
	1	2	3	4	5	6	7	8	9
	lending standards due to bank balance sheet factors (capital and liquidity)								
Taylor-rule residuals $i,t-1$ (TR)	7.217 [6.04]***	23.681 [3.54]***	5.855 [6.46]***	11.642 [3.35]***	23.081 [4.02]***	14.947 [3.82]***	26.081 [3.80]***	4.042 [4.21]***	11.474 [2.34]**
10-year rate $i,t-1$	3.374 [2.05]**	-4.766 [0.43]	1.638 [1.30]	1.688 [1.36]	6.625 [1.53]	-10.323 [1.83]*	-4.857 [0.40]	1.987 [1.75]*	9.176 [0.90]
Capital stringency $i,t-1$	2.059 [0.85]	31.201 [1.35]	0.112 [0.05]	2.46 [0.88]	2.098 [0.55]	-29.661 [1.94]*	-24.79 [0.93]	7.306 [2.81]***	-10.867 [0.71]
(TR*Capital stringency) $i,t-1$		3.054 [0.77]		-4.144 [1.74]*	-6.671 [1.94]*	-6.331 [2.36]**	-8.327 [2.05]**		0.112 [0.04]
(10-year rate*Cap stringency) $i,t-1$		-9.411 [1.74]*				7.694 [2.07]**	6.317 [0.99]		3.965 [1.09]
GDP growth $i,t-1$	-1.723 [3.98]***	-0.647 [1.33]	-1.838 [8.26]***	-1.825 [8.14]***	-1.654 [5.68]***	-1.776 [8.02]***	-1.624 [5.59]***	-0.78 [3.69]***	-0.628 [1.85]*
Inflation $i,t-1$	3.343 [4.37]***	3.836 [4.31]***	1.629 [2.87]***	1.432 [2.47]**	1.688 [2.35]**	1.528 [2.74]***	1.869 [2.60]***	2.677 [4.62]***	2.456 [3.25]***
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	yes	no	no	yes	no	yes	no	yes
# of observations	288	288	288	288	288	288	288	288	288
# of countries	12	12	12	12	12	12	12	12	12
Wald statistic	117.21***	13348***	163.61***	164.11***	18049***	172.09***	16744***	92.68***	15582***

Table 5 shows the results of GLS (country-quarter) panel regressions, where the dependent variable *lending standards due to bank balance sheet factors (capital and liquidity)* is the net percentage of banks reporting a tightening of credit standards due to bank balance sheet constraints for loans or credit lines to non-financial firms and households (they are the answers to Questions 2, 9 and 11 of the BLS). Taylor-rule residuals (TR) are the residuals of the regression of EONIA rates on GDP growth and inflation over the period 2002q3-2008q2. The 10-year rate is the long-term government bond interest rate in each country. Capital stringency is an index of stringency of capital requirements. See Section II, Appendix A and B for a detailed description of all the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The panel regressions are estimated over the period 2002q4-2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the panel regressions include country fixed effects and standard errors are corrected for autocorrelation and correlation across countries.

Table 6: Negative real effects of lax monetary policy and soft lending standards – Correlations

	Euro area							Euro area + US					
			Before the crisis				After the crisis						
	total loans	private consumption	unemployment rate	fiscal surplus	CDS spreads	GDP	lending standards bank capital	total loans	private consumption	unemployment rate	fiscal surplus	CDS spreads	GDP
	1	2	3	4	5	6	7	8	9	10	11	12	13
Taylor-rule residuals (TR)	0.63	0.54	-0.61	0.56	-0.87	0.28	0.23 (0.13)	0.61	0.52	-0.54	0.52	-0.87	0.30
Lending standards for mortgage loans if TR negative	0.43	0.42	-0.60	0.58	-0.59	-0.08	-0.42	0.20	0.20	-0.48	0.42	0.20	-0.12
Residual lending standards for mortgage loans	-0.35	-0.29	0.44	-0.24	0.31	-0.26	-0.90	-0.33	-0.25	0.34	-0.19	0.58	-0.11
Lending standards for corporate loans if TR negative	0.20	0.20	-0.46	0.42	0.17	-0.10	-0.54	0.42	0.41	-0.62	0.58	-0.50	-0.11
Residual lending standards for corporate loans	-0.36	-0.27	0.43	-0.23	0.54	-0.08	-0.45	-0.35	-0.29	0.42	-0.24	0.31	-0.27
# of countries	12	12	12	12	11	12	12	13	13	13	13	12	13

Table 6 shows the correlations between real, fiscal and financial variables after 2008q3 (the beginning of the crisis) and variables related to Taylor-rule residuals and lending standards up to 2008q3. GDP, (aggregate) private consumption and (volume of) total loans are the percentage change of these variables after the crisis (2009q4) as compared to before the crisis. Unemployment rate, (government) fiscal surplus (over GDP), and CDS spread (on government debt) are the change during the crisis (2009q4 minus 2008q3). CDS spreads are not available for Luxembourg. Lending standards bank capital is the net percentage of banks reporting a tightening of credit standards due to bank balance sheet factors (capital and liquidity) for loans or credit lines to non-financial firms and households (they are the answers to Questions 2, 9 and 11 of the Bank Lending Survey (BLS)). Taylor-rule residuals (TR) are the country average of the residuals of the regressions of EONIA rates (for the Euro area) and fed funds rates (for the US) on GDP growth and inflation over the period 2002q3-2008q3. Lending standards for business and mortgage loans if TR negative are averages at the country level taken when Taylor-rule residuals were negative (over the period 2002q3-2008q3 for the Euro area and over the period 2001q4-2006q2 for the U.S). Residual lending standards for mortgage and corporate loans are the residuals of the regression of total lending standards on Taylor-rule residuals over the period 2002q4-2008q3. Lending standards are measured as the net percentage of banks in each country reporting a tightening of credit standards for the approval of loans or credit lines to enterprises and households (questions 1 and 8 of the BLS and 1, 8 and 9 of the Senior Loan Officer Survey (SLO), see Appendix A). The dependent variables are from several sources: total loans from the ECB, private consumption from the OECD, unemployment rate and fiscal surplus from EUROSTAT and CDS spreads from Thomson Financial Datastream. See Section II and Appendix B for a detailed description of the other variables and the data sources. In Column 7 the two figures refer to the correlations of Taylor-rule residuals with lending standards for mortgage loans and lending standards for business loans (in parenthesis). For the Euro area, data are from 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). For Euro area + US, the data are from the 12 Euro area countries and for the US.

Appendix A

The Bank Lending Survey (BLS)

Question		Variable	Definition of variables
Supply of loans		**Total lending standards for:**	
Over the past three months, how have your bank's credit standards as applied to the approval of loans…	or credit lines to enterprises changed? (Q1)	corporate loans	**Net percentage**=difference between the sum of banks answering "tightened considerably" and "tightened somewhat" and the sum of banks answering "eased somewhat" and "eased considerably" in percentage of the total number of banks.
	to households for house purchase changed? (Q8)	mortgage loans	
	to households for consumer credit and other lending changed? (Q8)	consumer loans	
Factors affecting the supply of loans			
Q2 Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans or credit lines to enterprises?	**A Costs of funds and balance sheet constraints** A1.Costs related to your bank's capital position A2.Your bank's ability to access market financing A3.Your bank's liquidity position **B Pressure from competition** **C Perception of risk**	Lending standards due to bank balance sheet factors for corporate loans = average of the net percentage for A1, A2 and A3	**Net percentage**=difference between the sum of the banks answering "contributed considerably to tightening" and "contributed somewhat to tightening" and the sum of the banks answering "contributed somewhat to easing" and "contributed considerably to easing"
Q9 Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of loans to households for house purchase?	**A. Costs of funds and balance sheet constraints** **B. Pressure from competition** **C. Perception of risk**	Lending standards due to bank balance sheet factors for mortgage loans=net percentage for A	
Q11 Over the past three months, how have the following factors affected your bank's credit standards as applied to the approval of consumer credit and other lending to households?	**A. Costs of funds and balance sheet constraints** **B. Pressure from competition** **C. Perception of risk**	Lending standards due to bank balance sheet factors for mortgage loans=net percentage for A	

The Senior Loan Officer Survey (SLO)

Question		Variable	Definition of variables
Supply of loans		**Total lending standards for:**	
Over the past three months, how have your bank's credit standards for …	approving applications for C&I loans or credit lines - other than those to be used to finance mergers and acquisitions - to large and middle-market firms changed? (Q1)	corporate loans	**Net percentage**=difference between the sum of banks answering "tightened considerably" and "tightened somewhat" and the sum of banks answering "eased somewhat" and "eased considerably" in percentage of the total number of banks.
	from individuals for mortgage loans to purchase homes changed? (Q9)	mortgage loans	
	for consumer loans othen than credit card loans changed? (Q8)	consumer loans	

Appendix B

Macroeconomic and financial variables

Variables	Definition	Time span	Data source
Euro area			
Overnight rate	Quarterly average of the EONIA overnight interest rate	2002Q3-2008Q2	ECB
10-year rate	Quarterly average of long-term (10-year) national government bond yield	2002Q3-2008Q2	Thomson Financial Datastream
GDP growth	Annual growth of real GDP	2002Q3-2008Q2	Eurostat
Inflation	Quarterly average of the monthly inflation rate expressed in annual terms	2002Q3-2008Q2	Eurostat
Securitization	Ratio between all deals involving asset-backed securities and mortgage-backed securities with collateral from the respective country and GDP for the same country	2002Q3-2008Q2	Dealogic and Eurostat
Taylor-rule residuals	Residual of a panel regression of overnight rate (EONIA) on GDP growth and inflation	2002Q3-2008Q2	ECB and authors' calculation
# of periods of low monetary policy	Number of consecutive quarters in which the Taylor-rule residuals were negative since 1999:Q1.	2002Q3-2008Q2	ECB and authors' calculation
US			
Overnight rate	Quarterly average of the fed funds effective overnight interest rate	1991:Q1-2008:Q2	Thomson Financial Datastream
10-year rate	Quarterly average of long-term (10-year) national government bond yield	1991:Q1-2008:Q2	Thomson Financial Datastream
GDP growth	Annual growth of real GDP	1991:Q1-2008:Q2	Federal Reserve
Inflation	Quarterly average of the monthly inflation rate expressed in annual terms	1991:Q1-2008:Q2	Federal Reserve
Securitization (US only)	Growth rates of asset-backed commercial papers	1991:Q1-2008:Q2	Federal Reserve
Taylor-rule residuals	Residual of a panel regression of overnight rate (fed funds) on GDP growth and inflation	1991:Q1-2008:Q2	Thomson Financial Datastream and authors' calculation
# of periods of low monetary policy	Number of consecutive quarters in which the Taylor-rule residuals were negative. The variable starts in 1999:Q1 for the panel analysis and in 1991:Q1 for the US only regressions.	1991:Q1-2008:Q2	Thomson Financial Datastream and authors' calculation

Appendix B

Bank regulation/supervision and securitization indicators

Capital stringency index

The index ranges from 0 to 9 with higher values indicating more stringent capital requirements.

The following questions are quantified according to the answers yes=1 and no=0 and then summed up to yield the index:

1) Is the minimum capital asset ratio requirement risk weighted in line with the Basel guidelines?

2) Does the minimum ratio vary as a function of market risk?

3) Are market value of loan losses not realized in accounting books deducted from capital?

4) Are unrealized losses in securities portfolios deducted?

5) Are unrealized foreign exchange losses deducted?

6) What fraction of revaluation gains is allowed as part of capital?

7) Are the sources of funds to be used as capital verified by the regulatory or supervisory authorities?

8) Can the initial disbursement or subsequent injections of capital be done with assets other than cash or government securities?

9) Can initial disbursement of capital be done with borrowed funds?

Data sources: See Barth, Caprio and Levine, *Rethinking Bank Regulation*, Cambridge University Press, 2006

(see also the successive updates of the survey and Laeven and Levine, 2009).

Securitization regulation

The indicator ranges from 0 to 20 with higher values indicating more legal requirements surrounding securitization transactions.
The information is taken from the questions related to A. Securitization laws, B. SPVs,
and C. Transfer and ring-fencing of assets in the annex of the report *Legal Obstacles to Cross-Border Securitization in the EU*.
The answers are coded =0, 0.5, 1 according to how specific and regulated the legal framework is.

List of questions:

A. Securitization Laws

1) Is there specific legislation applicable to securitization?

2) Does the law provide any definition of securitization?

3) Which securitization techniques are governed by national law (traditional securitization, synthetic securitization etc…) ?

        answer=1 if the law specifies securitization techniques

4) Are there any limitations in terms of types of securitized assets?

B. SPVs

5) Is it possible to effectively segregate or ring-fence the originator's assets?

6) What are the types of SPVs available in your jurisdiction for the purpose of securitization transactions?

        answer=1 if SPVs can be established as a company

7) Does the law provide any specific restrictions regarding the place of establishment of the SPVs?

8) Are SPVs considered to be credit institutions?

9) What is the authority in charge of supervising SPVs?

        answer=1 if SPVs are subject to the supervision of supervisory agency or central bank

10) Is it more common to use an offshore SPVs?

11) Does the law distinguish between SPVs acquiring receivables and SPVs issuing?

12) Does national legislation allow SPVs to engage in a wide range of financing activities?

13) Does the law permit the creation of segregated compartments or cells of assets and liabilities?

14) Are there any rules imposed by domestic legislation regarding the management of excess cash?

15) What are the requirements imposed by law for managing an SPVs?

        answer=1 if well defined requirements are specified

16) Are there any limitations in terms of shareholdings in management companies or SPVs?

C. Transfer and ring-fencing of assets

17) Does the law permit the ring-fencing of assets that are the subject of a securitization?

18) Are originators permitted to retain the economic benefits of the transferred assets?

19) Is segregation of assets legally possible on the basis of the provision of general characteristics or general information?

20) Are there any formalities imposed on transfer of assets? Is there a requirement to use a notary or produce similar evidence…?

Data source: *Legal Obstacles to Cross-Border securitization in the EU*, European Financial Markets Lawyers Group, 2007.

Appendix C

Summary statistics

Panel A: Financial and macroeconomic variables

	Euro area				Euro area + US				US			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Overnight rate	2.80	0.79	2.02	4.05	2.81	0.87	1.00	5.26	4.14	1.65	1.00	6.52
Taylor-rule residuals	-0.13	0.76	-1.49	1.44	-0.11	0.85	-1.77	2.73	0.05	1.55	-3.22	2.28
# of periods of low monetary policy	4.92	8.11	-13.00	20.00	4.87	8.06	-13.00	20.00	-2.64	12.16	-28.00	19.00
10-year rate	4.04	0.44	3.06	5.22	4.05	0.45	3.06	5.22	5.51	1.22	3.43	8.23
GDP growth	2.72	1.87	-1.96	8.40	2.72	1.81	-1.96	8.40	2.96	1.40	-0.97	5.38
Inflation	2.44	0.95	-0.17	4.98	2.48	0.95	-0.17	4.98	2.79	0.81	1.26	5.29
Securitization	2.19	2.35	0.00	11.36					9.01	34.97	-174.90	78.99
Securitization regulation	8.08	3.81	1.50	14.00								
Capital stringency index	5.24	1.15	3.00	7.00								

Panel B: Lending standards

	Euro area				Euro area + US				US			
	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Total lending standards for												
Corporate loans	18	31	-50	100	17	31	-50	100	7	23	-24	84
Mortgage loans	3	29	-100	100	4	29	-100	100	4	17	-16	74
Consumer loans	6	23	-36	100	7	22	-36	100	9	14	-9	67
Lending standards due to bank balance sheet factors												
Corporate loans	8	16	-25	87								
Mortgage loans	4	14	-67	80								
Consumer loans	4	16	-33	100								

Panel A shows the summary statistics of the macroeconomic and financial variables used in the analysis. The statistics are calculated over the period 2002q3-2008q2 for the Euro area and the Euro area + US and over the period 1991q1-2008q2 for the US only. The overnight rate is the quarterly average of the daily overnight rate (EONIA for the euro area and effective fed funds rate for the US). The Taylor-rule residuals are the residuals of the regression of EONIA rates (for the Euro area) and fed funds rates (for the US) on GDP growth and inflation. The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. Securitization is defined as the total volume of securitization activity in each country divided by GDP for the Euro area and as the growth rate of asset-backed commercial papers for the US. Capital stringency is an index of stringency of capital requirements in each country. Securitization regulation is a country indicator constructed using the regulation surrounding the market for securitization. See Section II and Appendix B for a detailed description of the variables and the data sources. Panel B shows the summary statistics of the answers from the bank lending surveys used in the analysis. The statistics are calculated over the period 2002q4-2008q3 for the Euro area and the Euro area + US and over the period 1991q2-2008q3 for the US only. Total lending standards is the net percentage of banks reporting a tightening of credit standards in each country in the Bank Lending Survey (BLS) for the Euro area and in the Senior Loan Officer Survey (SLO) for the US. They are the answers to Questions 1 and 9 of the BLS and to Questions 1, 8 and 9 of the SLO. Lending standards due to bank balance sheet factors is the net percentage of banks reporting a tightening of credit standards due to costs of funds and balance sheet constraints (bank capital and liquidity) for loans or credit lines to enterprises and households (they are the answers to Questions 2, 9 and 11 of the BLS). See Appendix A for a detailed description of the surveys.

Appendix D

Robustness

Short- and long-term rates, weighted regressions, clustered standard errors, dynamic panels, term spread, lending rates, lending standards

	GDP-weighted regressions			Clustered standard errors			Euro area — Dynamic panel			Euro area — Control variables						Euro area — Bank risk-taking		
							total lending standards									bank balance sheet and competition factors		
	corporate	mortgage	consumer	corporate	mortgage	consumer	corporate	mortgage	consumer	corporate	corporate	mortgage	mortgage	consumer	consumer	corporate	mortgage	consumer
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Overnight rate i,t-1	19.841 [7.14]***	7.081 [5.66]***	6.846 [6.07]***	18.949 [4.04]***	9.52 [2.57]**	6.845 [2.10]*	12.66 [6.48]***	6.456 [5.34]***	5.909 [6.93]***	29.393 [8.67]***	22.999 [9.42]***	20.79 [11.69]***	12.136 [7.26]***	8.987 [4.70]***	7.559 [6.27]***	5.35 [4.09]***	2.563 [2.95]***	1.846 [3.57]***
10-year rate i,t-1	13.097 [3.24]***	10.293 [5.21]***	0.943 [0.56]	10.642 [2.04]*	14.015 [3.43]***	4.58 [1.34]	2.811 [0.81]	10.316 [4.88]***	0.34 [0.23]							3.498 [1.94]*	3.532 [2.96]***	2.721 [3.70]***
GDP growth i,t-1	-7.478 [9.18]***	-6.674 [9.35]***	-5.346 [9.10]***	-6.381 [3.73]***	-5.405 [4.33]***	-4.538 [3.13]***	-2.84 [4.43]***	-3.433 [4.68]***	-2.787 [5.72]***	-3.421 [4.57]***	-3.642 [4.84]***	-4.519 [5.88]***	-4.568 [5.15]***	-2.85 [4.65]***	-2.936 [4.76]***	-1.327 [3.88]***	-0.693 [2.71]***	-0.972 [5.42]***
Inflation i,t-1	0.033 [0.02]	2.224 [1.96]*	0.35 [0.40]	4.561 [1.54]	0.689 [0.23]	3.024 [1.41]	1.542 [1.26]	0.879 [0.87]	0.758 [1.09]	3.898 [2.36]**	5.09 [3.23]***	2.248 [1.95]*	1.466 [0.95]	1.411 [1.24]	1.681 [1.50]	0.382 [0.58]	-0.005 [0.01]	0.767 [1.95]*
Term spread i,t-1										9.604 [2.46]**		12.358 [5.68]***		2.624 [1.15]				
Lending rate i,t-1											-2.217 [1.97]**		2.478 [2.92]***		0.132 [0.34]			
Total lending standards i,t-1							0.513 [11.77]***	0.42 [9.81]***	0.563 [12.07]***									
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
# of observations	288	288	288	288	288	288	276	276	276	288	288	288	288	288	288	288	288	288
# of countries	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Wald statistic	281.54***	318.38***	199.24***				546.54***	704.76***	714.13***	202.22***	189.07***	285.97***	171.83***	138.22***	144.04***	70.78***	91.66***	192.27***
R-squared				0.5	0.39	0.37												

The table shows the results of a series of panel regressions with Euro area data. In Columns 1 to 15 the dependent variable *total lending standards* is the net percentage of banks in each country reporting a tightening of credit standards. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises and households. They are the answers to Questions 1 and 8 of the BLS (see Appendix A). Columns 1 to 3 report the results of GLS weighted panel regressions, where the weights are the GDP for each Euro area countries. Columns 4 to 6 report the results of LS panel regressions where the standard errors are clustered by country. Columns 7 to 9 report the results of GLS panel regressions where the lagged total lending standards are included as explanatory variables (respectively for corporate, mortgage and consumer loans). Columns 10 to 15 show the results of GLS panel regressions with additional control variables, the term spread and the lending rate. The last three columns report results of GLS panel regressions where the dependent variable is the average tightening of lending standards due to balance sheet constraints and to pressure from competition (see Appendix A for a detailed description of these variables). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. The term spread is the difference between the 10-year rate and the overnight rate. The lending rate is the average rate that banks charge in each country for corporate, mortgage and consumer loans respectively. The average is calculated over the different maturities using the outstanding amount of loans for each maturity as weights. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The test statistics are in brackets. All the GLS panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.
*, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively.

Appendix online

Factors affecting lending standards and bank risk-taking --Non-financial firms

Short- and long-term rates, factors affecting lending standards

Euro area

| | bank related factors | | | | | | | | borrower's risk factors | |
| | balance sheet constraints | capital position | liquidity position | market financing | bank competition | non-bank competition | market finance competition | economic conditions | industry/firm outlook | risk on collateral |
	1	2	3	4	5	6	7	8	9	10
Overnight rate i,t-1	4.021 [7.69]***	5.29 [3.60]***	8.434 [11.20]***	10.821 [6.44]***	11.947 [5.92]***	2.321 [3.30]***	4.25 [5.07]***	21.343 [5.93]***	13.607 [3.10]***	6.39 [3.43]***
10-year rate i,t-1	1.751 [2.31]**	5.885 [2.58]***	3.535 [2.98]***	2.196 [0.96]	9.629 [3.38]***	0.407 [0.36]	1.087 [0.81]	5.794 [1.29]	15.794 [3.11]***	9.96 [3.63]***
GDP growth i,t-1	-0.955 [4.78]***	-2.134 [3.50]***	-1.719 [4.80]***	-1.499 [2.99]***	-1.127 [1.69]*	-0.103 [0.32]	-0.7 [2.66]***	-3.12 [3.61]***	-5.491 [9.77]***	-2.676 [5.59]***
Inflation i,t-1	0.618 [1.96]*	-0.872 [0.90]	1.518 [2.51]**	2.583 [2.37]**	0.5 [0.36]	-0.846 [1.83]*	-1.673 [3.79]***	3.438 [1.69]*	3.385 [2.29]**	2.814 [2.67]***
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	no	no	no	no	no	no	no	no	no
# of observations	288	288	288	288	288	288	276	276	276	288
# of countries	12	12	12	12	12	12	12	12	12	12
Wald statistic	152.77***	111.29***	315.38***	98.26***	158.08***	39.46**	130.08***	164.47***	326.95***	122.5***

The table shows the results of a series of panel regressions with Euro area data. The dependent variable is the net percentage of banks in each country reporting a tightening of credit standards for the approval of loans or credit lines to enterprises due to the specific factor reported in the headings. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises. They are the answers to Question 2 of the BLS (see Appendix A and http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for a detailed description of the questions). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the GLS panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.

Appendix online

Factors affecting lending standards and bank risk-taking --Households

Short- and long-term rates, factors affecting lending standards

	Euro area										
	mortgage loans					consumer loans					
	bank related factors				borrower's risk factors	bank related factors				borrower's risk factors	
	balance sheet constraints	bank competition	non-bank competition	economic conditions	housing market prospects	balance sheet constraints	bank competition	non-bank competition	economic conditions	credit worthiness	risk on collateral
	1	2	3	4	5	6	7	8	9	10	11
Overnight rate i,t-1	5.814	3.095	0.37	8.779	6.748	4.026	1.309	0.682	8.732	8.606	3.608
	[6.54]***	[2.62]***	[1.53]	[4.92]***	[4.17]***	[4.34]***	[1.87]*	[3.05]***	[4.83]***	[5.88]***	[6.04]***
10 -year rate i,t-1	1.594	6.24	1.124	3.604	8.699	2.065	4.296	0.405	0.466	-3.815	3.895
	[1.24]	[3.57]***	[3.81]***	[1.47]	[3.84]***	[1.81]*	[4.01]***	[1.23]	[0.22]	[1.71]*	[5.05]***
GDP growth i,t-1	-1.643	-0.308	0.052	-3.527	-2.513	-0.737	-1.85	0.104	-1.819	-3.123	-2.025
	[7.19]***	[0.58]	[3.51]***	[5.94]***	[5.37]***	[3.91]***	[5.86]***	[1.83]*	[3.89]***	[6.75]***	[7.50]***
Inflation i,t-1	0.089	0.12	-0.155	4.973	2.295	1.527	0.598	-0.058	2.725	-0.664	1.944
	[0.16]	[0.11]	[3.68]***	[4.37]***	[2.14]**	[2.81]***	[0.90]	[0.41]	[3.00]***	[0.68]	[3.65]***
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	no	no	no	no	no	no	no	no	no	no
# of observations	288	288	288	288	288	288	276	276	276	288	288
# of countries	12	12	12	12	12	12	12	12	12	12	12
Wald statistic	137.54***	129.45***	85.34***	193.16***	312.98***	92.25***	149.97***	163.12***	104.17***	212.99***	344.99***

The table shows the results of a series of panel regressions with Euro area data. The dependent variable is the net percentage of banks in each country reporting a tightening of credit standards for the approval of loans to households due to the specific factor reported in the headings. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans to households. They are the answers to Questions 9 and 11 of the BLS (see Appendix A and http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for a detailed description of the questions). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Portugal, and Spain). The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the GLS panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.

Appendix online

Terms and conditions of loans -- Non-financial firms

Short- and long-term rates, terms and conditions of loans

	Euro area						
	margin on average loans	margin on riskier loans	non-interest rate charges	loan size	collateral requirements	loan covenants	loan maturity
	1	2	3	4	5	6	7
Overnight rate $i,t-1$	22.838 [5.04]***	13.111 [3.12]***	3.438 [2.41]**	8.681 [4.48]***	8.001 [4.24]***	9.361 [6.11]***	10.265 [3.97]***
10-year rate $i,t-1$	11.777 [1.80]*	18.85 [3.06]***	6.959 [3.18]***	10.821 [3.93]***	11.93 [4.61]***	8.111 [3.79]***	8.215 [2.17]**
GDP growth $i,t-1$	-6.449 [6.15]***	-6.058 [6.57]***	-1.935 [4.01]***	-4.09 [6.66]***	-3.561 [5.67]***	-4.241 [7.56]***	-3.57 [7.53]***
Inflation $i,t-1$	2.491 [1.14]	4.706 [2.29]**	2.484 [2.32]**	2.857 [2.52]**	2.604 [1.97]**	-0.696 [0.76]	0.966 [0.75]
country fixed effects	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	no	no	no	no	no	no
# of observations	288	288	288	288	288	288	276
# of countries	12	12	12	12	12	12	12
Wald statistic	174.14***	258.45***	90.06***	254.3***	182.57***	225.78***	150.52***

The table shows the results of a series of panel regressions with Euro area data. The dependent variable is the net percentage of banks in each country reporting a tightening of terms and conditions for loans or credit lines to enterprises. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans or credit lines to enterprises. They are the answers to Question 3 of the BLS (see http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for a detailed description of the questions). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the GLS panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.

Appendix online

Terms and conditions of loans – Households

Short- and long-term rates, terms and conditions of loans

	Euro area										
	mortgage loans						consumer loans				
	margin on average loans	margin on riskier loans	collateral requirements	loan to value ratio	loan maturity	non-interest rate charges	margin on average loans	margin on riskier loans	collateral requirements	loan maturity	non-interest rate charges
	1	2	3	4	5	6	7	8	9	10	11
Overnight rate i,t-1	10.494	8.817	5.723	7.846	5.242	0.315	11.237	8.185	3.319	2.851	0.315
	[3.50]***	[4.14]***	[7.27]***	[4.51]***	[5.02]***	[0.36]	[6.63]***	[3.84]***	[4.31]***	[4.56]***	[0.36]
10-year rate i,t-1	13.645	7.836	1.75	2.644	2.002	5.7	5.566	2.325	1.12	1.433	5.7
	[3.13]***	[2.49]**	[1.49]	[1.01]	[1.19]	[3.90]***	[2.14]**	[0.76]	[0.94]	[1.46]	[3.90]***
GDP growth i,t-1	-2.704	-2.481	-1.799	-2.705	-1.735	-1.305	-1.86	-1.896	-1.33	-1.415	-1.305
	[2.77]***	[4.76]***	[6.83]***	[4.54]***	[3.74]***	[4.02]***	[2.93]***	[3.89]***	[4.71]***	[5.13]***	[4.02]***
Inflation i,t-1	0.344	-0.433	0.478	-0.724	0.221	-1.613	0.045	2.28	1.129	2.199	-1.613
	[0.16]	[0.30]	[0.77]	[0.60]	[0.26]	[2.51]**	[0.03]	[1.77]*	[2.12]**	[4.00]***	[2.51]**
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
time fixed effects	no	no	no	no	no	no	no	no	no	no	no
# of observations	288	288	288	288	288	288	288	276	276	276	288
# of countries	12	12	12	12	12	12	12	12	12	12	12
Wald statistic	116.24***	167.13***	223.14***	136.26***	232.1***	75.98***	225.69***	160.09***	113.72***	194.36***	75.98***

The table shows the results of a series of panel regressions with Euro area data. The dependent variable is the net percentage of banks in each country reporting a tightening of terms and conditions for loans to households. The net percentages are reported in the Euro area Bank Lending Survey (BLS) for the approval of loans to households. They are the answers to Questions 10 and 12 of the BLS (see http://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for a detailed description of the questions). The overnight rate is the quarterly average of the daily overnight rate (EONIA). The 10-year rate is the long-term government bond interest rate in each country. GDP growth is the annual growth rate of real GDP for each country. Inflation is the quarterly average of inflation rates for each country. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The panel includes data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. All the GLS panel regressions include country fixed effects and standard errors corrected for autocorrelation and correlation across countries.

Appendix online

Short-term (monetary policy) rates and lending standards

	corporate loans				mortgage loans				consumer loans			
					US							
					total lending standards							
	1	2	3	4	5	6	7	8	9	10	11	12
Overnight rate i,t-1	3.544 [2.08]**	3.842 [1.96]*			0.251 [0.25]	0.107 [0.08]			1.029 [1.12]	0.982 [0.76]		
Taylor-rule residuals i,t-1			4.162 [2.14]**	3.842 [1.96]*			0.43 [0.30]	0.107 [0.08]			1.056 [0.86]	0.982 [0.76]
GDP growth i,t-1		-4.175 [2.03]**		-2.679 [1.29]		-2.826 [2.69]***		-2.784 [3.22]***		-0.676 [0.63]		-0.293 [0.30]
Inflation i,t-1		1.36 [0.26]		3.901 [0.85]		3.649 [0.87]		3.72 [1.08]		0.975 [0.27]		1.624 [0.53]
# of observations	70	70	70	70	70	70	70	70	70	70	70	70
R-squared	0.06	0.14	0.08	0.14	0	0.12	0	0.12	0.01	0.02	0.01	0.02

The Table shows the results of OLS regressions where the dependent variable *total lending standards* is the net percentage of banks reporting a tightening of credit standards in the Senior Loan Officer Survey (SLO) for the approval of loans or credit lines to enterprises and households in the US. They are the answers to Questions 1, 8 and 9 of the SLO (see Appendix A). The overnight rate is the quarterly average of the daily effective fed funds rate. The Taylor-rule residuals (TR) are the residuals of the regression of fed funds rates on GDP growth and inflation over the period 1991q1-2008q2. The 10-year rate is the long-term government bond interest rate. GDP growth is the annual growth rate of real GDP. Inflation is the quarterly average of inflation rates. See Section II and Appendix B for a detailed description of the variables and the data sources. All the explanatory variables are lagged by one quarter. The regression is estimated over the period 1991q2-2008q3. The test statistics are in brackets. *, ** and *** denote statistical significance at the 10%, 5% and 1% level respectively. Standard errors are robust.

Appendix online

Serial correlation

Wooldridge (2002) and Drukker (2003) test for autocorrelation in panel data

	Euro area			Euro area + US		
	corporate loans	mortgage loans	consumer loans	corporate	mortgage	consumer
	1	2	3	4	5	6
F(1, 11)	8.066	7.331	6.515	8.756	8.131	7.478
Prob(>F)	[0.016]	[0.020]	[0.027]	[0.012]	[0.015]	[0.018]
# of observations	276	276	276	299	299	299

The Table shows the results of the Wooldridge test for serial correlation of order 1 in panel data on data on total lending standards for corporate, mortgage and consumer loans. Total lending standards is the net percentage of banks reporting a tightening of credit standards in each country in the Bank Lending Survey (BLS) for the Euro area and in the Senior Loan Officer Survey (SLO) for the US. They are the answers to Questions 1 and 9 of the BLS and to Questions 1, 8 and 9 of the SLO. See Appendix A for a detailed description of the surveys. Columns 1 to 3 show the value of the F-statistic and the probability of rejection of the hypothesis of no correlation for the Euro area panel. The panel includes 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). Columns 4 to 6 show the value of the F-statistic and the probability of rejection of the hypothesis of no correlation for the panel including 12 Euro area countries and the US. The test is run over the period 2002q4-2008q3.


Autocorrelation of residuals

	Euro area			Euro area + US		
	corporate loans	mortgage loans	consumer loans	corporate loans	mortgage loans	consumer loans
			Residuals i,t			
	1	2	3	4	5	6
Residuals i,t-1	0.363	0.332	0.446	0.436	0.398	0.493
	[4.96]***	[3.77]***	[4.59]***	[5.82]***	[4.54]***	[5.30]***
Residuals i,t-2	0.134	0.054	0.075	0.141	0.069	0.087
	[1.85]*	[0.78]	[1.01]	[2.08]**	[0.98]	[1.23]
# of observations	264	264	264	286	286	286
R-squared	0.2	0.14	0.21	0.27	0.19	0.25

The Table shows the results of 2nd stage panel least squares (LS) regressions to check for autocorrelation. The residuals are calculated from LS panel regressions of total lending standards for corporate, mortgage and consumer loans on overnight rates, 10-year rate, GDP and inflation (i.e. the benchmark regressions reported in Table 2, Panel B). The Euro area panel includes 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). The Euro area + US panel includes also the US. Regressions are estimated over the period 2002q4-2008q3.

Appendix online

Lending standards and actual lending behavior

Panel A: Correlations between lending standards and credit growth in the Euro area and in the US

Euro area countries   **United States**

Corporate loans

Mortgage loans
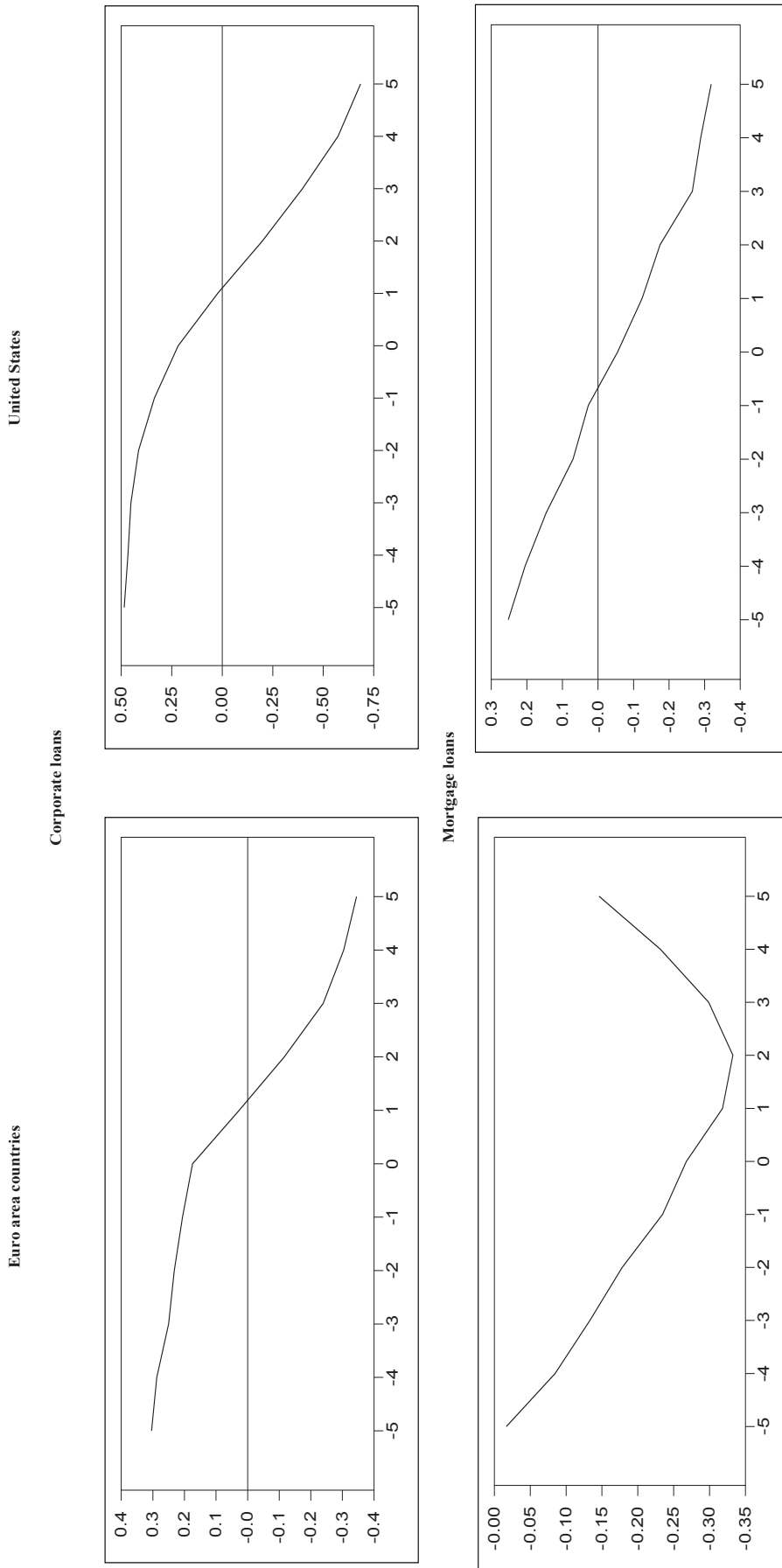
The figures show the correlations over time between lending standards and credit growth. The graph shows the correlation between (lending standards)$_t$ and (credit growth)$_{t+k}$ (with k that can take positive or negative values). k indicates the number of quarters. Correlations in the Euro area (left column) are calculated using country-level data for 12 Euro area countries (Austria, Belgium, France, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Spain). Lending standards for corporate and mortgage loans are the net percentage of banks reporting a tightening of credit standards in each country in the Bank Lending Survey (BLS) for the Euro area and in the Senior Loan Officer Survey (SLO) for the US. They are the answers to Questions 1 and 9 of the BLS and to Questions 1, 8 and 9 of the SLO. Credit growth is the growth rate of the outstanding amount of bank loans in each country (sources: ECB for Euro area countries and Federal Reserve for the US). Correlations are calculated over the period 2002q4-2009q4 for the Euro area and 1991q1-2009q4 for the US.
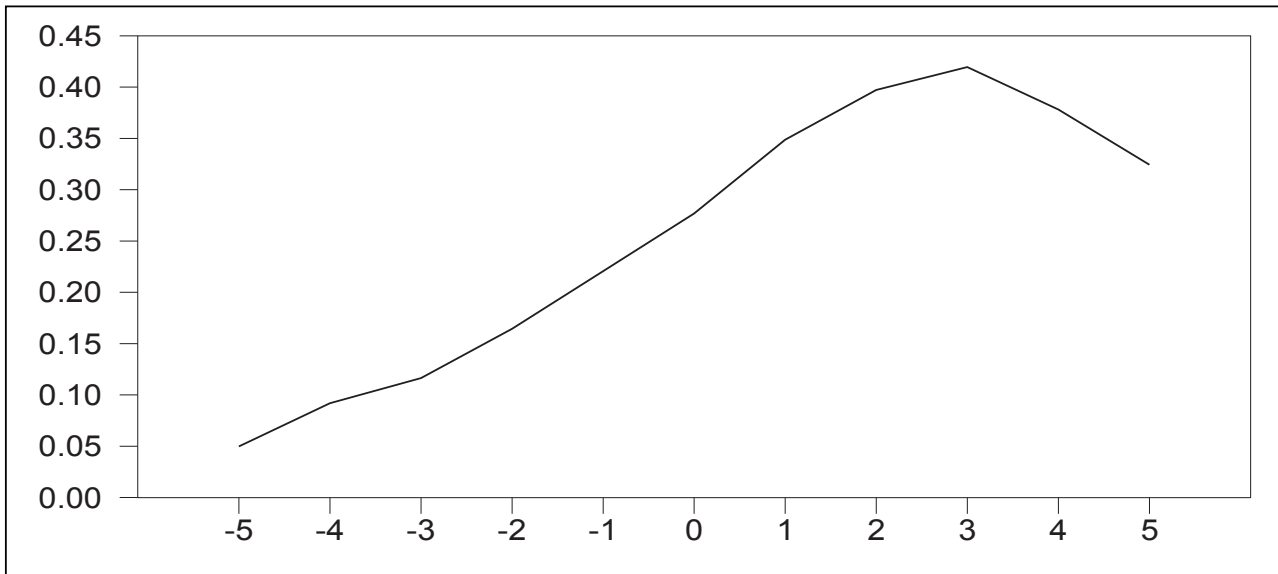
Appendix online
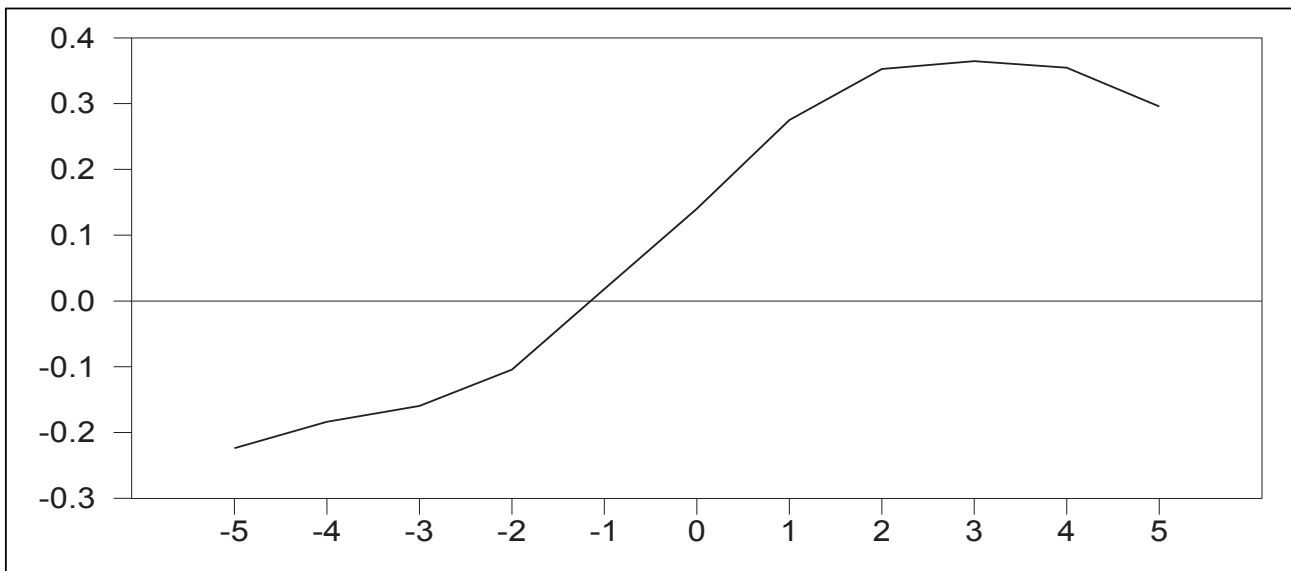
Lending standards and actual lending behavior

Panel B: Correlations between lending standards and lending spreads in the Euro area

Euro area countries

Corporate loans

Mortgage loans

The figure shows the correlations over time between lending standards (net percentage of banks that tightened their lending standards over the previous quarter) and loan spreads, measured as the difference between lending rates applied by banks and EONIA rates. The graph shows the correlation between (lending standards)$_t$ and (loan spreads)$_{t+k}$ (with k that can take positive or negative values). Correlations are calculated using country-level data for 12 Euro area countries. Lending standards for corporate and mortgage loans are from the Bank Lending Survey (BLS). Correlations are calculated over the period 2002q4-2009q4.

Appendix online

Lending standards and actual lending behavior

Panel C: Responses of credit growth and lending spreads to a shock (tightening) to lending standards
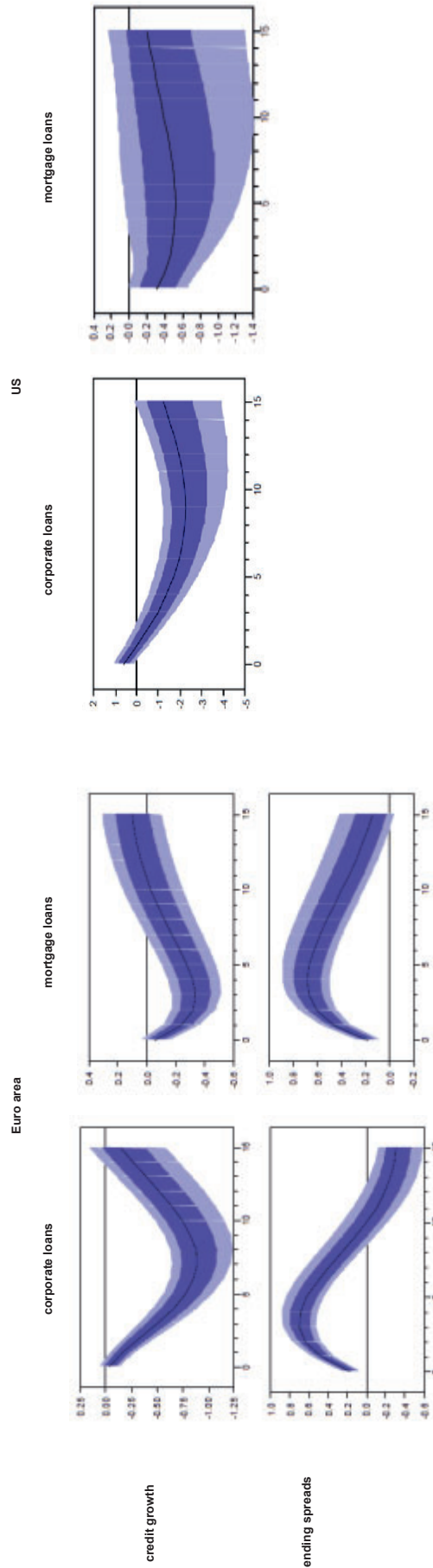
These graphs plot the impulse responses of credit growth (for the Euro area and for the US) and lending spreads (for the Euro area) to a one-standard deviation shock to lending standards in a reduced Bayesian VAR including only lending standards from the bank lending surveys, credit growth and lending spreads. The median response is shown along with 69 and 90 percent confidence bands. Lending standards for corporate and mortgage loans are from the Bank Lending Survey (BLS) for the Euro area and from the Senior Loan Officer Survey (SLO) for the US. Data on credit growth are from the ECB and the Federal Reserve, respectively, and data on lending spreads are from the ECB.