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The Effects of Unconventional Monetary Policies on Bank Soundness

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The Effects of Unconventional Monetary Policies on Bank Soundness

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Abstract

Unconventional monetary policy is often assumed to benefit banks. However, we find little supporting evidence. Rather, we find some evidence for heightened medium-term risks. First, in an event study using a novel instrument for monetary policy surprises, we do not detect clear effects of monetary easing on bank stock valuation but find a deterioration of medium-term bank credit risk in the United States, the euro area, and the United Kingdom. Second, in panel regressions using U.S. banks' balance sheet information, we show that bank profitability and risk taking are ambiguously affected, while balance sheet repair is delayed.

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I. INTRODUCTION

To combat the financial turmoil and subsequent "Great Recession", major advanced countries have adopted unconventional monetary policies: keeping the policy rate near zero, attempting to manage expectations actively (forward guidance), expanding central banks' balance sheets by purchasing long-term government bonds and risky assets, and introducing schemes to facilitate bank lending.[2] In particular, when the financial market faced acute dysfunction, central banks' actions prevented banks, and the economy at large, from falling into a "bad" equilibrium or debt-deflation spiral (for a review, see for example, IMF, 2013a).

In theory, even after the acute phase of the crisis ended, unconventional monetary policies may benefit banks. In the short run, banks engaging in maturity transformation should gain from low short-term rates as long as the long-term rates remain relatively stable. Similarly, banks can gain from borrowing at low cost and investing in assets delivering higher returns provided that policies do not depress the returns on those assets as well. Moreover, banks may take advantage of any reduction in term premia to replace short-term debt with long-term debt and reduce the risk of maturity mismatches in their balance sheets (Stein, 2012).

However, in the medium term, too easy monetary policies may hurt banks. The boost in spread income wanes as unconventional policies flatten the yield curve and reduce risk premia. Consequently, banks may rationally take extra leverage and risk (Borio and Zhu, 2008). This happens, for example, with an extraordinary relaxation of collateral rules that makes funding available at low cost to all banks almost regardless of the strength of their balance sheets. Also, with low interest rates, banks may prefer to roll over loans to non-viable firms rather than declaring them non-performing and registering a loss in their income statement. Previous studies have found evidence of such "evergreening" policies in Japan in the 1990s and 2000s (Peek and Rosengren, 2003; Caballero, Hoshi and Kashyap, 2008).

The overall effect of unconventional monetary policies on banks' profitability and risk is thus theoretically unclear. Both the benefits and costs, however, should be reflected in the changes in banks' stock prices and their bond risk premia at the time of announcement of new monetary policy measures. We analyze the sign and magnitude of such changes by regressing daily changes in bank asset prices on the surprise changes in monetary policy on all Federal Open Market Committee's announcement days from January 2000 until October 2012. In addition to this event study analysis, we examine the effects of low interest rates—both their level and the duration of the period of low rates—and central banks' asset purchases on banks' profitability, risk taking, and balance sheet repair using bank-level data for the United States over the period 2007–2012. While the event-study regressions uncover changes in medium-term credit risks and profitability of banks, the panel analysis looks for any symptoms of risk already present in banks' balance sheets.

[2] In this paper, we refer to the policies aimed at keeping the short-term interest rate near zero as unconventional monetary policies, although a policy rate cut is by itself a conventional policy tool.

The event-study regressions show that bank credit risk increases with monetary easing over the medium term without clear effects on bank stock valuation. To accurately gauge the effects, we use the surprise component of policy announcements. This is because the expected element should not affect market prices at the time of announcement as it should be already priced in. In particular, in the benchmark regressions, we use the change in the one-year-ahead three-month futures rates as the surprise measure, so as to capture both the contemporaneous part of a monetary policy announcement (reflected in the target policy rate change) and any expected developments for near-term future rates (focus of the forward guidance and quantitative easing). However, this measure may also reflect the expected effect on one-year-ahead rates of today's policy. Besides, downward changes are potentially limited once the policy rate hits the zero lower bound. As an alternative, we thus construct a novel instrument for the surprise based on the number of news articles before and after each policy announcement. This measure is not constrained by the zero lower bound. The instrumental variable estimates confirm the negative effect of monetary easing on bank credit risk.

The results of bank balance sheet panel regressions point to contrasting effects on banks' profitability and risk. While unconventional monetary policies do not appreciably affect the profitability of banks, they seem to reinforce banks' soundness by allowing them to reduce leverage and extend the maturity of their debt. However, a prolonged period of low interest rates is also associated with an increase in the ratio of risk-weighted assets to total assets. In addition, we find that increases in central banks' balance sheets could delay loss provisioning for existing loans, thereby potentially increasing the overall credit risk as also found in the event study results.

To the best of our knowledge, our paper is the first to provide a comprehensive assessment of the effects of unconventional monetary policies on the soundness of the banking sector. While the empirical literature on unconventional monetary policy has been growing, most studies focus either on the transmission question, i.e., the effects of unconventional policies on long-term government bond yields and risky asset prices, or on the macroeconomic question, i.e., the effects on inflation and GDP growth rate (see review papers, for example, Woodford, 2012, and IMF, 2013b).

A few papers have examined the relationship between monetary policy and bank risk-taking but primarily over the pre-crisis period. Altunbas, Gambacorta, and Marqués-Ibáñez (2010) found evidence that low interest rates over an extended period of time contributed to an increase in banks' risk, measured by their expected default frequency, over the pre-crisis period 1999–2008. Using data on U.S. banks' corporate loan ratings over a longer period that includes the first years of the crisis (1997–2011), Dell'Ariccia, Laeven, and Suarez (2013) also found a negative relationship between risk-taking by banks and increases in real policy rates. The strength of that relationship depends on banks' capitalization and the effect of interest rates on risk-taking is smaller for poorly capitalized banks. Similar results were obtained by Jiménez, Ongena, Peydrò and Saurina (2009) with data on loans granted by Spanish banks over the period 1984–2006, and by Ioannidou, Ongena and Peydrò (2009) with Bolivian data.

A recent paper by English, Van den Heuvel, and Zakrajšek (2012) is most similar to our study. Using pre-crisis period data, they study the effects of changes in the level of policy rates and the slope of the yield curve on bank stock valuations and profitability. They show a drop in bank stock prices following an unexpected increase in the level of policy rates and a steepening of the yield curve. Although higher short-term rates and a steeper yield curve increase banks' return on assets, the positive effect on near-term profitability is offset by a slowdown in asset growth and an outflow of core deposits, which represent an inexpensive source of funding compared to market alternatives. Yet a policy rate cut is typically associated with a steepening of the yield curve. This is consistent with the assumption that monetary easing is effective at boosting economic activity, which should increase inflation and growth expectations.

The rest of the paper is organized as follows. Section II reports the results of the event-study regressions. It explains our measures of monetary policy surprises and then examines the forward-looking effects of those surprises on bank stock returns and credit risk measures. Section III analyzes bank-level panel data and sheds light on the channels through which monetary policy easing affects banks. Section IV concludes.

II. Event Study

A. Surprise Component of Monetary Policy Announcements

We compare the average effects on banks of unconventional monetary policies with those of conventional monetary policies. We do so by regressing daily bank stock returns and daily changes in credit risks on monetary policy surprises on (almost) all FOMC announcement days since 2000. We define the conventional monetary policy period as the period before August 2007 while the so-called unconventional policy period starts after the collapse of Lehman Brothers on September 16, 2008 (see more detailed discussion below). The effects of unconventional policies could differ from those of conventional policies both quantitatively and qualitatively.

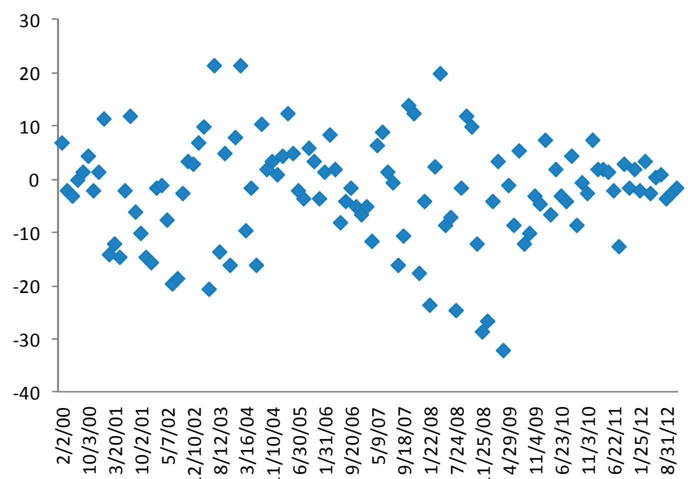
A difficulty in conducting an event study on monetary policy is that the expected actions are already priced into asset prices at the time of the policy announcement. In other words, only the surprise component of an announcement can affect asset prices. Yet, in the conventional policy period, when the interest rate is the only policy tool, once the impact of one unit (e.g., one basis point) of surprise is estimated, the overall impact of the total policy rate change (e.g., 25 basis point cut) can be calculated simply by multiplying the coefficient by the total policy rate change (e.g., 25 times the estimated coefficient). Unfortunately, a similar estimate for the overall effect by an unconventional policy is difficult to obtain, as unconventional policy measures do not take the form of a change in the policy rate. Instead, we investigate whether the effects of unconventional policies differ in terms of signs and magnitude for one unit of surprise from those of conventional policies.

To compare the results, it is essential to gauge the surprise component for both conventional and unconventional monetary policy actions in a similar way. For conventional policies, Bernanke and Kuttner (2005) and Kuttner (2001) used daily changes in the 30-day federal funds futures contract rate as a measure of the surprise element of a monetary policy action for the United States. However, mirroring the behavior of the federal funds rate, the federal funds futures rate has been near zero and moving very little since late-2009. Moreover, the zero lower bound on short-term interest rates has caused central banks to target interest rates on longer-term securities as well as riskier assets.

As our benchmark surprise measure we use one-year-ahead futures of the three-month Eurodollar rate. This is because the one-year-ahead futures rate is less affected by the zero lower bound than the current-month futures contract rate and also because it relates more to the unconventional monetary policy's intention to influence longer-term interest rates. Moreover, even in conventional times, changes in the one-year-ahead futures contract rate reflect not only the target policy rate changes but also implicit forward guidance on future economic conditions and future policy rates implied by the FOMC statements, which is an important part of monetary policy (Gürkanyak, Sack, and Swanson, 2005, and Campbell, Evans, Fisher and Justiniano, 2012).

We acknowledge that the change in the one-year-ahead three-month Eurodollar futures rate is not a perfect measure of monetary policy surprises. First, rate changes are also constrained by the zero lower bound in later years, even though unconventional policy measures such as quantitative easing may not be constrained. In this case, the measured surprise can be smaller than the true surprise, and this would create an upward bias in the estimated magnitude of the effects of surprise. Figure 1 appears to show a reduction in the variance of the changes in the one-year-ahead futures rate in the unconventional policy period. Yet, changes are larger than those in the current-month federal funds futures rates, which stay at essentially zero after late-2009.

Figure 1. Surprise-Change in One-Year Ahead Three-Month Eurodollar Futures



Sources: Bloomberg L.P. and authors' calculations.

Second, a bold monetary easing action by the Fed, especially in the acute crisis phase, may be also seen as signaling a pessimistic view about the economy, and the market may accordingly revise its own assessment of economic growth downward. In this case, the one-year-ahead futures rate would decline more than in the absence of such unintentional signals.[3] However, the direction of the overall bias is unclear because the opposite case is also possible (i.e., a less-than-expected action may signal that the Fed holds an optimistic view).

In addition to the measurement issues, endogeneity problems may also arise in the regression when using the one-year-ahead futures rate. The one-year-ahead futures rate reflects expectations of economic conditions a year later, which are influenced by current monetary policy. Put differently, changes in the one-year-ahead futures rate may capture not only the monetary surprise itself but also the expected outcome one year from now of the announced monetary actions. If, for example, today's policy rate cut is effective at increasing growth and inflation a year later, changes in the one-year-ahead futures rate may be reduced or even reversed. Moreover, the underlying interest rate of the Eurodollar futures contract is the London interbank rate (LIBOR), which picks up the credit risk of banks in addition to the policy rate.[4] Thus, any change in the expectations of future credit risks due to current monetary policy is also reflected in the change in the one-year-ahead Eurodollar futures rate. In this case, if the current policy rate cut is effective at lowering credit risks, the movements in the one-year-ahead futures rate may be even larger.

So far researchers have not come up with a clean surprise measure of unconventional monetary policy. Only a few attempts have been made: Rosa (2012) provides a measure of the unanticipated component of asset purchases programs by the Fed based on the Financial Times' coverage, and Joyce, Lasaosa, Stevens and Tong (2011) relies on market participants' expectations of asset purchases by the Bank of England. However, Rosa's measure can only take three values (-1, 0, and 1) depending on whether the announcement is deemed more restrictive, similar, or more expansionary than expected and his classification relies on a single news source. The data used by Joyce et al. are unfortunately unavailable for the United States. In any case, asset purchases are only one type of unconventional monetary policy measure.

We expanded Rosa's approach and counted the number of news articles on monetary policy three days before and after each policy announcement (total news coverage) using *Factiva*, which is a news-article search service provided by the Dow Jones company. We also collected the numbers of "positive" and "negative" news references in terms of monetary

[3] Such unintentional signals would also affect other asset prices.

[4] The Eurodollar futures contract itself does not imply any counterparty risk as the standardized contract is centrally traded at the Chicago Mercantile Exchange. However, the underlying rate, the Eurodollar LIBOR, may still include a counterparty credit risk premium.

easing.[5] These three variables, specifically, the before-after changes in total, positive, and negative news coverage, are used as instruments to avoid the endogeneity issues discussed above. Unlike Rosa's measure, our surprise measure does not involve a judgment call by the researcher.

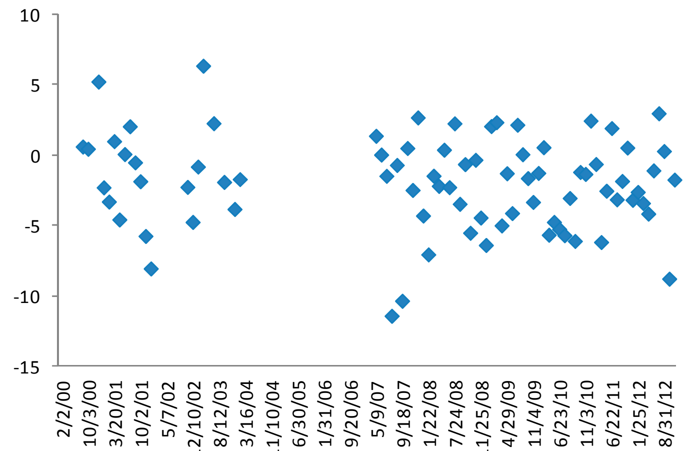
Figure 2 shows the plot of the fitted surprise measure constructed from the first stage regression of a two stage least squares estimation.[6] Note that the movements of the fitted surprise are no longer constrained by the zero-lower bound in the later period unlike the changes in the one-year-ahead three-month Eurodollar futures rates (shown in Figure 1). In this sense, our two stage least squares strategy addresses not only the endogeneity problem but also corrects a possible bias due to the zero lower bound.

There is still a caveat. The number of news articles used as an instrument for the monetary policy surprise may increase just because unconventional monetary policy is newsworthy and not because of a surprise related to monetary policy easing or tightening. However, because many unconventional policies were already discussed and announced (for example, in speeches) before actual FOMC meetings and we only use FOMC episodes (with just two exceptions), the potential bias stemming from the novelty of the policy tools should be small. Indeed, the mean and the variance of our fitted surprise measure in Figure 2 are more or less the same during the conventional policy period and the unconventional policy period.

[5] For the United States, search query terms for *total surprise* in *Factiva* are: ("FOMC" or "Federal Reserve") and ("interest rates" or QE or "quantitative easing"). For a *positive surprise*, they are: ("FOMC" or "Federal Reserve") and ("interest rates" or QE or "quantitative easing") and ("aggressive" or "aggressively" or "exceeded expectations" or "beyond expectations" or "positive surprise"). For a *negative surprise*, they are: ("FOMC" or "Federal reserve") and ("interest rates" or QE or "quantitative easing") and ("disappointed" or "disappoint" or "below expectations"). In the place of ("FOMC" or "Federal Reserve"), we used ("ECB" or "European Central Bank") for the euro area and ("BOE" or "Bank of England") for the United Kingdom. We collected data from January 2000 to October 2012 and adjusted for duplicated articles after March 2008 when *Factiva* started to report duplicates. Note that *Factiva* is continuously expanding its coverage over global and web contents. We only searched for English-language news sources.

[6] See below for a detailed explanation of the two stage least square estimation strategy. Note that the plot is created only for monetary easing episodes because positive and negative news variables are well-defined only in these cases.

Figure 2. Surprise-Fitted Values in the First State of TSLS By News Based Instruments



Sources: Bloomberg L.P. and authors' calculations.

B. Benchmark Regressions

We run simple regressions for key bank-related asset prices based on our sample of monetary policy decision dates in the spirit of Bernanke and Kuttner (2005). Specifically, we regress daily bank stock returns and daily changes in spreads between bank corporate bond yields and the Treasury bond yields on the surprise component of the monetary policy announcements.[7] By including a dummy variable for unconventional policy announcements, we allow for possible differences in the level effect (that is, the constant term) and the marginal effect (that is, the coefficient on surprise) between conventional and unconventional monetary policy announcements:

$$y_z = \beta_0 + \beta_1 UMPdummy_z + \beta_2 Surprise_z + \beta_3 \left(Surprise_z * UMPdummy_z \right) + \varepsilon_z, \quad (1)$$

where the subscript *z* corresponds to each FOMC announcement and *UMPdummy* takes value one for announcements during the unconventional policy period and zero otherwise. Unscheduled meetings are included in our sample of events but speeches (outside FOMC meetings) are in general excluded to ensure consistency as well as to contain any biases that might arise from pooling different types of events.

[7] For the United States and the euro area, bank stock returns are calculated based on the *MSCI Bank Stock Index*. For the United Kingdom, returns are based on the *FTSE All Share (Bank) Index*. All indices are provided commercially by Bloomberg. The bank bond yield spreads from government bond yields are *Financial Sector Bond Option Adjusted Spreads* (that is, for early retirement option) for the same maturity government bond yields, provided commercially by Bank of America Merrill Lynch via Bloomberg. The financial sector covers more institutions than just the deposit-taking banking sector. Note that, for the euro area, government bond yields are defined as the average of German and French government bond yields. Summary statistics of the variables are provided in Table 1a.

We are interested in the overall average effects of monetary policy announcements and thus use as many policy announcement events as possible. This is in contrast to most previous studies on unconventional monetary policy which focus only on a few events and look at asset prices movements for each event separately. In particular, we include FOMC days in which there was no policy change. This is because the surprise component can be negative or positive depending on market expectations before the FOMC meeting, even if no change in monetary policy was announced. Note that in these events without any policy changes, the expectations for the use of some specific policy tool (like asset purchases or forward guidance) cannot be identified but the size of the expectations for monetary easing can still be gauged by our measure of surprise.

We define the conventional policy period as the period up to July 31, 2007, because the FOMC held its first ad hoc meeting (conference call) on August 10, 2007, in response to the beginning of the financial turmoil.[8] Thus, in the regression, the conventional policy period (i.e., *UMPdummy = 0*) covers the period from January 1, 2000, to July 31, 2007. The unconventional policy period (i.e., *UMPdummy = 1*) covers the period following the collapse of Lehman Brothers, that is, September 16, 2008 to October 31, 2012. Essentially all FOMC meeting dates are included except for September 12, 2001, corresponding to the FOMC meeting held one day after the September 11 attack on New York and Washington, D.C.[9]

The first column of Table 2 shows the effect of conventional monetary policy surprises on bank stock daily returns. It is insignificant. Similarly, the simple average effect of monetary policy surprises in both conventional and unconventional policy periods (second column) is not significant. The third column shows the results for the full specification, allowing different constant terms and coefficients for both the conventional and unconventional monetary policy periods. Again, no significant result arises. This finding is consistent with previous studies. Bernanke and Kuttner (2005) report positive effects of surprise policy rate cuts on the market-wide stock index. However, as already discussed, a policy rate cut typically steepens the yield curve. Considering the positive effect of the policy rate cut and the negative effect from a steepened yield curve found in English, et al. (2012), the overall effect is ambiguous and we interpret our results in this light.

However, we found negative, significant effects of monetary easing on bank credit risk measured by the daily changes in the spread between the bank corporate bond yields and the Treasury bond yields for the similar maturities (Table 2, columns 4 to 12). For all maturities, an increase of about 0.08 basis point (bp) in spreads is observed for any unit of monetary

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[8] The ad hoc FOMC meeting was held to address the market turmoil after Bear Stearns liquidated two hedge funds on July 31, 2007, and after BNP Paribas halted redemption of three investment funds on August 9, 2007.

[9] Two Jackson Hole speech days are included (in 2010 and 2012) as Chairman Bernanke first announced QE1 and QE2 respectively in those two speeches. However, excluding them barely affects the regression results. Also, note that we exclude any event which happened on weekends and Mondays, so that we can compute consistent daily changes in asset prices. This would have excluded some important speech days, in case we had wanted to include them. FOMC meetings are rarely held on Mondays so that we lose few observations.

easing surprise.[10] Roughly speaking, 1 bp of monetary easing increases the credit spread by about 0.1 bp. Over the three years since the beginning of the easing cycle after the onset of the financial crisis, the policy rate came down from about 5 percent. Assuming that the cumulative easing from interest cuts, QE, and forward guidance is "equivalent" to 6 percent in interest rate terms, the impact on the credit spread would correspond to a 50 to 60 bp increase, which is substantial. From a study on bank funding cost and credit ratings (Ueda and Weder di Mauro, 2013), we know that a 60 bp funding cost increase is equivalent to a downgrade of almost 3 notches in the credit rating scale used by most credit rating agencies.

Since unconventional monetary policies aim at easing monetary conditions, they may be better compared only to monetary easing episodes in the conventional monetary policy period. Bernanke and Kuttner (2005) indeed find slightly different coefficient estimates in regressions using all monetary policy events and in those using only tightening episodes. This is consistent with anecdotal evidence that monetary tightening is often gradual, while easing is often executed more rapidly. Also, even if tightening and easing proceed at the same pace, their impact might be asymmetric.

On the basis of the monetary easing events only, the effect of monetary surprises is found to be slightly lower than the one found in the benchmark regression (results omitted). Note that all episodes in the unconventional policy period are defined as monetary easing episodes. As for the conventional policy period, an FOMC announcement is classified as an easing episode if the expected change in the one-year-ahead futures rate is negative. The expected change is defined as the actual change in policy rates minus the surprise change.

Table 3 shows the results using our news-based surprise measures as instruments in two stage least squares (TSLS) regressions. Specifically, in the first stage, logarithms of the before-after ratios of the number of total news, positive news, and negative news references are used as three regressors, substituting for the one-year-ahead three-month Eurodollar futures rate.[11] Then, the fitted value is used as our *Surprise* variable in the key regression (1). The reported standard errors account for the two stage least squares estimation. To avoid any bias which

[10] Columns 4, 7, and 10 show a significant effect of monetary policy surprises during the conventional policy period. This effect is not significant over the whole sample period, which includes both conventional and unconventional policy periods (columns 5, 8, and 10). Formally, we can test whether the effects of monetary policy surprises differ between the two periods by including an indicator variable for the unconventional policy period and interaction terms. The results, shown in columns 6, 9, and 12 do not support the hypothesis of different effects.

[11] For the weak identification test, we look at the Kleinbergen-Paap rk Wald statistic. It is equal to 1.9, suggesting that the instruments are weak. However, there are two reasons for this. First, the interaction term (*Surprise*UMP dummy*) is instrumented by (*Fitted Surprise * UMP dummy*) following Wooldridge (2002). In the specification without the interaction term, the test statistic is at a less problematic level, 5.3 (see discussions by Baum, Schaffer, and Stillman, 2007). Second, and more importantly, the changes in the original variable, the one-year-ahead three-month Eurodollar futures rate, may be constrained by the zero lower bound in later years as already discussed. Therefore, our instruments, which are not affected by this constraint, can appear "weak" since they can reflect true policy changes more freely. Indeed, in the year-by-year regressions (see the next subsection), the Kleinbergen-Paark Wald statistic tends to decline in the regressions using later year data.

may stem from the ambiguity in the search terms used to identify "positive" or "negative" surprises, we only consider monetary easing episodes in the conventional policy period and the whole sample of events in the unconventional period.

The results are broadly consistent with those of the benchmark regressions. Monetary policy easing surprises are associated with a deterioration of bank credit risk at the 1–3 year and 3–5 year maturities, but statistical significance is lost for the longer, 5–7 year, maturity. Again, we do not find any significant effect on bank stock returns.

C. Robustness Checks

The results are robust to changes in the sample of events (taking out observations when the surprise measure exceeds its sample mean by more than two-standard deviations) and to alternative definitions of the conventional and unconventional monetary policy periods (results omitted).[12]

As an additional robustness check, it is, however interesting to investigate whether the effects of unconventional policies have changed over time after the collapse of Lehman Brothers. Unconventional policies were explicitly or implicitly employed to calm down the acute financial turmoil, especially in 2009 and 2010, but the stress subsided as time went by. Again, rather than describing what happened in each event, we use regression analysis but compare each year after 2008 to the conventional policy period as previously defined (January 2000, to July 2007). The periods we consider are (i) September 16, 2008 to September 30, 2009; (ii) October 1, 2009 to September 30, 2010; (iii) October 1, 2010 to September 31, 2011; and (iv) October 1, 2011 to October 31, 2012.[13]

Table 4 shows the year-by-year regression results. During the first year after the Lehman collapse, the effects of monetary policy announcements are the same as in the benchmark regression. In other words, unconventional policies do not seem to have qualitatively different effects compared to conventional policies. Perhaps the crisis was so acute that the unconventional policies did not have much effect. Or, on the contrary, if non-linear dynamics are at play, unconventional policies may have prevented the economy from falling into a "bad equilibrium" that cannot be observed. In this case, the hypothesis of zero effect of unconventional monetary policy as a counterfactual is not correct. The linear effect that is not significantly different from zero may in fact conceal a larger impact. However, a formal technique to study such non-linear counterfactuals has not yet been developed.

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[12] Specifically, we considered two alternative dates for the start of the unconventional policy period: August 17, 2007, when the FOMC launched the first emergency measures following an unscheduled meeting, and January 30, 2008, when FOMC lowered the policy rate to 3 percent. The conventional policy period can be also extended until the end of 2007. As for the start date of the conventional policy period, we considered March 2001 (that is, the beginning of the previous easing cycle) as an alternative to January, 2000.

[13] The regression results for the first year after the Lehman collapse do not change much if we exclude the FOMC meeting held on September 16, 2008 (results omitted).

Unconventional policies had qualitatively different effects in the second year after the Lehman collapse (October 2009 to September 2010). They had a significant negative effect on stock returns but improved medium-term (3–5 years) credit risk significantly. This suggests that bold policies may have lowered the default probability of banks but also involved weaker expectations for profitability, and is consistent with the view that some monetary policy measures worked as merely a life support system for distressed banks at that time. In the third year after the Lehman collapse, unconventional monetary policy, though it became less active, appears to increase both bank stock prices and credit risk. Lastly, in the fourth year, unconventional monetary policies seem to have lost any distinct effect on banks' profitability and soundness and the results are similar to those of the benchmark regressions.

In summary, unconventional policies do not have robust specific effects, as those effects differ depending on the year (and surely depending on each event). However, the common effects of both conventional and unconventional monetary policies on bank credit risk remain significant over all sample years.

D. Euro Area and the United Kingdom

A natural question is whether the effects of monetary policy are different in other countries. To answer this question, we estimated similar regressions for the euro area (Table 5a) and the United Kingdom (Table 5b). As regards bank credit risk, the regression results show similar results to the ones obtained for the United States in that monetary easing surprises appear to cause a deterioration of bank credit risk. The magnitude of the effect for the United Kingdom is similar to that for the United States, while the magnitude for the euro area is about twice as large. In addition, for the euro area and the United Kingdom, bank stock prices fall with monetary easing, an effect not observed in the United States. Again, most of these effects are common to both conventional and unconventional policies.

The results from the two stage least squares estimation are a bit weaker. Like in the United States, we do not find a significant effect of monetary policy on bank stock returns. Credit risk in the euro area still deteriorates, while the effect is not significant anymore in the United Kingdom (results omitted).

E. U.S. Bank-level Regressions

This section examines whether the effects of monetary policy on bank stock returns and credit risk vary with individual bank characteristics such as asset size and capitalization. We use quarterly balance sheet data (i.e., total assets and the equity/assets ratio) for a balanced sample of 88 U.S. banks from the SNL Financial database.[14] Total assets are divided by GDP to ensure stationarity. The variables are lagged by one quarter and then used as the additional controls in the regression. We also include interaction terms with the surprise measure and the unconventional monetary policy dummy. Note that bank balance sheet data are quarterly

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[14] The database is provided commercially by SNL Financial. Data availability issues prevent us from conducting the same analysis for the euro area and the United Kingdom.

while monetary policy announcements typically occur once a month. To control for differences in the information content of balance sheet variables in different months within a quarter, we include a dummy variable for the first month of each quarter (*Mon1 dummy*) and another dummy variable for the second month of each quarter (*Mon2 dummy*).[15] The following equation is estimated with bank fixed effects.

$$
\begin{aligned}
y_{iz} = \gamma_{0i} &+ \gamma_1 Mon1dummy + \gamma_2 Mon2dummy \\
&+ \gamma_3 UMPdummy_z + \gamma_4 Surprise_z + \gamma_5 \left(Surprise_z * UMPdummy_z \right) \\
&+ \gamma_6 Lag\left(Asset / GDP \right)_{iz} + \gamma_7 Lag\left(Equity / Asset \right)_{iz} \\
&+ \gamma_8 \left(Lag\left(Asset / GDP \right)_{iz} * UMPdummy_z \right) + \gamma_9 \left(Lag\left(Equity / Asset \right)_{iz} * UMPdummy_z \right) \\
&+ \gamma_{10} \left(Surprise_z * Lag\left(Asset / GDP \right)_{iz} \right) + \gamma_{11} \left(Surprise_z * Lag\left(Equity / Asset \right)_{iz} \right) \\
&+ \gamma_{12} \left(Surprise_z * Lag\left(Asset / GDP \right)_{iz} * UMPdummy_z \right) \\
&+ \gamma_{13} \left(Surprise_z * Lag\left(Equity / Asset \right)_{iz} * UMPdummy_z \right) + \nu_{iz}, \qquad (2)
\end{aligned}
$$

where subscript z denotes a FOMC announcement and i refers to a bank.

Table 6 shows the results.[16] We are in particular interested in the coefficients on the *Surprise* measure and its interactions. Results from the fixed effect estimation are shown in columns 1 to 5 and those from two-stage-least-squares estimation where we use our news variable are shown in columns 6 to 10.

The results generally support the benchmark regression results—little effect of monetary easing on bank stocks. Conventional monetary policy surprises have no effect on bank stock returns (column 1) though unconventional monetary easing has a positive effect (γ_5, around 0.08). Moreover, this effect is larger for larger banks ($\gamma_{12,}$ around 0.001). These effects come out strongly only in the third year after the collapse of Lehman Brothers (column 4). However, TSLS regressions indicate that these effects disappear once the endogeneity problems and the measurement problems introduced by the zero-lower-bound are accounted for by use of the news-based surprise variable.

Similar regressions are run on bank credit default swap (CDS) spreads. Bank CDS spreads are in principle a better measure of bank credit risk compared to bank corporate bond spreads

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[15] *Mon1 dummy* takes the value one if the month of a monetary policy announcement is January, April, July, or October, and zero otherwise. *Mon2 dummy* takes the value one if the month of a monetary policy announcement is February, May, August, or November, and zero otherwise. These dummies are usually significant in the regressions.

[16] The coefficient estimates for the bank fixed effects, *Mon1* and *Mon2* dummies, and the constant term are not reported. The use of a balanced panel potentially introduces a survivorship bias and may lead to underestimating the coefficients as banks which exited the sample following a bankruptcy, a merger or a takeover may have experienced larger movements in their stock prices. Standard errors are corrected for clustering at bank level.

from Treasury bond yields. This is because monetary easing may primarily alter Treasury bond yields without affecting bank bond yields. In the presence of market frictions that prevent arbitrage between the two markets, the observed increase in spreads may not reflect an increase in the bank risk premium. Such arbitrage failures may have happened in the few months immediately following the collapse of Lehman Brothers.

The CDS market for U.S. banks is relatively new (the earliest available data are from 2005) and notoriously thin in earlier years. We therefore focus on the period after the collapse of Lehman Brothers and on four banks only: Bank of America, JP Morgan, U.S. Bancorp, and Wells Fargo. The regressions are run separately for each bank using simple OLS.

Tables 7a (OLS estimation) and 7b (TSLS estimation) show robust evidence of a negative effect of monetary policy surprises only for U.S. Bankcorp. This does not disprove the results of the benchmark regressions. The sampled four banks are quite large compared to the average bank whose bond is included in the index of bank corporate bond spreads provided by Bank of America Merrill Lynch. In particular, perhaps with the exception of U.S. Bancorp, these banks are most likely protected by "too-big-to-fail" considerations. This would limit the downward movements of CDS spreads for these banks. In our view, finding a consistent and significant result for at least one of the largest banks corroborates the benchmark results for the average bank.

III. Panel Analysis on Balance Sheets and Income Statements of Banks

In this section, we use bank balance sheet data to shed light on the channels through which unconventional monetary policies affect bank credit risks. We focus on three channels: bank profitability, risk-taking, and efforts toward balance sheet repair. We consider the following dynamic panel regressions:

$$\begin{aligned} x_{i,t} &= \alpha_1 x_{i,t-1} + \alpha_2 MonetaryPolicy_t + \alpha_3 BankCharacteristics_{i,t} \\ &\quad + \alpha_3 \left(MonetaryPolicy_t * BankCharacteristics_{i,t} \right) + \alpha_4 Controls_t + \xi_{i,t}, \end{aligned} \tag{3}$$

where $x_{i,t}$ denote variables of bank i at time t, which are indicators for bank profitability, risk taking, and balance sheet repair (see below for details).

$MonetaryPolicy_t$ measures conventional aspects as well as unconventional monetary policy measures. Three specifications are considered. The first one includes "Taylor rule" residuals (the Taylor gap[17]) as a measure of the monetary policy stance. When the Taylor rule indicates

[17] The Taylor gap is computed as the difference between the effective federal funds rate and the rate given by a standard Taylor (1993) rule: *Taylor rate = long-run real interest rate + inflation objective + weight*inflation deviation + weight*output gap*. For robustness, an average of four estimates of the Taylor rate (with different weights and output gap estimates) was used. We used two different sets of weights on the inflation deviation and the output gap: (i) 1.5 and 0.5 and (ii) 0.5 and 0.5. As for output gap estimates, we also use two different estimates: one from the World Economic Outlook database and the other defined as deviations from a Hodrick-Prescott filter trend.

that the interest rate should be below zero, the central bank may choose to employ unconventional measures (such as QE). In the regression, such measures are summarized by the change in the ratio of central bank assets to GDP. In addition, the regression includes a measure of the length of time during which the policy rate stayed below the Taylor rule rate over the previous 5 years, to represent prolonged periods of exceptionally low interest rates (in itself an unconventional measure). Because the Taylor gap by construction combines several variables that may affect banks in different ways, the second specification separately includes the effective federal funds rate, the inflation rate, and the output gap instead (the last two variables as $Controls_t$). The slope of the yield curve computed as the difference between 10-year and three-month Treasury yields is added in a third specification to better capture the effect of forward guidance. All monetary policy variables in the three specifications, except the one measuring the length of time during which the Taylor gap is negative, are lagged by one period to address endogeneity issues that may result from monetary policy reacting to the banking sector issues.

$BankCharacteristics_{i,t}$ corresponds to individual bank characteristics: equity-to-assets ratio, log asset size and an indicator variable for banks that are on the Financial Stability Board's list of global systemically important banks. Both the equity ratio and the asset size variables are lagged by one period. We include the interaction terms of these bank characteristics with the monetary policy indicators to investigate possible heterogeneous effects across banks.

$Controls_t$ comprises the real growth rate, to control for the business cycle; the ratio of the cyclically adjusted government balance to GDP to control for fiscal policy; and the VIX to control for the stress in the financial system. We also include time dummies.

The dataset consists of quarterly balance sheet data for U.S. commercial listed banks from the SNL database and of U.S. macroeconomic data over the period 2007Q3-2012Q3. The full sample includes data for 614 banks. Because not all variables are available for all banks in every period, the sample composition varies depending on the variable of interest. We exclude observations that are three standard deviations away from the sample mean. For each regression, the panel is balanced by keeping only banks for which data are available for every quarter over the estimation period (see descriptive statistics provided in Table 8).

We employ the system GMM estimation method (Arellano and Bover, 1995; Blundell and Bond, 1998) to alleviate the endogeneity issues. The analysis uses the monetary policy variables as independent variables, assuming they "cause" the changes in the bank soundness indicators. However, the central bank actions since 2007 have been partly in response to problems in banks, so that they may not be truly independent. This system GMM estimator is consistent provided the instruments are valid, which is tested with a Sargan test. Lags of all variables (except the interaction terms) are used as instruments for the differenced equation. The number of lags used (and hence the number of instruments) varies according to the dependent variable and the sample size. The first, second, or third lag of the difference of each variable (except the interaction terms) is used as an instrument for the level equation. The estimator is computed in two steps (using the inverse of the covariance matrix of the moment vector from the first-step estimation as the weighting matrix in the second step).

Standard errors are computed using the Windmeijer bias-corrected estimator (Windmeijer, 2005).[18]

The results still need to be interpreted with caution. Besides the influence of monetary policy, bank balance sheets have been affected by fiscal, financial, and other factors over the period. To limit a possible "omitted variable bias," the regressions therefore also include a number of variables controlling for output growth, fiscal policies, and stress in the financial system, along with time effects.

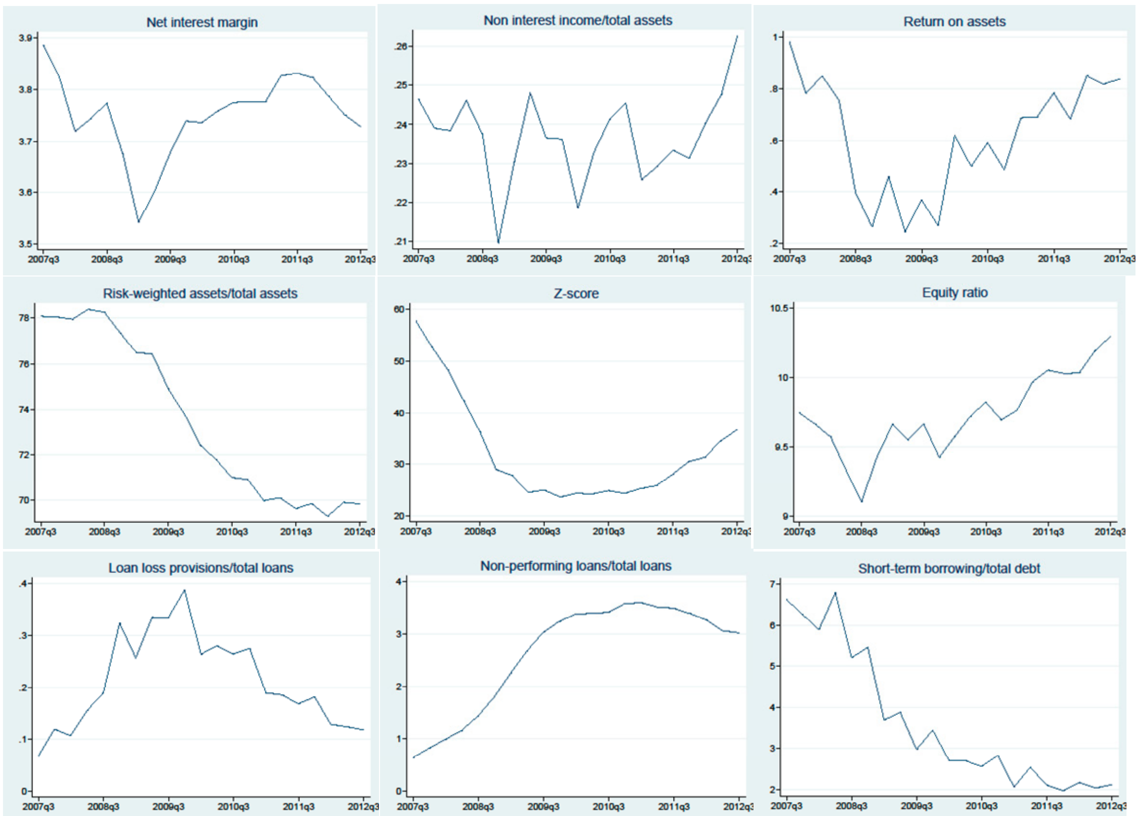
A. Effects on Profitability

Unconventional monetary policies can have both positive and negative effects on banks' profitability. On the positive side, banks can benefit from near-zero policy rates that reduce their funding costs. Quantitative easing policies supporting asset prices will also have positive valuation effects. On the negative side, a prolonged period of low rates accompanied by a flattening of the yield curve reduces revenues from long-term loans with variable rates, new loans and newly issued fixed income securities, compressing the interest margin of banks engaged in maturity transformation. This negative price effect on the interest margin may be partially offset by changes in the volume of loans or an increase in non-interest income (for instance, fees).

We attempt to disentangle those various effects of unconventional monetary policies by looking separately at banks' net interest margin, the ratio of non-interest income over total assets, and the return on average assets. Figure 3 plots the three variables, averaged across all banks in the sample, over the sample period. After a sharp drop in 2007–2008, the net interest margin of U.S. banks has partially recovered but still falls short of its 2007Q3 level. The pattern of the return on assets is similar, with a decline at the beginning of the sample period and a recovery since 2009Q4.

[18] We also estimated the same set of regressions using fixed effect OLS estimation. The results are broadly consistent. Note that the bias in the fixed effect estimation increases with the autocorrelation of the dependent variable. An endogeneity problem arises if the lagged monetary policy is "predicted" by the current bank soundness indicators (dependent variables). This occurs when the dependent variables are highly autocorrelated.

Figure 3. U.S. Bank Balance Sheet Indicators



Sources: SNL Financial and authors' calculations.

The regression results are reported in Table 9. An increase in central bank assets negatively affect banks' net interest margin (column 1). The Taylor gap does not have a significant effect, possibly because of the zero lower bound constraint. However, if we allow for heterogeneous effects depending on bank characteristics (column 2), the Taylor gap comes out as significant for highly capitalized banks. Note that a negative Taylor gap implies monetary easing.

In the third column, we replace the Taylor gap by its components, that is, the effective federal funds rate, the inflation rate, and the output gap. In the fourth column, we further add the yield curve slope as a regressor. In both specifications, a reduction in the federal funds rate also has a negative and significant effect on the net interest margin (columns 3 and 4) especially for larger banks. Yet the effect is very small when compared to the sample mean of the net interest margin (Table 1) and so economically insignificant. This can be interpreted as the result of the two opposing forces described above: low rates reduce funding costs; but over time, revenues from new loans and debt securities also decline, offsetting the decline in funding costs.

The effects on the ratio of non-interest income to total assets are reported in columns 5 to 8. Both a negative Taylor gap and a low level of interest rates are associated with a higher ratio of non-interest income to total assets. The same is also true for a steep yield curve, which may be counterintuitive, as a steeper yield curve should imply higher margins and thus higher income from banks' maturity transformation business. Yet, the length of time during which interest rates are below the Taylor rule has negative effects on non-interest income. Also, an increase in central bank assets reduces non-interest income. Overall, we cannot find clear effects of unconventional monetary policies on banks' non-interest income, consistent with previous findings (e.g., English et al., 2012).

The overall effects of monetary policy on bank profits are reflected in the return on assets (columns 9 to 12). The return on assets increases with the decrease in interest rates, consistent with the effects found on non-interest income. However, this initial positive effect seems to be offset by the negative effect of every quarter during which the policy rate remains below the Taylor rate. Thus, the overall effect of unconventional monetary policies on bank profitability is negative or at best ambiguous. We do not find any evidence of heterogeneous effects as a function of banks' size or capitalization.

B. Bank Risk-taking

The effect of MP-plus on bank risk-taking is theoretically less ambiguous than the effect on profitability. The relationship between short-term interest rates and bank risk-taking involves two reinforcing forces. Low interest rates along with lower asset price volatility encourage banks to reduce their demand for low-risk low-yield assets and increase their purchases of riskier assets offering higher returns (portfolio reallocation). This negative relationship between short-term interest rates and risk-taking is strengthened in a model of financial intermediation where banks, operating under limited liability and asymmetric information, can engage in costly monitoring to reduce the credit risk in their loan portfolios, and endogenously modify their capital structure in response to a monetary policy change (Allen and Gale, 2004, and Dell'Ariccia, Laeven, and Marquez, 2010). Under limited liability, a policy change that decreases banks' profits, as unconventional monetary policies do to a limited extent, reduces the franchise value of banks and hence the incentive for monitoring the borrowers and investing prudently. A policy rate cut also reduces the incentive for banks to finance themselves with equity as a commitment device to prevent excessive risk-taking and decreases the cost of debt and deposits, so that leverage increases.

We examine bank risk-taking by looking at three different measures. First, we consider the ratio of risk-weighted assets to total assets. Risk-weighted assets are a weighted sum of a bank's assets with weights determined by the riskiness of each asset according to banking regulations and the bank's internal models. This measure is also used in De Nicolò, Dell'Ariccia, Laeven, and Valencia (2010). Yet, the ability of banks to manipulate this ratio by adjusting the risk-weights may bias the comparison across banks. Second, we look at the ratio of equity to total assets, which is inversely related to banks' leverage. Third, we use the z-score, which is the ratio of the return on total assets plus the ratio of equity over total assets, divided by the standard deviation of returns over 12 quarters. It measures the number of standard deviations a return realization has to fall in order to deplete equity and so is inversely related to a bank's probability of insolvency. A higher z-score is then interpreted as lower bank risk (De Nicolò, 2000).

The risk-weighted assets to total assets ratio increases with the period of low interest rates and a flatter yield curve (Table 10, columns 1 to 4). This is consistent with the portfolio reallocation and risk-shifting theories and the results from our event study. It is also consistent with previous empirical studies on the pre-crisis period (De Nicolò et al., 2010; Altunbas, Gambacorta, and Marqués-Ibáñez, 2010, and Dell'Ariccia, Laeven, and Suarez, 2013). Yet, the signs and very small magnitude of the coefficients on the interaction terms do not provide much support to the hypothesis that those effects are stronger for weak or poorly capitalized banks.

However, the equity ratio increases (i.e., the leverage decreases) with low interest rates, especially when kept so for a long period of time (columns 5 to 8). Likely because of this positive effect on bank capitalization, the overall effects on of bank distress measured by z-score turns out beneficial (columns 9 to 12). Note that a special caution may be warranted. While we included many control variables and time effects in the regressions, the monetary policy variables might still capture part of the effect of the ongoing financial reforms which directly affect banks' capital requirements and hence banks' leverage. We could not find good variables to control for the effects of those reforms.

C. Balance Sheet Repair

Lastly, we consider the effects of unconventional monetary policies on banks' efforts to repair their balance sheets. On the asset side, balance sheet repair implies removing toxic assets and writing off loans whose beneficiaries are insolvent and incurring losses. When interest rates are very low, banks can however rollover existing loans or even extend new loans to nonviable firms at nearly zero cost. Therefore, banks tend to avoid repairing their balance sheets. Several empirical studies (e.g., Peek and Rosengren, 2003, and Caballero, Hoshi, and Kashyap, 2008) show the prevalence of "evergreening" practices among large Japanese banks in the 1990s. Moreover, the ongoing financial reforms and higher capital requirements may add to the perceived cost of recognizing any losses. On the liability side, banks can take advantage of lower term premium to issue longer-term debt to replace short-term debt, thereby extending the overall maturity of their liabilities. This reduces the risk of maturity mismatches (Stein, 2012).

We proxy banks' efforts towards balance sheet repair by three measures. The first measure is the ratio of the provisions for possible losses on loans and leases (excluding provisions for possible losses on real estate owned) to total (gross) loans. The second one is the ratio of non-performing loans to total loans. The third one is the share of short-term debt in banks' total borrowing.

Banks' loan loss provision ratio declines with the expansion of central bank's assets (Table 11, columns 1 to 4), although this relationship is weaker for larger banks. This suggests a risk of evergreening. An alternative view is that with unconventional monetary policies supporting economic activity, existing loans become more viable and hence need fewer provisions. We indeed find some evidence that non-performing loans are reduced with low interest rates and a positive output gap (columns 5 to 8). On the liability side, we find a decrease in the short-term debt ratio when policy rates decrease (columns 9 to 12, taking significant interaction terms into account). This suggests that banks, especially large ones, do take advantage of lower rates to extend the maturity profile of their debt.

IV. Conclusion

We examined the effects of unconventional monetary policy on banking sector soundness. We could not find clear supporting evidence for the common perception that unconventional monetary policy helped banks. Rather, we find some evidence for heightened medium-term risks, which is likely due to delayed balance sheet repair by banks. These findings are the result of two sets of analyses: an event study on bank stock valuation and credit risk, and panel regressions on bank level measures of profitability, risk taking, and balance sheet repair.

In the event study, using a novel instrument for monetary policy surprises, we find robust evidence that unexpected monetary policy easing tends to increase bank medium-term credit risk in the United States, the euro area, and the United Kingdom.

Using quarterly U.S. bank-level data after the crisis started, we find that unconventional monetary policy measures have ambiguous effects on banks' profitability. They are also associated with a reduction in some aspects of bank risks, namely leverage and short-term debt ratios. However, they lead to a rise in the ratio of risk-weighted assets to total assets and may potentially delay balance sheet repair by smaller banks, for example, by allowing for an evergreening of non-performing loans.

A caveat is that the crisis-period data may require an analysis based on non-linear counterfactuals. We implicitly examine whether the effects are different from zero, but the economy could have taken much more negative paths without the support of unconventional monetary policy. Further technical developments are warranted to address this issue when analyzing crisis-period data.

V. References

Adrian, Tobias and Hyun Song Shin, 2011, "Procyclical Leverage and Value-at-Risk," Federal Reserve Bank of New York Staff Reports 338, July 2008 revised March 2011.

Allen, Franklin and Douglas Gale, 2004, "Financial Intermediaries and Markets," Econometrica, Vol. 72, No.4, pp. 1023–1061.

Altunbas, Yener, Leonardo Gambacorta, and David Marqués-Ibáñez, 2010, "Does Monetary Policy Affect Bank Risk-taking?" ECB Working Paper 1166 (Frankfurt).

Arellano, Manuel, and Olympia Bover, 1995, "Another Look at the Instrumental Variable Estimation of Error-components Models," *Journal of Econometrics*, Vol. 68, pp. 29–51.

Bank of England, 2012, *Financial Stability Report* (London, November).

Baum, Christopher, Mark Schaffer and Steven Stillman, 2007, "Enhanced routines for instrumental variables/generalized method of moments estimation and testing," Stata Journal, Vol. 7, No. 4, pp. 465-506, December.

Bernanke, Ben S., and Kenneth N. Kuttner, 2005, "What Explains the Stock Market's Reaction to Federal Reserve Policy?" *Journal of Finance*, Vol. 60, No. 3, pp. 1221–57.

Blundell, Richard, and Stephen Bond, 1998, "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models," *Journal of Econometrics*, Vol. 87, pp. 115–43.

Borio, Claudio and Haibin Zhu, 2008, "Capital Regulation, Risk-Taking and Monetary Policy: A Missing Link in the Transmission Mechanism?" BIS Working Paper 268 (Basel).

Caballero, Ricardo, Takeo Hoshi, and Anil Kashyap, 2008, "Zombie Lending and Depressed Restructuring in Japan," *American Economic Review*, Vol. 98, No. 5, pp. 1943–77.

Campbell, Jeffrey R., Charles Evans, Jonas D. M. Fisher, Alejandro Justiniano, 2012, "Macroeconomic Effects of Federal Reserve Forward Guidance," Federal Reserve Bank of Chicago Working Paper, 2012–03.

Dell'Ariccia, Giovanni, Luc Laeven, and Robert Marquez, 2010, "Monetary Policy, Leverage, and Bank Risk-Taking," IMF Working Paper No. 10/276 (Washington: International Monetary Fund).

____, Luc Laeven, and Gustavo Suarez, 2013, "Bank Leverage and Monetary Policy's Risk-Taking Channel: Evidence from the United States" IMF Working Paper No. 13/143 (Washington: International Monetary Fund).

De Nicolò, Gianni, 2000, "Size, Charter Value and Risk in Banking: An International Perspective," Board of Governors of the Federal Reserve System International Finance Discussion paper, 689, December.

____, Giovanni Dell'Ariccia, Luc Laeven, and Fabian Valencia, 2010, "Monetary Policy and Bank Risk Taking," IMF Staff Position Note No. 10/09 (Washington: International Monetary Fund).

English, William B., Skander J. Van den Heuvel, and Egon Zakrajšek, 2012, "Interest Rate Risk and Bank Equity Valuations," Finance and Economics Discussion Series No. 2012–26 (Washington: Federal Reserve Board, May), www.federalreserve.gov/pubs/feds/2012/index.html.

Gürkaynak, Refet, Brian Sack, and Eric Swanson, 2005, "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements," *International Journal of Central Banking*, Vol. 1, No. 1, pp. 55–93.

International Monetary Fund, 2013a, "Do Central Bank Policies Since the Crisis Carry Risk to Financial Stability?" *Global Financial Stability Report,* World Economic and Financial Surveys (Washington, April), Chapter 3.

____, 2013b, "Unconventional Monetary Policies—Recent Experience and Prospects," April.

Ioannidou, Vasso P., Steven Ongena and Jose Luis Peydrò, 2009, "Monetary Policy, Risk-Taking and Pricing: Evidence from a Quasi-Natural Experiment," unpublished manuscript.

Jiménez, Gabriel, Steven Ongena, José-Luis Peydrò, and Jesús Saurina, 2009, "Hazardous Times for Monetary Policy: What Do Twenty-Three Million Bank Loans Say About the Effects of Monetary Policy on Credit Risk-Taking?" Banco de España Working Paper 0833.

Joyce, Michael, Ana Lasaosa, Ibrahim Stevens and Matthew Tong, 2011, "The Financial Market Impact of Quantitative Easing in the United Kingdom," *International Journal of Central Banking*, Vol. 7, No. 3, pp. 113–61.

Kuttner, Kenneth N., 2001, "Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds," *Journal of Monetary Economics*, 47, pp. 523-544.

Peek, Joe, and Eric S. Rosengren, 2003, "Unnatural Selection: Perverse Incentives and the Misallocation of Credit in Japan," NBER Working Paper No. 9643 (Cambridge, Massachusetts: National Bureau of Economic Research, April).

Rosa, Carlo, 2012, "How "unconventional" are large-scale asset purchases? The impact of monetary policy on asset prices," Federal Reserve Bank of New York Staff Reports 560.

Stein, Jeremy C., 2012, "Evaluating Large-Scale Asset Purchases," Speech delivered at the Brookings Institution, October 11.

Taylor, John B., 1993, "Discretion Versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, Vol. 39, pp. 195–214.

Ueda, Kenichi and Beatrice Weder di Mauro, 2013, "Quantifying Structural Subsidy Values for Systemically Important Financial Institutions," *Journal of Banking and Finance*, Vol. 37, pp. 3830-3842.

Windmeijer, Frank, 2005, "A Finite Sample Correction for the Variance of Linear Efficient Two-Step GMM Estimators," *Journal of Econometrics*, 126, pp. 25-51.

Woodford, Michael, 2012, "Methods of Policy Accommodation at the Interest-Rate Lower Bound," presented at the Jackson Hole symposium, August.

Wooldridge, Jeffrey M., 2002, *Econometric Analysis of Cross Section and Panel Data*.

Table 1a. Summary Statistics for the Variables Used in the Event Study

Surprise is the daily change in one-year ahead three-month futures rates: Eurodollar futures for the United States, Euribor futures for the euro area, and Sterling futures for the United Kingdom. *UMP dummy* takes the value one for the unconventional monetary policy period, which is defined as after August 1, 2007. *Total news ratio* is the ratio of the number of English-language news articles reported in Factiva in three days after the monetary policy announcement to the number of news articles in three days before the announcement. *Positive news ratio* is calculated in the same way as the *Total news ratio* but contains only expressions indicating positive surprise for monetary easing. *Negative news ratio* is calculated in the same way as the *Total news ratio* with negative expressions only. Due to the smaller coverage of English language news for the ECB, in *Positive* and *Negative news ratios*, several outliers are observed and winsorized at 3 for the euro area.

United States

	Sample size	Mean	Std. Dev.	Min	Max
Surprise	123	-2.772	10.620	-48.0	21.5
Ump dummy	123	0.496	0.502	0	1
Total news ratio	123	2.063	1.508	0.282	14.594
Positive news ratio	123	2.226	1.792	0.208	15.833
Negative news ratio	122	2.749	2.327	0.030	12.000
Daily return of bank stock index (%)	118	0.738	3.370	-7.246	19.283
Daily change in bank-government bond yield spread (1-3 year maturity, bp)	120	1.575	9.969	-19	95
Daily change in bank-government bond yield spread (3-5 year maturity, bp)	120	0.867	7.309	-13	69
Daily change in bank-government bond yield spread (5-7 year maturity, bp)	120	0.825	7.166	-18	59

Euro area

	Sample size	Mean	Std. Dev.	Min	Max
Surprise	172	-0.029	7.986	-21.5	30.0
Ump dummy	172	0.372	0.485	0	1
Total news ratio	172	0.776	0.296	0.349	2.194
Positive news ratio	172	0.824	0.620	0.000	3.000
Negative news ratio	172	1.159	0.884	0.000	3.000
Daily return of bank stock index (%)	171	-0.143	2.222	-7.271	8.245
Daily change in bank-government bond yield spread (1-3 year maturity, bp)	171	0.281	3.518	-12	21
Daily change in bank-government bond yield spread (3-5 year maturity, bp)	171	0.216	2.739	-10	14
Daily change in bank-government bond yield spread (5-7 year maturity, bp)	171	0.123	2.911	-19	12

United Kingdom

	Sample size	Mean	Std. Dev.	Min	Max
Surprise	152	-1.092	7.165	-25.0	27.0
Ump dummy	152	0.408	0.493	0	1
Total news ratio	152	0.806	0.390	0.327	2.684
Positive news ratio	150	0.963	0.843	0.000	5.000
Negative news ratio	148	1.375	1.385	0.000	8.500
Daily return of bank stock index (%)	152	-0.059	1.954	-7.422	8.972
Daily change in bank-government bond yield spread (all maturity, bp)	152	0.132	3.036	-7.000	29.000

Table 1b. Correlation Matrix for the Variables Used in the Event Study

United States

correlations	Surprise	Ump dummy	Total news ratio	Positive news ratio	Negative news ratio	Stock return	Bond spread (1-3 yr)	Bond spread (3-5 yr)	Bond spread (5-7 yr)
Surprise (bp)	1.000								
Ump dummy	-0.106	1.000							
Total news ratio	-0.144	0.051	1.000						
Positive news ratio	-0.238	0.035	0.646	1.000					
Negative news ratio	0.157	-0.116	0.238	0.215	1.000				
Daily return of bank stock index (%)	-0.060	0.185	0.249	0.213	-0.019	1			
Daily change in bank-government bond yield spread (1-3 year maturity, bp)	0.041	0.127	0.145	0.016	0.005	0.157	1.000		
Daily change in bank-government bond yield spread (3-5 year maturity, bp)	0.055	0.080	0.179	0.029	0.004	0.169	0.922	1.000	
Daily change in bank-government bond yield spread (5-7 year maturity, bp)	0.022	0.066	0.242	0.054	0.017	0.087	0.863	0.935	1.000

Euro area

correlations	Surprise	Ump dummy	Total news ratio	Positive news ratio	Negative news ratio	Stock return	Bond spread (1-3 yr)	Bond spread (3-5 yr)	Bond spread (5-7 yr)
Surprise (bp)	1.000								
Ump dummy	-0.108	1.000							
Total news ratio	-0.061	0.256	1.000						
Positive news ratio	0.007	0.030	0.526	1.000					
Negative news ratio	-0.045	0.091	0.324	0.209	1.000				
Daily return of bank stock index (%)	0.322	-0.109	-0.160	-0.044	-0.069	1.000			
Daily change in bank-government bond yield spread (1-3 year maturity, bp)	-0.460	0.153	0.213	-0.094	0.055	-0.302	1.000		
Daily change in bank-government bond yield spread (3-5 year maturity, bp)	-0.454	0.184	0.196	-0.049	0.069	-0.316	0.887	1.000	
Daily change in bank-government bond yield spread (5-7 year maturity, bp)	-0.358	0.143	0.036	-0.133	0.007	-0.235	0.773	0.871	1.000

United Kingdom

correlations	Surprise	Ump dummy	Total news ratio	Positive news ratio	Negative news ratio	Stock return	Bond spread (all yr)
Surprise (bp)	1.000						
Ump dummy	-0.004	1.000					
Total news ratio	-0.064	0.005	1.000				
Positive news ratio	-0.013	-0.069	0.527	1.000			
Negative news ratio	0.115	0.064	0.208	0.125	1.000		
Daily return of bank stock index (%)	0.302	-0.021	-0.054	0.041	-0.081	1.000	
Daily change in bank-government bond yield spread (all maturity, bp)	-0.179	0.099	0.046	-0.081	0.068	-0.459	1.000

Table 1c. Summary Statistics and Correlation Matrix for the Variables Used in the U.S. Bank-Level Event Study

	Sample size	Mean	Std. Dev.	Min	Max
Asset/GDP ratio (lagged, %)	10032	6.265	21.892	0.039	166.932
Equity/Asset ratio (lagged, %)	10032	9.511	2.106	0.484	20.463
Daily stock return (%)	10032	0.683	3.383	-22.330	36.398
Daily change in CDS spread (5 year maturity, bp)	272	-0.449	11.327	-41.0	68.2
Daily change in CDS spread (1 year maturity, bp)	351	-1.207	8.999	-49.2	47.5

	Surprise	Ump dummy	Total news ratio	Positive news ratio	Negative news ratio	Asset / GDP ratio	Equity / Asset ratio	Stock return	1yr CDS change	5yr CDS change
Surprise (bp)	1.000									
Ump dummy	-0.083	1.000								
Total news ratio	-0.073	0.014	1.000							
Positive news ratio	-0.193	0.018	0.613	1.000						
Negative news ratio	0.169	-0.111	0.249	0.202	1.000					
Asset/GDP ratio (lagged, %)	-0.003	0.062	-0.001	0.002	-0.008	1.000				
Equity/Asset ratio (lagged, %)	-0.001	0.342	0.003	0.004	-0.053	-0.100	1.000			
Daily stock return (%)	-0.053	0.130	0.116	0.072	-0.083	0.018	0.028	1.000		
Daily change in CDS spread (5 year maturity, bp)	-0.140	-0.009	0.103	0.109	0.085	0.053	-0.121	-0.003	1.000	
Daily change in CDS spread (1 year maturity, bp)	-0.190	-0.043	-0.044	0.014	0.033	-0.010	-0.022	-0.312	0.670	1.000

Table 2. Benchmark Regression Using Surprise Measure Computed from Changes in 1-year Ahead 3-month Futures Rates

The dependent variable is either the daily bank stock return (%) or the daily change in yield spread (bp) between bank corporate bonds and Treasury bonds with the similar maturity. The events are FOMC announcements between January 2000 and October 2012, except for September 12, 2001. Also, two Jackson Hole speech dates are added for 2010 and 2012. The regressors are: *Surprise,* which denotes for the daily change in one-year ahead three-month Eurodollar futures rate; *UMP dummy*, which takes the value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise* * *UMP dummy*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Bank Stock, Daily Return (%)			Bank Bond - Treasury Bond Spread, Daily Change (bp)								
				1 - 3 year maturity			3 - 5 year maturity			5 - 7 year maturity		
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Surprise	-0.018	-0.063	-0.018	-0.078	0.101	-0.078	-0.087	0.081	-0.087	-0.075	0.042	-0.075
	[-0.873]	[-1.246]	[-0.870]	[-2.806]***	[0.667]	[-2.797]***	[-3.081]***	[0.726]	[-3.071]***	[-2.084]**	[0.378]	[-2.077]**
Ump dummy			0.966			3.349			2.369			1.872
			[1.179]			[0.942]			[0.919]			[0.751]
Surprise * Ump dummy			-0.099			0.494			0.453			0.316
			[-0.917]			[1.202]			[1.495]			[1.063]
Constant	0.125	0.543	0.125	0.205	1.291	0.205	0.178	0.901	0.178	0.242	0.832	0.242
	[0.650]	[1.740]*	[0.648]	[0.401]	[0.995]	[0.399]	[0.556]	[0.948]	[0.554]	[0.758]	[0.911]	[0.756]
Obs. Number	62	103	103	62	103	103	62	103	103	62	103	103
F-stat	0.761	1.552	1.712	7.876	0.444	2.950	9.495	0.527	3.672	4.343	0.143	1.672
F p-value	0.386	0.216	0.169	0.007	0.507	0.036	0.003	0.469	0.015	0.041	0.706	0.178
R^squared	0.013	0.033	0.085	0.034	0.008	0.066	0.095	0.010	0.090	0.072	0.003	0.044

Table 3. Two Stage Least Square Using News-based Instruments, Easing Episodes Only

The dependent variable is either the daily bank stock return (%) or the daily change in yield spread (bp) between bank corporate bonds and Treasury bonds with the similar maturity. The events are FOMC announcements between January 2000 and October 2012, except for September 12, 2001. Also, two Jackson Hole speech dates are added for 2010 and 2012. In the conventional period, only monetary easing episodes are used. The regressors are: *Surprise,* which is fitted value based on the first-stage regression of the daily change in one-year ahead three-month Eurodollar futures rate on the logarithms of after-before ratio of number of total news, positive news, and negative news (see text); *UMP dummy*, which takes the value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise * UMP dummy*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Bank Stock, Daily Return (%)			Bank Bond - Treasury Bond Spread, Daily Change (bp)								
				1 - 3 year maturity			3 - 5 year maturity			5 - 7 year maturity		
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Surprise	-0.074	-0.041	-0.070	-0.111	-0.050	-0.182	-0.097	-0.086	-0.126	-0.057	-0.254	-0.107
	[-1.348]	[-0.353]	[-1.309]	[-2.222]**	[-0.206]	[-2.201]**	[-2.062]**	[-0.446]	[-1.943]*	[-1.113]	[-1.122]	[-1.496]
Ump dummy			0.939			3.546			1.831			0.209
			[0.676]			[0.889]			[0.620]			[0.070]
Surprise * Ump dummy			0.078			0.269			0.074			-0.337
			[0.264]			[0.460]			[0.161]			[-0.623]
Constant	0.548	1.028	0.54	-1.123	-1.222	-1.007	-0.624	-0.642	-0.577	-0.298	0.024	-0.218
	[1.479]	[1.863]*	[1.459]	[-2.265]**	[-2.006]**	[-1.623]	[-1.296]	[-1.113]	[-1.096]	[-0.485]	[0.029]	[-0.339]
Obs. Number	23	64	64	23	64	64	23	64	64	23	64	64
F-stat	1.660	0.121	1.347	4.507	4.659	4.262	3.881	2.005	2.070	1.131	1.437	1.455
F p-value	0.212	0.729	0.268	0.046	0.013	0.009	0.062	0.143	0.114	0.300	0.246	0.236
R^squared	-0.122	0.034	0.004	-0.055	0.004	0.036	0.040	-0.029	-0.013	0.072	-0.119	-0.239

Table 4. Benchmark Regression, Year by Year

The dependent variable is either the daily bank stock return (%) or the daily change in yield spread (bp) between bank corporate bonds and Treasury bonds with the similar maturity. The events are FOMC announcements between January 2000 and October 2012, except for September 12, 2001. Also, two Jackson Hole speech dates are added for 2010 and 2012. The unconventional policy period is divided into four subperiods: the first year after the collapse of Lehman Brothers (columns 1, 5, 9, 13); the second year (columns 2, 6, 10, 14); the third year (columns 3, 7, 11, and 15); and the fourth year (columns 4, 8, 12, and 16). The regressors are: *Surprise,* which denotes for the daily change in one-year ahead three-month Eurodollar futures rate; *UMP dummy*, which takes the value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise * UMP dummy*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Bank Stock, Daily Return (%)				Bank Bond - Treasury Bond Spread, Daily Change (bp)											
					1 - 3 year maturity				3 - 5 year maturity				5 - 7 year maturity			
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2008	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2008	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2008	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	Sep 16 2008 - Sep 2009	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012	Sep 16 2008 - Sep 2009	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012	Sep 16 2008 - Sep 2009	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012	Sep 16 2008 - Sep 2009	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Surprise	-0.018	-0.018	-0.018	-0.018	-0.078	-0.078	-0.078	-0.078	-0.087	-0.087	-0.087	-0.087	-0.075	-0.075	-0.075	-0.075
	[-0.863]	[-0.862]	[-0.861]	[-0.862]	[-2.776]***	[-2.771]***	[-2.770]***	[-2.772]***	[-3.048]***	[-3.043]***	[-3.041]***	[-3.044]***	[-2.061]**	[-2.058]**	[-2.057]**	[-2.059]**
Ump dummy	2.908	0.797	-0.262	0.877	11.043	-0.065	2.722	-0.693	9.064	-0.116	2.741	-2.237	7.720	-0.698	3.859	-2.660
	[1.172]	[1.833]*	[-0.339]	[1.123]	[0.923]	[-0.098]	[2.372]**	[-0.914]	[1.083]	[-0.311]	[2.592]**	[-4.858]***	[0.959]	[-1.285]	[2.401]**	[-3.981]***
Surprise * Ump dummy	-0.048	0.297	-0.445	0.149	0.815	0.031	-0.336	-0.211	0.726	0.123	-0.267	-0.157	0.572	0.133	-0.733	-0.107
	[-0.341]	[4.314]***	[-3.462]***	[0.406]	[1.228]	[0.369]	[-2.831]***	[-0.761]	[1.545]	[2.662]***	[-2.139]**	[-0.873]	[1.284]	[1.362]	[-3.629]***	[-0.383]
Constant	0.125	0.125	0.125	0.125	0.205	0.205	0.205	0.205	0.178	0.178	0.178	0.178	0.242	0.242	0.242	0.242
	[0.643]	[0.642]	[0.641]	[0.642]	[0.396]	[0.396]	[0.396]	[0.396]	[0.550]	[0.549]	[0.549]	[0.549]	[0.750]	[0.749]	[0.749]	[0.749]
Obs. Number	75	71	70	72	75	71	70	72	75	71	70	72	75	71	70	72
F-stat	1.453	10.636	4.794	0.841	3.036	2.680	14.908	3.383	3.801	3.417	9.172	11.529	1.837	2.189	9.744	7.701
F p-value	0.235	0.000	0.004	0.476	0.035	0.054	0.000	0.023	0.014	0.022	0.000	0.000	0.148	0.097	0.000	0.000
R^squared	0.149	0.112	0.234	0.042	0.153	0.034	0.104	0.039	0.214	0.097	0.207	0.174	0.147	0.084	0.339	0.181

Table 5a. Events Study Results—Euro Area

The dependent variable is either the daily bank stock return (%) or the daily change in yield spread (bp) between bank corporate bonds and Treasury bonds with the similar maturity. The events are monetary policy official announcements between January 2000 and October 2012. The regressors are: *Surprise,* which denotes for the daily change in one-year ahead three-month Euribor futures rate; *UMP dummy*, which takes value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise * UMP dummy*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Bank Stock, Daily Return (%)			Bank Bond - Treasury Bond Spread, Daily Change (bp)								
				1 - 3 year maturity			3 - 5 year maturity			5 - 7 year maturity		
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Surprise	0.056	0.112	0.056	-0.126	-0.195	-0.126	-0.154	-0.163	-0.154	-0.130	-0.130	-0.130
	[2.283]**	[4.078]***	[2.275]**	[-5.331]***	[-5.015]***	[-5.312]***	[-6.065]***	[-5.534]***	[-6.043]***	[-5.631]***	[-4.663]***	[-5.611]***
Ump dummy			-0.305			0.702			0.785			0.604
			[-0.668]			[0.917]			[1.319]			[0.888]
Surprise * Ump dummy			0.129			-0.156			-0.013			0.008
			[2.190]**			[-1.829]*			[-0.213]			[0.139]
Constant	0.005	-0.126	0.005	-0.048	0.214	-0.048	-0.067	0.18	-0.067	-0.11	0.074	-0.11
	[0.034]	[-0.742]	[0.034]	[-0.449]	[0.815]	[-0.448]	[-0.614]	[0.887]	[-0.612]	[-0.964]	[0.333]	[-0.960]
Obs. Number	108	156	156	108	156	156	108	156	156	108	156	156
F-stat	5.213	16.628	6.717	28.423	25.147	13.757	36.782	30.624	14.991	31.710	21.742	12.327
F p-value	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^squared	0.060	0.138	0.187	0.367	0.176	0.212	0.447	0.198	0.215	0.357	0.112	0.121

Table 5b. Events Study Results—United Kingdom

The dependent variable is either the daily bank stock return (%) or the daily change in yield spread (bp) between bank corporate bonds and Treasury bonds with the similar maturity. The events are monetary policy official announcements between January 2000 and October 2012. The regressors are: *Surprise,* which denotes for the daily change in one-year ahead three-month Sterling futures rate; *UMP dummy*, which takes value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise * UMP dummy*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Bank Stock, Daily Return (%)			Bank Bond - Treasury Bond Spread, Daily Change (bp)		
				All maturity		
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	n.a.	After Sep 16 2008	After Sep 16 2008	n.a.	After Sep 16 2008	After Sep 16 2008
	(1)	(2)	(3)	(4)	(5)	(6)
Surprise	0.066	0.079	0.066	-0.071	-0.075	-0.071
	[2.656]***	[3.218]***	[2.647]***	[-6.331]***	[-3.205]***	[-6.309]***
Ump dummy			0.222			0.390
			[0.559]			[0.510]
Surprise * Ump dummy			0.035			-0.009
			[0.623]			[-0.156]
Constant	0.043	0.122	0.043	-0.182	-0.047	-0.182
	[0.321]	[0.779]	[0.320]	[-1.493]	[-0.171]	[-1.487]
Obs. Number	90	138	138	90	138	138
F-stat	7.057	10.358	3.971	40.087	10.269	14.193
F p-value	0.009	0.002	0.010	0.000	0.002	0.000
R^squared	0.114	0.084	0.089	0.162	0.029	0.033

Table 6. The U.S. Bank-Level Panel Regressions of Stock Returns

The dependent variable is the daily bank stock return (%). Events are FOMC announcements between January 2000 and October 2012, except for September 12, 2001. Also, two Jackson Hole speech dates are added for 2010 and 2012. The aggregate-level regressors are: *Surprise,* which denotes for the daily change in one-year ahead three-month Eurodollar futures rate in fixed effect estimation (columns 1-5); or, for the two stage least square specifications (columns 6-10), *Surprise* is the fitted value based on the first-stage regression of the daily change in one-year ahead three-month Eurodollar futures rate on the logarithms of after-before ratio of number of total news, positive news, and negative news (see text); *UMP dummy*, which takes the value one for the unconventional policy period (defined in the row just above the column numbers); and the interaction term, *Surprise * UMP dummy*. Coefficients for the level controls are not reported: bank fixed effects, constant, dummy for the first month in each quarter, and the dummy for the second month in each quarter. The bank-level regressors are*: Lagged Asset/GDP ratio*, *Lagged Equity/Asset Ratio*, and interaction terms between these bank-level variables and *Surprise* as well as *UMP dummy*. Triple interaction terms are also included. T-statistics are presented in parenthesis based on robust standard errors clustered at bank level: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	Fixed Effect Estimation Bank Stock Daily Return (%)					TSLS Estimation Bank Stock Daily Return (%)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample period for conventional policy (UMP dummy = 0)	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007	Pre-Aug 2007
Sample period for unconventional policy (UMP dummy = 1)	Sep 16 2008 - Oct 2012	Sep 16 2008 - Oct 2012	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012	Sep 16 2008 - Oct 2012	Sep 16 2008 - Oct 2012	Oct 2009 - Sep 2010	Oct 2010 - Sep 2011	Oct 2011 - Oct 2012
Surprise	0.018	0.015	0.017	0.019	0.018	-0.071	-0.106	-0.106	-0.060	-0.104
	[0.933]	[0.783]	[0.876]	[0.978]	[0.929]	[-1.334]	[-1.887]*	[-1.927]*	[-1.136]	[-1.880]*
UMP dummy	0.637	1.707	-1.789	-0.672	0.545	1.680	2.625	-1.684	-0.790	-0.003
	[1.387]	[2.157]**	[-2.065]**	[-1.019]	[1.410]	[2.091]**	[1.726]*	[-1.966]**	[-0.935]	[-0.002]
Surprise * UMP dummy	-0.078	-0.048	-0.172	-0.282	0.144	0.172	0.188	0.042	-0.342	-0.259
	[-2.424]**	[-1.107]	[-1.163]	[-2.032]**	[0.945]	[1.185]	[1.266]	[0.195]	[-0.789]	[-0.136]
Lagged Asset/GDP	-0.006	-0.005	0.002	0.004	0.001	-0.012	-0.013	0.006	0.007	0.005
	[-1.265]	[-0.775]	[1.198]	[1.278]	[0.545]	[-0.565]	[-0.347]	[0.438]	[0.516]	[0.236]
Lagged Equity Ratio	-0.031	-0.018	-0.034	-0.047	-0.042	-0.068	-0.050	-0.026	-0.072	-0.04
	[-1.424]	[-0.628]	[-1.469]	[-2.157]**	[-1.777]*	[-1.403]	[-0.676]	[-0.517]	[-1.370]	[-0.770]
(Lagged Asset/GDP) * UMP dummy	0.004	0.004	0.005	-0.002	0.006	-0.001	0.000	-0.003	-0.008	-0.008
	[1.724]*	[1.226]	[2.345]**	[-0.847]	[5.725]***	[-0.069]	[0.010]	[-0.406]	[-1.090]	[-0.585]
Lagged Equity Ratio * UMP dummy	-0.017	0.007	0.191	0.036	0.007	-0.075	0.016	0.186	0.049	0.035
	[-0.404]	[0.092]	[2.447]**	[0.640]	[0.199]	[-0.979]	[0.107]	[2.313]**	[0.602]	[0.278]
Surprise * (Lagged Asset/GDP)	0.000	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	[0.964]	[0.944]	[0.696]	[0.567]	[0.708]	[-1.246]	[-0.950]	[-1.168]	[-1.388]	[-1.233]
Surprise * Lagged Equity Ratio	-0.003	-0.003	-0.003	-0.003	-0.004	0.002	0.006	0.005	0.003	0.004
	[-1.580]	[-1.525]	[-1.577]	[-1.577]	[-1.574]	[0.425]	[0.927]	[0.851]	[0.503]	[0.701]
Surprise * (Lagged Asset/GDP) * UMP dummy	-0.001	-0.001	0.000	-0.003	0.001	-0.001	-0.001	0.000	-0.002	-0.011
	[-3.979]***	[-3.397]***	[0.752]	[-3.315]***	[1.875]*	[-0.584]	[-0.371]	[0.328]	[-0.539]	[-0.898]
Surprise * Lagged Equity Ratio * UMP dummy	0.000	0.000	0.040	-0.008	-0.012	-0.011	-0.008	0.028	-0.019	0.002
	[-0.145]	[0.112]	[3.005]***	[-0.657]	[-0.933]	[-0.770]	[-0.537]	[1.447]	[-0.491]	[0.009]
Obs. Number	8800	6424	6072	6072	6072	5544	3168	2816	2816	2816
Number of Banks	88	88	88	88	88	88	88	88	88	88
F-stat	49.446	71.268	27.551	128.592	96.028	11.725	19.201	15.475	27.458	10.626
F p=value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R^squared	0.058	0.102	0.062	0.132	0.022	0.001	0.032	0.028	0.139	-0.139

Table 7a. The U.S. Bank-level Regressions of Credit Default Swap Spreads for Major Banks

The dependent variable is the daily change in CDS spread (bp) for each bank. Events are FOMC announcements after September 16, 2008, until October 2012. Two Jackson Hole speech dates are added for 2010 and 2012. The aggregate regressor is *Surprise,* which denotes for the daily change in one-year ahead three-month Eurodollar futures rate. The coefficients for the level controls are not reported: constant, dummy for the first month in each quarter, and the dummy for the second month in each quarter. The bank-level regressors are: *Lagged Asset/GDP ratio*, *Lagged Equity/Asset Ratio*, and interaction terms between these bank-level variables and *Surprise*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	1-year CDS Spread Daily Change (bp)				5-year CDS Spread Daily Change (bp)			
Bank	Bank of America (5)	JP Morgan (6)	US Bancorp (7)	Wells Fargo (8)	Bank of America (9)	JP Morgan (10)	US Bancorp (11)	Wells Fargo (12)
Surprise	3.739	8.543	-3.325	-0.188	4.611	1.254	-3.152	-1.674
	[0.952]	[1.415]	[-2.596]**	[-0.116]	[1.918]*	[0.268]	[-1.896]*	[-1.348]
Lagged Asset/GDP	0.017	-0.002	0.832	-0.398	0.149	-0.371	1.155	-0.080
	[0.061]	[-0.007]	[1.696]	[-1.338]	[1.038]	[-1.289]	[1.873]*	[-0.853]
Lagged Equity Ratio	-9.357	0.001	-2.467	-2.628	-7.539	-1.679	-3.641	0.693
	[-2.094]**	[0.001]	[-2.372]**	[-1.827]*	[-2.540]**	[-0.727]	[-2.843]**	[0.461]
Surprise * (Lagged Asset/GDP)	-16.863	-0.036	-0.300	-0.027	-10.664	-0.005	-0.351	-0.014
	[-2.280]**	[-1.427]	[-2.782]**	[-2.162]**	[-1.971]*	[-0.229]	[-2.669]**	[-2.257]**
Surprise * Lagged Equity Ratio	-11.985	-0.443	0.927	0.295	-5.310	-0.068	1.014	0.316
	[-2.540]**	[-1.306]	[2.757]**	[2.744]***	[-1.243]	[-0.310]	[2.421]**	[1.736]*
Obs. Number	40	40	23	40	40	40	24	40
F-stat	3.067	2.496	6.133	6.959	1.486	4.224	2.985	3.634
F p-value	0.014	0.036	0.002	0.000	0.207	0.002	0.033	0.005
R^squared	0.312	0.181	0.572	0.511	0.228	0.260	0.523	0.319

Table 7b: The U.S. Bank-Level Regressions of Credit Default Swap Spreads for Major Banks

The dependent variable is the daily change in CDS spread (bp) for each bank. Events are FOMC announcements after September 16, 2008, until October 2012. Two Jackson Hole speech dates are added for 2010 and 2012. The aggregate regressor is *Surprise,* which is the fitted value based on the first-stage regression of the daily change in one-year ahead three-month Eurodollar futures rate on the logarithms of after-before ratio of number of total news, positive news, and negative news (see text). The coefficients for the level controls are not reported: constant, dummy for the first month in each quarter, and the dummy for the second month in each quarter. The bank-level regressors are: *Lagged Asset/GDP ratio*, *Lagged Equity/Asset Ratio*, and interaction terms between these bank-level variables and *Surprise*. T-statistics are presented in parenthesis based on robust standard errors: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

	1-year CDS Spread Daily Change (bp)				5-year CDS Spread Daily Change (bp)			
Bank	Bank of America	JP Morgan	US Bancorp	Wells Fargo	Bank of America	JP Morgan	US Bancorp	Wells Fargo
	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Surprise	-42.390	33.057	-2.597	5.125	-0.160	6.130	-3.388	-3.849
	[-1.124]	[0.645]	[-1.825]*	[0.739]	[-0.006]	[0.231]	[-1.729]*	[-1.638]
Lagged Asset/GDP	0.363	0.86	0.702	-0.553	0.164	-0.235	1.283	-0.088
	[0.693]	[0.487]	[1.652]*	[-3.301]***	[0.615]	[-0.245]	[2.089]**	[-1.047]
Lagged Equity Ratio	23.13	-19.033	-2.614	-5.217	-4.930	10.550	-2.862	1.490
	[1.005]	[-0.540]	[-2.631]***	[-1.964]**	[-0.272]	[0.566]	[-1.385]	[1.120]
Surprise * (Lagged Asset/GDP)	-0.062	-0.071	-0.189	-0.041	0.002	-0.069	-0.067	-0.020
	[-0.837]	[-0.748]	[-1.072]	[-1.023]	[0.025]	[-1.249]	[-0.184]	[-1.634]
Surprise * Lagged Equity Ratio	5.241	-2.916	0.644	-0.153	0.008	0.509	0.497	0.622
	[1.174]	[-0.559]	[1.494]	[-0.303]	[0.002]	[0.192]	[0.615]	[1.880]*
Obs. Number	40	40	23	40	40	40	24	40
F-stat	1.142	0.209	2.017	10.933	1.275	1.240	2.191	1.264
F p-value	0.362	0.981	0.120	0.000	0.294	0.311	0.092	0.299
R^squared	-2.615	-4.033	0.409	0.051	0.157	-0.882	-0.014	0.214

Table 8. Summary Statistics for the Variables Used in the Panel Regressions

Variable	Number of observations	Mean	Standard deviation	Min	Max
Bank level variables					
Net interest margin (in percent of average earnings assets)	7581	3.750	0.605	1.469	6.236
Non-interest income (in percent of total assets)	7518	0.237	0.149	-0.355	0.958
Return on assets (in percent)	6132	0.615	0.821	-5.968	5.915
Risk-weighted assets (in percent of total assets)	5502	73.552	10.577	38.676	104.538
Equity ratio (in percent)	8106	9.730	2.344	-1.027	21.499
Z-score	6678	32.265	29.658	-5.788	153.634
Loan loss provisions (in percent of total loans)	6174	0.212	0.238	-0.337	1.666
Non-performing loans (in percent of total loans)	6111	2.628	2.283	0.000	13.485
Short-term borrowing (in percent of total borrowing)	3633	3.619	7.978	0.000	53.688
Monetary policy variables					
Taylor gap (in percent)	21	-1.544	1.705	-3.693	1.739
Policy interest rate (in percent)	21	0.917	1.361	0.250	4.750
Yield curve slope (in percent)	21	2.442	0.867	0.786	3.789
Number of quarters with negative Taylor gaps over the last 5 years	21	15.857	1.769	14.000	18.000
Change in central bank's assets to GDP (in percent)	21	0.554	1.754	-1.024	7.485

Sources: SNL; Haver Analytics; and IMF staff estimates.

Table 9. Panel Regressions on Measures of Banks' Profitability

The dependent variables are the net interest margin, the ratio of non-interest income to total assets, and the return on assets. The Taylor gap is the difference between the policy rate and the rate given by a standard Taylor (1993) rule. Different estimates of the Taylor gap produce different results (magnitude, sign and significance). To reduce bias that may result from using any specific estimate of the Taylor gap, we use an average of four possible measures of the Taylor rate. Cyclically adjusted government balances are annual series from the Fiscal Monitor. The coefficients on the time dummies are not reported. System GMM estimation (Arellano and Bover (1995) and Blundell and Bond (1998)) is used: * denotes significance at the 10 percent threshold, ** at 5 percent, and *** at 1 percent.

		Net interest margin (in percent of average earning assets)				Non-interest income (in percent of total assets)				Return on assets (in percent)			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged dependent variable		0.755***	0.763***	0.772***	0.771***	0.206***	0.217***	0.218***	0.215***	0.056**	0.054**	0.055**	0.054**
Lagged Taylor gap		0.02	0.001			**-0.025*** **	**-0.037*** **			**-0.088*** **	**-0.224*** **		
Lagged Taylor gap*bank size			0.000				**0.001*** **				0.008		
Lagged Taylor gap*equity ratio			**0.002** **				0.000				0.005		
Lagged effective Federal Funds rate				-0.027	-0.006			-0.001	**-0.029** **			**-0.239** **	**-0.322*** **
Lagged Fed Funds rate*bank size				**0.004** **	**0.006*** **			0.000	-0.001			0.004	0.002
Lagged Fed Funds rate*equity ratio				0.000	0.000			0.000	**0.001*** **			0.004	0.008
Lagged yield curve slope					**-0.143** **				0.015				0.031
Lagged yield curve slope*bank size					**0.009*** **				-0.001				-0.005
Lagged yield curve slope*equity ratio					0.000				**0.002** **				0.007
Number of quarters with negative Taylor gaps over the last 5 years		0.01	0.000	-0.006	-0.02	**-0.028*** **	**-0.031*** **	**-0.026*** **	-0.009*	**-0.105** **	-0.113*	-0.002	0.054
Number of quarters*bank size			**0.004** **	0.002	**0.004*** **		0.000	-0.001	-0.001*		-0.005	-0.011*	-0.012
Number of quarters*equity ratio			-0.001	-0.001	-0.001		0.000	0.000	0.000		0.003	0.001	0.001
Lagged change in central bank's assets to GDP		**-0.013*** **	0.01	0.026	**0.057** **	**-0.004*** **	**-0.030*** **	**-0.041*** **	**-0.047*** **	0.003	0.098	0.035	-0.006
Lagged change in central bank's assets*bank size			-0.003*	-0.002*	**-0.003** **		**0.002*** **	**0.002*** **	**0.002*** **		-0.004	-0.005	-0.005
Lagged change in central bank's assets*equity ratio			0.001*	0.001	0.001		0.000**	0.000***	0.000***		-0.004	-0.004	-0.004
Lagged real growth		0.004	0.011***	-0.017**	0.006	-0.018***	-0.004***	-0.008***	-0.013***	-0.001	-0.016	0.089***	0.063*
Lagged output gap				0.033**	0.054**			-0.027***	-0.030***			-0.166***	-0.203***
Lagged inflation				0.017	-0.015			0.048***	0.031***			-0.042	-0.011
Lagged cyclically adjusted government balance / GDP		-0.016	-0.040**	-0.062**	-0.157**	0.026***	0.025***	0.042***	0.078***	0.115***	0.135**	0.374***	0.525***
Chicago Board Options Exchange Market Volatility Index		0.000	0.000	-0.003**	-0.002	-0.002***	-0.001***	-0.002***	-0.002***	-0.017***	-0.015***	-0.004	-0.005
Lagged bank size (log assets)		0.043	-0.023	0.005	-0.051	0.060***	0.059***	0.068***	0.074***	0.269***	0.355***	0.449***	0.474***
Lagged equity-to-total-assets ratio		0.006	0.021	0.028*	0.028	0.000	-0.001	-0.001	-0.008*	-0.039	-0.076	-0.066	-0.095
Global Systemically Important Bank (dummy variable)		-0.941	-0.903	-0.881	-0.883	-0.236*	-0.228*	-0.223*	-0.240*	-3.274***	-3.200***	-3.175***	-3.167***
Number of observations		7220	7220	7220	7220	7160	7160	7160	7160	5840	5840	5840	5840
Number of banks		361	361	361	361	358	358	358	358	292	292	292	292
Average number of observations per bank		20	20	20	20	20	20	20	20	20	20	20	20
Number of instruments		338	338	338	338	338	338	338	338	249	249	249	249
Sargan test (p-value)		0.257	0.331	0.296	0.292	0.430	0.311	0.296	0.329	0.106	0.190	0.209	0.181
Test for zero autocorrelation in first-differenced errors (p-value)	Order 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Order 2	0.941	0.960	0.934	0.958	0.086	0.107	0.099	0.097	0.090	0.115	0.106	0.112

Table 10. Panel Regressions on Measures of Banks' Risk

The dependent variables are the ratio of risk-weighted assets to total assets, the equity ratio and the z-score. Risk-weighted assets are a weighted sum of a bank's assets, with weights determined by the riskiness of each asset. The z-score is the ratio of the return on assets plus the ratio of equity over total assets, divided by the standard deviation of asset returns. It is inversely related to a bank's probability of insolvency. A higher z-score is thus interpreted as lower bank risk. The Taylor gap is the difference between the policy rate and the rate given by a standard Taylor (1993) rule. Different estimates of the Taylor gap produce different results (magnitude, sign and significance). To reduce bias that may result from using any specific estimate of the Taylor gap, we use an average of four possible measures of the Taylor rate. Cyclically adjusted government balances are annual series from the Fiscal Monitor. The coefficients on the time dummies are not reported. . System GMM estimation (Arellano and Bover (1995) and Blundell and Bond (1998)) is used: * denotes significance at the 10 percent threshold, ** at 5 perrcent, and *** at 1 percent.

	Risk-weighted assets ratio (RWA/total assets, in percent)				Equity ratio (Equity/total assets, in percent)				Z-score			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged dependent variable	0.867***	0.868***	0.868***	0.871***	0.829***	0.830***	0.827***	0.828***	0.853***	0.853***	0.853***	0.851***
Lagged Taylor gap (in percent)	0.539***	0.376			-0.018	-0.037			-0.09	1.147*		
Lagged Taylor gap*bank size		-0.013				0.001				-0.168***		
Lagged Taylor gap*equity ratio		0.004										
Lagged effective Federal Funds rate			1.058**	2.000***			-0.153**	-0.03			0.511	1.843
Lagged Fed Funds rate*bank size			-0.012	-0.036			-0.004	-0.001			-0.165*	-0.240**
Lagged Fed Funds rate*equity ratio			-0.009	-0.017							0.000	0.000
Lagged yield curve slope				1.250*				-0.319**				1.864
Lagged yield curve slope*bank size				-0.095***				0.019**				-0.375**
Lagged yield curve slope*equity ratio				-0.024								0.000
Number of quarters with negative Taylor gaps over the last 5 years	0.912***	0.932***	0.493**	-0.106	0.080*	0.088*	0.190***	0.126**	1.410**	1.988***	1.908***	0.763
Number of quarters*bank size		0.005	0.02	0.000		0.001	0.002	0.007		-0.121*	0.076	-0.006
Number of quarters*equity ratio		0.022	0.022	0.025								
Lagged change in central bank's assets to GDP	0.058	-0.275	0.129	0.033	0.019	-0.001	0.008	0.06	0.478***	0.743	0.837	0.617
Lagged change in central bank's assets*bank size		0.02	0.021	0.032**		0.000	-0.001	-0.002		-0.042	-0.032	-0.018
Lagged change in central bank's assets*equity ratio		-0.011	-0.014	-0.012								
Lagged real growth	0.328***	0.046	-0.283**	-0.177	0.053***	-0.025***	0.190***	0.253***	0.352	-0.605***	1.884***	1.363***
Lagged output gap			0.592***	0.422			-0.015	-0.069			-0.196	0.287
Lagged inflation			0.005	0.677**			-0.486***	-0.339***			-4.787***	-2.737***
Lagged cyclically adjusted government balance / GDP	-0.328**	-0.435*	-1.413***	-1.897**	-0.060*	-0.072	0.117*	-0.058	-0.896**	-0.065	0.563	-0.746
Chicago Board Options Exchange Market Volatility Index	0.027**	-0.014	-0.031**	-0.047***	0.002	0.000	0.028***	0.024***	-0.207***	-0.276***	0.045	0.082
Lagged bank size (log assets)	-0.568**	-0.689*	-0.927**	-0.302	-0.01	-0.016	-0.039	-0.158	-1.488	0.316	-2.173	0.026
Lagged equity-to-total-assets ratio	0.033	-0.22	-0.209	-0.163								
Global Systemically Important Bank (dummy variable)	6.444	4.909	4.761	4.106	-0.776	-0.766	-0.787	-0.815	19.202**	18.835**	17.520**	17.602**
Number of observations	5240	5240	5240	5240	7720	7720	7720	7720	6360	6360	6360	6360
Number of banks	262	262	262	262	386	386	386	386	318	318	318	318
Average number of observations per bank	20	20	20	20	20	20	20	20	20	20	20	20
Number of instruments	148	148	148	148	336	336	336	336	292	292	292	292
Sargan test (p-value)	0.531	0.577	0.590	0.683	0.184	0.167	0.165	0.158	0.268	0.221	0.214	0.204
Test for zero autocorrelation in first-differenced errors (p-value) Order 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Order 2	0.128	0.138	0.138	0.140	0.464	0.467	0.470	0.491	0.385	0.414	0.400	0.418

Table 11. Panel Regressions on Measures of Banks' Balance Sheet Repair

The dependent variables are the ratio of loan loss provisions to total loans, the ratio of non-performing loans to total loans and the short-term debt ratio. The Taylor gap is the difference between the policy rate and the rate given by a standard Taylor (1993) rule. Different estimates of the Taylor gap produce different results (magnitude, sign and significance). To reduce bias that may result from using any specific estimate of the Taylor gap, we use an average of four possible measures of the Taylor rate. Cyclically adjusted government balances are annual series from the Fiscal Monitor. The coefficients on the time dummies are not reported. System GMM estimation (Arellano and Bover (1995) and Blundell and Bond (1998)) is used. When the Arellano-Bond test for autocorrelation in the first differenced errors does not accept the null hypothesis of zero autocorrelation at order 2, we use higher lags of the variables as instruments in the system GMM estimation.* denotes significance at the 10 percent threshold, ** at 5 percent, and ** at 1 percent.

		Loan loss provision ratio (LLP/total loans, in percent)				**Non-performing loan ratio (NPL/total loans, in percent)**				**Short-term debt ratio (short-term borrowing/total borrowing, in percent)**			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged dependent variable		0.668***	0.627***	0.680***	0.630***	0.957***	0.949***	0.948***	0.947***	0.320***	0.293***	0.281***	0.283***
Lagged Taylor gap (in percent)		-0.014	-0.019			0.014	0.038			-0.094	**1.513*** **		
Lagged Taylor gap*bank size			**0.003*** **				0.005				-0.074*		
Lagged Taylor gap*equity ratio			-0.001				-0.001				0.028		
Lagged effective Federal Funds rate				-0.027	0.027			**0.175** **	**0.217** **			**-2.703** **	**-2.686** **
Lagged Fed Funds rate*bank size				0.001	0			-0.003	0.001			**0.259*** **	**0.235** **
Lagged Fed Funds rate*equity ratio				0.003*	0.003			0.003	0.002			-0.011	-0.011
Lagged yield curve slope					**-0.141*** **				-0.323*				2.471
Lagged yield curve slope*bank size					**0.008*** **				**0.018** **				-0.12
Lagged yield curve slope*equity ratio					-0.001				-0.002				-0.004
Number of quarters with negative Taylor gaps over the last 5 years		-0.006	**-0.031** **	-0.022	**-0.038*** **	-0.004	-0.050	-0.104*	**-0.142** **	-0.568	-1.069*	-1.185	-1.090*
Number of quarters*bank size			**0.008*** **	**0.004*** **	**0.007*** **		**0.009** **	0.008	**0.011** **		**0.160** **	0.083*	0.055
Number of quarters*equity ratio			0	0	0		0.003	0.005	0.005		0.003	0.008	0.007
Lagged change in central bank's assets to GDP		**-0.023*** **	**-0.059*** **	**-0.047*** **	-0.015	**0.024** **	0.03	0.064	**0.124** **	**-0.215** **	-0.091	-0.348	-0.616
Lagged change in central bank's assets*bank size			**0.003*** **	**0.003*** **	**0.003*** **		0.001	0	-0.001		-0.011	0.021	0.022
Lagged change in central bank's assets*equity ratio			0	0	0		0	0.001	0.001		0.015	0.009	0.009
Lagged real growth		-0.031***	0.010***	-0.004	0.016	-0.023	0.023*	-0.091***	-0.068**	-0.234	0.274**	-0.237	-0.271
Lagged output gap				0.021**	0.054***			0.052	0.108*			0.082	-0.404
Lagged inflation				-0.004	-0.066***			0.115	0.091			0.349	0.575
Lagged cyclically adjusted government balance / GDP		-0.003	-0.050***	-0.054***	-0.158***	0.008	-0.084**	-0.228***	-0.432***	0.795	-0.385	-0.365	0.813
Chicago Board Options Exchange Market Volatility Index		0.004***	0.004***	0.003***	0.006***	0.006***	0.009***	-0.005	-0.003	0.026	0.043***	-0.003	-0.027
Lagged bank size (log assets)		0.007	-0.111***	-0.064**	-0.126***	0.018	-0.127*	-0.11	-0.216**	1.146	-1.389	-0.202	0.554
Lagged equity-to-total-assets ratio		-0.003	-0.001	-0.011	-0.003	-0.008	-0.053	-0.082*	-0.075	-0.028	-0.022	0.004	0.026
Global Systemically Important Bank (dummy variable)		-0.705**	-0.712**	-0.664**	-0.644**	-0.006	0.207	0.234	0.299	-10.458	-11.238	-11.447	-11.036
Number of observations		5880	5880	5880	5880	5820	5820	5820	5820	3460	3460	3460	3460
Number of banks		294	294	294	294	291	291	291	291	173	173	173	173
Average number of observations per bank		20	20	20	20	20	20	20	20	20	20	20	20
Number of instruments		235	189	189	189	200	148	148	148	148	148	148	148
Sargan test (p-value)		0.273	0.311	0.358	0.329	0.357	0.398	0.365	0.435	0.359	0.547	0.460	0.452
Test for zero autocorrelation in first-differenced errors (p-value)	Order 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Order 2	0.000	0.000	0.000	0.000	0.225	0.196	0.186	0.184	0.070	0.085	0.093	0.093