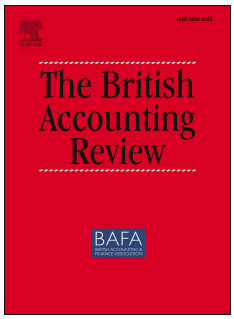

Investor behavior around targeted liquidity announcements

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Investor behavior around targeted liquidity announcements

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Abstract

We exploit announcements related to targeted longer-term financing operations (TLTROs) as exogenous shocks in investor perceptions to test recent theories on bank funding liquidity (Liu 2015, Ahnert et al. 2019). We find that banks with high derivative holdings and more exposed to sovereign credit risk respond better to the announcements, consistent with the view that lower funding costs benefit banks with higher asset encumbrance and located in more vulnerable Eurozone countries. The TLTRO announcements also elicit reductions in short positions on bank stocks relative to stocks of non-financial corporations without impairing their market liquidity. Robustness tests rule out that our results are driven by confounding events and anticipation effects. Placebo tests confirm that the TLTRO announcements are driving the estimated price reactions and changes in short positions.

JEL CLASSIFICATION: E52, E58, G14, G21

Keywords: Liquidity, Banks, Short-Selling, Price Reaction

1 Introduction

Bank funding liquidity is important to preserve financial stability and promote economic growth. Thus, making cheap and long-term funding sources available to banks should reduce their weighted average cost of capital, which could result in lower loans rates for bank borrowers (Baker and Wurgler 2015). However, central bank funding usually comes with strings attached, in the form of collateral requirements, thereby exacerbating asset encumbrance (Ahnert et al. 2019). In June 2014, the European Central Bank (ECB) launched the Targeted Longer-Term Refinancing Operations (hereafter, TLTRO). The key feature of this program relative to its predecessor, the LTRO, is that the funding for eligible institutions – that is, Eurozone Monetary Financial Institutions (MFI) – is dependent not only on collateral, but also on its amount of eligible loans to households and non-financial firms, with the objective to improve the monetary policy transmission.[1] The amount of funding provided to banks via the TLTRO program is over 2.1 trillion Euros as of July, 2022.[2]

In this paper, we are the first to examine the capital-market effects of TLTROs for 82 banks from 17 Eurozone countries from 2014 to 2020, focusing on 12 ECB press releases related to the TLTRO program. Our research expands on recent literature evaluating the capital-market effects of securities regulation (Christensen et al. 2016) and the valuation effects of other unconventional monetary policies such as the LTRO program (Andrade

[1] https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html. We report more information on the institutional background in the Internet Appendix, Section A.

[2] https://www.ecb.europa.eu/press/pr/wfs/dis/html/index.en.html.

et al. 2018, Crosignani et al. 2020, Carpinelli and Crosignani 2021). While there is some evidence regarding the real effects of TLTROs (for example, Benetton and Fantino (2021)), there is currently no evidence on the TLTRO program's impact on the market for bank stocks. This is an important topic for policymakers for three reasons. First, stock prices are forward-looking indicators of banks' health and improve the accuracy of estimates of the potential impact of credit crunches on the real economy (Cortes et al. 2021). In particular, investors might exploit central bank announcements to form expectations regarding future interest rates (Enders et al. 2019). Second, an event-study approach based on daily prices also enables us to have a more precise estimate of the effects of the TLTRO program than using backward-looking annual financial data, as long as the event windows are not too wide (Fiordelisi and Ricci 2016). Finally, and more importantly, while the objective of this program is to encourage lending to households and non-financial firms, it might lead to wealth transfers (in the form of equity capital) across the banking sector because banks with a low cost of funding might not benefit as much as weaker banks from the TLTRO program. Therefore, by estimating the impact of TLTROs on bank stock prices, we can complement the literature on their real effects.

Our main findings are as follows. First, we estimate the Cumulative Abnormal Returns (CARs) for a three-day event window and show that the aggregate market reaction to the 12 announcements, based on the whole portfolio of bank stocks in the sample and bootstrapped *p-values*, is statistically insignificant. However, the market reacts positively only to announcements of reductions in the interest rate charged to banks that apply for

TLTRO funding. Second, the market perceives the policy announcements to be value-enhancing especially for banks with high derivative holdings, suggesting that banks with higher asset encumbrance benefit from the reduction in funding costs resulting from the TLTROs. Therefore, our results do not support the view that banks with high derivative holdings benefit less from TLTRO funding because they can manage their funding liquidity risk better than banks with low derivative holdings (Venkatachalam 1996).

We also find that sovereign risk has a positive impact on the CARs, similar to derivative holdings. This positive impact is confirmed in cross-sectional regressions where we proxied for sovereign risk using a dummy for banks in Greece, Ireland, Italy, Portugal and Spain (henceforth, "GIIPS") and the debt-to-GDP ratio. Since banks in high sovereign-risk countries tend to borrow more from central bank facilities with collateral requirements (Berthonnaud et al. 2021), these results are also consistent with the view that asset encumbrance is positively correlated with the CARs.

These results are important because the collateral requirements attached to TLTRO increase, *ceteris paribus*, asset encumbrance. The positive impact of derivatives on the price reaction suggests that investors are unlikely to perceive excessive asset encumbrance as a problem. As shown by Ahnert et al. (2019), this could be due to the failure of banks to internalize the cost of guarantees in case of liquidation. Such guarantees, thus, incentivize banks to increase asset encumbrance, which might exacerbate financial fragility. Consistent with this view, we also find that the positive effect of derivatives on the price reaction becomes even stronger for banks with high NPL ratios. This result indicates that TLTRO

funding is particularly beneficial for banks with high asset encumbrance and high credit risk.

To ensure that we are interpreting our findings correctly, we run a battery of tests aiming to unpack the mechanism underlying the price reaction to the TLTRO announcements. First, we investigate the extent to which our results reflect investors' expectations regarding participation in the TLTRO program. Specifically, we run probit regressions to examine whether the price reaction to the three TLTRO waves correlates with the future choice to tap TLTRO funding. This is indeed the case: the area under Receiver Operating Characteristic (ROC) curves is above 0.80 when the CARs are the only explanatory variable, confirming that the CARs related to the announcements have significant predictive power. These results confirm that we are capturing the "policy effect" of the program rather than an "information effect".

Second, we dig deeper into the mechanism underlying our main results by investigating how the TLTRO announcements affect retail investor attention and net short positions[3] of institutional investors. In the weeks of the TLTRO announcements retail investor attention – proxied by the Google Search Volume Index (Da et al. 2011) – for the keyword "TLTRO" is significantly larger than in other weeks. On the other hand, retail investor attention for the tickers of the bank stocks in our sample remains stable. Thus, our results are unlikely to be driven by changes in retail investor attention unrelated to TLTRO events. Net short positions on bank stocks – relative to those on non-bank stocks – go down after the announcements related to the three waves of the TLTRO program. These findings

[3]Net short positions are equal to the total number of shares in a company that have been short-sold by investors minus the total number of shares held long.

corroborate those regarding the CARs and retail investor attention because short-sellers are institutional investors.

Our results are also robust to a host of sensitivity checks. In particular, our main findings are insensitive to the benchmark used to estimate the CARs and the length of the estimation window (90 or 120 days). We also show that confounding events related to dividend declarations and announcements of board changes or M&A deals leave our main findings virtually unaltered. On the other hand, the price reaction to placebo events, which consider five trading days before each of the actual TLTRO announcements, is statistically insignificant. Thus, it is unlikely that investors anticipated these announcements.

This study mainly contributes to four strands of literature. First, we contribute to the literature investigating how conventional and unconventional monetary measures affect bank stock returns (Ricci 2015, Fiordelisi and Ricci 2016, Ampudia and Van den Heuvel 2022). Unlike these studies, we focus on the importance of sovereign risk and derivative usage for the price reaction in response to the TLTRO announcements, and we also consider even change in net short positions.

The second strand comprises a relatively small but quickly evolving literature on the consequences of targeted funding liquidity measures (Perdichizzi et al. 2023, Benetton and Fantino 2021, Flanagan 2019). However, these papers focus on the real effects of the TLTRO program rather than shareholder wealth effects.

Third, our paper speaks to the literature on short selling of bank stocks (Beber and Pagano 2013, Beber et al. 2021), and the connection between funding and market liquidity

(Brunnermeier and Pedersen 2009). Unlike these studies, we examine net short positions on bank and non-bank stocks around the TLTRO announcements to test the theoretical predictions of Liu (2015). In doing so, we also contribute to the broader literature on how short sellers react to new public information (Blau et al. 2011, Drake et al. 2011, Engelberg et al. 2012, Blau and Pinegar 2013, Blau et al. 2015). We are the first to reveal heterogeneities with respect to monetary policy announcements.

Finally, our findings are important for the literature on bank liquidity regulation (Raz et al. 2022, Bruno et al. 2018). Specifically, the study by Bruno et al. (2018) is similar to our paper in that it employs an event study methodology to estimate the shareholder wealth effects of events related to the Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR). However, this paper neglects the importance of derivatives for the price reaction to these events and does not provide an examination of short-sellers behavior.

2 Hypotheses

In this Section, we develop our hypotheses based on previous literature on the potential impact of unconventional monetary policies on bank stock prices according to different channels.

2.1 Aggregate market reaction to TLTRO

Announcements related to policy measures aiming at restoring financial stability can have heterogeneous effects, depending on the type of policy considered (Ait-Sahalia et al.

2012). An important channel of these policies is the equity market because it incorporates investors' expectations concerning the impact of such policies (Bomfim 2003, Bernanke and Kuttner 2005). For example, a recent paper by English et al. (2018) finds that unanticipated increases in interest rates decrease bank stock prices in the US.

Fiordelisi and Ricci (2016) find that investors prefer policy interventions whose purpose is to calm financial markets before a bank is in distress, rather than public bailouts and bank failures. These findings suggest that investors welcome interventions that prevent distress in the banking system and dislike late action in the form of outright public bailouts. The TLTRO program has a similar objective, and might result in equity gains for banks, especially those with higher cost of debt capital (Flanagan 2019). Thus, we predict that the ECB announcements should lead to a positive market reaction:

- **H1:** TLTRO announcements lead to a positive price reaction on Eurozone banks.

We test for the validity of **H1** by using a market-weighted and equal-weighted portfolio of bank stocks to estimate the cumulative abnormal returns (hereafter, CARs) around the 12 announcement dates.

2.2 Determinants of the price reaction

In addition to assessing the overall investors' reaction to the TLTRO program, we study whether bank-specific and macroeconomic factors can explain the cross-sectional variability in the price reaction (Fiordelisi and Ricci 2016, Bruno et al. 2018).

We focus on two variables that previous literature associates with bank funding costs and,

since obtaining TLTRO funding is subject to collateral requirements, asset encumbrance. As we describe more in detail below, these considerations lead us to focus on sovereign risk and derivative holdings (Berthonnaud et al. 2021, Bruno et al. 2018, Engler and Große Steffen 2016, Ahmed et al. 2011).

2.2.1 Sovereign debt risk

The market reaction to the TLTRO announcements might depend on sovereign debt risk because the correlation between sovereign debt risk and the risk of the banking sector (Acharya et al. 2014) might result in weaker liquidity positions for banks in countries with poor fundamentals. Banks located in GIIPS countries tend to be more exposed to sovereign debt risk and Acharya et al. (2019) provide evidence consistent with the view that non-standard monetary policies improve banks' health in the periphery of the Eurozone.[4]

Sovereign risk in the Eurozone might also be correlated with asset encumbrance because banks in countries with higher sovereign risk are more likely to tap central bank funding with collateral requirements (Berthonnaud et al. 2021).

For these reasons, we expect a positive price reaction for banks headquartered in a GIIPS country.

- **H2:** Banks headquartered in countries with high sovereign risk experience a better price reaction to announcements related to the TLTRO program than other banks.

[4]Moreover, Fratzscher and Rieth (2019) find that announcements related to the LTRO program had a stronger impact on banks in Italy and Spain, and Fratzscher et al. (2016) find that ECB liquidity injections have a negative impact on the bond yields of peripheral countries.

2.2.2 Derivative holdings

The potential effect of derivative holdings on the price reaction to the TLTRO program is ambiguous. On the one hand, they might improve bank funding position if they are used for hedging. On the other hand, they might increase the degree of encumbrance in banks' balance sheets. We explain these two channels below.

When central banks set their policy rates, they create a natural demand for derivatives (Upper 2006) because bank executives deem hedging strategies based on derivatives more efficient than on-balance sheet strategies for asset-liability management (Venkatachalam 1996). The use of derivatives decreases the sensitivity of bank performance to macroeconomic shocks, especially during adverse states of the economy (Froot et al. 1993). Thus, derivative holdings can improve bank liquidity conditions (Purnanandam 2007).

Since derivatives can help a bank manage its funding position, if used for hedging purposes, banks with volumes of derivative transactions might not need to access TLTRO as much as other banks. Accordingly, we formulate the following hypothesis:

- **H3a:** Derivative holdings have a negative impact on the price reaction to TLTRO announcements.

However, banks with higher derivative ratios might react more positively to the TLTRO announcements because of the asset-encumbrance problem. Banks often have to pledge assets to collateralize transactions in the derivatives' market. If a bank suffers from a poor funding liquidity position, margin calls related to its derivative position could exacerbate this problem. Thus, very high levels of derivative holdings may trigger adverse feedback-loops,

whereby the inability of a bank to generate liquidity worsens asset encumbrance and *vice versa*. In turn, this gives rise to rollover risk and, thus, insolvency risk (Ahnert et al. 2019).

Under Basel III liquidity requirement rules, TLTRO funding is included in the numerator (Available Stable Funding, ASF) of the NSFR, with a weight of 100%. On the other hand, derivative liabilities have a weight of 0%. Moreover, derivative assets have a weight of 100% in the denominator of the NSFR (Required Stable Funding, RSF). Thus, TLTRO funding can be used to reduce the impact of derivative assets, or as a substitute of derivative liabilities.

We expect that because of the relationship between derivative holdings and asset encumbrance, which, in turn, increases bank risk, and because of the treatment of TLTRO funding under Basel III rules, banks with high derivative holdings should benefit more than others from the TLTRO program:

- **H3b:** Derivative holdings have a positive impact on the price reaction to TLTRO announcements.

2.3 Bank funding liquidity and short-selling

Short-selling on financial stocks is often viewed as a potential risk to financial stability. For this reason, during the financial crisis many stock exchange regulators implemented short-sales bans to mitigate its impact on bank stocks. However, such bans often have unintended consequences, such as lower market liquidity and slower price discovery (Beber et al. 2021), and they can also lead to a higher probability of default and volatility for bank

stocks (Beber and Pagano 2013). For this reason, we analyze the potential effect of TLTRO announcements on short sales because, unlike outright short-sales bans, they can improve bank value without necessarily impairing market liquidity or increasing the volatility of bank stock prices. TLTRO announcements are public information, and their timing is hard to anticipate for the average market participant. However, the release of new information generates trading opportunities for short sellers because they can exploit their superior ability in analyzing publicly available information (Engelberg et al. 2012). New information contained in TLTRO announcements might thus affect short-selling activities if short sellers believe that bank liquidity conditions can affect bank value.

These considerations are consistent with recent theoretical models on the connection between bank funding liquidity and short selling. In particular, Liu (2015) argues that short-selling activities on bank stocks might increase the probability of bank failure and increase the likelihood of a run from bank creditors. Moreover, banks with a higher degree of liquidity risk – in terms of funding liquidity, *not* market liquidity – are more likely to suffer from short-selling attacks by speculators. For this reason, the TLTRO announcements might reduce short-selling activities because they provide an additional source of funding liquidity to Eurozone banks, thus decreasing their liquidity risk.

- **H4a:** TLTRO announcements are followed by a reduction in net short position for Eurozone bank stocks relative to other stocks.

Nevertheless, short sellers could interpret the content of TLTRO announcements as an indication that weak banks could use the ECB funding to prop up firms with weak financial

conditions (Altavilla et al. 2018). If this is the case, the TLTRO announcements could signal a reduction in the value of Eurozone banks, leading to profitable short-selling opportunities.

- **H4b:** TLTRO announcements are followed by a increase in net short position for Eurozone bank stocks relative to other stocks.

3 Data and Methodology

In this Section, we describe our dataset and econometric strategy. In particular, in Section 3.1, we report the steps of our data collection and sample selection, and we present descriptive statistics for our main variables; in Section 3.2, we describe how we estimate the price reaction to the TLTRO announcements, and how we measure their impact on short sales on the stocks of the banks in our sample.

3.1 Data and Sample Representativeness

We study the period from June 5, 2014 (date of the first TLTRO announcement), to May 29, 2020. However, due to the need to use a pre-event estimation window of 120 days – starting 122 trading days before the event – the start date of our sample of returns is December 17, 2013. We collect data from different sources. Bank stock prices are from Datastream. Data on bank-specific variables and macroeconomic variables are from BankFocus and Eurostat, respectively. Finally, we collect information on the announcement dates from the official website of the European Central Bank.[5] In Table 1, we summarize

[5] https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html.

the event dates for our analysis.

[INSERT TABLE 1 HERE]

Our sample selection process consists of the following steps. First, we start with the universe of publicly listed banks in the Eurozone available on BankFocus. Second, we focus only on those financial institutions classified as commercial banks, bank holding companies, savings banks, and cooperative banks. Third, we exclude banks without a consolidated financial statement. Finally, we filter out banks for which information on total assets or deposits is unavailable. This final step is required to ensure that the banks selected engage in financial intermediation activities (Cubillas et al. 2017), and leads to a final sample of 82 banks. Our final sample comprises banks from 17 Eurozone countries. The following countries in the Eurozone are missing from our sample: Latvia, Luxembourg – both of them because of a lack of observations – and Croatia – because it joined the Euro after our sample period.

Table 2, Panel A, reports the geographic distribution of our sample, while Panel B of the same table provides a breakdown according to the type of bank: Bank Holding Companies (BHCs), commercial banks, and Cooperative and Savings banks. Panel C documents the sample representativeness relative to the population of listed banks in the EU-17 over the sample period in terms of total assets, total loans, and total deposits. The sample accounts for more than 97% of the total assets of all publicly listed banks in Eurozone countries. We obtain a similar coverage rate for the share of total loans and total deposits.

Table 3, Panel A, reports the main descriptive statistics, by country, of the variables

used in our main tests for the whole sample period (mean, median, standard deviation, 25^{th} and 75^{th} percentiles). Panel B reports the number and percentage of banks in our sample which obtain TLTRO funding, separately for each wave, and also for LTRO.

[INSERT TABLES 2 AND 3 HERE]

3.2 Methodology

3.2.1 Estimating abnormal returns

Consistent with prior studies in the banking literature (Correa et al. 2014, Fiordelisi and Ricci 2016, Bruno et al. 2018, Ahern 2017), we compute the CARs for days around TLTRO announcements employing the market model:

$$AR_{i,t} = R_{i,t} - (\alpha_i + \beta_i R_{m,t}) \tag{1}$$

where $AR_{i,t}$ is the abnormal return of bank i at day t. $R_{i,t}$ and $R_{m,t}$ are the bank stock price return and market portfolio return at day t, respectively. We use two indices as benchmarks for the market portfolio: the MSCI Europe and the MSCI Europe Bank.

In line with Ahern (2017), we employ an estimation window of 120 trading days (-122,-2) for the market model. For robustness, we also report the results using an estimation window of 90 trading days. A shorter estimation window also allows us to reduce potential problems related to parameter instability during our sample period.

Finally, we estimate the CARs for the 3-day event window (-1,1) using the following formula:

$$CAR_{i,t} = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{2}$$

3.2.2 Aggregate market reaction

To evaluate the aggregate price reaction to the TLTRO announcements, we build an equal-weighted and a market-weighted portfolio of stocks for the banks in our sample. Next, we compute the overall reaction to the TLTRO program by estimating the average CARs over all 12 events. We also run tests based on subsamples of the 12 announcements to understand what type of announcements is driving our results. We start with the seven announcements related to the launch of the three waves of the TLTRO program (three events: TLTRO-I, TLTRO-II, and TLTRO-III), and reductions in the TLTRO interest rates (four events). Considering only these seven events excludes the potential influence of five events related to technical aspects of the TLTRO program. We also look separately at the impact of the three events related to the Launch of the three TLTRO waves, and the four events related to reductions in the TLTRO interest rates. Finally, we estimate the overall price reaction to the five events related to technical aspects of the program.

Finally, in line with the previous literature (Bruno et al. 2018, Armstrong et al. 2010), we estimate the bootstrapped p-values to test the significance of CARs. First, we exclude all the days around the announcement events using a three-day event window (-1, +1) from the sample. Next, we randomly choose placebo events from the remaining trading days using a pseudo-random number generation algorithm. Finally, we estimate the placebo CARs based on the randomly selected placebo events. We repeat this process 1,000 times to build

a simulated distribution of randomly selected placebo CARs. This procedure allows us to generate critical values for two-tailed statistical tests and compute the significance level at which the estimated CARs differ from zero.

3.2.3 Bank heterogeneity and abnormal returns

After estimating the CARs for each bank stock and each announcement, we examine their drivers by regressing them on a set of variables that might affect the price reaction:

$$CAR_{i,t} = a + bX_{i,t-1} + \epsilon_{i,t} \tag{3}$$

where $X_{i,t-1}$ includes proxies related to hypotheses **H2** and **H3**, as well as control variables.

In the spirit of Bruno et al. (2018), we test **H2** by including in our analysis a dummy identifying banks with headquarters in a GIIPS country (Greece, Ireland, Italy, Portugal, and Spain), also known as "peripheral" countries. Moreover, since GIIPS countries have weaker fundamentals in terms of sovereign debt to Gross Domestic Product (GDP), and there might be substantial heterogeneity in economic fundamentals across different GIIPS countries, we also test the impact of sovereign debt risk by testing the impact of the *Debt to GDP ratio*, calculated as public debt divided by GDP.

We test the validity of **H3a** and **H3b** in the same vein as Bayazitova and Shivdasani (2012). We use the notional value of outstanding derivatives contracts scaled by total assets (*Total Derivatives*). In other tests, we further decompose *Total Derivatives* in *Asset-Side Derivatives* (total asset-side derivatives to total assets) and *Liabilities-Side Derivatives* (total

liabilities-side derivatives to total assets). In line with previous arguments, we expect that the coefficients on *Asset-Side Derivatives* and *Liabilities-Side Derivatives* might be negatively or positively correlated with CARs, depending on which hypothesis between **H3a** or **H3b** is valid.

We also examine the impact of control variables, including: bank size, because it might be related to bank bailout choices (Davila and Walther 2020, Fiordelisi and Ricci 2016) and implicit guarantees that might affect the cost of capital (Gandhi and Lustig 2015, Gandhi et al. 2020); the Net Interest Margin ratio, which is the ratio of net interest income divided by total assets (*NIM*), and the Net Non Financial Income ratio (*NFI*), defined as the ratio between the bank non-financial income to total assets; finally, we include a dummy identifying Global Systemically Important Banks (*G-SIBs*) because G-SIBs are strongly inter-connected and have larger balance-sheet and off-balance-sheet activities than other listed banks (Fiordelisi and Ricci 2016), and thus they might amplify the monetary transmission mechanism during periods of potential downturns (Adrian and Shin 2008).

In all our regressions, we cluster the standard errors at the bank-level to adjust for within-bank correlation in the error term and we winsorize our continuous variables at the 1^{st} and 99^{th} percentiles. Moreover, to decide whether a pooled model or a panel-data model would be preferred and, in the latter case, what type of panel data model is required (a Random-Effects model or a Fixed-Effects model), we run Hausman and Breusch-Pagan tests. In particular, we employ the robust version of the Hausman test (Arellano 1993, Wooldridge 2010), as recommended by Onali et al. (2017), to decide whether a Fixed Effects (FE) model

or a Random Effects (RE) model should be used. If the Hausman test is insignificant, the RE model is consistent and should be preferred to the FE model because it is more efficient. Moreover, if the Hausman test is insignificant, we also employ the Lagrange Multiplier (LM) test by Breusch and Pagan (1980) to choose between a pooled model and an RE model. If the Breusch-Pagan LM test is insignificant, the pooled OLS model will be more efficient than the RE model.

3.2.4 Estimating the impact of TLTRO announcements on short sales

To evaluate the effects of TLTRO announcements on net short position on bank stocks – concerning **H4** – we exploit the disclosure requirements introduced by Regulation (EU) No 236/2012 of the European Parliament on short-selling to collect data on net short positions for both banks and non-bank stocks from the database WRDS European Short Data for the period June 2014–April 2020. This database covers stocks listed on markets in Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Spain, Sweden, and UK. We collect data for all the Eurozone countries in our original sample, for consistency with our main results, and thus: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, and Spain. Notably, no data is available in WRDS European Short Data for the Portuguese market, one of the GIIPS countries. We run the following regressions:

$$Short_{it} = \mu + \gamma_i Banks_i + \lambda_t Announcement_t + \phi_{it}(Banks_i \times Announcement_t) + \nu_{it} \quad (4)$$

where $Short_{it}$ is the percentage difference, for each stock i and day t, between short and long positions held by all the short-sellers on that stock (in cash or on derivatives markets).[6] $Banks_i$ is equal to one for the stocks of the banks in our sample, and zero otherwise (non-bank stocks).[7] The reasoning behind this approach is that non-banking institutions are ineligible for TLTRO funding, unless they are holding companies that control a banking institution.[8] In our main tests, we consider in the control sample any non-bank stock which is listed in the markets considered. However, some of these firms might have their headquarters located outside of the Eurozone, although their stocks are listed in a Eurozone market. For this reason, we also run robustness tests including in the control sample only stocks whose first two characters of the ISIN – which is the same regardless of the stock exchange where the stock is listed – indicate that the firm is located in a Eurozone country.[9]

The variable $Announcement_t$ is a dummy variable identifying, for each announcement, the days before ($Announcement_t = 0$) and after ($Announcement_t = 1$). In particular, we consider the windows: (-1,1), (-2,2), and (-6,6) where zero identifies the announcement date. These event windows are short enough to guarantee that there is no overlap between the after-event period and the pre-event period of consecutive announcements. In particular,

[6] The threshold for the reporting requirements can change over time. Originally, it was 0.2%, but from March 2020 it became 0.1%, and then again 0.2% from March 2021 – see: https://www.centralbank.ie/regulation/industry-market-sectors/securities-markets/short-selling-regulation and https://www.esma.europa.eu/press-news/esma-news/esma-allow-decision-reporting-net-short-position-01-and-above-expire.

[7] Using non-banking institutions as a comparison group in event studies is consistent with previous studies on announcements of policy interventions on banks (Fiordelisi and Ricci 2016).

[8] Non-bank holding companies might receive TLTRO funding. However, our sample does not include non-bank holding companies.

[9] In particular, the first two characters of the ISIN are: AT for Austria, BE for Belgium, DE for Germany, ES for Spain, FI for Finland, FR for France, GR for Greece, IE for Ireland, IT for Italy, and NL for the Netherlands.

$Announcement_t = 1$ for (0,1), (0,2) and (0,6). The coefficient of interest is ϕ_{it}, which measures the effect of the announcements on bank stocks relative to non-bank stocks.

4 Results

4.1 Aggregate effect of TLTROs

Table 4 reports our main results, using both equal-weighted and market-weighted portfolios. In this analysis, we employ MSCI Europe as a proxy for the market portfolio. In particular, in Columns (1) and (2), we use an estimation window of 120 trading days, while in Columns (3) and (4), we use an estimation window of 90 trading days. We also report the bootstrapped p-values for the CAR based on 1,000 simulations for the period starting from June 5, 2014, to May. 29, 2020, as discussed above.

In Panel A of Table 4, we present the results for all 12 policy announcements. We find that the investors react neither positively nor negatively to the TLTRO program. This result does not support **H1**. For this reason, we also provide an analysis of the investors' reaction to different types of announcement. Such a decomposition uncovers important heterogeneities. First, when we exclude the five events related to technical aspects of the TLTRO program (Panel B), we observe a significant positive aggregate price reaction, unlike the case for all 12 announcements (Panel A). The magnitude of the effect is also significant. The average market capitalization for our sample banks is 721 billion euros and the total CAR for the 12 events is 15.7%, implying a rise in market capitalization of 113 billion euros. However, for events related to a reduction in the interest rate for banks participating in the

TLTRO program (Panel D) we find a significant positive price reaction for the whole sample (total CAR for the market-weighted portfolio: 10.5%), equivalent to a gain in total market capitalization of 75.71 billion euros. For announcements related to technical aspects the results are statistically insignificant.

[INSERT TABLE 4 HERE]

In Table 5, we report the results for each of the 12 announcements. Most of the announcements do not lead to CARs statistically significant at the 5% level. The only announcement that appears to lead to a positive and statistically significant CAR is announcement number 11, related to an interest rate cut.

[INSERT TABLE 5 HERE]

Finally, as a preliminary test of our hypotheses, we compare the price reaction of portfolios constructed as follows: GIIPS and non-GIIPS banks (Table 6); banks with high levels of derivative holdings (High Derivatives) and banks with low levels of derivative holdings (Low Derivatives), in Table 7; and GIIPS with High Derivatives versus Low Derivatives (Table 8). We find that GIIPS banks react more positively than non-GIIPS banks, in line with **H2**. The results concerning derivative holdings are less robust. However, the aggregate price reactions are never negative and statistically significant and, the CARs for High Derivatives are statistically significant and larger than those for Low Derivatives in six instances. Finally, the results reported in Table 8 indicate that GIIPS banks tend to have a better price reaction when they hold a higher level of derivatives.

[INSERT TABLES 6, 7 and 8 HERE]

However, these results are based on a univariate analysis. In the next section (Section 4.3), we employ a multivariate analysis approach.

4.2 Further robustness checks for the aggregate reaction

In this section, we report a battery of robustness checks of our findings on the aggregate reaction to TLTRO announcements. These results are reported in the Internet Appendix. First, we re-run our analysis using a different benchmark for the market portfolio, MSCI Europe Bank. Our main findings remain robust, as shown in in Table A2. Second, we investigate whether there are any anticipation effects by estimating CARs for placebo events corresponding to five trading days before each of our announcements. Table A3 reports our results. Since the coefficients related to the placebo events remain statistically insignificant for our main results, anticipation effects are unlikely to drive our main results. Third, we investigate the potential influence of bank-level confounding events. In particular, we allow for announcements related to dividends, changes in the board of directors of the bank, and official announcements and rumors of M&A deals[10] that occur three calendar days before or after any of the 12 TLTRO announcements. For the M&A events, we include cases in which the banks from our sample are involved as "target", "vendor", and "acquiror", respectively.[11]

The results reported in Table A4, are very similar to those in Table 4.[12]

[10] For this analysis, we rely on Zephyr from Bureau Van Dijk.

[11] M&A deals refer to those activities related to acquisitions, institutional buy-outs, capital increases, management buy-ins (MBIs), management buy-outs (MBOs), mergers, demergers, purchases of minority stakes, and share-buy-backs.

[12] We perform two further robustness checks, whose results are similar to those in Table 4 and are available

4.3 Bank characteristics and targeted-liquidity provisions

In Table 9, we report the results of the cross-sectional regressions. The coefficient on *GIIPS* is positive and statistically significant at 1% in all the regressions. Moreover, the coefficient on *Debt to GDP ratio* is statistically significant at 5% (or better), confirming that banks located in countries with high sovereign debt levels experience better price reactions TLTRO announcements than other banks, coherent with **H2**.

The coefficient on *Derivatives* is positive and statistically significant (at 1% level). When we distinguish between asset-side derivatives (*Asset-Side Derivatives*) and liabilities-side derivatives (*Liabilities-Side Derivatives*), both variables enter the regressions with a positive and statistically significant coefficient (Columns 2, 3, 5 and 6). These results indicate that the TLTRO program is particularly advantageous to banks with a higher fraction of derivative holdings, supporting **H3a**. We interpret this result as evidence of a positive effect of asset encumbrance on the price reaction: lower funding costs enable banks to have a higher degree of asset encumbrance (Ahnert et al. 2019), improving shareholder wealth. The positive coefficient on both *Asset-Side Derivatives* and *Liabilities-Side Derivatives* supports this interpretation because both of them increase the need for collateral, and thus asset encumbrance.[13]

upon request. First, since 26% of our sample consists of Italian banks, we re-run our main regressions without Italian banks. Second, recent papers (among others, Amici et al. (2013)), use a slightly different methodology to estimate the price reaction to stock-specific events. This method requires adjustments when estimating the statistical significance of the abnormal returns (Kolari and Pynnönen 2010, Boehmer et al. 1991). However, our setup excludes the possibility of running these tests since we build two (equally- and market-weighted) portfolios to estimate the overall price reaction. This setup eliminates by default bias deriving from cross-sectional correlation in stock-level abnormal returns. To allow for potential volatility clustering, we follow Bruno et al. (2018) – whose methodology is also based on constructing portfolios – and employ an AR(1)-GARCH(1,1) model to allow for volatility clustering.

[13] These results are consistent with those in Table 6 and 7.

These findings are robust to the inclusion of bank fixed effects and the length of the estimation window.[14] When we use bank fixed effects, the time-invariant variables in our regressions are omitted (the dummies *GIIPS* and *G-SIBs*).[15] In the regressions with the bank fixed effects, the magnitude of some coefficients increases.

Among the controls, *Size* enters all regressions with a statistically insignificant coefficient. The coefficient on *NIM* is positive and statistically significant at the 10% level, while the coefficients on *NFI* is statistically significant, indicating that banks whose income structure depends mainly on lending activities benefit more from the TLTRO announcements. Finally, the coefficients on *G-SIBs* are statistically insignificant.

[INSERT TABLE 9 HERE]

In Table 10, we dig deeper into the effect of derivative holdings to rule out possible alternative explanations and to examine their interactions with other variables related to different bank business models. In particular, it might be argued that derivative holdings are capturing other features of bank business models that are unrelated to asset encumbrance but might affect the price reaction because of their relation with bank risk and funding structure. For this reason, we add to our model three additional controls: *TIER1 ratio*, or the ratio of regulatory Tier 1 capital divided by risk-weighted assets; *NPL ratio*, calculated as non-performing loans dividend by total loans; and *Liquidity*, which is the ratio of liquid assets to total assets. In addition to using these variables as controls, we also generate three

[14] For the sake of brevity, this set of results is available upon request.

[15] Omitting the variable *Debt to GDP ratio*, for consistency with the fact that we do not have *GIIPS*, leaves the results virtually unaltered.

dummies, *High TIER1*, *High NPL*, and *High Liquidity*. These dummies are equal to one for observations for which the values of the corresponding continuous variable – *TIER1 ratio*, *NPL ratio*, and *Liquidity* – are above the median, and zero otherwise. We then interact these binary variables with *Total Derivatives* to examine whether the channel through which *Total Derivatives* affects the price reaction depends on bank capitalization levels, credit risk, and liquidity.

[INSERT TABLE 10 HERE]

Table 10 indicates that the results for *Total Derivatives* are robust to the inclusion of the three controls mentioned (see columns (1) and (4)). Adding the dummies and their respective interaction terms leaves the coefficients on *Total Derivatives* positive and statistically significant. The coefficients on the dummies and their interaction terms are statistically insignificant at the 5% level, except for the coefficient on the interaction between *High NPL* and *Total Derivatives* (see columns (3) and (7)), which is positive and significant. This finding suggests that the positive impact of *Total Derivatives* on the price reaction becomes even stronger for banks with high credit risk. These results are consistent with Altavilla et al. (2018), who find that banks with high NPL ratios benefit to a greater extent from monetary policy easing. Finally, we also add an interaction term between *GIIPS* and *Total Derivatives* to investigate if the positive impact of derivatives holdings on the price reaction is stronger for banks in GIIPS countries (column (5)). However, the interaction term *GIIPS*High Derivatives* enters the regressions with a statistically insignificant coefficient.

4.4 Robustness tests: Cross-sectional regressions

In this Section, we report additional robustness tests. The tables with the results of these tests are in the Internet Appendix.

First, we replace MSCI Europe with MSCI Europe Bank as a proxy for the market portfolio to check whether our results rely on the market index chosen. The results are reported in Table A5 and align with those previously shown in Table 9. We obtain virtually the same results when we use country-level indices as a proxy for the market portfolio, as reported in Table A6.[16]

Second, we investigate the potential effect of confounding events. In particular, we allow for announcements related to dividends, changes in the board of directors of the bank, and official announcements and rumors of M&A deals[17] that occur three calendar days before or after any of the 12 TLTRO announcements. For the M&A events, we include cases in which the banks from our sample are involved as "target", "vendor", and "acquiror", respectively.[18] We present the results for the regressions on CARs after excluding observations with confounding events in Table A7. The results are virtually the same as those reported in Table 9.[19]

Third, we further explore how bank-specific and macroeconomic variables are correlated with the estimated CARs (Table A8). More specifically, we focus on CARs related to the

[16] We use the same indices considered by Bruno et al. (2018), and four additional indices: SAX 16 (Slovakia), SBI TOP (Slovenia), OMXT (Estonia), and OMXV (Lithuania).

[17] For this analysis, we rely on Zephyr from Bureau Van Dijk.

[18] M&A deals refer to those activities related to acquisitions, institutional buy-outs, capital increases, management buy-ins (MBIs), management buy-outs (MBOs), mergers, demergers, purchases of minority stakes, and share-buy-backs.

[19] We also repeat the same analysis by checking whether our results remain stable after the inclusion of the to the bank price reaction to the predecessor of TLTRO program (LTRO). The results remain stable.

launch of the three TLTRO waves and the reduction of the TLTRO interest rates (Events 1, 4, 5, 7, 10, 11 and 12). We find similar results to those reported in Section 4.3: banks with higher levels of derivative holdings react more positively to these announcements, and banks located in one of the GIIPS countries, react more positively to these announcements.

Fourth, we run the analysis again, considering several types of derivatives rather than all derivatives. In particular, we consider interest rate derivatives, FX derivatives, equity derivatives, commodity derivatives, and credit derivatives. For each category of derivatives, we consider its notional value scaled by total assets. The results are similar to those reported in Table 9 and are reported in Table A9, with the only exception for equity derivatives, for which the coefficient enters the regression with a non-significant sign.

Finally, we run a placebo analysis based on running the regressions on the CARs (equation 3) estimated for the window (-5,-3). The results, reported in Table A10, show that the coefficients on the variables of interest (e.g. *Total Derivatives*) become insignificant. These findings indicate that the negative impact of *Total Derivatives* in our main regressions are not due to a systematic relation between the CARs and the explanatory variables, confirming that their estimated effects on the price reaction to TLTRO announcements are genuine.

4.5 Results for net short positions

Table 11 reports the results of the regressions run according to equation (4) for the windows (-1,1) (Panel A), (-2,2) (Panel B), and (-6,6) (Panel C). Events related to the launch of the three TLTRO waves are associated with a reduction in the net short positions for the banks in our sample. This finding supports our hypothesis on short-sellers' behaviour

(**H4**): investors reduced their short positions on the stocks of Eurozone banks as a result of the TLTRO announcements. Thus, although TLTRO funding could lead to higher credit risk, short sellers do not believe this will ultimately lead to lower bank stock prices, at least in the short term.

[INSERT TABLES 11]

We then exploit the data on short positions to further examine anticipation effects. We consider the possibility that institutional investors changed their net short positions on the stocks of the banks in our sample before the ECB announcements, we run the regressions on net short positions (equation (4)) in pre-event windows. In particular, we consider the following pre-announcement windows: (-4,-2), (-5,-3), and (-6,-2), where the actual TLTRO announcements occur at zero, and $Announcement_t = 1$ for (-3,-2), (-4,-3), and (-3,-2), respectively. Table A14, in the Internet Appendix, reports the results. All the coefficients of interest are statistically insignificant, indicating no anticipation effects.

We also examine changes in Amihud's illiquidity ratio (Amihud 2002) around the TLTRO event dates. We do this because a reduction in short positions on bank stocks does not automatically imply an improvement in liquidity. In fact, short-sellers might improve price discovery and informativeness (Brunnermeier and Pedersen 2009, Beber and Pagano 2013). More specifically, we run the regressions again using the ratio of absolute stock returns divided by stock trading volume as a dependent variable in equation (4),[20] instead of $Short_{it}$. We find some evidence of a decrease in Amihud's illiquidity ratio around the days of the

[20]We collect data from Compustat Global for closing daily prices ("prccd") and trading volumes ("cshtrd"), as well as adjustment factors ("trfd" and "ajexdi").

announcements (Table 12), suggesting an improvement in market liquidity.

[INSERT TABLE 12 HERE]

The results in this section, combined with those regarding the aggregate price reaction, highlight that short sellers respond differently to TLTRO announcements relative to the general market. However, the reduction in short-selling activities is not associated to a reduction in the security market liquidity (Liu 2015).

5 Other robustness checks and extensions

In this Section, we dig deeper into the analysis of the drivers of the investors' reaction to the ECB announcements and changes in net short positions.

It might be argued that we are capturing changes in investor behavior unrelated to the TLTRO announcements. While we have already partly addressed this issue by allowing for confounding events and placebo tests in Sections 4.2 and 4.4, we further investigate this issue by testing whether the CARs for announcements related to the three TLTRO waves predict TLTRO usage. Besides, we examine the effect of TLTRO announcements on retail investor attention. This analysis is reported in Sections 5.1 and 5.2, respectively.

5.1 Do investors anticipate TLTRO announcements?

In this sub-section, we investigate the extent to which the price reaction reflects investor expectations regarding the potential repercussions of the TLTRO program on shareholder wealth. We employ the Google Search Volume Index (SVI) as a proxy for retail investor

attention (Da et al. 2011). Specifically, we examine whether the Google SVI for the word "TLTRO" is higher during weeks related to one of the 12 announcements in our sample than in other weeks. We cannot run this analysis at the daily level because the Google SVI data is available only at the monthly and weekly level for a prolonged period of time such as our sample period. The Google SVI is computed by counting the number of searches for a given topic during a certain week. This value is then standardized to obtain a score from 0 to 100. We display the time trend of the Google SVI for "TLTRO" over our sample period in Figure A3. In most cases, the Google SVI tends to spike in weeks when there are TLTRO announcements.

In Table 13, Panel A, we present the results of Wilcoxon rank-sum tests to examine whether the Google SVI tends to be higher in weeks related to the TLTRO announcements ("Event weeks") than in weeks when there are no TLTRO announcements ("No-event weeks"). The results suggest that investor attention is higher in "Event weeks" than in "No-event weeks" when we consider all 12 announcements, the seven announcements for the three TLTRO waves and the four announcements of reductions in the TLTRO interest rates, and the five announcements related to technical aspects.

To further examine the possibility that our results are confounded by retail investor attention unrelated to the TLTRO announcements, we also examine the Google SVI for the tickers of the banks in our sample. As explained by Da et al. (2011), if one searches for a stock using its ticker, rather than the name of its issuer, it is likely that such a search is motivated by the intention to invest in that stock. Searching for the bank name, on the other

hand, could be related to other reasons, such as comparing banking products provided by different banks. Thus, if the Google SVI for the tickers of the bank stocks in our sample does not go up in the weeks of the TLTRO announcements, it is plausible that we are capturing the price reaction to the TLTRO announcements, rather than retail investor attention due to other bank-specific events.

In Panel B of Table 13, the results for the Google SVI for the tickers of the bank stocks in our sample are statistically insignificant. This is consistent with the view that the price reaction we are capturing is unrelated to retail investor attention driven by bank-specific events instead of the TLTRO announcements.[21]

[INSERT TABLES 13 HERE]

5.2 Does the market reaction matter for the bank TLTRO uptakes?

In this section, we use probit regressions to examine the extent to which investors' reaction to the three waves of TLTRO announcements has significant predictive power with respect to the choice of a bank to exploit funding provided by the TLTRO program. We run the following probit models, separately for each of the three waves of the TLTRO program (TLTRO-I, TLTRO-II, and TLTRO-III):

$$TLTRO_i = \theta + \psi_1 CAR_i + \delta_i \tag{5}$$

[21] Second, we also include this variable to check the sensitivity of our results related to the cross-sectional variation of CARs to the investor attention around a given stock in our sample. Even in this case, the results remain unaltered.

where $TLTRO_i$ is equal to one if bank i receives TLTRO funding for that particular wave. As before, the CARs are estimated using the event window (-1,1), and estimation windows equal to 120 and 90 days. Moreover, to assess the predictive power of the CARs relative to other variables, we also run equation 5 augmented with the following control variables: *Size*, *NIM*, and *NFI*:

$$TLTRO_i = \theta + \psi_1 CAR_i + \psi_2 Size_i + \psi_2 NIM_i + \psi_3 NFI_i + \delta_i \tag{6}$$

Consistent with the literature on predicting distress in banks (Betz et al. 2014), we assess the predictive power of the CARs by comparing the areas under the Receiver Operating Characteristic (ROC) curves for models based on equations 5 and 6. ROC curves are based on calculating, for each predicted value of the dependent variable, both the proportion of correctly predicted cases for which $TLTRO_i = 1$ (True Positive Rate, TPR) and the proportion of cases for which the model mistakenly predicts $TLTRO_i = 1$ (False Positive Rate, FPR). In particular, the ROC curves are plots of the TPR (also known as Sensitivity) on the FPR (Dimmock and Gerken 2012). Since the FPR is equal to one minus the True Negative Rate (TNR, also known as Specificity), the ROC curves are often depicted using the label "Sensitivity" for the Y-axis and "$(1 -$ Specificity)" for the X-axis. This is the convention that we also follow for the Figure below.

As shown in Figure A4 reported in the Internet Appendix, the predicting power of the models based on equation 5 is very high (over 0.8), apart from the ones for TLTRO-III. If we compare these graphs with those for equation 6, as shown in Figure A5 (reported in the

Online Internet Appendix), it is clear that the control variables have only a marginal impact on the predictive power of the model for TLTRO-I and TLTRO-II, while for TLTRO-III their contribution is much higher: the area under the ROC curves is around 0.78 for equation 6 and just below 0.6 for equation 5.

In addition to the area under the ROC curves, we examine the values of the ROC curves at specific cut-off points for the FPR. The ROC curves in Figure A4 appear rather steep at the beginning, suggesting a high predictive power at low false positive rates. For example, the model related to TLTRO-I using an estimation window of 120 trading days (top-left graph in Figure A4) correctly predicts around 42% of cases for which $TLTRO_i = 1$ at a FPR of 5%, indicating that the predictive power of the model is economically meaningful. The corresponding value of the ROC curve for the model including the controls (top-left graph in Figure A5) correctly predicts around 53% of cases for which $TLTRO_i = 1$ at a FPR of 5%.

6 Conclusions

In this paper, we have examined the valuation effects of optional bank funding liquidity earmarked for lending to the real economy. Our main findings indicate that investors do not perceive this type of funding to benefit all eligible banks. However, we are the first to show that the price reaction is better for banks with high levels of derivative holdings and sovereign risk, two variables that tend to be positively associated with asset encumbrance and funding costs.

A potential critique to our approach is that we are not correctly capturing the price reaction to the TLTRO program because of confounding events. We have addressed this issue using both traditional and new methodological approaches. As an example of the former, we have re-estimated our models after excluding observations related to bank-specific confounding events, and we have employed estimation windows with different lengths. Following previous literature (among others, Bruno et al. (2018)), we have also employed bootstrap analysis and we have conducted placebo and falsification tests to understand if the market anticipates such a release of new information. In addition to these common checks, we have assessed the predictive power of the price reaction to the policy announcements with respect to the future choice of a bank to apply for funding. Moreover, we have examined changes in retail investor attention and net short positions on the banks in our sample.

Our findings bear two important policy implications. First, the TLTRO program is especially favorable to banks with high derivative holdings and sovereign risk. Since derivatives' trading and central bank funding are major sources asset encumbrance (EBA 2021), our findings suggest that the market might encourage further increases in asset encumbrance, which eventually might exacerbate financial fragility and, as suggested by Ahnert et al. (2019), limits on asset encumbrance might be necessary to reduce risk-shifting incentives. This risk is even higher for banks with high NPL ratios, and thus TLTRO funding might also be used to prop up unproductive borrowers. Ultimately, the increase in asset encumbrance and credit risk in these banks might exacerbate financial stability.

Second, this study bears important implications related to the relationship between

short-selling activities and bank stability. Recent theoretical literature posits that banks with weaker fundamentals and banks more exposed to potential funding shock are more likely to experience short-selling attacks (Liu 2015). Our findings on net short positions are consistent with the view that optional funding liquidity might reduce the probability of short-selling attacks on bank stocks. Thus, optional funding liquidity for banks can be a substitute for short-sale bans. However, while short-sale bans tend to decrease market liquidity, our results suggest that optional funding liquidity might increase it. Furthermore, our findings confirm that the view that optional funding liquidity might also reduce the probability of short-selling attacks on bank stocks, without impairing the security market liquidity.

References

Acharya, V. V., Drechsler, I. & Schnabl, P. (2014), 'A pyrrhic victory? bank bailouts and sovereign credit risk', *The Journal of Finance* **69**(6), 2689–2739.

Acharya, V. V., Eisert, T., Eufinger, C. & Hirsch, C. (2019), 'Whatever it takes: The real effects of unconventional monetary policy', *The Review of Financial Studies* **32**(9), 3366–3411.

Acharya, V. V. & Steffen, S. (2015), 'The "greatest" carry trade ever? understanding eurozone bank risks', *Journal of Financial Economics* **115**(2), 215–236.

Adrian, T. & Shin, H. S. (2008), 'Financial intermediaries, financial stability, and monetary policy', *FRB of New York staff report* (346).

Ahern, K. R. (2017), 'Information networks: Evidence from illegal insider trading tips', *Journal of Financial Economics* **125**(1), 26–47.

Ahmed, A. S., Kilic, E. & Lobo, G. J. (2011), 'Effects of sfas 133 on the risk relevance of accounting measures of banks' derivative exposures', *The Accounting Review* **86**(3), 769–804.

Ahnert, T., Anand, K., Gai, P. & Chapman, J. (2019), 'Asset encumbrance, bank funding, and fragility', *The Review of Financial Studies* **32**(6), 2422–2455.

Ait-Sahalia, Y., Andritzky, J., Jobst, A., Nowak, S. & Tamirisa, N. (2012), 'Market response

to policy initiatives during the global financial crisis', *Journal of International Economics* **87**(1), 162–177.

Albertazzi, U., Barbiero, F., Marqués-Ibáñez, D., Popov, A. A., d'Acri, C. R. & Vlassopoulos, T. (2020), 'Monetary policy and bank stability: the analytical toolbox reviewed'.

Altavilla, C., Boucinha, M. & Peydró, J.-L. (2018), 'Monetary policy and bank profitability in a low interest rate environment', *Economic Policy* **33**(96), 531–586.

Amici, A., Fiordelisi, F., Masala, F., Ricci, O. & Sist, F. (2013), 'Value creation in banking through strategic alliances and joint ventures', *Journal of Banking & Finance* **37**(5), 1386–1396.

Amihud, Y. (2002), 'Illiquidity and stock returns: cross-section and time-series effects', *Journal of Financial Markets* **5**(1), 31–56.

Ampudia, M. & Van den Heuvel, S. J. (2022), 'Monetary policy and bank equity values in a time of low and negative interest rates', *Journal of Monetary Economics, forthcoming* .

Andrade, P., Cahn, C., Fraisse, H. & Mésonnier, J.-S. (2018), 'Can the provision of long-term liquidity help to avoid a credit crunch? Evidence from the eurosystem's LTRO', *Journal of the European Economic Association* **17**(4), 1070–1106.

Arellano, M. (1993), 'On the testing of correlated effects with panel data', *Journal of Econometrics* **59**(1-2), 87–97.

Armstrong, C. S., Barth, M. E., Jagolinzer, A. D. & Riedl, E. J. (2010), 'Market reaction to the adoption of ifrs in europe', *The Accounting Review* **85**(1), 31–61.

Baker, M. & Wurgler, J. (2015), 'Do strict capital requirements raise the cost of capital? bank regulation, capital structure, and the low-risk anomaly', *American Economic Review* **105**(5), 315–20.

Bayazitova, D. & Shivdasani, A. (2012), 'Assessing TARP', *The Review of Financial Studies* **25**(2), 377–407.

Beber, A., Fabbri, D., Pagano, M. & Simonelli, S. (2021), 'Short-selling bans and bank stability', *The Review of Corporate Finance Studies* **10**(1), 158–187.

Beber, A. & Pagano, M. (2013), 'Short-selling bans around the world: Evidence from the 2007–09 crisis', *The Journal of Finance* **68**(1), 343–381.

Benetton, M. & Fantino, D. (2021), 'Targeted monetary policy and bank lending behavior', *Journal of Financial Economics* .

Bernanke, B. S. & Kuttner, K. N. (2005), 'What explains the stock market's reaction to federal reserve policy?', *The Journal of Finance* **60**(3), 1221–1257.

Berthonnaud, P., Cesati, E., Drudi, M. L., Jager, K., Kick, H., Lanciani, M., Schneider, L., Schwarz, C., Siakoulis, V. & Vroege, R. (2021), 'Asset encumbrance in euro area banks: Analysing trends, drivers and prediction properties for individual bank crises', *SSRN Electronic Journal* .

Betz, F., Oprică, S., Peltonen, T. A. & Sarlin, P. (2014), 'Predicting distress in european banks', *Journal of Banking & Finance* **45**, 225–241.

Blau, B. M., DeLisle, J. R. & Price, S. M. (2015), 'Do sophisticated investors interpret earnings conference call tone differently than investors at large? evidence from short sales', *Journal of Corporate Finance* **31**, 203–219.

Blau, B. M., Fuller, K. P. & Van Ness, R. A. (2011), 'Short selling around dividend announcements and ex-dividend days', *Journal of Corporate Finance* **17**(3), 628–639.

Blau, B. M. & Pinegar, J. M. (2013), 'Are short sellers incrementally informed prior to earnings announcements?', *Journal of Empirical Finance* **21**, 142–155.

Boehmer, E., Masumeci, J. & Poulsen, A. B. (1991), 'Event-study methodology under conditions of event-induced variance', *Journal of Financial Economics* **30**(2), 253–272.

Bomfim, A. N. (2003), 'Pre-announcement effects, news effects, and volatility: Monetary policy and the stock market', *Journal of Banking & Finance* **27**(1), 133–151.

Breusch, T. S. & Pagan, A. R. (1980), 'The lagrange multiplier test and its applications to model specification in econometrics', *The Review of Economic Studies* **47**(1), 239–253.

Brunnermeier, M. K. & Pedersen, L. H. (2009), 'Market liquidity and funding liquidity', *The Review of Financial Studies* **22**(6), 2201–2238.

Bruno, B., Onali, E. & Schaeck, K. (2018), 'Market reaction to bank liquidity regulation', *Journal of Financial and Quantitative Analysis* **53**(2), 899–935.

Carpinelli, L. & Crosignani, M. (2021), 'The design and transmission of central bank liquidity provisions', *Journal of Financial Economics* **141**(1), 27–47.

Christensen, H. B., Hail, L. & Leuz, C. (2016), 'Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement', *The Review of Financial Studies* **29**(11), 2885–2924.
URL: *https://doi.org/10.1093/rfs/hhw055*

Correa, R., Lee, K.-H., Sapriza, H. & Suarez, G. A. (2014), 'Sovereign credit risk, banks' government support, and bank stock returns around the world', *Journal of Money, Credit and Banking* **46**(s1), 93–121.

Cortes, G. S., Taylor, B. & Weidenmier, M. D. (2021), 'Financial factors and the propagation of the great depression', *Journal of Financial Economics* .
URL: *https://www.sciencedirect.com/science/article/pii/S0304405X21003755*

Crosignani, M., Faria-e-Castro, M. & Fonseca, L. (2020), 'The (unintended?) consequences of the largest liquidity injection ever', *Journal of Monetary Economics* **112**, 97–112.

Cubillas, E., Fernández, A. I. & González, F. (2017), 'How credible is a too-big-to-fail policy? international evidence from market discipline', *Journal of Financial Intermediation* **29**, 46–67.

Da, Z., Engelberg, J. & Gao, P. (2011), 'In search of attention', *The Journal of Finance* **66**(5), 1461–1499.

Davila, E. & Walther, A. (2020), 'Does size matter? Bailouts with large and small banks', *Journal of Financial Economics* **136**(1), 1–22.

Dimmock, S. G. & Gerken, W. C. (2012), 'Predicting fraud by investment managers', *Journal of Financial Economics* **105**(1), 153–173.

Drake, M. S., Rees, L. & Swanson, E. P. (2011), 'Should investors follow the prophets or the bears? evidence on the use of public information by analysts and short sellers', *The Accounting Review* **86**(1), 101–130.

Drechsler, I., Drechsel, T., Marques-Ibanez, D. & Schnabl, P. (2016), 'Who borrows from the lender of last resort?', *The Journal of Finance* **71**(5), 1933–1974.

EBA (2021), Report on asset encumbrance, Technical report, European Banking Authority.

Enders, Z., Hünnekes, F. & Müller, G. J. (2019), 'Monetary policy announcements and expectations: Evidence from german firms', *Journal of Monetary Economics* **108**, 45–63.

Engelberg, J. E., Reed, A. V. & Ringgenberg, M. C. (2012), 'How are shorts informed?: Short sellers, news, and information processing', *Journal of Financial Economics* **105**(2), 260–278.

Engler, P. & Große Steffen, C. (2016), 'Sovereign risk, interbank freezes, and aggregate fluctuations', *European Economic Review* **87**, 34–61.

English, W. B., Van den Heuvel, S. J. & Zakrajšek, E. (2018), 'Interest rate risk and bank equity valuations', *Journal of Monetary Economics* **98**, 80–97.

Fiordelisi, F. & Ricci, O. (2016), "'whatever it takes": an empirical assessment of the value of policy actions in banking', *Review of Finance* **20**(6), 2321–2347.

Flanagan, T. (2019), 'Stealth recapitalization and bank risk taking: Evidence from TLTROs', *SSRN Electronic Journal* .

Fratzscher, M., Duca, M. L. & Straub, R. (2016), 'Ecb unconventional monetary policy: Market impact and international spillovers', *IMF Economic Review* **64**(1), 36–74.

Fratzscher, M. & Rieth, M. (2019), 'Monetary policy, bank bailouts and the sovereign-bank risk nexus in the euro area', *Review of Finance* **23**(4), 745–775.

Froot, K. A., Scharfstein, D. S. & Stein, J. C. (1993), 'Risk management: Coordinating corporate investment and financing policies', *The Journal of Finance* **48**(5), 1629–1658.

Gandhi, P. & Lustig, H. (2015), 'Size anomalies in u.s. bank stock returns', *The Journal of Finance* **70**(2), 733–768.

Gandhi, P., Lustig, H. & Plazzi, A. (2020), 'Equity is cheap for large financial institutions', *The Review of Financial Studies* **33**(9), 4231–4271.

Hartmann, P. & Smets, F. (2018), The first twenty years of the european central bank: monetary policy, Working Paper Series 2219, European Central Bank.

Kolari, J. W. & Pynnönen, S. (2010), 'Event study testing with cross-sectional correlation of abnormal returns', *The Review of Financial Studies* **23**(11), 3996–4025.

Linzert, T., Nautz, D. & Bindseil, U. (2004), 'The longer term refinancing operations of the ecb', *Available at SSRN 533028* .

Liu, X. (2015), 'Short-selling attacks and creditor runs', *Management Science* **61**(4), 814–830.

Onali, E., Ginesti, G. & Vasilakis, C. (2017), 'How should we estimate value-relevance models? insights from european data', *The British Accounting Review* **49**(5), 460–473.

Perdichizzi, S., Duqi, A., Molyneux, P. & Al Tamimi, H. (2023), 'Does unconventional monetary policy boost local economic development? the case of tltros and italy', *Journal of Banking & Finance* **148**, 106736.

Purnanandam, A. (2007), 'Interest rate derivatives at commercial banks: An empirical investigation', *Journal of Monetary Economics* **54**(6), 1769–1808.

Raz, A. F., McGowan, D. & Zhao, T. (2022), 'The dark side of liquidity regulation: Bank opacity and funding liquidity risk', *Journal of Financial Intermediation, forthcoming* p. 100990.

Ricci, O. (2015), 'The impact of monetary policy announcements on the stock price of large european banks during the financial crisis', *Journal of Banking & Finance* **52**, 245–255.

Upper, C. (2006), 'Derivatives activity and monetary policy', *BIS Quarterly Review* .

Venkatachalam, M. (1996), 'Value-relevance of banks' derivatives disclosures', *Journal of Accounting and Economics* **22**(1-3), 327–355.

Wooldridge, J. M. (2010), *Econometric analysis of cross section and panel data*, MIT press.

Table 1: **Event dates**
This table describes the 12 TLTRO announcements.

Event date	Short description	Event
05/06/2014	The ECB announces the first wave of TLTRO (TLTRO-I).	1
03/07/2014	The ECB releases information on technical aspects of the implementation of TLTRO-I.	2
29/07/2014	The ECB publishes legal acts concerning TLTRO-I.	3
22/01/2015	The ECB announces a reduction in the TLTRO-I interest rate. The 10 basis point spread over the Eurosystem Main Refinancing Operations (MRO) rate is eliminated for operations occurring between March 2015 and June 2016.	4
10/03/2016	The ECB announces the second wave of TLTRO (TLTRO-II).	5
03/05/2016	The ECB publishes legal acts concerning TLTRO-II.	6
07/03/2019	The ECB announces the third wave of TLTRO (TLTRO-III).	7
06/06/2019	The ECB releases the key parameters and interest rates for TLTRO-III.	8
22/07/2019	The ECB publishes a document concerning the rules for participation and other details regarding the implementation of TLTRO-III.	9
12/09/2019	The ECB announces a reduction of the of TLTRO-III interest rate and the extension of the maturity to three years with repayment option after two years.	10
12/03/2020	The ECB announces the change in the interest rate, the lending threshold, the borrowing allowance, the bid limit per operation, the repayment option for beneficiary banks, and the settlement period (September 2021).	11
30/04/2020	The ECB decides to modify the interest rate and the starting date of the lending assessment period to be applied to TLTRO-III.	12

Source: *https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html*

Table 2: **Sample composition and representativeness**
This table shows the composition and representativeness of the sample. Panel A reports the number of banks by country and the related frequencies. Panel B reports the sample composition by bank specialization. Panel C reports the representativeness of our sample in terms of total assets, total loans, and total deposits.

Panel A: Country representativeness			
Country	Number of banks	Percent	Cum.
Austria	7	8.54	8.54
Belgium	1	1.22	9.76
Cyprus	1	1.22	10.98
Germany	2	2.44	13.41
Estonia	1	1.22	14.63
Spain	8	9.76	24.39
Finland	3	3.66	28.05
France	17	20.73	48.78
Greece	5	6.10	54.88
Ireland	4	4.88	59.76
Italy	21	25.61	85.37
Lithuania	1	1.22	86.59
Malta	3	3.66	90.24
Netherlands	4	4.88	95.12
Portugal	1	1.22	96.34
Slovenia	1	1.22	97.56
Slovakia	2	2.44	100
Total	*82*	*100*	-

Panel B: Sample composition by bank specialization (listed banks, Eurozone) %			
	Bank & holding companies %	Commercial banks %	Cooperative & Savings banks %
2014	12.00	58.67	29.33
2015	13.33	57.33	29.34
2016	13.16	57.89	28.95
2017	12.82	58.97	28.21
2018	12.35	60.49	27.16
Average	*12.73*	*58.67*	*28.59*

Panel C: Sample representativeness (% All publicly-listed Eurozone banks)			
	Total Assets %	Total Loans %	Total Deposits %
2014	97.49	97.00	98.63
2015	97.59	97.24	98.69
2016	97.69	97.36	98.79
2017	97.94	97.69	98.95
2018	98.06	98.55	98.95
Average	*97.75*	*97.57*	*98.80*

Table 3: **Descriptive statistics**

Panel A of this table reports the descriptive statistics - mean (Mean), median (Median), standard deviation (SD), 25th percentile, and 75th percentile - for variables used in our cross-sectional regressions. The statistics are reported for the full sample. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. *CAR (1,-1) 120* and *CAR (1,-1) 90* are the Cumulative Abnormal Returns for the event window (1,-1), with an estimation window of 120 and 90 trading days, respectively. *TIER1 ratio* is regulatory Tier 1 capital divided by risk-weighted assets. *NPL ratio* is non-performing loans dividend by total loans. *Liquidity* is liquid assets scaled by total assets. *Total Interest Derivatives*, *Total FX Derivatives*, *Total Equity Derivatives*, *Total Commodity Derivatives*, and *Total Credit Derivatives*, are the notional value of each category of derivatives (e.g., interest derivatives) divided by total assets. In Panel B reports the number of banks in our sample and those that receive TLTRO funding, separately for each wave, and LTRO funding.

Panel A	Mean	Median	SD	25th	75th
GIIPS	0.4595	0.0000	0.4986	0.0000	1.0000
Total Derivatives	0.0496	0.0167	0.0825	0.0038	0.0574
Asset-Side Derivatives	0.0265	0.0089	0.0430	0.0014	0.0323
Liabilities-Side Derivatives	0.0231	0.0081	0.0407	0.0016	0.0222
Size	17.4232	17.1485	1.9394	16.1186	18.6994
NIM	0.0156	0.0148	0.0063	0.0107	0.0190
NFI	0.0083	0.0076	0.0053	0.0049	0.0106
G-SIBs	0.0896	0.0000	0.2857	0.0000	0.0000
Debt to GDP	1.0043	0.9760	0.3557	0.7400	1.3480
CAR (1,-1) 120	0.0029	0.000	0.0459	-0.0185	0.0204
CAR (1,-1) 90	0.0046	0.0003	0.0466	-0.0173	0.0224
TIER1 ratio	0.1516	0.1392	0.0450	0.1225	0.1730
NPL ratio	0.0931	0.0460	0.1115	0.0249	0.1050
Liquidity	0.1890	0.1666	0.1220	0.0977	0.2634
Total Interest Derivatives	0.8609	0.0022	2.4338	0.0000	0.3474
Total FX Derivatives	0.1737	0.0026	0.5292	0.0000	0.0379
Total Equity Derivatives	0.0426	0.0000	0.1517	0.0000	0.0179
Total Commodity Derivatives	0.0009	0.0000	0.0041	0.0000	0.0098
Total Credit Derivatives	0.0825	0.0120	0.0964	0.0000	0.0400

Panel B	TLTRO-I	TLTRO-II	TLTRO-III	LTRO
Banks that receive funding (a)	45	45	56	34
Total banks (b)	82	82	82	82
(a)/(b)	55%	55%	68%	41%

Table 4: **Aggregate market reaction to TLTRO announcements.**
This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) portfolios for the whole sample of Eurozone banks. We use the MSCI Europe as a proxy for the market portfolio. In Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. CARs are estimated according to equations (1) and (2). In Panel A, we estimate the CARs for all the 12 Events. In Panel B, we estimate the CARs for events associated with the launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events). In Panel C, we estimate the CARs for the launch of the TLTRO waves (3 events). In Panel D we estimate the CARs for events related to reductions in the TLTRO interest rates (4 events). Finally, in Panel E, we estimate the CARs for events related to technical aspects (5 events) *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for June 5, 2014 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 (Panel A), for seven (Panel B), for three (Panel C), for four (Panel D), and for five (Panel E) randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All announcements (12 events)				
Total	0.078	0.108	0.094	0.127
BS p-values	0.174	0.160	0.124	0.134
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total	0.095*	0.157**	0.108**	0.171**
BS p-values	0.06	0.016	0.018	0.016
Panel C: Launch of the three TLTRO waves (3 events)				
Total	0.036	0.052	0.035	0.053
BS p-values	0.210	0.180	0.228	0.168
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total	0.059*	0.105**	0.073**	0.118**
BS p-values	0.094	0.024	0.042	0.014
Panel E: Announcements related to technical aspects (5 events)				
Total	-0.017	-0.048	-0.014	-0.044
BS p-values	0.654	0.312	0.732	0.374

Table 5: **Aggregate market reaction to each single TLTRO announcements.**
This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) for all the sample of Eurozone banks. We use MSCI Europe as a proxy for the market portfolio. Furthermore, in Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. CARs are estimated according to equations (1) and (2). We estimate CARs for all the 12 single Events. The *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for Jan. 1, 2012 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90		
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW	type
(1) Total	0.011	0.026	0.012	0.028	ann
(1) BS p-values	0.380	0.214	0.358	0.226	ann
(2) Total	0.005	0.010	0.006	0.011	tc
(2) BS p-values	0.725	0.631	0.653	0.603	tc
(3) Total	0.006	0.015	0.008	0.017	tc
(3) BS p-values	0.649	0.464	0.488	0.398	tc
(4) Total	0.024*	0.034	0.025*	0.036	cut
(4) BS p-values	0.100	0.136	0.088	0.112	cut
(5) Total	0.023	0.045*	0.024	0.045*	ann
(5) BS p-values	0.108	0.050	0.110	0.056	ann
(6) Total	0.013	-0.025	0.012	-0.024	tc
(6) BS p-values	0.314	0.258	0.344	0.276	tc
(7) Total	-0.005	-0.020	-0.006	-0.020	ann
(7) BS p-values	0.657	0.366	0.627	0.362	ann
(8) Total	-0.028*	-0.048**	-0.029**	-0.049**	tc
(8) BS p-values	0.068	0.044	0.042	0.042	tc
(9) Total	-0.007	0.004	-0.006	0.005	tc
(9) BS p-values	0.539	0.859	0.633	0.789	tc
(10) Total	0.006	0.013	0.008	0.015	cut
(10) BS p-values	0.619	0.519	0.525	0.478	cut
(11) Total	0.025*	0.067**	0.036**	0.074**	cut
(11) BS p-values	0.094	0.018	0.032	0.012	cut
(12) Total	-0.003	-0.011	-0.002	-0.010	cut
(12) BS p-values	0.755	0.567	0.851	0.629	cut

Table 6: **Aggregate market reaction to TLTRO announcements: GIIPS vs non-GIIPS .**

This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) for GIIPS banks, and non-GIIPS banks. We use MSCI Europe as a proxy for the market portfolio. Furthermore, in Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. In Panel A, we estimate CARs for all the 12 Events. In Panel B, we estimate CARs for events associated with the TLTRO launch programs and reductions in the TLTRO interest rates (7 events). In Panel C, we estimate CARs for the TLTRO launch programs (3 events). In Panel D we estimate CARs for events related to reductions in the TLTRO interest rates (4 events). Finally, in Panel E, we estimate CARs for events related to technical aspects (5 events) *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for June 5, 2014 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 (Panel A), for seven (Panel B), for three (Panel C), for four (Panel D), and for five (Panel E) randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All announcements (12 events)				
Total non-GIIPS	-0.020	0.026	-0.012	0.035
BS p-values	0.260	0.462	0.536	0.362
Total GIIPS	0.098**	0.082*	0.106**	0.091*
BS p-values	0.044	0.064	0.032	0.058
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total non-GIIPS	-0.004	0.052*	0.003	0.059*
BS p-values	0.772	0.080	0.842	0.062
Total GIIPS	0.099**	0.105***	0.105***	0.111***
BS p-values	0.016	0.008	0.002	0.010
Panel C: Launch of the three TLTRO waves (3 events)				
Total non-GIIPS	0.003	0.011	0.004	0.012
BS p-values	0.754	0.582	0.696	0.506
Total GIIPS	0.033	0.041*	0.032	0.041*
BS p-values	0.128	0.082	0.152	0.062
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total non-GIIPS	-0.007	0.041*	0.000	0.047*
BS p-values	0.446	0.070	0.998	0.052
Total GIIPS	0.066**	0.064**	0.073**	0.071***
BS p-values	0.020	0.024	0.014	0.008
Panel E: Announcements related to technical aspects (5 events)				
Total non-GIIPS	-0.016	-0.026	-0.016	-0.024
BS p-values	0.160	0.270	0.174	0.320
Total GIIPS	-0.001	-0.023	0.001	-0.020
BS p-values	0.976	0.422	0.946	0.478

Table 7: **Aggregate market reaction to TLTRO announcements: High vs Low Derivatives.**

This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) for two different portfolio based on the ratio of total derivatives to total assets of Eurozone banks. High Derivatives correspond to observations for which *Total Derivatives* is above the sample median, while Low Derivatives refers to observations for which *Total Derivatives* is equal to or below the sample median. We use MSCI Europe as a proxy for the market portfolio. Furthermore, in Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. CARs are estimated according to equations (1) and (2). In Panel A, we estimate CARs for all the 12 Events. In Panel B, we estimate CARs for events associated with the TLTRO launch programs and reductions in the TLTRO interest rates (7 events). In Panel C, we estimate CARs for the TLTRO launch programs (3 events). In Panel D we estimate CARs for events related to reductions in the TLTRO interest rates (4 events). Finally, in Panel E, we estimate CARs for events related to technical aspects (5 events) *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for Jan. 1, 2012 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 (Panel A), for seven (Panel B), for three (Panel C), for four (Panel D), and for five (Panel E) randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
Panel A: All announcements (12 events)				
Total High Derivatives	0.023	0.097	0.031	0.113
BS p-values	0.356	0.170	0.290	0.146
Total Low Derivatives	0.013	0.009*	0.018	0.010**
BS p-values	0.438	0.058	0.320	0.036
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total High Derivatives	0.045**	0.140**	0.052**	0.152**
BS p-values	0.036	0.020	0.016	0.022
Total Low Derivatives	0.023	0.012***	0.027*	0.012***
BS p-values	0.138	0.006	0.052	0.000
Panel C: Launch of the three TLTRO waves (3 events)				
Total High Derivatives	0.017	0.048	0.018	0.050
BS p-values	0.192	0.178	0.170	0.156
Total Low Derivatives	0.006	0.003	0.005	0.002
BS p-values	0.462	0.264	0.544	0.290
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total High Derivatives	0.028*	0.091**	0.034**	0.103**
BS p-values	0.070	0.036	0.042	0.024
Total Low Derivatives	0.017	0.009***	0.022*	0.010***
BS p-values	0.120	0.002	0.052	0.000
Panel E: Announcements related to technical aspects (5 events)				
Total High Derivatives	-0.010	-0.003	-0.008	-0.002
BS p-values	0.360	0.374	0.470	0.538
Total Low Derivatives	-0.023	-0.042	-0.022	-0.039
BS p-values	0.178	0.344	0.212	0.388

Table 8: **Aggregate market reaction to TLTRO announcements: GIIPS High Derivatives vs GIIPS Low Derivatives.**
This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) for two different portfolio based on the ratio of total derivatives to total assets and the banks located in GIIPS countries. We use MSCI Europe as a proxy for the market portfolio. Furthermore, in Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. CARs are estimated according to equations (1) and (2). In Panel A, we estimate CARs for all the 12 Events. In Panel B, we estimate CARs for events associated with the TLTRO launch programs and reductions in the TLTRO interest rates (7 events). In Panel C, we estimate CARs for the TLTRO launch programs (3 events). In Panel D we estimate CARs for events related to reductions in the TLTRO interest rates (4 events). Finally, in Panel E, we estimate CARs for events related to technical aspects (5 events) *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for Jan. 1, 2012 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 (Panel A), for seven (Panel B), for three (Panel C), for four (Panel D), and for five (Panel E) randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All announcements (12 events)				
Total GIIPS High Derivatives	0.0271	0.0699*	0.0313	0.0774*
BS p-values	0.1200	0.0700	0.1080	0.0680
Total GIIPS Low Derivatives	0.0244	0.0101**	0.0278	0.0111**
BS p-values	0.1320	0.0400	0.1020	0.0280
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total GIIPS High Derivatives	0.0385***	0.0884**	0.0420***	0.0941**
BS p-values	0.0080	0.0120	0.0000	0.0120
Total GIIPS Low Derivatives	0.0337**	0.0126***	0.0359***	0.0129***
BS p-values	0.0220	0.0060	0.0020	0.0000
Panel C: Launch of the three TLTRO waves (3 events)				
Total GIIPS High Derivatives	0.0148*	0.0371*	0.0155*	0.0375*
BS p-values	0.0880	0.0780	0.0760	0.0580
Total GIIPS Low Derivatives	0.0072	0.0026	0.0063	0.0023
BS p-values	0.3700	0.2740	0.4180	0.3140
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total GIIPS High Derivatives	0.0237**	0.0513**	0.0265**	0.0566***
BS p-values	0.0200	0.0340	0.0120	0.0200
Total GIIPS Low Derivatives	0.0265***	0.0100***	0.0295***	0.0106***
BS p-values	0.0040	0.0020	0.0040	0.0000
Panel E: Announcements related to technical aspects (5 events)				
Total GIIPS High Derivatives	-0.0094	-0.0025	-0.0081	-0.0018
BS p-values	0.3660	0.3980	0.4540	0.5740
Total GIIPS Low Derivatives	-0.0114	-0.0184	-0.0107	-0.0167
BS p-values	0.3200	0.4640	0.3640	0.4980

Table 9: **Determinants of CARs.**
This table shows the results of cross-sectional regressions on the bank-level CARs. The dependent variable is *CAR (-1,1)*, which are estimated according to equations (1)-(2) using an estimation window of 120-trading days in specifications (1)-(3), and 90-trading days in specifications (4)-(6). This set of regressions uses as a proxy for the market portfolio MSCI Europe. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. In our estimates, we rely on OLS regression with robust standard errors clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. "Hausman" is the statistic for the version of Hausman's test (Arellano 1993, Wooldridge 2010). "Breusch-Pagan" denotes the statistic for Breusch-Pagan LM test for choosing between a Random Effects model and a Pooled OLS model. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5	MSCI Europe - Estimation window 120			MSCI Europe - Estimation window 90		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)
GIIPS	0.0106***	0.0099***	0.0112***	0.0109***	0.0101***	0.0116***
	(2.9809)	(2.8283)	(3.0521)	(3.0449)	(2.8864)	(3.1190)
Total Derivatives	0.0575***			0.0607***		
	(3.1829)			(3.1056)		
Asset-Side Derivatives		0.0972***			0.1020***	
		(3.2482)			(3.1909)	
Liabilities-Side Derivatives			0.1204***			0.1277***
			(3.2071)			(3.1409)
Size	-0.0006	-0.0004	-0.0007	-0.0007	-0.0005	-0.0008
	(-0.8155)	(-0.5730)	(-0.9079)	(-0.8786)	(-0.6273)	(-0.9738)
NIM	0.4439**	0.4397**	0.4334**	0.4234*	0.4183*	0.4129*
	(2.1018)	(2.0788)	(2.0650)	(1.9616)	(1.9366)	(1.9230)
NFI	0.1848	0.1876	0.1795	0.1323	0.1351	0.1268
	(0.8872)	(0.8936)	(0.8664)	(0.6396)	(0.6475)	(0.6174)
G-SIBs	0.0030	0.0034	0.0034	0.0026	0.0030	0.0029
	(0.7732)	(0.8255)	(0.8731)	(0.6203)	(0.6840)	(0.7112)
Debt to GDP	0.0128***	0.0129***	0.0128***	0.0137***	0.0138***	0.0137***
	(2.7750)	(2.7933)	(2.7695)	(3.0147)	(3.0316)	(3.0094)
Intercept	YES	YES	YES	YES	YES	YES
Hausman	6.65	6.65	6.65	6.65	6.65	6.65
Breusch-Pagan	0.00	0.00	0.00	0.00	0.00	0.00
Observations	889	889	889	889	889	889
N. of banks	82	82	82	82	82	82
R2	0.042	0.041	0.042	0.043	0.042	0.044

Table 10: **Determinants of CARs: additional controls and interactions**

This table shows the results of cross-sectional regressions on the bank-level CARs. The dependent variable is *CAR (-1,1)*, estimated according to equations (1)-(2) using an estimation window of 120-trading days in specifications (1)-(5), and 90-trading days in specifications (6)-(10). This set of regressions uses as a proxy for the market portfolio MSCI Europe. *Total Derivatives* is total derivatives to total assets. *TIER1 ratio* is the ratio of Tier 1 capital divided by risk-weighted assets. *NPL ratio* is the ratio of NPL divided by total loans. *Liquidity* is the ratio of liquid assets over total assets. The dummies *High TIER1*, *High NPL* and *High Liquidity* are equal to one for observations whose value is higher than the sample median. The following control variables are included: *Size*, or the log of total assets; *NIM*, which is the difference between bank interest income and interest expenses divided by total assets; *NFI*, which is the net non-interest income divided by total assets; *G-SIBs*, a dummy equal to one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise; *Debt to GDP*, or the national debt to GDP of the country where the bank has its headquarters; and *GIIPS*, a dummy equal to one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. In our estimations, we rely on OLS regression with robust standard errors clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120					MSCI Europe - Estimation window 90				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)
Total Derivatives	0.0635***	0.0771***	0.0299**	0.1164**	0.0573***	0.0664***	0.0806***	0.0330***	0.1240**	0.0601***
	(3.1464)	(4.4865)	(2.6173)	(2.2257)	(2.9271)	(3.0721)	(4.4355)	(2.6840)	(2.3634)	(2.8490)
GIIPS	0.0138***	0.0137***	0.0125***	0.0106***	0.0106**	0.0137***	0.0136***	0.0130***	0.0109***	0.0107**
	(3.0374)	(3.0048)	(3.0592)	(3.1134)	(2.4376)	(3.0776)	(3.0402)	(3.1918)	(3.2182)	(2.4675)
TIER1 ratio	0.0421					0.0472				
	(1.0372)					(1.1579)				
NPL ratio	0.0114					0.0120				
	(0.6786)					(0.7149)				
Liquidity	0.0030					0.0037				
	(0.2006)					(0.2450)				
High TIER1*Total Derivatives		-0.0378*					-0.0382			
		(-1.6976)					(-1.6266)			
High TIER1		0.0032					0.0038			
		(0.8943)					(1.0806)			
High NPL*Total Derivatives			0.0743***					0.0753***		
			(3.5560)					(3.6112)		
High NPL			-0.0039					-0.0042		
			(-1.0003)					(-1.0855)		
High Liquidity*Total Derivatives				-0.0647					-0.0698	
				(-1.1946)					(-1.2715)	
High Liquidity				0.0044					0.0051	
				(1.2199)					(1.3858)	
GIIPS*Total Derivatives					0.0013					0.0053
					(0.0395)					(0.1596)
Intercept	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	769	777	869	889	889	769	777	869	889	889
Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
N. of banks	80	80	81	82	82	80	80	81	82	82
R2	0.045	0.044	0.047	0.043	0.042	0.045	0.044	0.049	0.045	0.043

Table 11: **Event study results on net short positions.**

This table shows the results of regressions on the net short positions. The dependent variable is the stock-level net short position. The regressions are run according to equation 4. Standard errors are clustered at the bank level. Robust t-statistics are reported in parentheses. Constant included but not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-1,1)	(1)	(2)	(3)	(4)	(5)
Banks	0.1099	0.3728	1.0607***	-0.2063	-0.3815
	(0.3344)	(1.2265)	(4.9295)	(-0.5623)	(-0.9582)
Announcement	-0.1931***	-0.2476***	-0.0794	-0.3952***	-0.1462
	(-2.8153)	(-3.1389)	(-0.7897)	(-3.2240)	(-1.1439)
Banks × Announcement	-0.2457	-0.4505	-1.3337***	0.2232	0.1859
	(-0.8423)	(-1.5456)	(-3.2775)	(0.6030)	(0.8173)
Observations	1,665	1,062	357	578	603
Stocks	324	288	119	207	140
R2	0.004	0.007	0.006	0.015	0.002
Panel B: (-2,2)	(1)	(2)	(3)	(4)	(5)
Banks	0.0648	0.2285	0.6033**	-0.0455	-0.3657
	(0.2923)	(0.8481)	(2.0711)	(-0.1635)	(-1.4296)
Announcement	-0.1522***	-0.1931***	-0.1211	-0.2644***	-0.1629*
	(-3.2577)	(-3.6217)	(-1.5157)	(-2.9832)	(-1.6975)
Banks × Announcement	-0.2006	-0.3062	-0.8762***	0.0624	0.1701
	(-1.0760)	(-1.5097)	(-3.9353)	(0.2693)	(0.7279)
Observations	1,997	1,327	443	728	670
Stocks	324	288	119	207	140
R2	0.003	0.006	0.006	0.009	0.003
Panel C: (-6,6)	(1)	(2)	(3)	(4)	(5)
Banks	-0.0799	-0.0788	0.0320	-0.1855	-0.1840
	(-0.4225)	(-0.3365)	(0.1134)	(-0.7623)	(-0.8031)
Announcement	0.0219	-0.0109	0.0869	-0.0885	0.0567
	(0.5393)	(-0.2521)	(1.4813)	(-1.2684)	(1.0308)
Banks × Announcement	-0.1503	-0.2399**	-0.7251***	0.0931	0.1068
	(-1.4583)	(-2.5189)	(-5.9136)	(0.7621)	(0.5969)
Observations	9,808	6,791	2,710	3,247	3,701
Stocks	324	288	119	207	140
R2	0.000	0.000	0.002	0.000	0.000

Table 12: **Event study results with Amihud's illiquidity ratio as a dependent variable.** This table shows the results of regressions on Amihud's illiquidity ratio, *Amihud Ratio*, which is computed as the absolute value of daily stock returns divided by the daily trading volume for that stock. The regressions are run according to equation 4, after replacing $Short_{it}$ with *Amihud Ratio*. Standard errors are clustered at the bank level. Robust t-statistics are reported in parentheses. Constant included but not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-1,1)	(1)	(2)	(3)	(4)	(5)
Banks	-0.0265*	-0.0313	-0.0299	-0.0394	-0.0118
	(-1.6910)	(-1.5623)	(-1.4986)	(-1.4990)	(-1.4942)
Announcement	0.0647**	0.0470	0.0626	0.0478	0.0981
	(2.2052)	(1.2359)	(0.8115)	(0.9647)	(1.3641)
Banks x Announcement	-0.0647**	-0.0469	-0.0626	-0.0477	-0.0982
	(-2.2039)	(-1.2337)	(-0.8107)	(-0.9629)	(-1.3642)
Observations	1,364	861	296	458	503
Stocks	291	258	110	179	127
R2	0.001	0.001	0.001	0.001	0.001
Panel B: (-2,2)					
Banks	-0.0253**	-0.0296**	-0.0265**	-0.0379**	-0.0088*
	(-2.3856)	(-2.2927)	(-2.1464)	(-2.1393)	(-1.7346)
Announcement	0.0658**	0.0487	0.0659	0.0493	0.1012
	(2.0235)	(1.3264)	(0.8142)	(1.0623)	(1.4072)
Banks x Announcement	-0.0658**	-0.0486	-0.0659	-0.0493	-0.1012
	(-2.0231)	(-1.3256)	(-0.8141)	(-1.0611)	(-1.4075)
Observations	1,655	1,103	377	591	552
Stocks	291	258	110	179	127
R2	0.001	0.001	0.001	0.002	0.001
Panel C: (-6,6)					
Banks	-0.0390**	-0.0389**	-0.0603	-0.0317***	-0.0301
	(-2.1887)	(-1.9863)	(-1.2590)	(-2.9418)	(-1.2818)
Announcement	0.0343	-0.0081	-0.0266	0.0048	0.1071
	(0.9056)	(-0.4219)	(-0.4953)	(0.5852)	(1.0853)
Banks x Announcement	-0.0342	0.0081	0.0266	-0.0048	-0.1070
	(-0.9044)	(0.4234)	(0.4965)	(-0.5833)	(-1.0846)
Observations	8,047	5,534	2,174	2,657	3,075
Stocks	291	258	110	179	127
R2	0.000	0.000	0.000	0.000	0.000

Table 13: **Event dates and investor attention (proxied by the Google SVI)**
This table reports Wilcoxon rank-sum tests for the Google SVI in weeks including the 12 ECB announcements ("Event weeks") versus other weeks ("No-event weeks") over the period January 5, 2014–December 27, 2020.

Panel A: SVI for keyword "TLTRO"				
Type(s) of announcement		*Average Google SVI index*	*Z-statistic*	*p-value*
All events	No-event weeks	7.1558	-4.5044	0.0000
	Event weeks	31.1667		
TLTRO waves and reductions in the interest rates	No-event weeks	7.1558	-3.9192	0.0001
	Event weeks	41.2857		
TLTRO waves	No-event weeks	7.1558	-2.6478	0.0081
	Event weeks	68.6667		
Reductions in the TLTRO interest rates	No-event weeks	7.1558	-2.9173	0.0035
	Event weeks	20.7500		
Technical aspects	No-event weeks	7.1558	-2.3976	0.0165
	Event weeks	17.0000		
Panel B: SVI for bank tickers				
Type(s) of announcement		*Average Google SVI index*	*Z-statistic*	*p-value*
All events	Non-event weeks	47.7430	0.0990	0.9212
	Event weeks	47.8302		
TLTRO waves and reductions in the interest rates	Non-event weeks	47.7430	0.4911	0.6233
	Event weeks	47.3300		
TLTRO waves	Non-event weeks	47.7430	0.2452	0.8063
	Event weeks	47.0818		
Reductions in the TLTRO interest rates	Non-event weeks	47.7430	0.4367	0.6623
	Event weeks	47.4958		
Technical aspects	Non-event weeks	47.7430	-0.4724	0.6366
	Event weeks	48.6611		

INTERNET APPENDIX

Investor behavior around targeted liquidity announcements

A Institutional Background

In the aftermath of the global financial crisis (GFC), the ECB adopted a series of unconventional monetary policy measures to improve the monetary policy transmission mechanism in the form of credit operations. This type of interventions differs from other unconventional monetary policy measures based on asset purchase programs (quantitative easing). For instance, after the bankruptcy of Lehman Brothers (October 2008), the ECB introduced fixed-rate liquidity provisions based on a full-allotment mode (Benetton and Fantino 2021).

A key element of these policies is a switch from a short-term provision of liquidity to a longer-term perspective (Linzert et al. 2004, Benetton and Fantino 2021). This new approach aims to help alleviate the strain on banks' balance sheets deriving from the maturity mismatch between assets and liabilities.[1]

Then, the ECB further extended the length of its support to credit institutions by using three longer-term refinancing operations (LTRO). While for the first LTRO funding (in July 2009) was provided with a maturity of one year (Benetton and Fantino 2021), subsequently the maturity was extended to three years, as announced on December 8, 2011 (Crosignani et al. 2020). These unconventional monetary policies became even more important when the Eurozone hit the zero-lower bound in 2013 (Hartmann and Smets 2018). In June 2014, the ECB introduced another series of programs based on targeted longer-term refinancing operations (TLTRO). The TLTRO program consists of refinancing operations that last for

[1] https://www.ecb.europa.eu/press/key/date/2018/html/ecb.sp180504.en.html

up to four (or three) years and are available to any monetary financial institutions (MFIs),[2] on a voluntary basis, in Eurozone countries. Similar to the LTRO program, the TLTRO program requires pledging marketable assets as collateral and the funding allocation is based on a full-allotment mode via an auction system: banks receive unlimited amounts of funding in exchange for adequate collateral (Carpinelli and Crosignani 2021).

In Figure A1, we summarize the main credit operations from the ECB in support of the banking sector and their evolution over time.

[INSERT FIGURE A1 HERE]

Table A1 reports the main differences between the LTRO program and the TLTRO program. In particular, TLTRO are "targeted", unlike LTRO, because the funding received must be deployed to fund households (excluding mortgages) and non-financial firms.[3]

[INSERT TABLE A1 HERE]

The TLTRO program consists of refinancing operations that last for periods of up to four (or three) years and are available to approved monetary financial institution in Eurozone countries. The program consists of three waves, announced on June 5, 2014 (TLTRO-I), March 10, 2016 (TLTRO-II), and March 7, 2019 (TLTRO-III), respectively.[4]

[2]The ECB defines MFI institutions (Regulation ECB/2021/2) as deposit-taking corporations – such as credit institutions, financial firms whose business relies on taking deposits and other substitutes for deposits from institutional units and granting loans (or making investments in securities for them), and electronic money institutions, engaging in financial intermediation activities in the form of issuing electronic money – national central banks, and money market funds. For more information: https://www.ecb.europa.eu/stats/financial_corporations/list_of_financial_institutions/html/index.en.html.

[3]https://www.ecb.europa.eu/mopo/implement/omo/tltro/html/index.en.html

[4]For more technical details on TLTRO, please visit:

- https://www.ecb.europa.eu/press/pr/date/2014/html/pr140729_updated_modalities.pdf

One of the key objectives of the TLTRO program is to ensure that the funding is used to extend credit to firms and households. In fact, the literature on LTRO suggests that, under this program, banks used the funding provided to purchase eligible high-yield securities and pledge them to obtain central bank liquidity (Acharya and Steffen 2015, Drechsler et al. 2016, Crosignani et al. 2020).[5] To avoid such a moral-hazard problem (Crosignani et al. 2020, Albertazzi et al. 2020), the TLTRO program includes a set of incentives and sanctions related to the amount of lending to the real economy. For example, banks' borrowing from the TLTRO-I facility is limited to 7% of their eligible loans. Moreover, banks with a lending amount above a bank-specific benchmark over the first two operations under TLTRO-I are allowed to borrow more over the subsequent six operations, whereas banks that underperform must pay back the funds received earlier than the other banks. As another example, under TLTRO-II, banks may receive funding for up to 30% of eligible loans, and they are charged lower interest rates if they exceed their lending benchmark.

In Figure A2, we report the evolution of the rates on the main refinancing operations and on the deposit facility.

- https://www.ecb.europa.eu/ecb/legal/pdf/celex_32016d0010_en_txt.pdf

[5] Carpinelli and Crosignani (2021) find that banks used LTRO liquidity to buy domestic government securities and replace missing wholesale funding.

Table A1: **Differences between LTRO and TLTRO**

The table reports the main differences between LTRO and TLTRO. *Marketable assets* stand for the central government securities, regional government securities, covered bank bonds, corporate bonds, and unsecured bank bonds. *Debt rollover* indicates whether the LTRO and TLTRO allow for the possibility of the rollover of the outstanding borrowings from the European Central Bank. *Allotment mode* refers to the allotment mode of both programs.

Name of the program	LTRO	TLTRO
Maturity of refinancing operations	One 1-year refinancing operations Two 3-year refinancing operations	TLTRO-I: 4-year refinancing operations TLTRO-II: 4-year refinancing operations TLTRO-III: 3-year refinancing operations
Collateral pledgeability	Marketable assets	Marketable assets
Interest rate on bank borrowings	Fixed-interest rate	TLTRO-I: Borrowing rates are fixed over the life of each operation at the prevailing rate on the Eurosystem Main Refinancing Operations (MROs) TLTRO-II and TLTRO-III: Borrowing rates may be as low as the interest rate on the deposit facility.
Allotment mode	Full-allotment model based on auctions	Full-allotment model based on auctions
Borrowing-lending nexus	None.	Borrowing allowance linked to loans to non-financial corporations and households in the Eurozone, apart from loans for house purchases.
Debt rollover	Longer-term refinancing operations are stand-alone operations.	Better terms for banks that match the lending conditions set by the ECB in the subsequent waves.
Repayment terms	At maturity	At maturity (early repayment admitted for beneficiary banks)

Sources: ECB website, Linzert et al. (2004), Albertazzi et al. (2020), Crosignani et al. (2020), Benetton and Fantino (2021)

Figure A1: **Timeline of the credit operations from the ECB in the aftermath of the global financial crisis**
This figure shows the timeline of the ECB credit operations in support of the banking sector.

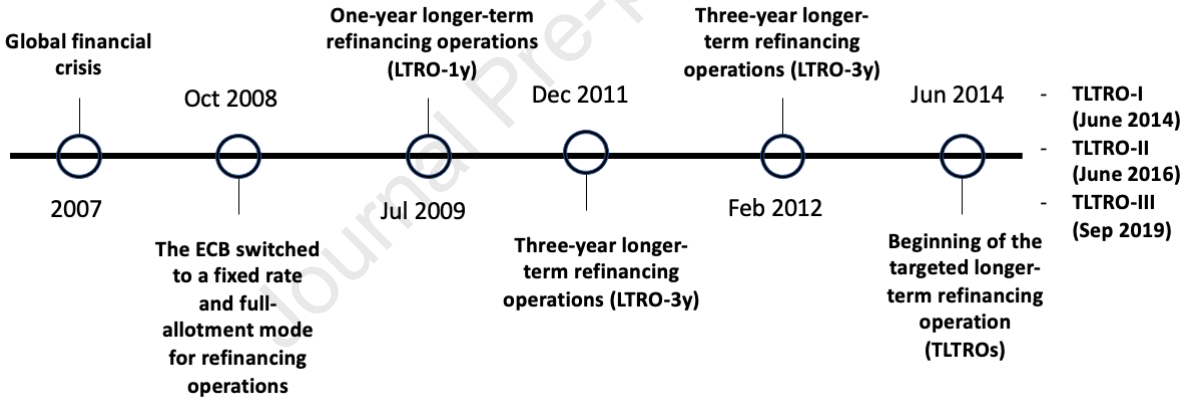

Figure A2: **Trend of key ECB interest rates**
This figure shows the evolution over our sample period of the deposit facility rate and the main refinancing operations rate

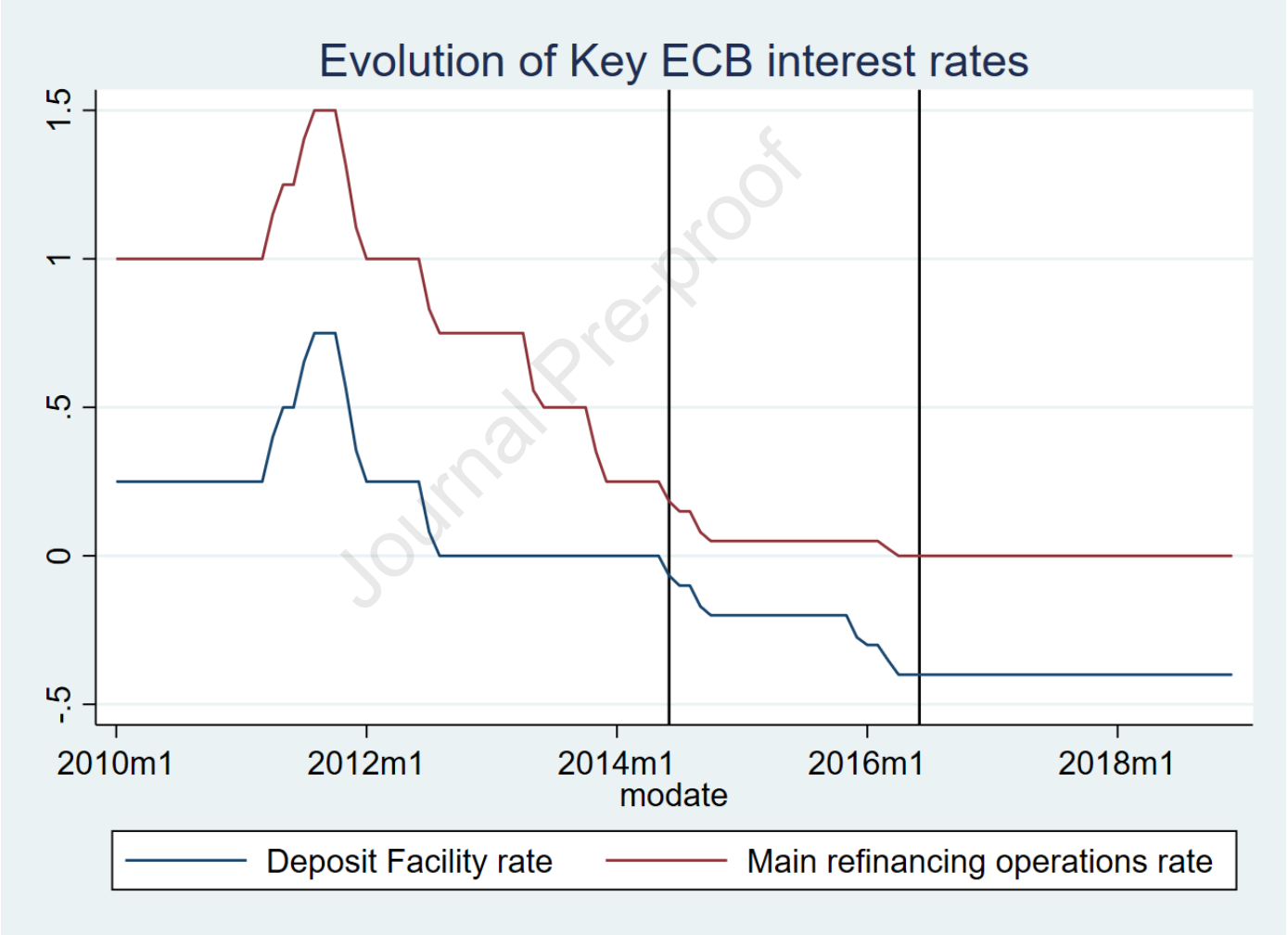

Table A2: **Robustness tests: market reaction to TLTRO announcements with a different market index - MSCI Europe Bank.**

This table presents the event-study results for the TLTRO announcements. We estimates cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) portfolios for the whole sample of Eurozone banks. We use the MSCI Europe Bank as a proxy for the market portfolio. In Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. CARs are estimated according to equation (1)-(2). In Panel A, we estimate the CARs for all the 12 Events. In Panel B, we estimate the CARs for announcements related to the launch of the three TLTRO programs and announcements associated with reductions in the TLTRO interest rates (7 events). In Panel C, we estimate the CARs for the launch of the TLTRO waves (3 events). In Panel D, we estimate the CARs for announcements associated with reductions in the TLTRO interest rates (4 events). Finally, in Panel E, we estimate the CARs for the announcements related to technical aspects of the TLTRO program (5 events) *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for June 5, 2014 - May 29, 2020. For each simulation, we calculate the average CAR by following equations (1) and (2) for 12 (Panel A), for seven (Panel B), for three (Panel C), for four (Panel D), and for five (Panel E) randomly selected trading days, respectively. To select only no-event trading days and compute CARs, we follow Bruno et al. (2018). Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe Bank - Estimation window 120		MSCI Europe Bank - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All TLTRO announcements (12 events)				
Total	0.040	0.062	0.050	0.077
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total	0.034	0.073	0.043	0.084*
BS p-values	0.430	0.126	0.216	0.082
Panel C: Launch of the three TLTRO waves (3 events)				
Total	0.009	0.014	0.005	0.014
BS p-values	0.672	0.622	0.808	0.598
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total	0.025	0.059	0.038	0.071*
BS p-values	0.416	0.116	0.200	0.056
Panel E: Announcements related to technical aspects (5 events)				
Total	0.006	-0.010	0.006	-0.007
BS p-values	0.858	0.740	0.790	0.828

Table A3: **Robustness tests: placebo events.**
This table presents tests based on placebo events that assume the events occur five trading days before the actual events. We estimate cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) portfolios for the whole sample of Eurozone banks, for GIIPS banks, and non-GIIPS banks. We use the MSCI Europe as a proxy for the market portfolio. In Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. In Panel A, we estimate the CARs for all the 12 Events. In Panel B, we estimate the CARs for seven events. In Panel C, we estimate the CARs for three events. In Panel D, we evaluate CARs for 4 events. In Panel E, we estimate the CARs for five events. *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for June 5, 2014 - May 29, 2020. Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Placebo Events (5 trading days earlier)	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All TLTRO announcements (12 events)				
Total	-0.064	0.004	-0.064	-0.006
BS p-values	0.488	0.916	0.496	0.988
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total	-0.04	0.064	-0.037	0.058
BS p-values	0.554	0.448	0.598	0.538
Panel C: Launch of the three TLTRO waves (3 events)				
Total	-0.005	-0.009	-0.003	-0.004
BS p-values	0.908	0.886	0.994	1.000
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total	-0.034	0.073	-0.034	0.063
BS p-values	0.480	0.254	0.496	0.326
Panel E: Announcements related to technical aspects (5 events)				
Total	-0.053*	-0.058	-0.052	-0.056
BS p-values	0.084	0.146	0.106	0.178

Table A4: **Robustness tests: market reaction to TLTRO announcements excluding observations with confounding events.**

This table presents the event-study results for the TLTRO announcements after excluding observations for which there are confounding events related to bank-level announcements of dividends, board changes, M&As deals (official announcements and rumours). We consider bank-level announcements occurring from three calendar days before to three calendar days after the TLTRO announcement. We estimate cumulative abnormal returns (CARs) by using equal-weighted (EW) and market-weighted (MW) portfolios for the whole sample of Eurozone banks, for GIIPS banks, and non-GIIPS banks. We use the MSCI Europe as a proxy for the market portfolio. In Columns (1)-(2) we employ an estimation window of 120 trading days, while in Columns (3)-(4) we use an estimation window of 90 trading days. In Panel A, we estimate the CARs for all the 12 Events. In Panel B, we estimate the CARs for seven events. In Panel C, we estimate the CARs for three events. In Panel D, we evaluate CARs for 4 events. In Panel E, we estimate the CARs for five events. *BS p-values* are the p-values for the average CAR calculated using 1,000 bootstrap simulations for June 4, 2014 - May 29, 2020. Furthermore, the p-values are estimated by considering the number of cases for which the CAR is either larger or smaller than the estimated value (2-tail tests). ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120		MSCI Europe - Estimation window 90	
	CAR (-1,1) EW	CAR (-1,1) MW	CAR (-1,1) EW	CAR (-1,1) MW
	(1)	(2)	(3)	(4)
Panel A: All announcements (12 events)				
Total	0.052	0.113	0.071	0.133
BS p-values	0.328	0.142	0.278	0.124
Panel B: Launch of the three TLTRO waves and reductions in the TLTRO interest rates (7 events)				
Total	0.098*	0.157**	0.113**	0.172**
BS p-values	0.054	0.016	0.012	0.022
Panel C: Launch of the three TLTRO waves (3 events)				
Total	0.030	0.045	0.030	0.046
BS p-values	0.318	0.254	0.294	0.242
Panel D: Reductions in the TLTRO interest rates (4 events)				
Total	0.067*	0.112**	0.082**	0.126**
BS p-values	0.066	0.020	0.020	0.010
Panel E: Announcements related to technical aspects (5 events)				
Total	-0.046	-0.044	-0.042	-0.039
BS p-values	0.208	0.374	0.252	0.438

Table A5: **Robustness tests: Determinants of CARs using the MSCI Europe Bank index as a proxy for the market portfolio.**

This table shows the results of cross-sectional regressions on the bank-level CARs. The dependent variable is *CAR (-1,1)*, which are estimated according to equations (1)-(2) using an estimation window of 120-trading days in specifications (1)-(6), and 90-trading days in specifications (7)-(12). This set of regressions uses as a proxy for the market portfolio MSCI Europe Bank. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. such as *Size*, *NIM*, *NFI*, *G-SIBs*, and *Debt to GDP*. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe Bank - Estimation window 120						MSCI Europe Bank - Estimation window 90					
	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GIIPS	0.0083***		0.0077***		0.0088***		0.0076***		0.0069***		0.0082***	
	(3.2497)		(3.2066)		(3.1936)		(2.7599)		(2.6415)		(2.7715)	
Total Derivatives	0.0488***	0.1446**					0.0529***	0.1399**				
	(3.8423)	(2.6930)					(4.1808)	(2.7340)				
Asset-Side Derivatives			0.0836***	0.2515**					0.0898***	0.2353***		
			(3.6951)	(2.8190)					(4.2296)	(3.0481)		
Liabilities-Side Derivatives					0.1009***	0.2806**					0.1104***	0.2820**
					(3.9822)	(2.6724)					(4.2825)	(2.4984)
Size	-0.0007	0.0103	-0.0005	0.0112	-0.0007	0.0091	-0.0008	0.0136	-0.0007	0.0143	-0.0009	0.0124
	(-0.7194)	(0.4909)	(-0.5566)	(0.5332)	(-0.7908)	(0.4392)	(-0.8692)	(0.7432)	(-0.6981)	(0.7860)	(-0.9569)	(0.6925)
NIM	0.4263*	1.6414*	0.4239*	1.6782*	0.4164*	1.6149*	0.4063*	1.4986*	0.4028*	1.5355*	0.3963	1.4688*
	(1.8034)	(1.8242)	(1.7922)	(1.8609)	(1.7363)	(1.8242)	(1.6743)	(1.8029)	(1.6565)	(1.8477)	(1.6037)	(1.7862)
NFI	0.2967	-1.0030	0.2993	-0.9645	0.2922	-1.0832	0.2135	-0.9333	0.2161	-0.9039	0.2086	-1.0059
	(1.3719)	(-1.0484)	(1.3765)	(-1.0223)	(1.3703)	(-1.1036)	(1.0290)	(-0.9918)	(1.0319)	(-0.9684)	(1.0283)	(-1.0514)
G-SIBs	0.0046		0.0049		0.0050		0.0044		0.0047		0.0047	
	(1.0409)		(1.0549)		(1.1138)		(0.9064)		(0.9366)		(0.9640)	
Debt to GDP	0.0099***		0.0099***		0.0099***		0.0107***		0.0108***		0.0107***	
	(3.1131)		(3.0359)		(3.1436)		(3.2270)		(3.1206)		(3.2778)	
Intercept	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	889	889	889	889	889	889	889	889	889	889	889	889
N. of banks	82	82	82	82	82	82	82	82	82	82	82	82
R2	0.0345	0.0140	0.0340	0.0130	0.0347	0.0130	0.0327	0.0120	0.0320	0.0110	0.0329	0.0110
Bank FEs	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table A6: **Determinants of CARs using national market indexes as proxies for the market portfolio.**

This table shows the results of cross-sectional regressions. The dependent variable is *CAR (-1,1)*, which are estimated according to equation (1)-(2) using an estimation window of 120-trading days in specifications (1)-(3), and 90-trading days in specifications (4)-(6). This set of regressions uses country-level market indexes as a proxy for the market index to estimate the CAR. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. such as *Size*, *GIIPS*, *NIM*, *NFI*, *G-SIBs*, and *Debt to GDP*. *Size* is the log of total assets. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. In our estimations, Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	National market indexes			National market indexes		
	Estimation window: 120 trading days			Estimation window: 90 trading days		
	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)	(5)	(6)
GIIPS	0.0061*	0.0054	0.0067*	0.0065*	0.0059*	0.0071*
	(1.6733)	(1.5165)	(1.8030)	(1.8080)	(1.6454)	(1.9380)
Total Derivatives	0.0410***			0.0433***		
	(3.5610)			(3.4863)		
Asset-Side Derivatives		0.0627***			0.0672***	
		(2.9782)			(3.0659)	
Liabilities-Side Derivatives			0.0941***			0.0980***
			(3.7367)			(3.5994)
Size	-0.0011	-0.0009	-0.0012	-0.0012	-0.0010	-0.0013
	(-1.4380)	(-1.1870)	(-1.5911)	(-1.4884)	(-1.2609)	(-1.6101)
NIM	0.5115**	0.5011**	0.5111**	0.4702**	0.4602**	0.4687**
	(2.4761)	(2.4044)	(2.5051)	(2.1961)	(2.1335)	(2.2133)
NFI	0.2906	0.2912	0.2878	0.2736	0.2742	0.2707
	(1.2853)	(1.2848)	(1.2708)	(1.2237)	(1.2247)	(1.2082)
G-SIBs	0.0030	0.0036	0.0030	0.0031	0.0036	0.0030
	(0.7848)	(0.8837)	(0.7827)	(0.7337)	(0.8239)	(0.7431)
Debt to GDP	0.0050	0.0051	0.0050	0.0031	0.0032	0.0031
	(0.9276)	(0.9348)	(0.9293)	(0.5694)	(0.5791)	(0.5702)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Observations	889	889	889	889	889	889
N. of banks	82	82	82	82	82	82
R2	0.0201	0.0190	0.0210	0.0176	0.0165	0.0185

Table A7: **Robustness tests: determinants of CARs excluding observations related to confounding events.** This table presents the event-study results for the TLTRO announcements after excluding observations for which there are confounding events related to bank-level announcements of dividends, board changes, M&As deals (official announcements and rumours). We consider bank-level announcements occurring from three calendar days before to three calendar days after the TLTRO announcement. The dependent variable is *CAR (-1,1)*, which are estimated according to equation (1)-(2) using an estimation window of 120-trading days in specifications (1)-(6), and 90-trading days in specifications (7)-(12). This set of regressions uses as a proxy for the market portfolio MSCI Europe. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. such as *Size*, *NIM*, *NFI*, *G-SIBs*, and *Debt to GDP*. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe Bank - Estimation window 120						MSCI Europe Bank - Estimation window 90					
	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GIIPS	0.0102***		0.0095***		0.0109***		0.0106***		0.0098***		0.0113***	
	(2.8174)		(2.6625)		(2.9135)		(2.9012)		(2.7396)		(2.9986)	
Total Derivatives	0.0566***	0.1376**					0.0605***	0.1395**				
	(2.8156)	(2.5738)					(2.7966)	(2.5585)				
Asset-Side Derivatives			0.0903***	0.2281**					0.0964***	0.2272**		
			(2.7377)	(2.5239)					(2.7576)	(2.6054)		
Liabilities-Side Derivatives					0.1240***	0.2839**					0.1330***	0.2935**
					(2.9195)	(2.3497)					(2.8991)	(2.3363)
Size	-0.0003	0.0165	-0.0001	0.0173	-0.0004	0.0154	-0.0004	0.0206	-0.0002	0.0213	-0.0005	0.0194
	(-0.3749)	(1.0699)	(-0.0928)	(1.1135)	(-0.5262)	(1.0102)	(-0.4965)	(1.3349)	(-0.1990)	(1.3709)	(-0.6527)	(1.2811)
NIM	0.4242*	1.7195**	0.4151*	1.7570**	0.4192*	1.6863**	0.4043*	1.6569**	0.3944*	1.6955**	0.3991*	1.6211**
	(1.9320)	(2.3778)	(1.8891)	(2.4146)	(1.9221)	(2.3702)	(1.8085)	(2.2071)	(1.7629)	(2.2464)	(1.7967)	(2.1903)
NFI	0.2163	-0.8893	0.2182	-0.8623	0.2106	-0.9603	0.1676	-0.6668	0.1696	-0.6437	0.1615	-0.7361
	(1.0769)	(-0.7440)	(1.0735)	(-0.7114)	(1.0588)	(-0.8190)	(0.8468)	(-0.5151)	(0.8456)	(-0.4912)	(0.8260)	(-0.5809)
G-SIBs	0.0037		0.0044		0.0036		0.0035		0.0043		0.0034	
	(0.7689)		(0.8831)		(0.7835)		(0.6770)		(0.7969)		(0.6886)	
Debt to GDP	0.0120**		0.0121**		0.0120**		0.0128***		0.0129***		0.0128***	
	(2.5105)		(2.5389)		(2.5003)		(2.7323)		(2.7599)		(2.7229)	
Intercept	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	848	848	848	848	848	848	848	848	848	848	848	848
N. of Banks	82	82	82	82	82	82	82	82	82	82	82	82
R2	0.0397	0.011	0.0388	0.010	0.0403	0.011	0.0413	0.010	0.0403	0.010	0.0420	0.010
Bank FE	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES

Table A8: **Determinants of CARs for the TLTRO launch program and announcements of reductions in the TLTRO interest rates.**

This table shows the results of cross-sectional regressions on the bank-level CARs for the TLTRO launch program and announcements of reductions in the TLTRO interest rates. Panel A and Panel B use MSCI Europe and MSCI Europe Bank as proxies for market portfolios, respectively. As before, the dependent variable is *CAR (-1,1)*, which are estimated according to equation (1)-(2) by using an estimation window of 120-trading days and of 90-trading days. This set of regressions uses as a proxy for the market portfolio MSCI Europe Bank. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. such as *Size*, *NIM*, *NFI*, *G-SIBs*, and *Debt to GDP*. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A	MSCI Europe - Estimation window 120			MSCI Europe - Estimation window 90		
	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)	(5)	(6)
GIIPS	0.0227***	0.0221***	0.0230***	0.0215***	0.0209***	0.0219***
	(4.2529)	(4.3829)	(4.0728)	(3.7449)	(3.7908)	(3.6365)
Total Derivatives	0.0574***			0.0592***		
	(5.2331)			(6.0649)		
Asset-Side Derivatives		0.1080***			0.1072***	
		(5.2870)			(5.6861)	
Liabilities-Side Derivatives			0.1077***			0.1163***
			(4.3211)			(5.6406)
Size	0.0031***	0.0032***	0.0031***	0.0031***	0.0032***	0.0031***
	(2.9030)	(3.0635)	(2.9595)	(2.7135)	(2.8903)	(2.7467)
NIM	0.5329**	0.5397**	0.5137**	0.4891*	0.4919*	0.4732*
	(2.1090)	(2.1782)	(1.9617)	(1.8669)	(1.9072)	(1.7402)
NFI	0.4823**	0.4857**	0.4773*	0.3324	0.3352	0.3277
	(2.0005)	(2.0672)	(1.9247)	(1.5233)	(1.5651)	(1.4666)
G-SIBs	-0.0025	-0.0027	-0.0016	-0.0035	-0.0035	-0.0028
	(-0.3062)	(-0.3244)	(-0.2040)	(-0.4050)	(-0.3983)	(-0.3293)
Debt to GDP	0.0154***	0.0154***	0.0155***	0.0187***	0.0187***	0.0188***
	(3.1317)	(3.1752)	(3.0600)	(3.4668)	(3.4572)	(3.4290)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Observations	525	525	525	525	525	525
N. of banks	82	82	82	82	82	82
R2	0.138	0.138	0.137	0.136	0.135	0.135

Table A8 (continued)

Panel B	MSCI Europe Bank - Estimation window 120			MSCI Europe Bank - Estimation window 90		
	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)	CAR (-1,1)
	(1)	(2)	(3)	(4)	(5)	(6)
GIIPS	0.0164***	0.0160***	0.0165***	0.0139***	0.0134***	0.0142***
	(4.3189)	(4.5068)	(4.1032)	(3.6394)	(3.7013)	(3.5145)
Total Derivatives	0.0440***			0.0451***		
	(3.2824)			(3.7618)		
Asset-Side Derivatives		0.0862***			0.0824***	
		(3.6206)			(3.5898)	
Liabilities-Side Derivatives			0.0787**			0.0878***
			(2.4420)			(3.2631)
Size	0.0019*	0.0020*	0.0020*	0.0019	0.0019	0.0019
	(1.6970)	(1.7805)	(1.7453)	(1.4916)	(1.6039)	(1.4914)
NIM	0.4608*	0.4694*	0.4429*	0.4131	0.4159*	0.4004
	(1.8796)	(1.9413)	(1.7609)	(1.6372)	(1.6603)	(1.5481)
NFI	0.5907*	0.5939*	0.5866*	0.3911	0.3934	0.3874
	(1.8608)	(1.9231)	(1.8004)	(1.5590)	(1.6150)	(1.4947)
G-SIBs	-0.0003	-0.0006	0.0005	-0.0011	-0.0012	-0.0006
	(-0.0456)	(-0.0894)	(0.0653)	(-0.1464)	(-0.1490)	(-0.0772)
Debt to GDP	0.0106**	0.0105**	0.0107**	0.0144***	0.0144***	0.0144***
	(2.0242)	(2.0683)	(1.9884)	(3.3142)	(3.3420)	(3.2507)
Intercept	Yes	Yes	Yes	Yes	Yes	Yes
Observations	525	525	525	525	525	525
N. of banks	82	82	82	82	82	82
R2	0.0822	0.0825	0.0816	0.0767	0.0766	0.0764

Table A9: **Determinants of CARs: effect of different categories of derivatives.**
This table shows the results of cross-sectional regressions on the bank-level CARs. The dependent variable is *CAR (-1,1)*, which are estimated according to equations (1)-(2) using an estimation window of 120-trading days in specifications (1)-(5), and 90-trading days in specifications (6)-(10). This set of regressions uses as a proxy for the market portfolio MSCI Europe. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Interest Derivatives* is total interest rate derivatives to total assets. *Total FX Derivatives* is total exchange rate derivatives to total assets. *Total Equity Derivatives* is total equity derivatives to total assets. *Total Commodity Derivatives* is total commodity derivatives to total assets. *Total Credit Derivatives* is total credit derivatives to total assets.*Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120					MSCI Europe - Estimation window 90				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)	CAR (-1 1)
Total Interest Derivatives	0.0006*					0.0006*				
	(1.8165)					(1.7264)				
Total FX Derivatives		0.0033*					0.0032*			
		(1.9318)					(1.8036)			
Total Equity Derivatives			0.0070					0.0082		
			(1.1165)					(1.1843)		
Total Commodity Derivatives				0.0646**					0.0648**	
				(2.5650)					(2.4349)	
Total Credit Derivatives					0.0180**					0.0177**
					(2.4097)					(2.2736)
GIIPS	0.0092**	0.0094**	0.0089**	0.0087**	0.0094**	0.0094**	0.0095**	0.0091**	0.0089**	0.0095**
	(2.5338)	(2.5681)	(2.4269)	(2.4239)	(2.5934)	(2.5544)	(2.5838)	(2.4722)	(2.4518)	(2.6136)
Size	0.0003	0.0003	0.0005	0.0004	0.0004	0.0003	0.0003	0.0004	0.0005	0.0004
	(0.4183)	(0.4570)	(0.6365)	(0.6248)	(0.5120)	(0.4051)	(0.4466)	(0.6107)	(0.6047)	(0.4971)
NIM	0.3841*	0.4051*	0.3716*	0.3544*	0.3802*	0.3574	0.3770*	0.3513	0.3279	0.3530
	(1.8093)	(1.8616)	(1.7217)	(1.7061)	(1.8346)	(1.6388)	(1.6873)	(1.5853)	(1.5357)	(1.6562)
NFI	0.1702	0.1800	0.1719	0.1683	0.1688	0.1169	0.1266	0.1186	0.1150	0.1157
	(0.8011)	(0.8525)	(0.8034)	(0.7886)	(0.7937)	(0.5556)	(0.6055)	(0.5582)	(0.5440)	(0.5491)
G-SIBs	0.0055	0.0047	0.0062	0.0064	0.0037	0.0054	0.0046	0.0057	0.0063	0.0036
	(1.3014)	(1.1266)	(1.2479)	(1.4036)	(0.8221)	(1.1934)	(1.0395)	(1.0849)	(1.2980)	(0.7584)
Debt to GDP	0.0131***	0.0129***	0.0130***	0.0132***	0.0129***	0.0140***	0.0138***	0.0139***	0.0141***	0.0139***
	(2.7953)	(2.7490)	(2.7478)	(2.8111)	(2.7647)	(3.0232)	(2.9811)	(2.9542)	(3.0381)	(2.9908)
Intercept	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	889	889	889	889	889	889	889	889	889	889
N. of banks	82	82	82	82	82	82	82	82	82	82
R2	0.038	0.038	0.038	0.038	0.039	0.039	0.039	0.039	0.039	0.040

Table A10: **Determinants of CARs: Placebo Test.**
This table shows the results of cross-sectional regressions on the bank-level CARs estimated in the pre-event period. The dependent variable is *CAR (-5,-3)*, which are estimated according to equation (1)-(2) using an estimation window of 120-trading days in specifications (1)-(3), and 90-trading days in specifications (4)-(6). This set of regressions uses as a proxy for the market portfolio the MSCI Europe index. *GIIPS* equals one if the bank is located in one of the GIIPS countries (Greece, Ireland, Italy, Portugal, and Spain) and zero otherwise. *Total Derivatives* is total derivatives to total assets. *Asset-Side Derivatives* is total asset-side derivatives to total assets. *Liabilities-Side Derivatives* is total liabilities-side derivatives to total assets. such as *Size*, *NIM*, *NFI*, *G-SIBs*, and *Debt to GDP*. *Size* is the log of total assets. *NIM* is the difference between bank interest income and interest expenses divided by total assets. *NFI* is the bank net non-interest income divided by total assets. *G-SIBs* equals one if the bank is one of the systemically important banks for the Financial Stability Board and zero otherwise. *Debt to GDP* is the national debt to GDP of the country where the bank has its headquarters. Standard errors are clustered at the bank level. All bank-level variables and CARs are winsorized at the 1^{st} and 99^{th} percentiles. Robust t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	MSCI Europe - Estimation window 120			MSCI Europe - Estimation window 90		
	CAR (-5,-3)	CAR (-5,-3)	CAR (-5,-3)	CAR (-5,-3)	CAR (-5,-3)	CAR (-5,-3)
	(1)	(2)	(3)	(4)	(5)	(6)
GIIPS	0.0036	0.0036	0.0035	0.0040	0.0039	0.0039
	(1.0786)	(1.0879)	(1.0501)	(1.1854)	(1.1757)	(1.1590)
Total Derivatives	0.0079			0.0142		
	(0.4133)			(0.8526)		
Asset-Side Derivatives		0.0193			0.0317	
		(0.5127)			(0.9656)	
Liabilities-Side Derivatives			0.0094			0.0202
			(0.2481)			(0.5960)
Size	-0.0009	-0.0009	-0.0009	-0.0013	-0.0013	-0.0013
	(-0.8296)	(-0.8509)	(-0.7901)	(-1.2650)	(-1.2793)	(-1.2093)
NIM	0.1974	0.2032	0.1901	0.2224	0.2297	0.2121
	(0.9967)	(1.0296)	(0.9578)	(1.1324)	(1.1711)	(1.0817)
NFI	-0.1588	-0.1575	-0.1600	-0.1549	-0.1530	-0.1568
	(-0.5726)	(-0.5661)	(-0.5776)	(-0.5665)	(-0.5569)	(-0.5747)
G-SIBs	0.0025	0.0023	0.0029	0.0028	0.0025	0.0032
	(0.7242)	(0.6709)	(0.7933)	(0.8211)	(0.7575)	(0.9228)
Debt to GDP	0.0011	0.0010	0.0011	0.0006	0.0005	0.0006
	(0.1634)	(0.1585)	(0.1704)	(0.0905)	(0.0847)	(0.0998)
Intercept	YES	YES	YES	YES	YES	YES
Observations	888	888	888	888	888	888
Number of banks	82	82	82	82	82	82
Bank FE	NO	NO	NO	NO	NO	NO
R2	0.0022	0.0022	0.0022	0.0025	0.0027	0.0025

Table A11: **Descriptive statistics on net-short positions.**
This table compares the average net-short positions six days before and after the TLTRO announcements, separately for bank stocks and non-bank stocks. We report the statistics for the whole sample of position holders, and separately for each position holder.

Sample and Position Holder	Type of stock	Pre-event	Post-event
Aggregate Bank stocks vs Non-bank stocks			
	Non-bank stocks	1.6667	1.6886
	Bank stocks	1.5868	1.4584
AHL Partners LLP			
	Non-bank stocks	2.1444	2.7126
	Bank stocks	2.2733	2.0333
AQR Capital Management LLC			
	Non-bank stocks	1.5030	1.4773
	Bank stocks	1.8310	1.5531
Abaco Asset Management LLP			
	Non-bank stocks	1.7000	0.0000
	Bank stocks	0.0000	0.6800
B&G Master Fund Plc			
	Non-bank stocks	3.2775	1.7700
	Bank stocks	0.0000	1.0100
BlackRock			
	Non-bank stocks	2.0217	1.9148
	Bank stocks	1.8083	2.0183
Bridgewater Associates LP			
	Non-bank stocks	0.6214	0.7280
	Bank stocks	0.6617	0.7988
Caxton International Limited			
	Non-bank stocks	1.2100	0.0000
	Bank stocks	0.5100	0.5950
Citadel			
	Non-bank stocks	1.9492	1.7585
	Bank stocks	2.1880	2.2020
GLG Partners			
	Non-bank stocks	1.4350	1.0725
	Bank stocks	0.9550	0.0000
Gladstone Capital Management LLP			
	Non-bank stocks	1.0550	1.4960
	Bank stocks	0.0000	1.2400
Kintbury Capital LLP			
	Non-bank stocks	0.0000	0.5300
	Bank stocks	0.0000	1.2650
Lansdowne Partners Limited			
	Non-bank stocks	0.6845	0.6337
	Bank stocks	0.6900	3.3900
Marshall Wace LLP			
	Non-bank stocks	1.3265	1.3446
	Bank stocks	1.6614	1.3383
Merian Global Investors			
	Non-bank stocks	0.8167	0.9560
	Bank stocks	0.0000	1.2600
Numeric Investors			
	Non-bank stocks	0.8441	0.8317
	Bank stocks	1.3500	1.0200
Oceanwood Capital Management LLP			
	Non-bank stocks	0.8050	0.7700
	Bank stocks	0.7000	0.6700
Odey Asset Management LLP			
	Non-bank stocks	1.1036	1.1870
	Bank stocks	0.0000	0.7300
Oxford Asset Management			
	Non-bank stocks	0.9817	1.2015
	Bank stocks	1.4000	1.5275
PDT Partners LLC			
	Non-bank stocks	1.8080	1.2156
	Bank stocks	0.6000	0.4975

Table A12

Isin	Bank Name	LTRO	TLTRO-I	TLTRO-II	TLTRO-III
DE0005140008	DEUTSCHE BANK AG	0	0	1	1
DE000CBK1001	COMMERZBANK AG	1	1	0	1
FR0000130809	SOCIETE GENERALE	0	1	0	1
FR0000131104	BNP PARIBAS SA	0	0	1	1
IT0000066123	BPER BANCA S.P.A.	1	1	1	1
IT0000072170	FINECOBANK BANCA FINECO SPA	0	0	0	1
IT0000072618	INTESA SANPAOLO	1	1	1	1
IT0001031084	BANCA GENERALI SPA	1	0	1	1
IT0003188064	BANCA IFIS SPA	0	1	1	1
IT0003487029	UNIONE DI BANCHE ITALIANE SPA	1	1	1	1
IT0005108763	BANCA CARIGE SPA	1	1	1	1
IT0005218380	BANCO BPM SPA	1	1	1	1
NL0011821202	ING GROEP NV	0	1	1	1

Table A13: **Event study results on net short positions – control sample with firms whose headquarters are located in the Eurozone.**

This table shows the results of regressions on the net short positions. The dependent variable is the stock-level net short position. The regressions are run according to equation 4. Standard errors are clustered at the bank level. Robust t-statistics are reported in parentheses. Constant included but not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-1,1)	(1)	(2)	(3)	(4)	(5)
Banks	0.1211	0.3843	1.0481***	-0.2089	-0.3710
	(0.3683)	(1.2637)	(4.8347)	(-0.5686)	(-0.9277)
Announcement	-0.1702**	-0.2218***	-0.0803	-0.3844***	-0.1287
	(-2.5172)	(-2.8571)	(-0.7898)	(-3.1038)	(-0.9974)
Banks × Announcement	-0.2687	-0.4764	-1.3328***	0.2124	0.1685
	(-0.9215)	(-1.6360)	(-3.2728)	(0.5731)	(0.7383)
Observations	1,649	1,050	353	574	599
Stocks	312	279	117	205	137
R2	0.003	0.006	0.006	0.015	0.002
Panel B: (-2,2)	(1)	(2)	(3)	(4)	(5)
Banks	0.0671	0.2322	0.5956**	-0.0502	-0.3663
	(0.3022)	(0.8607)	(2.0363)	(-0.1798)	(-1.4319)
Announcement	-0.1382***	-0.1750***	-0.1171	-0.2557***	-0.1566
	(-2.9767)	(-3.2999)	(-1.4477)	(-2.8358)	(-1.6391)
Banks × Announcement	-0.2146	-0.3243	-0.8803***	0.0537	0.1639
	(-1.1515)	(-1.5993)	(-3.9469)	(0.2310)	(0.7015)
Observations	1,978	1,311	438	721	667
Stocks	312	279	117	205	137
R2	0.003	0.005	0.005	0.009	0.003
Panel C: (-6,6)	(1)	(2)	(3)	(4)	(5)
Banks	-0.0789	-0.0756	0.0275	-0.1866	-0.1873
	(-0.4168)	(-0.3225)	(0.0970)	(-0.7671)	(-0.8193)
Announcement	0.0277	-0.0009	0.0892	-0.0811	0.0539
	(0.6854)	(-0.0204)	(1.5163)	(-1.1628)	(0.9723)
Banks × Announcement	-0.1562	-0.2499***	-0.7274***	0.0856	0.1096
	(-1.5157)	(-2.6269)	(-5.9282)	(0.7014)	(0.6118)
Observations	9,797	6,776	2,691	3,258	3,705
Stocks	312	279	117	205	137
R2	0.000	0.000	0.002	0.000	0.000

Table A14: **Placebo tests for the event study results on net short-positions.**
This table shows the results on the short positions by assuming "placebo event" dates occurring in the pre-announcement period. We rely on the following placebo event windows for our estimates: (-4,-2), (-5,-3), and (-6,-2), where *Announcement* = 1 for (-3,-2), (-4,-3), and (-3,-2), respectively. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-4,-2)	(1)	(2)	(3)	(4)	(5)
Banks	-0.3666	-0.2759	-0.1771	-0.3008	-0.6219
	(-0.8627)	(-0.5430)	(-0.2659)	(-0.7395)	(-1.2203)
Announcement	-0.2056**	-0.2674**	-0.3891***	-0.0525	-0.1213
	(-2.3005)	(-2.4199)	(-3.8315)	(-0.3154)	(-1.0828)
Banks x Announcement	0.0649	0.2622	0.5551	0.0594	0.0620
	(0.2362)	(0.8837)	(0.8660)	(0.2291)	(0.1238)
Observations	1,492	856	290	471	636
Stocks	279	219	131	136	156
R2	0.004	0.005	0.012	0.001	0.007
Panel B: (-5,-3)	(1)	(2)	(3)	(4)	(5)
Banks	0.0333	0.0818	0.3726	-0.0411	-0.2822*
	(0.1195)	(0.2473)	(1.1105)	(-0.0954)	(-1.8093)
Announcement	-0.0410	-0.0823	0.0014	-0.2366	0.0036
	(-0.5349)	(-1.0499)	(0.0189)	(-1.4097)	(0.0254)
Banks x Announcement	-0.1700	-0.0172	0.0425	-0.2159	-0.1716
	(-0.3737)	(-0.0365)	(0.0476)	(-0.6594)	(-0.4388)
Observations	1,053	556	358	198	497
Stocks	212	164	121	80	132
R2	0.000	0.001	0.002	0.010	0.002
Panel C: (-6,-2)	(1)	(2)	(3)	(4)	(5)
Banks	-0.1748	-0.0274	0.1323	-0.1302	-0.5795*
	(-0.5728)	(-0.0819)	(0.3810)	(-0.3237)	(-1.7110)
Announcement	-0.1098**	-0.1110	-0.1681**	-0.0255	-0.1406*
	(-2.0007)	(-1.5345)	(-2.2082)	(-0.2841)	(-1.8862)
Banks x Announcement	-0.1270	0.0136	0.2458	-0.1112	0.0196
	(-0.7035)	(0.0516)	(0.3382)	(-0.4752)	(0.0557)
Observations	2,094	1,276	477	673	818
Stocks	279	219	131	136	156
R2	0.003	0.002	0.003	0.001	0.008

Table A15: **Event study results on net short positions – controlling for Amihud's illiquidity ratio.**
This table shows the results of regressions on the net short positions. The dependent variable is the stock-level net short position. *Amihud Ratio* is computed as the absolute value of daily stock returns divided by the daily trading volume for that stock. The regressions are run according to equation 4. Standard errors are clustered at the bank level. Robust t-statistics are reported in parentheses. Constant included but not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-1,1)	(1)	(2)	(3)	(4)	(5)
Banks	-0.1220	0.1275	0.9138***	-0.7468*	-0.4196
	(-0.2951)	(0.2645)	(4.7591)	(-1.9129)	(-1.0287)
Announcement	-0.2096***	-0.2598***	-0.1459	-0.3949***	-0.1735
	(-2.9246)	(-3.3256)	(-1.2452)	(-2.9659)	(-1.1901)
Banks x Announcement	-0.1497	-0.3955	-1.3308***	0.5372	0.2133
	(-0.4177)	(-0.8975)	(-3.6124)	(1.0475)	(0.8947)
Amihud Ratio	-0.0135	0.0040	0.0366***	-0.0489***	-0.0259*
	(-0.8728)	(0.1299)	(3.1611)	(-2.6663)	(-1.9639)
Observations	1,364	861	296	458	503
Stocks	291	258	110	179	127
R2	0.005	0.008	0.009	0.017	0.003
Panel B: (-2,2)	(1)	(2)	(3)	(4)	(5)
Banks	-0.1081	0.0245	0.5468	-0.3954	-0.3989
	(-0.4192)	(0.0670)	(1.4230)	(-1.5283)	(-1.4228)
Announcement	-0.1622***	-0.2020***	-0.1946**	-0.2444**	-0.1853
	(-3.1751)	(-3.6558)	(-1.9884)	(-2.4904)	(-1.4162)
Banks x Announcement	-0.1637	-0.2927	-0.9641***	0.1855	0.1926
	(-0.7604)	(-1.0843)	(-9.8172)	(0.6440)	(0.7690)
Amihud Ratio	-0.0147	0.0012	0.0330**	-0.0516**	-0.0260*
	(-0.9444)	(0.0381)	(2.3891)	(-2.4300)	(-1.9650)
Observations	1,655	1,103	377	591	552
Stocks	291	258	110	179	127
R2	0.004	0.006	0.010	0.009	0.004
Panel C: (-6,6)	(1)	(2)	(3)	(4)	(5)
Banks	-0.2509	-0.3578*	-0.2649	-0.4638**	-0.2059
	(-1.4313)	(-1.8593)	(-1.0203)	(-2.4075)	(-0.8915)
Announcement	0.0283	-0.0083	0.0689	-0.0770	0.0604
	(0.6305)	(-0.1765)	(1.1034)	(-0.9646)	(1.0388)
Banks x Announcement	-0.0751	-0.1564	-0.6250***	0.1666	0.1031
	(-0.8882)	(-1.3449)	(-9.5575)	(1.3481)	(0.5726)
Amihud Ratio	-0.0025	-0.0183	-0.0246	-0.0194	-0.0030
	(-1.0902)	(-1.1191)	(-1.0893)	(-0.2184)	(-1.2674)
Observations	8,047	5,534	2,174	2,657	3,075
Stocks	291	258	110	179	127
R2	0.001	0.001	0.003	0.001	0.001

Table A16: **Event study results on net short positions – controlling for Amihud's illiquidity ratio with a control sample with firms whose headquarters are located in the Eurozone.**

This table shows the results of regressions on the net short positions. The dependent variable is the stock-level net short position. *Amihud Ratio* is computed as the absolute value of daily stock returns divided by the daily trading volume for that stock. The regressions are run according to equation 4. Standard errors are clustered at the bank level. Robust t-statistics are reported in parentheses. Constant included but not reported. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

	All events (12)	Launch of the TLTRO waves and reductions in the TLTRO interest rates (7 events)	Launch of the TLTRO waves (3 events)	Reductions in the TLTRO interest rates (4 events)	Technical aspects (5 events)
Panel A: (-1,1)	(1)	(2)	(3)	(4)	(5)
Banks	-0.0777	0.1686	0.9077***	-0.6610*	-0.3507
	(-0.1881)	(0.3508)	(4.6743)	(-1.6790)	(-0.8653)
Announcement	-0.1638**	-0.2005**	-0.1787	-0.3245**	-0.1229
	(-2.1971)	(-2.2696)	(-1.5066)	(-2.3346)	(-0.8710)
Banks x Announcement	-0.1237	-0.3619	-1.0817***	0.4400	0.1624
	(-0.3622)	(-0.8267)	(-3.8779)	(0.8327)	(0.6895)
Amihud Ratio	0.0865***	0.1137***	-0.7497	0.1106***	0.0369***
	(4.5684)	(5.9694)	(-1.1430)	(5.8541)	(3.7949)
Observations	1,290	806	270	443	484
Stocks	264	234	103	167	120
R2	0.010	0.017	0.007	0.034	0.003
Panel B: (-2,2)	(1)	(2)	(3)	(4)	(5)
Banks	0.0079	0.1984	0.8241***	-0.2253	-0.2873
	(0.0304)	(0.5393)	(4.3839)	(-0.8645)	(-1.0583)
Announcement	-0.1221**	-0.1621**	-0.2168**	-0.1855*	-0.0920
	(-2.2289)	(-2.3628)	(-2.1733)	(-1.8440)	(-0.7796)
Banks x Announcement	-0.2092	-0.3916	-0.9991***	0.0047	0.0991
	(-0.9935)	(-1.3537)	(-3.6436)	(0.0149)	(0.4061)
Amihud Ratio	0.0874***	0.1153***	-0.3196	0.1147***	0.0365***
	(4.6108)	(5.9352)	(-0.9066)	(5.9212)	(3.6602)
Observations	1,562	1,030	344	570	532
Stocks	264	234	103	167	120
R2	0.008	0.014	0.009	0.024	0.003
Panel C: (-6,6)	(1)	(2)	(3)	(4)	(5)
Banks	-0.1703	-0.2597	-0.1396	-0.3646*	-0.1784
	(-1.0270)	(-1.4133)	(-0.6314)	(-1.9717)	(-0.7691)
Announcement	0.0499	0.0071	0.0677	-0.0518	0.0851
	(1.1052)	(0.1448)	(1.1116)	(-0.6459)	(1.4314)
Banks x Announcement	-0.1027	-0.2133*	-0.6607***	0.0561	0.0783
	(-1.3276)	(-1.7705)	(-4.5664)	(0.4349)	(0.4340)
Amihud Ratio	0.0055*	0.0055*	0.0097***	0.0023***	0.0174
	(1.8632)	(1.8660)	(12.2821)	(5.8760)	(1.4207)
Observations	7,870	5,425	2,129	2,624	2,993
Stocks	264	234	103	167	120
R2	0.001	0.001	0.005	0.001	0.001

Figure A3: **Google SVI for keyword "TLTRO".**
This figure shows the values of Google SVI for the keyword "TLTRO" over our sample period.

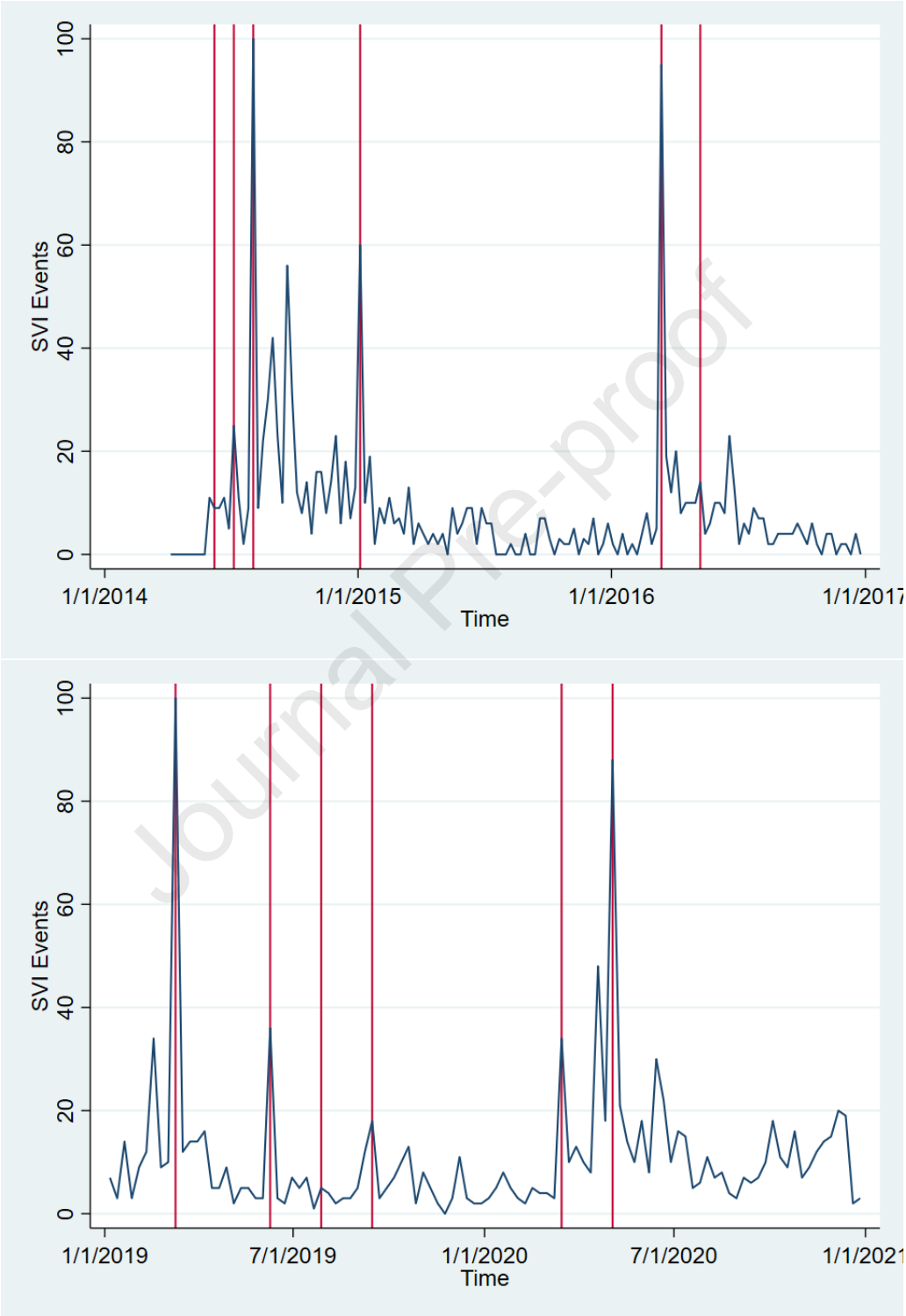

Figure A4: **ROC curves based on equation 5.**
This figure shows the area under the ROC curve for a probit model where the dependent variable is equal to one if a bank received funding under one of the three waves of the TLTRO program, TLTRO-I, TLTRO-II, and TLTRO-III. The independent variable is the estimated bank-level CAR(-1,1) for the corresponding announcement. "CAR_120" ("CAR_90") denotes that the estimation window is based on 120 (90) trading days.

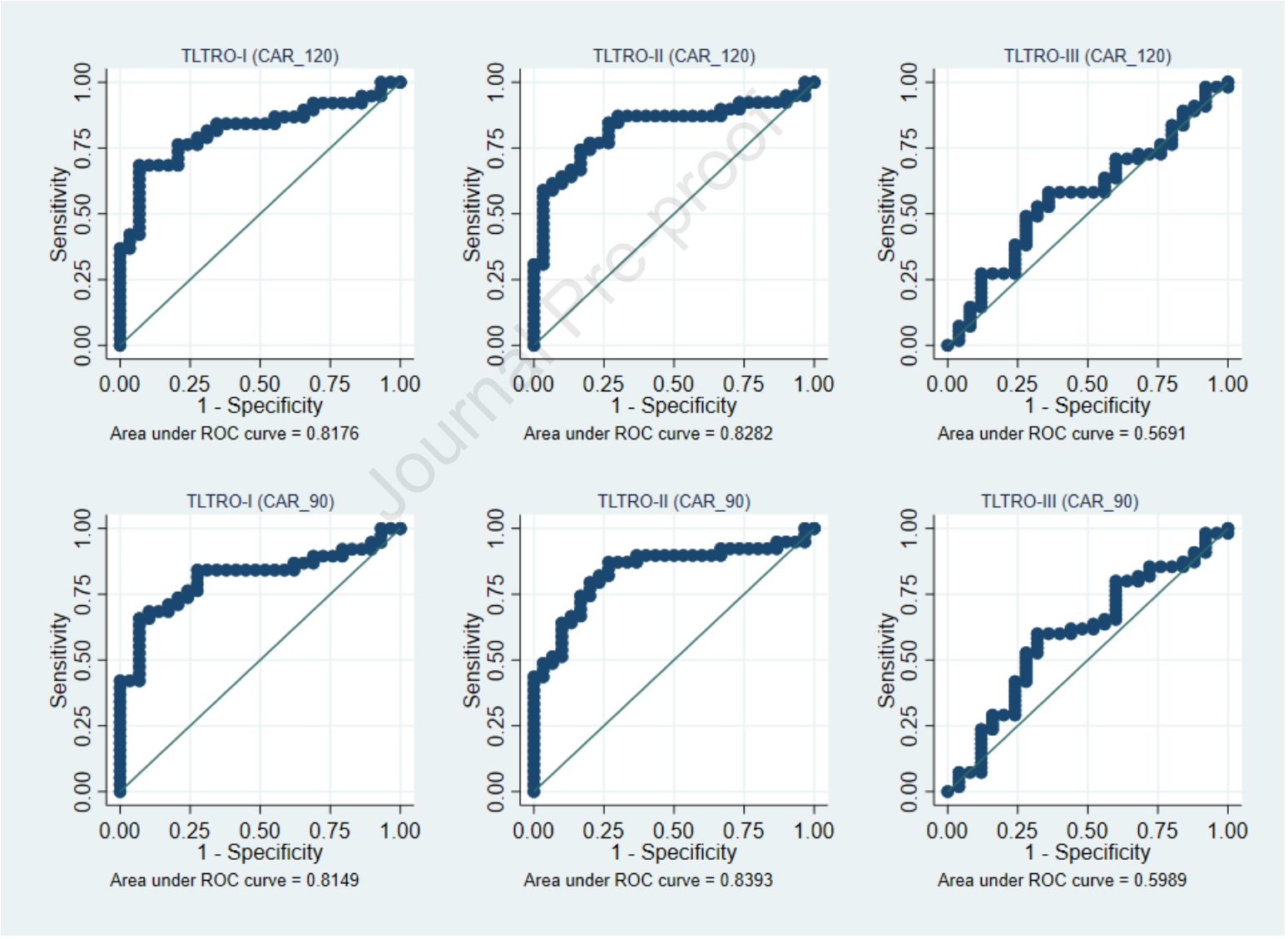

Figure A5: **ROC curves with control variables (equation 6).**
This figure shows the area under the ROC curve for a probit model where the dependent variable is equal to one if a bank received funding under one of the three waves of the TLTRO program, TLTRO-I, TLTRO-II, and TLTRO-III. The main independent variable is the estimated bank-level CAR(-1,1) for the corresponding announcement. The controls are: *Size*, *NIM*, and *NFI*. "CAR_120" ("CAR_90") denotes that the estimation window is based on 120 (90) trading days.