DNB Working Paper

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EUROSYSTEEM

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Working Paper No. 748

July 2022

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July, 2022

Abstract

This paper studies the influence of central bank lending operations on the announcement effects of European banks' seasoned equity offerings (SEOs). We find that larger participation in lending operations is associated with more negative cumulative abnormal returns following the announcement. This result supports the hypothesis that SEOs made by banks that rely more on central bank lending facilities show more negative signaling effects. However, these effects are short-lived and fade away after two trading days following the SEO announcement. Further, we find that offerings motivated by capital strengthening are more likely to signal overpriced equity.

Keywords: Banks; Bank capital; Seasoned equity offerings; Unconventional monetary policy
JEL: E52, E58, G14, G21

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1. Introduction

During the initial phase of the Global Financial Crisis (GFC), central banks stepped in as lenders of last resort to provide liquidity and preserve the stability of the financial system as a whole.[1] In subsequent years, central banks, including the Eurosystem, provided longer-term lending operations as part of their unconventional toolkit to support bank funding, stimulate economic activity and restore inflation dynamics. These interventions were sizable (see Figure 1). Lending operations evolved with increasing maturities and new features by linking terms and conditions to banks' credit expansion.

This paper studies how lending operations offered by the central bank affect the effects of banks' equity offerings. We focus on the abnormal returns of equity prices around the announcement of *seasoned equity*

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[1]In this paper, we abstract from capital infusions made by the state to preserve the solvency of individual financial institutions.

offerings (SEOs) of listed euro area banks. The announcement effects of SEOs are important because they may comprise a large part of equity flotation costs (Li et al., 2019, Eckbo et al., 2007). Empirical studies have established that SEOs announcements tend to be accompanied by negative abnormal returns (Veld et al., 2020). Asymmetric information regarding the firm's prospects between managers and owners (Ross, 1977, Myers and Majluf, 1984) or managers' attempts to time the market (Baker and Wurgler, 2002) can explain the negative signaling effects of a SEO.

Although recent studies have focused on banks' capitalization and regulation (see Section 2), the potential impact of unconventional monetary policy interventions on SEOs announcement signals has mainly been neglected. As part of easing policies of the central bank, lending operations enhance the liquidity position of banks and offer an alternative source of funding, which may facilitate banks' recapitalization (Brunnermeier and Sannikov, 2016, Flanagan, 2019, Albertazzi et al., 2020, Carpinelli and Crosignani, 2021). As a result, the bank's management gains more flexibility and discretion to decide when and how they would like to raise external equity. The increased flexibility could exacerbate signaling effects and lead to larger negative effects of SEOs announcements on stock prices. However, from a risk perspective, lending operations by the central bank may also be perceived as a confirmation that public safeguards are in place. This implicit confirmation could counteract the negative price effects of a SEO announcement.

In this paper, we aim to answer this empirical question: how does a bank's reliance on central bank lending operations affect the impact of a SEO announcement on stock price performance? To the best of our knowledge, this empirical study is the first shedding light on the potential link between central bank lending operations and the stock price effects of issuing equity. To answer this question, we combine data on euro area banks' SEOs with quarterly information on bank-specific take-up of central bank lending operations, obtained from the Eurosystem's internal market operations dataset. We then adopt a two-stage empirical approach. First, we estimate cumulative abnormal returns (CAR) using an event-study approach and track these returns over different windows following a SEO announcement. Second, we employ cross-sectional regressions to explain the estimated CAR by banks' participation in Eurosystem lending operations controlling for a rich set of offer, bank, market, and country-specific controls.

Our findings show that banks with a larger reliance on central bank lending operations are faced with relatively more negative abnormal returns immediately after a SEO announcement. This result supports the hypothesis that SEOs made by banks that rely more on central bank lending facilities show more negative signaling effects. However, we find that these effects are short-lived and fade away beyond two trading days after the announcement. We also find that SEOs motivated explicitly by the need to strengthen their capitalization have a stronger and more persistent negative correlation with post-announcement performance.

The remainder of this paper is organized as follows. Section 2 reviews the related literature. Section 3 provides details on our dataset. In Section 4, we describe our empirical methodology, and in Section 5, we

report the main empirical results, including several robustness checks. Finally, Section 6 concludes.[2]

2. Related Literature

This paper is related to the broader literature on SEOs announcement effects and their drivers. Adverse reactions to SEOs announcements may be explained by the existence of asymmetric information between the managers of a firm and outside investors (Ross, 1977, Myers and Majluf, 1984). Building on these information asymmetries, the pecking order theory (Myers and Majluf, 1984) suggests that the choice of a financial structure (equity vs debt) can signal information to the market about the value of the firm. Baker and Wurgler (2002) show that managers seek to raise equity when the firm's stock is overvalued. In this case, the decision by managers to raise equity can be perceived by investors as an attempt to "time the market", which would signal overvaluation leading to a downward correction in stock prices.

In early empirical work, Asquith and Mullins Jr (1986), Barclay and Litzenberger (1988) and Masulis and Korwar (1986) document the existence of negative market reactions around SEOs announcements. Empirical evidence that firms tend to raise equity following a period of out-performance is provided by Asquith and Mullins Jr (1986), Korajczyk et al. (1991). More recently, Veld et al. (2020) have documented in a meta-analysis of 199 published studies that the cumulative abnormal return (CAR) around offerings announcements is -0.98% and varies by the type of offers and geographical coverage of the study. Erel et al. (2012) argue that macroeconomic conditions affect firms' ability to raise capital and influence their decisions on the types of securities offered. Dissanaike et al. (2014) study SEOs by firms in the United Kingdom and find that announcement effects during the GFC were driven less by signalling effects and more by macroeconomic conditions. Moreover, the authors point that market-timing considerations were not very relevant during the GFC.

SEOs of banks are likely to differ from those of non-banks because their financial structure is primarily driven by their business (credit intermediation), access to safety nets (central bank facilities, deposit guarantees) and regulation.[3] Banks' equity issues are partly motivated by regulatory standards and may be enforced by supervisory authorities, rather than management preferences, which weakens the signal of bank SEOs compared to unregulated sectors. On the other hand, access to safety nets may strengthen the negative signal of bank SEO announcements. In this context, Keeley et al. (1989) emphasize that a higher proportion of equity reduces the option value of deposit guarantee.

In one of the first studies on equity offerings by banks, Polonchek et al. (1989) found that SEOs announcement signals are muted relative to non-banks due to stringent capital regulation. Cornett and Tehranian (1994) provide early evidence that involuntary equity offerings by banks, defined as those that are needed

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[2]An Online Appendix containing details on the dataset and additional empirical results is available upon request.

[3]Due to the opaque nature of their operations and common exposures, banks' equity offerings could also lead to significant intra-industry spill-overs (Botta, 2019, Slovin et al., 1992).

to meet capital requirements, are associated with smaller price responses. Liu (2016) finds that, following SEOs announcements, banks in the United States face less negative reactions than non-banks. Moreover, the author finds that this difference between banks and non-banks decreased during the GFC but increased again after the Dodd-Frank Act, which supports the view that bank regulations affect the signals of banks' SEOs announcements. In another study, Li et al. (2019) show that more stringent bank regulation is associated with more positive SEOs announcement reactions. However, the authors find that this relationship is concave, with very high levels of regulation likely to lead to more negative reactions for banks. The positive relationship is only found for voluntary offerings and not for offerings by undercapitalized banks. Dinger and Vallascas (2016) explore the drivers of SEOs for undercapitalized banks and find that market discipline rather than capital regulations are the primary driver of the decision to offer equity.

In the presence of central bank lending facilities, SEOs announcement signals may become more negative, *ceteris paribus.* The former is because lending operations lead to better macroeconomic and market conditions and more room for discretion, which can facilitate market-timing behavior of banks and reinforce agency conflicts between managers and investors (Veld et al., 2020).[4] The increased incentive for market timing is also related to the more general observation that expansionary monetary policy can boost equity valuations and capitalization (Brunnermeier and Sannikov, 2016). Flanagan (2019) finds that the ECB's Targeted Long-Term Refinancing Operations (TLTRO) programs increased banks' net worth via subsidized loans, while Albertazzi et al. (2020) show that the ECB's lending operations reduced the fragility of the banking system. Carpinelli and Crosignani (2021) documents that banks in Italy used TLTRO liquidity to substitute missing wholesale funding. Thus, lending facilities by the central bank can alleviate solvency and liquidity constraints and provide banks discretion on the timing of their SEOs. Solvency and liquidity constraints are important drivers of banks' decision to raise equity (DeAngelo et al., 2010, Black et al., 2016). Announcements of asset purchase programs may have a similar impact. Acharya et al. (2019) document that the ECB's Outright Monetary Transactions (OMT) program announcement through Mario Draghi's "whatever it takes" speech resulted in equity windfalls for banks from countries most in distress. Nevertheless, studying the effects of the announcements of asset purchase programs is beyond the scope of our analysis.

From a risk perspective, however, public sector support measures—attractive lending operations are an example—may be perceived as confirming that public safeguards are in place. Such a confirmation, which can be particularly important during crisis periods, may counteract negative price effects of a SEO announcement. For instance, Elyasiani et al. (2014) found that investors reacted positively to TARP injections. Investors could have interpreted the injections as an indication that the recipient banks were "too-big-to-fail" or that the likelihood of the recipient banks' failure decreased following the capital injection. Our analysis adds to the literature on SEOs announcements by banks, focusing on the impact of central bank policies on stock

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[4]Studies on the impact of ECB policies on macroeconomic conditions include Altavilla et al. (2021), Andrade et al. (2016) and Fratzscher et al. (2016). However, the literature on the macroeconomic effects of unconventional monetary policies is not conclusive (Borio and Zabai, 2018).

price performance. More specifically, we investigate how banks' reliance on lending operations exacerbates negative signaling effects.

3. Data

We collected data on SEOs of listed euro area banks from the SDC Global New Issues database covering 1986-2020 and filtered for banks (primary SIC Code 6000). We discarded initial public offerings (IPOs) and convertibles and retained offerings of common or ordinary shares (i.e., no American Depository Receipts or unit offerings). We deleted secondary offerings, withdrawn offers, and registrations, but we retained rights issues and private placements. We created unique events by collapsing the dataset using the "package id" and "Original Date" fields.[5] We carried out manual checks and corrected or deleted some dates.[6]

Additionally, we scanned events and original documents, such as press releases, for the motivation of each offer. We classified offerings into three categories, depending on their primary motivation: (1) offers made to finance an acquisition, (2) offers made for strengthening capital or reducing leverage, and (3) offers made to repay state aid. When the primary motivation was not clear (for instance, if there were multiple purposes or if documentation was not available), we adopted a conservative stance and classified these offers as *unknown*.[7]

Figure 2 presents the number of SEOs announcements and total proceeds per year in our dataset. Initially, the dataset contains 450 offering announcements, of which 263 are rights issues and 38 private placements. The number of offerings peaked in the GFC (2008-2009) and again in 2014 when euro area banks were subject to a comprehensive assessment to identify capital shortfalls ahead of the start of the Single Supervisory Mechanism. Regarding the motivation of offerings, 77 SEOs were primarily intended to strengthen the capital base, 53 to finance mergers and acquisitions, and 17 to repay state aid.[8] Table 1 presents the distribution of SEOs announcements per country. Most SEOs were announced in Germany, a country with a large number of banks, and the countries most affected by the European debt crisis (Greece, Ireland, Italy, Portugal, and Spain). The number of SEOs announced by banks in other countries has been lower, except for France and Austria, which recorded 37 and 23 announcements, respectively.

Furthermore, we collected information on banks' financial statements and stock price data from Refinitiv EIKON. We complement the dataset with country-specific and time-varying macro variables on real GDP growth, unemployment, and inflation from the OECD. Table 2 provides details on the definitions of the

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[5]"Package ID" is the Thomson Reuters unique identifier for the type of security package."Original Date" is when the offer is first publicly announced or rumored.

[6]A list of events for which we corrected or deleted dates is provided in the Online Appendix.

[7]In robustness checks, we include the *unknown* category as a control. This variable is not statistically significant, which indicates that there is no systematic misclassification of offers into the *unknown* category.

[8]Alternatively, we classify offers used for M&A when the field "Use of Proceeds" from the SDC dataset contains the word *acquisition*. This alternative classification leads to 41 offers being classified as made for M&A versus 53 using our classification. 24 offers overlap and using the alternative index does not alter the estimation results.

variables used for this empirical study, and Table 3 shows the main summary statistics.

For the amount of central bank financing, we employed an internal, confidential Eurosystem dataset on lending (or "refinancing") operations. These are available for each Monetary Financial Institution (MFI) and cover the 2008Q4-2020Q4 period. The dataset includes regular lending operations (e.g., the weekly Main Refinancing Operations or MRO and the three-month Longer-Term Refinancing Operations or LTRO) and non-standard operations. The latter include longer-term operations (up to four years), which sometimes have specific terms and conditions, such as links to banks' lending performance.[9]

Our data on lending operations are available starting from 2008Q4 onward and therefore do not cover the entire period of our SEOs observations. However, the lending operations data match the years during which the Eurosystem conducted unconventional policy. Before the GFC, under the conventional monetary policy regime, the Eurosystem provided just enough liquidity through its lending operations to ensure that banks would meet the ECB's minimum reserve requirements. A combination of pricing and tender techniques discouraged banks from holding more liquidity (or "reserves") than required, which was an effective way to steer short-term market interest rates to levels close to the ECB's main policy rate. However, since the start of the crisis, the Eurosystem has provided ample liquidity to banks by offering its main refinancing operations against a fixed interest rate and with full allotment. In other words, banks could borrow as much as they wanted against the MRO rate.[10] After this change, it became more attractive for banks to participate in lending operations, which helped contain liquidity problems in financial markets. In subsequent years, the ECB offered lending operations with more attractive features, such as longer maturities (up to several years), broader collateral acceptance and attractive interest rates, which helped banks fund themselves and to continue providing credit intermediation. Altogether, there has been a move from conventional lending operations with tight liquidity conditions towards unconventional operations with ample liquidity through fixed-rate full allotment and more attractive terms and conditions.

Because of limited data availability and in line with the change in the modalities of lending operations since 2008, we set banks' take-up of lending operations to zero for observations prior to 2008Q4 (i.e., the period with conventional monetary policy with tight liquidity conditions). In this setting, SEOs announcements that occurred before the start of 2008Q4 *de facto* act as controls in our study. As part of our robustness checks presented in Section 5, we revisit this assumption and run regressions including only observations from 2008Q4 onwards.

As we consider a bank at the highest level of consolidation, we have to aggregate its participation through different entities. For example, BNP Paribas can participate in Eurosystem's tender operations through its

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[9]The latter are known as Targeted Longer-Term Refinancing Operations (TLTROs), in which access to attractive funding is conditional, as banks have to meet a minimum benchmark of lending to non-financial firms and households.

[10]Before the move to "fixed-rate, full-allotment" on 8th October 2008, operations were implemented through variable-rate tenders, which is a bidding procedure where banks that want to borrow most end up paying a higher interest rate, while allotment is capped at the level deemed sufficient to meet aggregate liquidity demand.

parent entity, but also via its subsidiaries that may be located in various euro area countries and are included in our dataset as separate MFIs. We take the sum of all these group entities' take-up and include it as a proportion of total group assets.

Because we use bank-specific data on lending operations, which is confidential as the Eurosystem only publishes aggregated data, one could argue that we assume that markets react based on information they do not possess. In reality, however, some information on bank-specific participation in lending operations is known because banks publish this themselves, while analysts covering the European banking system often provide estimates regarding the actual and potential take-up. This has been particularly the case for the more recent TLTRO programs that account for the bulk of allotted amounts since 2014. Nonetheless, we conduct a robustness check using the national aggregate of central bank deposits as a proxy for each bank's participation in the ECB lending operations. This aggregate is published externally via the MFI Balance Sheet Items statistics. We scale the aggregate measure with the total MFI assets in each country. We consider the country-level data an appropriate robustness check because the take-up is correlated within banks of the same country.

Finally, we do not explore a breakdown of the financing from central bank lending operations by operation-specific modalities and other characteristics, such as the remaining maturity. The reasons are twofold. First, granular information on the exact mix of lending from each operation and other characteristics is not publicly available and more difficult to gauge with proxies than the total lending exposure. Thus, a detailed breakdown could be inconsistent with the information available to markets at the announcement. Second, there is no significant overlap of operations over time, and thus, there is limited cross-sectional variation. Hence, identifying the impact of modalities of individual lending operations on the SEOs announcement signals would be empirically unfeasible.

4. Methodology

Our methodology consists of two steps. In the first step, we carry out a standard event study (MacKinlay, 1997) to obtain estimates for the CAR in a three-day event window (-1,1) around the announcement. To track the short-term post-announcement effects, we extend the upper boundary of the window up to ten days (-1,10). We use a market model in which we regress the daily bank stock price returns on the daily returns of the Eurostoxx600 Banks index with a default regression window of (-270,-20) days before the announcement. To assess the statistical significance of CAR, we use the test statistic proposed by Kolari and Pynnönen (2010) to account for the cross-sectional correlation of CAR due to event clustering.

In the second step, we perform cross-sectional regressions using the CAR as the dependent variable and the take-up of Eurosystem lending as the main explanatory variable. Presumably, differences in take-up levels reflect the relative attractiveness of lending operations, which is not identical across banks and over time. Indeed, Sugo and Vergote (2020) show that the main driver of TLTRO take-up is the cost advantage relative to a market funding benchmark such as covered bonds, which differs across banks.

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In addition, we add the following set of offer, bank, market, and macroeconomic controls:

- *Offer characteristics.* We include the relative offer size, whether the offering is a rights issue and whether it is a private placement. We also include the purpose of the offer, particularly whether the offer was performed to strengthen the capital base.

- *Bank characteristics.* We control for bank size since offerings by larger banks are more likely to be associated with moral hazard problems. We also include leverage, measured by equity as a share of total assets.

- *Market characteristics.* To account for the timing of the announcement, we include proxies of overpriced equity, as firms are more likely to raise equity when their overvalued (Baker and Wurgler, 2002). Specifically, we control for the cumulative change in the stock price of the bank in the period (-120,-1) days before the announcement (named *run-up*) and the average price-to-book ratio over the same window. As regards market conditions, we include a similar measure of market run-up. Further, we control for measures of realized daily stock price and market return volatility during the period (-250,-1) days before the event.

- *Macroeconomic controls.* In a separate specification, we control for country GDP growth, unemployment, and inflation to capture country-specific and time-varying factors which could affect the reaction of the markets after SEOs announcements (Elyasiani et al., 2014).

Finally, we use standard errors clustered at the issuer level. We always include dummies for the country of issuing bank to capture country-specific and time-invariant factors over our sample period.

5. Empirical Results

Table 4 reports cross-sectional regressions for the CAR measured in the (-1,1) days window around announcement.[11] The main variable of interest, participation in Eurosystem's lending operations, is indicated by *Lending_CB*. Columns (1) to (6) report estimation results when we successively add offer, bank, market, and time-varying country-specific control variables. All regressions include country-specific dummies. The coefficient of *Lending_CB* remains statistically significant at the 5% confidence level when we include additional controls in the regressions. The negative sign of the coefficient implies that banks that rely more heavily on the Eurosystem's lending operations face larger equity offering announcement costs. The absolute size of the coefficient drops in specifications where we add offering controls. The decrease in the size of the coefficient may be particularly attributed to whether offerings are motivated by recapitalization to strengthen the balance sheet. The coefficient further drops somewhat when we add the control variables for bank characteristics in Column (4) and increases again when we add macro controls and common financial

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[11]Estimation results for the CAR are provided in the Online Appendix.

variables in Columns (5) and (6). Column (6) reports the richest specification. In this column, the coefficient value suggests that one percentage point of additional lending from the central bank relative to assets is associated with 2.5 basis points lower cumulative abnormal returns around a SEO announcement. This coefficient would imply that for a bank with an average take-up of around 6% in the post-2008 period, CAR over the window (-1,1) around announcement would be around 15 bps lower than a bank with no take-up. However, for a bank with a take up at the 90th percentile at 16.7%, the CAR would be 41.8 bps lower than a bank with no take-up.

A possible interpretation of the negative coefficient is that lending operations facilitate banks' management to optimize the timing of equity offerings, which could exacerbate signaling effects caused by asymmetric information between management and investors. Lending operations improve banks' liquidity position and—particularly since 2008—provide attractive funding, which reduces the likelihood that banks are forced to raise equity under difficult circumstances. Especially SEOs by banks with a significant participation in lending operations may thus be perceived as more discretionary than would otherwise have been the case. Indeed, Sugo and Vergote (2020) argue that TLTRO operations provided a funding cost advantage and facilitated banks to activate a share of their non-high quality liquid assets (non-HQLA) to raise the overall liquidity of their balance sheet. Moreover, Flanagan (2019) documents a significant equity windfall from participation in TLTRO operations, which was particularly large for banks facing higher funding costs in private markets.

Regarding the purposes of offerings, SEOs motivated by strengthening capital ratios negatively correlate with CAR, which is significant at the 5% confidence level across specifications. This result seems inconsistent with the fact that these offers are likely to be less discretionary and thus less prone to signaling problems. However, the result is in line with the findings of the meta-analysis by Veld et al. (2020) regarding offers used to pay down debt. The other motivations—financing mergers and acquisitions, repaying state aid—do no have a significant impact on CAR (not reported).

The leverage ratio has a negative impact, which is significant in two of the three specifications. The negative coefficient is in line with what we would expect to the extent that offers made by banks with more equity relative to assets are associated with increased agency problems. Interestingly, the coefficients for the size of a bank and market controls that may capture market timing behavior or bank (price-to-book ratio, stock market volatility, and stock market run-up) are not statistically significant.

To better understand how the impact of larger reliance on central bank financing evolves over a longer period, we re-run the regressions for more extended windows, up to ten days post-announcement. These regressions are based on the full specification that includes all offer, bank, market, and country controls. We plot the coefficient estimates for banks' participation in lending operations in Figure 3.[12] These results suggest that the influence of *Lending_CB* decreases as the window is extended. Furthermore, the coefficient

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[12] We additionally report the values of these coefficients in the Online Appendix.

is only statistically significant at the 5% and 10% confidence levels in the windows (-1,1) and (-1,2) days around an announcement. At the same time, the leverage and stock price volatility variables are significant for the longer windows while the size of these coefficients increases. So, whereas reliance on lending operations becomes less significant over longer post-announcement windows, bank and market characteristics become more relevant explanatory factors for stock performance following the announcement. In addition, private placements seem to be associated with less negative reactions and have more influence in the wider windows. Altogether, even though the reliance of central bank financing contains information regarding a SEO announcement, the stock price under-performance over a longer window—which is most relevant for equity raising costs—is more related to fundamental variables such as market conditions and balance sheet strength at the time of the announcement.

We perform a battery of robustness checks for the above results. First, we perform sample splits. In the first sub-sample, we retain SEOs announcements after 1999Q1, which coincides with the existence of the euro and the Eurosystem's market operations history. In the second sub-sample, we retain only the post-2008 period for which there is a perfect overlap between the offerings dataset and the lending operations dataset over the period with ample liquidity conditions and fixed-rate full-allotment operations. Thus, we do not have to set the take-up measure to 0% for the announcements before 2008Q4. We present estimation results for the $(-1,1)$ window and the main coefficient of interest in Table 5 for the most parsimonious and the richest regression specifications. We observe that the take-up coefficient decreases, in absolute terms, to around 0.023 when we keep the sample from 1999 onwards. However, the coefficient becomes even more negative and increases, in absolute terms, by 0.042 after retaining only the overlapping sample after 2008.

Second, we replace our bank-specific take-up measure with a publicly available country aggregate proxy. As explained in Section 3, one could argue that analysts and market participants do not precisely know the individual MFI-level take-up of lending operations at the moment of a SEO announcement. Therefore, we use aggregated country-level data for central bank deposits as a share of credit institutions' total assets to proxy lending from the Eurosystem instead of our internal confidential data.[13] While the use of bank-specific participation in lending operations in our main analysis may overstate the information known by market participants, the use of aggregated data is more likely to understate the available knowledge. Despite the strong assumption of a similar exposure of each bank in the same country relative to the Eurosystem, the coefficient for the country aggregate measure of central bank deposits is negative and significant in Table 6. However, due to the loss of variation at the bank level within the same country, the results tend to be noisier as we progressively add control variables. Interestingly, the results for the recapitalization dummy and leverage also remain robust.

Third, we vary the definition of the dependent variable. We generate CAR estimates based on alternative windows and alternative stock market benchmarks for the event study. For the alternative windows, we

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[13]We present the evolution of the aggregate measure in the Online Appendix.

use as dependent variable the CAR estimated over a (-2,2) and (-3,3) window around the announcement. Estimation results, which are presented in Table 7, show that the main coefficient of interest, the banks' take-up of central bank lending, remains robust. For the alternative benchmarks in the event study regression, we replace the Eurostoxx Banks index by each bank's national stock price index.[14] Additionally, we use a constant mean model to construct the CAR and the Eurostoxx index. We find that the CAR estimated with the constant mean model is lower, since the measure is more affected by the pre-announcement performance of the stock. The average CAR estimated with the national stock price index is comparable to the average CAR estimated using the Eurostoxx index.[15] Nevertheless, the main coefficient of interest appears to be robust to the choice of the benchmark index (see Table 8).

Finally, we lag the Eurosystem lending operations variable by one quarter. We show these results in Table 9. The coefficient for the lagged measure remains statistically significant and retains the negative sign. However, its size almost halves when we only include country dummies.

6. Conclusions

We provide one of the first studies on the interaction between unconventional monetary policies and banks' equity raising costs. Using data on banks' SEOs announcements combined with internal Eurosystem data on banks' participation in lending operations, we find that banks with a larger take-up face more negative stock price returns around SEOs announcements. However, this effect is only short-lived as the lending operations take-up measure becomes insignificant beyond a two-day window. The variable for the purpose of the offering and solvency controls become more significant when we allow for wider announcement windows for the richest specifications.

Our results may be attributed to the fact that central bank lending operations have facilitated recapitalizations through equity windfalls and alleviated liquidity concerns. This result would be in line with previous studies showing that expansionary monetary policies can act as "stealth recapitalizations" (Brunnermeier and Sannikov, 2016, Acharya et al., 2019, Flanagan, 2019). The estimated negative effects could indicate that, as a response to extended lending operations, banks' SEOs decisions were more discretionary than they would have been in the absence of the facilities.

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[14]We use the national stock price index instead of the national banking sector-specific index because for some countries, individual banks have a large weight in the banking sector index.

[15]We present a comparison of average CAR across windows for the three different event study models in the Online Appendix.

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Figures and Tables

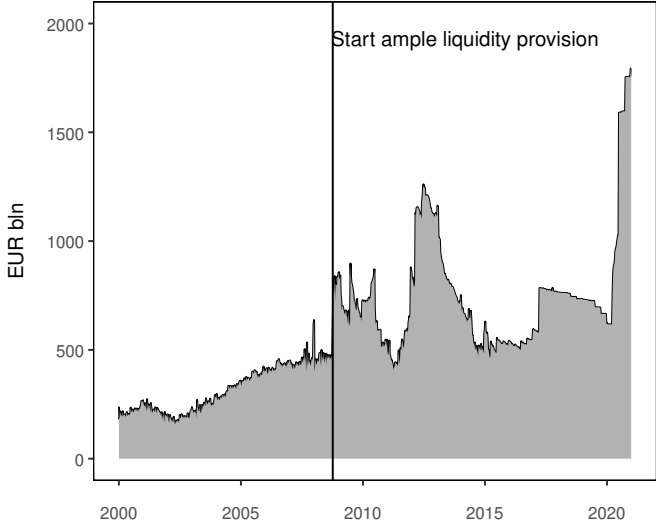**Figure 1:** Eurosystem lending operations

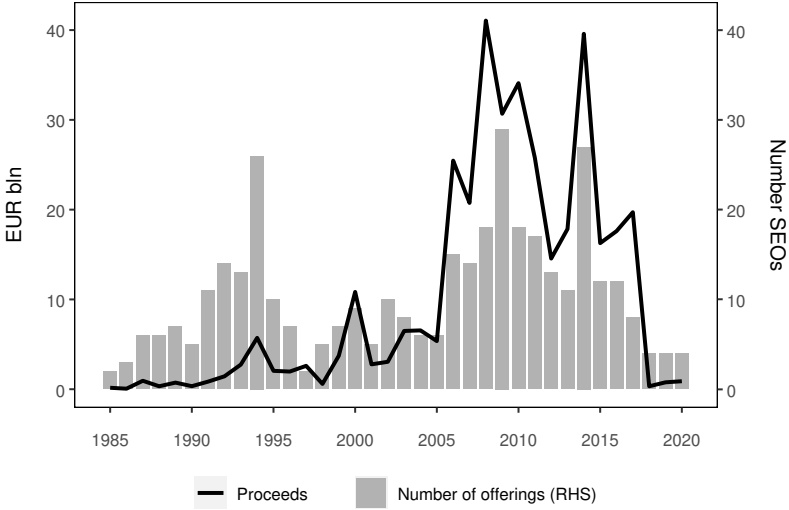
Figure 2: Number of SEOs and proceeds

Table 1: Number of SEOs announcements and total amount of proceeds per country

Country	Total proceeds, EUR bln	SEOs announcements, non missing proceeds	SEOs announcements
Germany	69.5	75	79
Italy	80.0	72	84
Spain	69.5	56	63
Greece	44.5	53	58
Portugal	15.7	38	41
France	46.3	34	37
Austria	13.3	22	23
Finland	1.7	12	14
Cyprus	6.4	10	10
IrelandRep	6.3	10	11
Belgium	24.5	8	9
Netherlands	5.9	6	6
Slovenia	0.3	4	4
Lithuania	0.0	3	3
Malta	0.1	3	3
Estonia	0.0	2	3
Latvia	0.0	1	1
Luxembourg	0.1	1	1
Total	384.3	410	450

Table 2: Definitions of variables

Variable	Definition	Source
Lending_CB	Sum of LTRO, MRO, and other refinancing operations in EUR by the Eurosystem over total assets	Internal open market operations dataset
Lending_CB_aggregate	National aggregate of central bank lending to banks over bank assets, includes emergency liquidity assistance	ECB SDW
Offer_size	Total proceeds of the offering over total assets, lagged by one year	SDC, Refinitiv
Rights_issue	Dummy that takes the value 1 if rights issue, zero otherwise	SDC
Private_placement	Dummy that takes the value 1 if offer is a private placement, zero otherwise	SDC
Recapitalization	Dummy that takes the value 1 if the offer proceeds will be used for strengthening capital or reducing leverage, zero otherwise	Own assessment
Merger_acquisition	Dummy that takes the value 1 if the offer proceeds will be used for M&A, zero otherwise	Own assessment or SDC
Bank_size	Natural logarithm of the one year lagged total assets	Refinitiv
Leverage_ratio	Equity divided by total assets, lagged by one year	Refinitiv
Price_to_book	Price-to-book ratio in the window (-120,-2) days before the announcement	Refinitiv
Return_on_assets	Net Income divided by total assets, lagged by one year	Refinitiv, own calculations
Stock_return_runup	Cumulative return of the bank's stock price in the window (-120,-2) days before announcement	Refinitiv, own calculations
Stock_volatility	Realised volatility of the bank's daily stock price returns in the window (-251,-2) days before announcemt	Refinitiv, own calculations
Index_return_runup	Cumulative return of the STOXX Europe 600 Banks index in the window (-120,-2) days before announcement	Refinitiv, own calculations
Index_volatility	Realised volatility of STOXX Europe 600 Banks index daily returns in the window (-251,-2) days before announcement	Refinitiv, own calculations
ST_rate	3-Month or 90-day rates and yields: interbank rates for the euro Area	OECD, Fred St. Luis
LT_rate	10-year government bond yield, denominated in EUR	ECB IRS
GDP	Real GDP, quarterly, year-on-year growth rate, seasonally adjusted	OECD
Inflation	Total, monthly, annual growth rate	OECD
Unemployment	Unemployment rate, monthly, seasonally adjusted	OECD

Table 3: Summary statistics

	mean	sd	median	min	max
Lending_CB	0.027	0.059	0	0	0.575
Offer_size	0.014	0.018	0.009	0	0.178
Rights_issue	0.629	0.484	1	0	1
Private_placement	0.101	0.302	0	0	1
Recapitalization	0.187	0.39	0	0	1
Bank_size	17.549	1.967	17.703	11.195	21.491
Leverage_ratio	0.053	0.028	0.051	-0.036	0.196
Price_to_book	1.713	4.058	1.173	-18.417	50.887
Stock_return_runup	-0.065	0.402	0	-1.746	0.997
Stock_volatility	0.025	0.018	0.02	0	0.145
Index_return_runup	0.011	0.204	0.034	-1.099	0.663
Index_volatiliy	0.015	0.008	0.012	0.006	0.04
ST_rate	0.024	0.023	0.016	-0.004	0.073
LT_rate	0.051	0.029	0.046	-0.007	0.18
GDP	0.01	0.035	0.017	-0.179	0.109
Inflation	0.024	0.022	0.023	-0.061	0.156
Unemploument	0.107	0.056	0.09	0.03	0.277

Table 4: CAR over (-1,1) days around announcement

	(1)	(2)	(3)	(4)	(5)	(6)
Lending_CB	-0.296***	-0.297***	-0.204***	-0.192**	-0.250**	-0.251**
Offer_size		-0.344	-0.343	-0.621**	-0.564*	-0.499
Right_issue			0.005	0.008	0.007	0.005
Private_placement			0.03	0.028	0.013	0.008
Recapitalization			-0.037***	-0.036**	-0.040***	-0.038***
Bank_size				-0.005	-0.004	-0.004
Leverage_ratio				-0.44	-0.565*	-0.572*
Price_to_book				0.001	0.001	0.001
Stock_return_runup				-0.014	-0.012	-0.03
Stock_volatility				-0.322	-0.405	-0.689
Macro controls	No	No	No	No	Yes	Yes
Common variables	No	No	No	No	No	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr	0.1	0.09	0.13	0.16	0.16	0.17
N	309	294	294	275	252	247

Notes: Standard errors clustered by issuer. ***/**/* indicate statistical significance at 1%, 5% and 10% levels. Macro controls: real GDP growth, unemployment rate, long-term interest rate. Common variables: Eurostoxx banks run-up (-120,-2) days, Eurostoxx banks realized volatility (-250,-2) days, 3-month interbank rate.

Figure 3: Impact of 1% increase in the share of lending operations to total assets on a SEO announcement CAR, 95% confidence interval
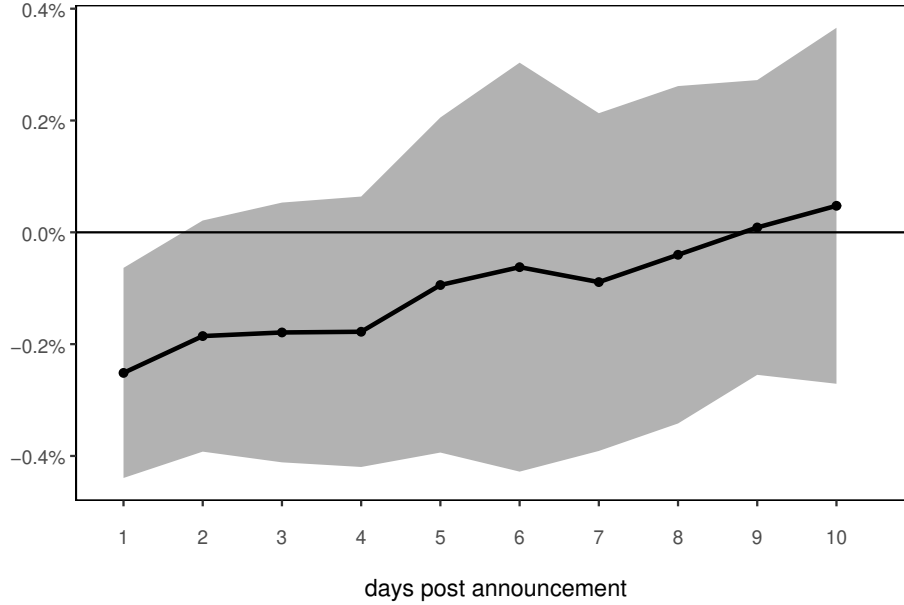

days post announcement

Table 5: CAR over (-1,1) days around announcement, period splits

	Baseline		Post-1999		Post-2008	
	(1)	(2)	(3)	(4)	(5)	(6)
Lending_CB	-0.296***	-0.251**	-0.261***	-0.232**	-0.240**	-0.293**
	(0.07)	(0.10)	(0.07)	(0.09)	(0.11)	(0.13)
Controls	No	Yes	No	Yes	No	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr	0.1	0.17	0.09	0.18	0.09	0.26
N	309	247	245	219	157	136

Notes: Standard errors (clustered by issuer) in parenthesis. ***/**/* indicate significance at 1%, 5% and 10% levels. Controls includes the full set of offering, bank, market and macroeconomic control variables.

Table 6: CAR over (-1,1) days around announcement, country aggregates of central bank funding

	(1)	(2)	(3)	(4)	(5)	(6)
Lending_CB_aggregate	-0.291*	-0.272*	-0.194	-0.197	-0.522**	-0.581*
Offer_size		-0.187	-0.251	-0.704	-0.496	-0.439
Rights_issue			0.001	0.005	-0.001	-0.005
Private_placement			0.037	0.025	-0.001	-0.004
Recapitalization			-0.041***	-0.041***	-0.049***	-0.049***
Bank_size				-0.004	-0.004	-0.003
Leverage_ratio				-0.628	-0.579*	-0.565*
Price_to_book				0	0.001	0.001
Stock_return_runup				-0.033	-0.036	-0.052*
Stock_volatility				-0.242	-0.465	-0.572
Macro controls	No	No	No	No	Yes	Yes
Common variables	No	No	No	No	No	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr	0.07	0.07	0.12	0.16	0.18	0.19
N	246	239	239	228	220	220

Notes: Standard errors clustered by issuer. ***/**/* indicate significance at 1%, 5% and 10% levels. Macro controls: real GDP growth, unemployment rate, long-term interest rate. Common variables: Eurostoxx banks run-up (-120,-2) days, Eurostoxx banks realized volatility (-250,-2) days, 3-month interbank rate.

Table 7: CAR over (-1,1) days around announcement, alternative windows

	CAR(-1,1)		CAR(-2,2)		CAR(-3,3)	
	(1)	(2)	(3)	(4)	(5)	(6)
Lending_CB	-0.296***	-0.251**	-0.397***	-0.255**	-0.482***	-0.251*
	(0.07)	(0.10)	(0.10)	(0.11)	(0.13)	(0.15)
Controls	No	Yes	No	Yes	No	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr	0.1	0.17	0.13	0.2	0.16	0.21
N	309	247	310	247	311	248

Notes: Standard errors (clustered by issuer) in parenthesis. ***/**/* indicate significance at 1%, 5% and 10% levels. Controls includes the full set of offering, bank, market and macroeconomic control variables.

Table 8: CAR over (-1,1) days around announcement, alternative event study benchmarks

	Eurostoxx Banks		National Index		Mean	
	(1)	(2)	(3)	(4)	(5)	(6)
Lending_CB	-0.296***	-0.265***	-0.277***	-0.194**	-0.285***	-0.286***
	(-0.07)	(-0.09)	(-0.07)	(-0.09)	(-0.07)	(-0.1)
Controls	No	Yes	No	Yes	No	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr	0.1	0.15	0.08	0.14	0.08	0.17
N	309	237	286	237	310	237

Notes: Standard errors (clustered by issuer) in parenthesis. ***/**/* indicate significance at 1%, 5% and 10% levels. Controls includes the full set of offering, bank, market and macroeconomic control variables.

Table 9: CAR over (-1,1) days around announcement, lagged amounts lending operations amounts

	Baseline		Lagged Amounts	
	(1)	(2)	(3)	(4)
Lending_CB	-0.296***	-0.251**		
	(-0.07)	(-0.1)		
Lag_Lending_CB			-0.162***	-0.086***
			(-0.04)	(-0.03)
Controls	No	Yes	No	Yes
Country dummies	Yes	Yes	Yes	Yes
R-sqr	0.1	0.17	0.08	0.16
N	309	247	309	247

Notes: Standard errors (clustered by issuer) in parenthesis. ***/**/* indicate significance at 1%, 5% and 10% levels. Controls includes the full set of offering, bank, market and macroeconomic control variables.