Stressed Banks? Evidence from the Largest-Ever Supervisory Review

Puriya Abassi
Raj Iyer
José Luis Peydró
Paul E. Soto

February 2020

Stressed Banks?
Evidence From the Largest-Ever Supervisory Review[*]

Puriya Abbassi   Rajkamal Iyer   José-Luis Peydró   Paul E. Soto

Abstract

Regulation needs effective supervision; but regulated entities may deviate with unobserved actions. For identification, we analyze banks, exploiting ECB's asset-quality-review (AQR) and supervisory security and credit registers. After AQR announcement, reviewed banks reduce riskier securities and credit (also overall securities and credit supply), with largest impact on riskiest securities (not on riskiest credit), and immediate negative spillovers on asset prices and firm-level credit supply. Exposed (unregulated) nonbanks buy the shed risk. AQR drives the results, not the end-of-year. After AQR compliance, reviewed banks reload riskier securities, but not riskier credit, with medium-term negative firm-level real effects (costs of supervision/safe-assets increase).

JEL Classification: E58; G21 ; G28; H63; L51.

Keywords: Asset quality review; stress tests; supervision; risk-masking; costs of safe assets.

I. INTRODUCTION

Government regulation is widespread in modern societies, with governments intervening throughout the marketplace (Stigler, 1971; Tirole, 2014; White House, 2015). However, effective supervision is challenging, as regulated entities may take unobserved actions that deviate from what policy-makers aim for (Laffont and Tirole, 1993). From the perspective of designing effective supervisory practices and for testing theory, it is important to understand how regulated entities try to circumvent regulations and the real effects arising due to this behavior.

We show risk-masking by banks—due to supervision—and its medium-term real effects. We analyze the banking sector because: (i) supervision of banks is more challenging than that of other industries (Dewatripont and Tirole, 1994), as bank assets are more opaque (Morgan, 2002), banks hold a sizeable part of liquid assets, the riskiness of which can be changed quickly (Myers and Rajan, 1998). The 2008 financial crisis showed the difficulty in supervision (Duffie, 2019), though banks also hold and produce safe assets (Caballero, Farhi and Gourinchas, 2016 and 2017). (ii) We can exploit the unexpected announcement on October 23, 2013 of the largest-ever supervisory exercise, i.e. the European Central Bank (ECB)'s comprehensive bank assessment including an asset quality review (AQR) based on assets as of December 31, 2013, which would then be used for a stress test exercise in the second half of 2014; stress-testing is the major new component of the supervisory toolkit after the crisis (e.g. Bernanke, 2013), and to be effective, a correct risk assessment of bank assets is crucial (ECB, 2013); there is, however, considerable debate as to whether banks choose assets that perform well in the test and then liquidate them after passing (e.g., Tarullo, 2014; Coen, 2017).[1] (iii) We can exploit supervisory security-level and loan-level data for each bank, reviewed and non-reviewed by the ECB (also unregulated nonbank asset-level data), matched with firm and bank data.

In brief, our robust results show that, after the AQR announcement, reviewed banks cut riskier securities and loans (also overall securities and credit supply), with the largest impact on the riskiest securities, not on the riskiest credit. The risk is partly passed to exposed (unregulated) nonbanks. There are immediate negative spillovers on both asset prices and firm-level credit availability. As stress tests have been conducted every two years since then, we show that results

---

[1] There have been several instances of banks that have passed the stress tests and then failed within a short period time thereafter. Dexia, the Franco-Belgian bank, e.g. passed the European Banking Authority (EBA)'s stress tests in the summer of 2011 (it came 12th out of 91 banks scrutinized by the EBA), but three months later, in October, required a bail-out from the government ("Dexia poses setback for EBA stress tests", *Financial Times*, on October 5, 2011).

are driven by the AQR, not by end-of-year effects. After the AQR compliance, reviewed banks reload riskier securities, but not riskier credit (with stronger effects for banks with higher trading expertise). Consistently, there are medium-term negative real effects of the supervision via a credit supply cut and the associated increase in safe assets by banks.

Our main contribution to the literature—in addition to the identification (with the AQR shock and matched administrative datasets) of supervision of regulated entities via the banking sector — is to show that: (i) risk-masking is substantially stronger with more liquid assets (securities *vs.* credit, especially with respect to the riskiest ones); (ii) unregulated nonbank intermediaries help in risk-masking (especially exposed ones); and importantly (iii) there are *medium-term* real effects associated with supervision via credit supply reduction and the increase in safe assets by banks; we find negative impact on firm-level output, investment and employment, not just *immediate* negative spillovers on asset prices and credit supply. In the remainder of this Introduction, we provide a detailed preview of the paper, including a discussion of the literature and its contrast with our paper.

Preview of the paper. We analyze whether banks dress up for the regulators by masking their risk after the announcement of the ECB's AQR.[2] We also examine whether banks undo this change in the risk composition after the culmination of the AQR. We analyze whether banks alter specific types of assets, e.g. liquid securities vs. illiquid loans, and whether banks also change their overall level of assets. Moreover, we study the associated supply of credit to firms (and real effects), spillovers on asset prices, and the role played by unregulated nonbanks.

The ECB announced on October 23, 2013 that it would undertake an asset quality review, where bank assets were going to be reviewed in the form of a point-in-time assessment—December 31, 2013—for a pre-identified list of 130 (reviewed) banks within the Euro Area, totaling around EUR 22 trillion bank assets. These banks had to report their assets, in particular loans and securities.[3] Note that—for reviewed banks—the assets held as on *December 31, 2013*, played an important role as they were assessed by the AQR. After a period of compliance (between January and June 2014), which was used by supervisors to consult reviewed banks to give them an opportunity to

---

[2] Note that supervisors are aware of the risk-masking incentives by banks. For example, Coen (2017): "Identifying regulatory arbitrage […] likely a reflection of incentives that banks have to "window-dress" their balance sheets at period-ends by downsizing their balance sheets, or improving their composition." William Coen, Secretary General of the Basel Committee on Banking Supervision, London, May 2017.

[3] https://www.ecb.europa.eu/press/pr/date/2013/html/pr131023.en.html. "*An asset quality review, as elaborated below, examining the asset side of bank balance sheets as at 31 December 2013. This assessment will be broad and inclusive, comprising credit and market exposures.*" (See ECB, 2013).

provide comments, the AQR was concluded in July 2014, and the subsequent stress test results based on each bank's AQR were presented in October 2014 (ECB, 2013 and 2014). There was surprise in the timing and the criteria of the AQR, reflected in the stock market reaction on the day of the AQR announcement, as bank share prices significantly fell after the ECB unveiled its plans.[4] In consequence, the announcement of the AQR with a pre-determined reference date for the AQR presents a quasi-natural experiment to examine whether banks game the supervisory exercise, in turn reducing the effectiveness of stress tests as a regulatory tool, and what the short- and medium-term effects of supervision are for the overall economy.

We exploit a unique proprietary dataset from the Bundesbank, which is—together with the German federal financial supervisory authority 'BaFin'—the bank supervisor in Germany. The supervisory data provides detailed, granular information at the security level (at monthly frequency) and at the loan level (at quarterly frequency) for each bank in Germany—a bank dominated economy—covering the period before and after the ECB's AQR.

The exhaustive detail on security-level holdings of each bank allows us to examine the risk characteristics of the securities traded by banks and also the timing of the trades. For example, we have security-level information on rating, issuer, yield, price and maturity. Importantly, not only do we have the security-level holdings of each bank, but also the credit register containing information on the individual loans made by banks, including the ex-ante risk of each loan. The security and credit registers are matched with firm and bank balance sheet variables.[5] Finally, we exploit a similar security register for nonbanks, investment funds, which are not similarly regulated (e.g., stress tests); we also know whether each investment fund belongs to a bank, and if not, whether they are exposed, or not, based on the portfolio of each bank and investment fund.

Under the hypothesis that banks try to mask risk during the supervisory exercise, the main testable hypotheses that we examine are: (i) between the ECB's announcement of the supervisory exercise (October 23, 2013) and the day that banks have to report their securities and loans to the ECB (December 31, 2013), banks will accumulate safer assets, especially those that the ECB considers to be of highest quality (e.g. securities with ratings from AAA to AA- or loans with low

---

[4] "Eurozone bank shares sink after ECB outlines health check plan", Financial Times, October 23, 2013; "European shares snap winning run as banks hit by ECB review", Reuters, October 23, 2013. E.g. Italian bank stocks fell by as much as 3% in early trading and most other leading banks in Spain, France and Germany saw share prices fall about 2% (see e.g., "Draghi says bank tests need failures for credibility; ECB probe", Financial Times, October 24, 2013).
[5] Abbassi, Iyer, Peydró and Tous (2016) describe in detail the security and credit registers (see also Section 3). As far as we know, only Germany, Portugal and Italy contain security and credit registers for all banks.

risk weights, see ECB, 2005 and 2014);[6] (ii) after the asset quality review is concluded (July 2014), banks will liquidate these safer assets and will invest back in assets with a relatively higher risk. We also analyze the associated asset price and credit supply spillovers (including the real effects), and the role of unregulated intermediaries.

To study the heterogeneity in risk behavior across different securities and across different loans, and to identify our main hypotheses, we analyze securities holdings at the *bank-security-month* level and loans at the *bank-firm(borrower)-quarter* level. For our two main hypotheses, we analyze *before* and *after* each main event (either the ECB announcement in October 2013, or the conclusion of the AQR in July 2014) whether, for the *same* security or for the *same* firm (for lending), *reviewed* versus *non-reviewed* banks change their holdings depending on the ex-ante security or firm (loan) *risk*. We similarly analyze overall changes in security holdings and credit supply. As the size of a bank determines whether or not a given institution is being reviewed (banks over 30 billions are reviewed): (i) for the comparison group of non-reviewed banks, we either analyze all of the non-reviewed banks or only the largest (with respect to their size) non-reviewed banks; (ii) we only analyze very few reviewed and non-reviewed banks with very similar size (around the EUR 30 billion cut-off to be reviewed); (iii) we analyze unconditionally the behavior of only reviewed banks before and after each of the two main events; (iv) we control for heterogeneity across banks with different sets of bank (or even bank-security and bank-firm) fixed effects. We also analyze whether reviewed or non-reviewed banks differ in other end-of-year periods (placebo tests in 2012 and 2014, as well as the 2015 AQR for the 2016 stress test). Moreover, we aggregate up all securities and loans-over bank capital, or instead of OLS on asset-level data, we do weighted regressions by the size of each asset-so that our results are not driven by smaller securities or loans.

We find that, after the announcement of the AQR, reviewed banks differentially increase the share of their safe securities, which are the bonds with the top-tier credit rating for the ECB and thus lowest regulatory risk weights. For reviewed banks, unconditionally (without any controls), the share of safe securities increases during the very short-time period of the AQR relative to the period before the announcement. More formally, using a regression framework with controls, we find that between September and December 2013, reviewed banks as compared to non-reviewed banks buy on average between 3.5% and 4.0% more of the securities with top-tier rating. We also

---

[6] See also for example https://www.eba.europa.eu/documents/10180/16166/4+Ausust+2006_Mapping.pdf and https://www.bankingsupervision.europa.eu/ecb/pub/pdf/assetqualityreviewphase2manual201403en.pdf. According to the standardized approach of capital adequacy under Basel II and III, this rating bucket has the lowest risk weight (http://www.bis.org/bcbs/publ/d347.pdf).

find significant results if we analyze other risk measures as securities with high yield, securities from GIIPS-country headquartered borrowers, long-term maturity or long-term maturity non-safe securities. For these riskiest (long-term low-rated) securities, effects are much larger (26%).[7]

We also examine how reviewed banks respond to the AQR in terms of their lending behavior. Comparing the period after the announcement of the AQR versus before, and within the same firm and bank, we find that reviewed banks increase their share of supply of credit to safer firms relative to non-reviewed banks (where safer firms are classified as those with below average firm risk based on ex-ante probabilities of defaults).[8] We perform similar robustness tests as in the case of securities and find similar results, with an increase between 2.6% and 4.2% of the supply of safer loans for reviewed banks after the ECB announcement. However, different from the riskiest securities, effects for the riskiest loans are relatively similar (3% drop) compared to the average loan risk, and very different as compared to the riskiest securities (26% drop).

Interestingly, reviewed banks also cut the overall supply of credit to firms in the real sector and reduce their overall level of security holdings (irrespectively of risk). That is, not only do reviewed banks increase their share of safer loans and securities, but also overall they downsize their balance sheets by reducing their supply of credit and security holdings. Economically, the average increase in safe securities corresponds to EUR 12.25 billion for all reviewed banks and the average increase in the share of credit exposures to safe firms amounts to EUR 41.23 billion for all reviewed banks after the AQR announcement, as compared to non-reviewed banks. This increase of EUR 53.48 billion of safe assets is large, given the very short time (two months between announcement and compliance), accounting for 29% of reviewed banks' overall equity.

Importantly, the results are not due to a general end-of-year effect, but only related to the 2013 last quarter's ECB supervisory audit, as we do not find (neither statistically nor economically) significant effects in the last quarter of 2012 or of 2014 (which we use as placebo tests). We also

---

[7] We also find differential effects for securities issued by banks (though not reported). The results are robust to e.g. the inclusion of controls for security fixed effects to analyze the same security before and after the AQR and for bank-security fixed effects to account for unobserved matching between characteristics of banks and securities. We also find similar results if we do not saturate the econometric model with any fixed effects (though identification in this case is weaker). We also find similar results when we limit the sample of reviewed and non-reviewed banks to those with more comparable sizes, or when we run the estimation within the subset of only reviewed banks examining the risk differences in securities just before and just after the announcement among reviewed banks.

[8] The median default rate within this group of firms equals 0.2%, which corresponds to default rates observed for investment-grade firms worldwide (see e.g., Standard and Poor's Ratings Services, 2012). This coincides also with the Eurosystem's credit quality requirements as laid down in Article 108 (a) (ECB/2014/60) and the mapping exercise carried out by the Joint Committee of the European Supervisory Authorities (2014). Our results are robust to altering the cut-offs of the ex-ante default rate and to using the ex-ante continuous default rate.

find similar results in the 2015 AQR (for the stress tests of 2016), and hence results are not driven by the first AQR (stress test) done by the ECB, but by supervision in general.

We also analyze the role played by unregulated nonbanks. To understand to whom the risk (that banks are shedding) is being reallocated, we study who buys the assets that reviewed banks sell. We find that investment funds, especially the ones that pre-AQR hold securities issued by reviewed banks in their ex-ante portfolio, buy the risky securities that reviewed banks sell. Thus, the risk from the banking sector is being reallocated to the unregulated more exposed nonbanks.[9]

The results above suggest that banks actively shift their portfolio towards safer assets due to the AQR announcement. However, a key question that arises (our second testable hypothesis) is whether this shift is temporary or permanent. Thus, to understand the effectiveness of the supervisory exercise, it is necessary to also examine the response of banks in the post-AQR period. In the post-AQR period (after July 2014), we find that reviewed banks (as compared to non-reviewed banks) *partly* reload their risk back to the pre-AQR announcement levels. Reviewed banks fully reload on riskier securities; however, this is not the case for riskier credit.

We also examine heterogeneous effects and find that results on dialing-up and -down are stronger for reviewed banks with higher trading expertise (trading banks).[10] Trading banks that are reviewed reduce risk as the other reviewed banks in securities after the AQR announcement, but they increase the risky securities more than other banks during the post-AQR period, whereas in lending, trading banks stay at the same level during the post-AQR period than before.

We also analyze the real effects of supervision. We find that the risk-masking immediately (after AQR announcement) induces negative spillovers on asset prices and credit supply at the firm level (i.e. around two months of the policy change). As we find that in the dialing-up of risk, there are no effects on loading up of riskier credit (differently from securities), we analyze whether the (binding) reduction in credit supply after the AQR implies longer-term real effects. The reduction in credit supply to firms is not compensated by borrowing from other banks (e.g. non-reviewed banks) or by other sources of finance, and hence there is a firm-level decrease in total bank credit and total debt liabilities. This in turn generates an associated reduction in output (sales), investment and employment (over more than one year after the policy announcement). That is, the supervision

---

[9] Interestingly, we do not find that investment funds in the same bank holding group buy the sold securities (unreported). Note that the AQR assessed the consolidated banking group, not just the banking part.

[10] Trading banks are the ones that are in Eurex (the largest trading platform in Germany), or with higher ex-ante income from trading. We do not find further heterogeneity among reviewed banks (based on size, equity, or capital ratio).

with its associated increase in safe assets by banks not only generates *immediate* negative spillovers on asset prices and credit supply, but also *medium-term* negative real effects.

Contribution to the literature. Over and above the identification of supervision of regulated entities' unobserved actions (Stigler, 1971; Tirole, 2014) via exploiting the banking sector (with the AQR shock and matched supervisory datasets), our paper relates to the theoretical work that examines the risk-taking incentives associated with liquid assets (Myers and Rajan, 1998). The evidence we find is consistent with the notion that it is easier to change the riskiness of a banks' portfolio by changing liquid assets (securities) in contrast to illiquid assets (loans). We show that risk-masking is substantially stronger with more liquid assets—securities versus credit—especially using the riskiest assets sold before the supervisory audit, and by securities in general bought just after the audit. As far as we are aware, there is no other empirical paper showing these effects. However, we also find important effects through changes in credit supply.

We also contribute to the literature analyzing the increased demand of safe assets (Gorton, Lewellen and Metrick, 2012) and its potential costs. The ECB's comprehensive assessment represents the largest and most important supervisory exercise following the 2008/09 financial crisis with the aim to ensure a fundamentally sound and trustworthy banking sector in Europe. Consistent with theory, we show that this announcement incentivized increased holdings of safe assets among affected banks (including the selling of riskier securities issued by banks or some foreign issuers, e.g. GIIPS). However, it also implied adverse medium-term consequences for related firms and their real activities, including firm-level employment, output and investment (e.g., Caballero, Farhi and Gourinchas, 2016 and 2017; Caballero and Fahri, 2017). Note that the effects are not stemming from a permanent increase in regulation but just from a temporary supervision exercise (in fact many of our effects disappear in the medium term, but not the binding credit and real effects).

We hence show important real effects of supervision, not only immediate effects on asset prices and credit supply, but more medium-term effects of supervision on firm-level real effects. By showing this, we advance the literature on regulatory arbitrage, window dressing and banking supervision, which are mostly on showing temporal changes of very short-term balance-sheet items. We instead show that also credit supply to riskier firms changes and there are not only immediate spillovers but also longer-term ones. In particular, our results contribute to the growing literature that examines the incentives of banks to arbitrage regulation, where the bulk of the empirical work focuses on bank liabilities (Hellwig, 2010; Demirguc-Kunt et al., 2013; Acharya

et al., 2013 and 2014; Boyson et al., 2016), whereas we analyze the asset side. Our paper also contributes to the literature on window dressing by banks. This literature has either used (i) bank-level data, and hence could not distinguish between bank-driven vs. demand-driven effects (e.g. Allen and Saunders, 1992, vs. Kotomin and Winters, 2006), different from our paper, where we show that results are driven by banks' behavior due to bank supervision;[11] or (ii) short-term wholesale claims with very short-term effects (van Horen and Kotidis, 2018; Munyan, 2017; Banegas and Tase, 2016; Anbil and Senyuz, 2018), while instead we show a more holistic view of banks with *all* of the assets and show that results are strong even in illiquid assets—supply of credit—with associated medium-term (not just short-term) spillovers on the economy. Moreover, there are also some recent papers on bank supervision (Agarwal et al., 2014; Lucca et al., 2014; Granja et al., 2017; Granja and Leuz, 2019; Hirtle et al., 2019), and we contribute by showing the real effects of supervision via a change of credit supply by supervised banks with longer-term effects on firm-level real effects. We also find spillovers on asset prices due to banking supervision (Du et al., 2018, and Abbassi and Bräuning, 2018, find asset price spillovers, but due to banking regulation). Note that none of our results are driven by a *change in regulation*, but just a supervisory exercise. In addition, we also contribute to the role of nonbanks to arbitrage bank regulation (Plantin, 2014; Martinez-Miera and Repullo, 2018; Farhi and Tirole, 2018; Buchak et al., 2018; Irani et al., 2019) by showing a new channel on how exposed nonbanks (the ones that have bank securities in their portfolio) interact with banks shedding their riskier assets.

More general, our paper contributes to the theoretical literature that examines the optimal form of regulation (Stigler, 1971; Posner, 1975; Glaeser and Shleifer, 2001; Becker and Opp, 2013), and more related, Goldstein and Sapra (2014) analyze the optimal public disclosure of stress test results, and also discuss the potential incentives of risk-masking by banks. Our results hold

---

[11] Papers that analyze window dressing in banking, differently from us, do not analyze supervision and use bank-level rather than security and credit register data and do not analyze longer-term effects for borrowers. Allen and Saunders (1992) use bank-level data to argue window dressing of total assets, where money market instruments are the key liabilities facilitating temporary upward movements in total assets. However, results in Kotomin and Winters (2006) using bank-level data suggest that window dressing is customer (demand) rather than bank-driven. Both studies focus on the rationales behind window dressing of total assets, whereas Owens and Wu (2015) analyze specifically possible window dressing channels in the liability accounts that afford banks the most discretion, such as repo and federal funds. In nonbanks, there is evidence that fund managers and institutional investors dress up their quarter-end or year-end portfolio holdings by selling losing stocks and buying winning stocks (e.g., Lakonishok et al., 1991; Musto, 1999; He et al., 2004; Ng and Wang, 2004). However, banks suffer substantially more regulation and supervision (the question of our paper) than nonbanks, and crucially there are also negative real effects associated to banking supervision.

important policy implications for stress tests in particular, and for supervision in general of regulated entities, as we discuss in detail in the Conclusion.[12]

The remainder of the paper is structured as follows. Section II discusses ECB's AQR. Section III presents our data. Section IV reviews the empirical strategy and results. Section V concludes.

II. ECB'S ASSET QUALITY REVIEW

On October 23, 2013, the European Central Bank (ECB) officially announced Europe's most comprehensive asset quality review (AQR) of the banking sector in order "to foster transparency, to repair and to build confidence". The timing and the criteria of the AQR came by surprise;[13] banks were informed that the central bank, along with national competent authorities (NCAs) responsible for banking supervision, would review the carrying value of assets on the banks' balance sheets as of December 31, 2013.[14] The AQR was thus a point-in-time assessment.

The banks that were selected to participate in this exercise ('reviewed banks', hereafter) were identified based on the following criteria: (i) total value of the bank's assets exceeded EUR 30 billion, (ii) the ratio of the bank's total assets to GDP of its country of establishment exceeded 20%, unless the total value of their assets was below EUR 5 billion, and (iii) the institution was among the three largest credit institutions in a participating member state, regardless of size. A bank was included if any of these criteria applied. In the end, the ECB identified a list of 130 credit institutions (25 of which were German banks) from 18 European Union member states that had total assets of around EUR 22 trillion.[15]

---

[12] Securities holdings are around 20% of bank assets in Europe and are also large in US. Recent policy initiatives aim at limiting security trading by banks (US' Volker Rule in Dodd-Frank, EU's Likaanen Report and UK's Vickers' Report).

[13] The surprise in the content of the announcement is reflected in the stock market reaction on the day of the AQR announcement, as bank share prices fell after the ECB unveiled its plans ("Eurozone bank shares sink after ECB outlines health check plan", *Financial Times*, October 23, 2013; "European shares snap winning run as banks hit by ECB review", *Reuters*, October 23, 2013). For instance, Italian bank stocks fell by as much as 3% in early trading and most other leading banks in Spain, France and Germany saw share prices fall about 2% (see e.g., "Draghi says bank tests need failures for credibility; ECB probe", *Financial Times*, October 24, 2013). Moreover, as of September, 24, 2013, it was unclear when the process would start or how long it would take, although it would be completed before the ECB took over full supervisory responsibility in October 2014 ("Consultants who praised defunct bank to advise on ECB review", *Financial Times*, September 24, 2013). On October 15, 2013, the ECB had yet to give banks guidance on how assets will be examined, whether half- or full-year results will matter, and what types of loans will be examined ("AQR and stress tests could threaten European banks", *Reuters*, October 15, 2013).

[14] The execution of this exercise involved several parties. While NCAs were responsible for all national project management activities, NCAs appointed so-called NCA bank teams comprising of NCA staff and external auditors, property appraisers and valuation advisors providing their expertise, know-how and independence. In total, the complete exercise spanned over 6,000 experts.

[15] While these banks are the biggest banks in the euro area, they are not the same "significant credit institutions" that are currently supervised by the ECB's single supervisory mechanism (SSM). The list of the reviewed banks are in Table 11: https://www.ecb.europa.eu/pub/pdf/other/aggregatereportonthecomprehensiveassessment201410.en.pdf.

The detailed asset-level review covered all types of assets including securities and credit exposures. The review, in general though, intended to check the riskier assets on banks' balance sheets; therefore, for banks with large trading books, reviewers paid stronger attention.[16] After banks' reporting ("bottom-up") as of December 31, 2013, in a next step, NCAs and the ECB engaged in quality assurances until the summer of 2014 to ensure the reported data was consistent and accurate, and then the stress tests followed. While the final report of the entire comprehensive assessment was published on October 26, 2014, the ECB published the bank-level disclosure template on July 17, 2014, comprising detailed AQR results (identical to the EBA's disclosure template), and the subsequent stress test results based on each bank's AQR were presented in October 2014 (ECB, 2013 and 2014).[17]

Figure A1 illustrates the timeline of the ECB's AQR, which highlights its four key periods. The period before October 2013 denotes the period before the AQR-announcement ('pre-AQR'), while October, November and December 2013 are the months in the run-up to the AQR reporting due date as of December 31, 2013, which is why we refer to it as the 'AQR' period. We define the period between January 2014 and June 2014 as the 'AQR-compliance' period, which was used by supervisors to consult reviewed banks to give them an opportunity to provide comments and suggestions. The period from July 2014 onwards describes the 'post-AQR' period. Our analysis ends just before the results on the stress tests were released and the European single supervisory mechanism (SSM) became effective.

To ensure symmetry around the AQR, we choose our sample so as to have nine months before the AQR announcement and nine months after the AQR due date, yielding a sample of 21 months from January 2013 through September 2014. As explained in the empirical strategy, we also study the data only around the AQR announcement in October 2013, comparing the AQR reporting due date (December 31, 2013) to *just before* the AQR announcement.

After the implementation of the ECB's SSM, which became effective in November 2014, the ECB's SSM conducts stress tests on the supervised banks every two years (e.g. 2016).[18] For these stress-testing exercises, however, the ECB's SSM requires banks to provide information on their prior year's end-December bank balance sheet assets. That is, for the stress test in 2016, banks

---

[16] The ECB applied a risk-based approach while determining the portfolios that were reviewed in the AQR. That is, for each bank, "at least 50% of credit risk-weighted assets and half of the material portfolios" were selected. The assessment was a prudential rather than accounting exercise implying that the outcomes of the review were not necessarily reflected directly in the banks' accounts following the exercise.

[17] See https://www.bankingsupervision.europa.eu/ecb/pub/pdf/notecomprehensiveassessment201407en.pdf.

[18] For more information, please refer to https://www.bankingsupervision.europa.eu.

were required to report information on their assets as at end of 2015. Therefore, we will also analyze end-of-year effects (e.g. 2012 and 2014) vs. AQR years (2013, and then also 2015).

III. DATA

For our analysis, we use proprietary security and credit register data that we obtained from the Deutsche Bundesbank, which—together with the German federal financial supervisory authority 'BaFin'—is the macroprudential and microprudential bank supervisor in Germany. We have access to the micro data on securities investments of banks (negotiable bonds and debt securities, equities, and mutual fund shares) at the security level for each bank in each month. The data comprise of investments of German banks at the security level on a monthly frequency from January 2013 through September 2014. For each security, banks report the nominal value at the end of each month they hold (stock at the end of each month).[19] We use the unique International Security Identification Number (ISIN) associated with every security to merge the data on security investments with security-level information on rating and yield from FactSet, and on price, maturity and the issuer from the Eurosystem's CSDB.[20]

We also obtain data on individual loans made by banks from the German credit register maintained by the Deutsche Bundesbank. The credit register provides information on the amount of loans outstanding at the borrower level for each bank. In addition, it also provides for selected banks borrower-level information on estimated probability of default (PD) for a loan, and the date of a given default (where applicable). For the credit register, banks had to report, on a quarterly frequency, all borrowers whose overall credit exposure exceeds EUR 1.5 million; however, the credit register covered nearly 70% of the total credit volume in Germany.[21]

---

[19] Note that the reporting requirement specifies that securities holdings, which are passed on or acquired as part of a repo contract, are not double-counted in the securities database. Thus, the transactions we capture are not a mechanical artifact of repo transactions (see also Amann, Baltzer, and Schrape, 2012). While we know the security holdings of the banks, we do not know whether they are classified as trading book assets, available for sale or held to maturity.

[20] The Centralised Securities Database (CSDB) contains information on all debt securities, equities and mutual fund shares/units issued by residents of EU Member States or by others. Please see https://www.ecb.europa.eu/pub/pdf/other/centralisedsecuritiesdatabase201002en.pdf for more information.

[21] From 2014 onwards though, this threshold was lowered to EUR 1.0 million. Note however, that this does not affect our analysis of our main (first) hypothesis on whether banks window-dress after the AQR announcement as compared to the pre-AQR announcement (a comparison between December 31 and October 23, 2013). Moreover, on our second hypothesis on risk increase after the AQR compliance, we restrict ourselves to borrowers that were in the credit register at least once also in 2013, i.e., before the reporting level was reduced from EUR 1.5 million to EUR 1.0 million in 2014. This restriction ensures that results are not biased by new borrowers appearing in 2014 as a result of the change in the threshold. However, outstanding credit positions below the 2013's threshold of EUR 1.5 million might still show up in the 2014 data for a given borrower if the exposure exceeds the threshold of EUR 1 million. Moreover, our results (see Table 7, columns 3 and 4) show that there are no statistical differences in results between end of December 2013 and end of July 2014 (not even after the AQR after July); therefore, the credit changes between reviewed and non-reviewed banks

We append the security and credit register data to confidential supervisory monthly balance-sheet statistics at the bank level. As most securities held by banks are bonds (81%), and we also analyze loans (the other key component on bank assets), we only analyze bonds within bank securities.[22] In particular, we collect monthly balance sheet items such as each bank's equity, total assets, and total loans. Moreover, we follow the ECB's AQR procedure and focus primarily on credit exposures to non-monetary financial institutions, including large non-financial corporates. Also, we restrict ourselves to banks with a credit exposure to a firm for which we observe a value on its probability of default (PDs). We have this information for 93 distinct banks.[23] Note that this restriction on the availability of borrower PDs reduces the set of banks to those with the most economically meaningful credit portfolios as only those banks provide the PDs for their borrowers. Both restrictions are necessary to explore banks' securities investments and credit supply depending on the ex-ante security and borrower risk type (safer versus riskier).

There are two further data sources that we obtain. To further shed light on the implications of our results for real activity, we obtain annual data from Bureau van Djik on firm financial statements, which we merge with our credit register data.[24] Moreover, we also examine who buys the securities that banks may sell. To that aim, we use security register data for investment funds at the fund-security-month level. As before, we use the unique International Security Identification Number (ISIN) associated with every security to merge the data on security investments with security-level information on rating from FactSet. This allows us to identify the exact identity of the issuer of every security that a given fund is holding as part of their investments. Finally, to analyze price spillovers, we also exploit the change in security prices.

IV. EMPIRICAL STRATEGY AND RESULTS

In this section, we will discuss the empirical identification strategy and the results. We analyze the following testable predictions under the hypothesis that banks try to mask risk before the supervisory exercise: (i) between the ECB announcement of the supervisory exercise (October 23,

---

[22] E.g., if we would analyze the stock of shares, the risk measures would be very different between securities and credit, and moreover, shares cover a small share of banks' investments (less than 4% of total assets). Therefore, for the sake of comparison between securities and loans, and for the sake of quantitative importance, we restrict our analysis to bonds.

before and after the threshold change are not different. Finally, we analyze *all* firm debt liabilities, stemming from *all* banks (even not reported in the credit register) and other sources of finance (as trade credit, market debt, or nonbank debt), when we analyze the firm-level real effects (see Table 9).

[23] We replace each borrower's PD with its cross-sectional average PD across all banks that assigned a PD to that borrower, hence any bank's individual PD-reporting does not drive our results.

[24] See Schild, Schultz, and Wieser (2017) for a detailed description of the methodology.

2013) and the day that banks have to report their securities and loans (December 31, 2013) to the ECB, banks will accumulate safer assets, especially those that the ECB considers to be of high quality; (ii) after the asset quality review is concluded (July 2014), banks will liquidate these safer assets and will invest back in assets with a relatively higher risk.[25]

To test for these hypotheses, we first analyze the securities holdings and the loans of banks before and after the AQR. We exploit the fact that the ECB required banks to report their assets as on December 31, 2013 (point-in-time assessment) and examine the evolution of security holdings and loans of reviewed banks and non-reviewed banks based on this cut-off date. We examine whether banks increase their holdings of safe assets during this period (as well as reduce the overall security holdings and supply of credit). Second, we analyze whether after July 2014 the reviewed (versus non-reviewed) banks increase their risk back to the levels similar to before the ECB announcement in October 2013. For the first hypothesis, we analyze the period of three months around the ECB announcement, whereas for the second hypothesis we use all the data.

To study heterogeneity in risk behavior across different securities and across different loans, and to identify the two hypotheses, we analyze securities holdings at the *bank-security-month* level and loans at the *bank-firm(borrower)-quarter* level. For our two main hypotheses, in a difference-in-differences setting, we analyze *before* and *after* each main event (either the ECB announcement in October 2013, or the completion of the AQR in July 2014) whether, for the *same* security or for the *same* firm (in the case of lending), *reviewed* versus *non-reviewed* banks change their holdings depending on the ex-ante security or firm (loan) *risk*. We also aggregate assets and study changes over bank capital or perform a weighted least squares regression based on asset volumes.

As the size of a bank determines whether or not a given institution is being reviewed, (i) we analyze only the 25 largest (with respect to their size) non-reviewed banks, thus matching the same number of banks being reviewed;[26] (ii) we analyze whether reviewed or non-reviewed banks differ in other-end-of–year periods (placebo tests in 2012 and 2014), as well as in the following stress test of 2016 based on the AQR as at the end of 2015; (iii) we only analyze very few reviewed and non-reviewed banks with very similar size (around the cut-off of EUR 30 billion); (iv) we analyze unconditionally the behavior of only reviewed banks before and after each of the two main

---

[25] Our null hypothesis in the regressions is no change; the alternative is a change (i.e., a coefficient different from zero).
[26] Reviewed banks are larger than non-reviewed banks (e.g. differences in bank sizes of 182 vs. EUR 2 billion), but with rather similar levels of securities holdings (19.48% vs. 21.84% of total assets) and safe credit (77.45% vs. 73.77%), though some differences in the level of credit (44.32% vs. 58.92%) and safe securities (39.36% vs. 26.47%).

events.[27] Moreover, we control for heterogeneity across banks with different sets of bank (or even bank-security and bank-firm) fixed effects. We provide summary statistics on the main variables in Appendix Table A2, where Table A1 contains the definitions of the variables used in the paper.

IV.1 DIALING-UP OF SAFE ASSETS IN THE RUN-UP TO THE AQR

The first testable hypothesis, which we examine in this paper, is that after the announcement of the supervisory exercise banks will accumulate safer assets, especially those with a better rating that would perform well in the supervisory test. We also analyze other risk measures as part of our robustness checks, for example based on yield, maturity or whether the borrower is headquartered in a GIIPS country (i.e., Greece, Ireland, Italy, Portugal, or Spain). To penalize risk inherent to bank assets, the Eurosystem primarily relies on ratings rather than yields and the origin of issuance (e.g., GIIPS, and there is substantially more penalization in ratings than in maturity, see ECB, 2005, 2013 and 2014). Note also that to judge on the riskiness of loans, we use the ex-ante probability of default, which is comparable to the ex-ante rating in securities, and is normally not available in credit registers in other countries. We start by studying the securities holdings of reviewed banks versus non-reviewed banks at the *bank-security-month* level using the following econometric model:

$$\text{Log(securities holdings)}_{b,s,t} = \beta(\text{Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_b) + \alpha_b + \alpha_s + \alpha_t + \delta' controls + \varepsilon_{b,s,t} \quad (1)$$

where the dependent variable is the logarithm of nominal holdings of security s by bank b at month t.[28] Our sample is constructed symmetrically around the AQR announcement, i.e. 3 months before the announcement (i.e., end of July, August, and September 2013) versus 3 months after the announcement (i.e., end of October, November, and December 2013).[29] 'AQR' is a (post) dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (i.e. during October, November and December 2013), and zero before. We follow the Eurosystem's harmonized rating scale for the definition of safe assets and define a security as

---

[27] As we will see, our results are robust to banks close to the EUR 30 billion threshold, though we lose most banks and observations (including the very interesting largest banks) or are robust to only analyzing reviewed banks. Moreover, as our placebo tests presented in the next section show, we do not find a differential effect between reviewed and non-reviewed banks in the last quarter of the year before the AQR (i.e., in 2012) or in the last quarter of the year after the AQR (i.e., in 2014); therefore, the differences in changes in securities and credit between the two group of banks are due to the AQR. Moreover, we also find effects in 2015, the next AQR. Note that our sample of reviewed banks close to the EUR 30 billion threshold are also interesting to the extent that they have no foreign subsidiary in Europe (but, our results are also significant in the overall sample if we restrict the sample to these type of banks).

[28] Note that we use the nominal values (as opposed to fair values) to ensure that a decrease (or increase) in holdings is due to an actual decrease (or increase) in any given security position.

[29] Comparing end of September to end of December 2013 yields very similar results, see Table 3, Panel A.

safe when the security has a rating between AAA to AA-.[30] That is, 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'Reviewed' is a binary variable that equals the value of one for any bank reviewed under the AQR, and zero otherwise. The estimated coefficient β then measures the differential securities holdings of safe (versus risky) securities by reviewed banks versus non-reviewed banks before versus after the AQR announcement. We cluster standard errors at the bank and security level. For identification, in addition to time fixed effects to control for overall macro shocks, we include controls for security fixed effects to analyze the same security before and after the AQR, bank fixed effects to account for time-invariant heterogeneity in bank characteristics. In some regressions, we also include bank-security fixed effects to account for unobserved matching between banks and securities. 'Controls' includes all relevant levels and interactions between 'Safe', 'AQR' and 'Reviewed' that are not absorbed by the fixed effects.[31]

Based on Figure A2—unconditionally, i.e., before imposing any control such as those in equation (1)—we find that, after the announcement of the AQR, reviewed banks increase the share of their safe securities on average by more than 2% during the very short time period of the AQR relative to the period before the announcement. Note that we are finding similar results if we analyze only the reviewed banks or if we compare reviewed versus non-reviewed banks.

More formally, estimating equation (1), we find in column 1 of Table 1 that, after the AQR announcement, reviewed banks reduce their share of securities by 1.68% as compared to the largest non-reviewed banks. In column 2, we add bank fixed effects and find that our main result remains very similar in terms of significance and magnitude, despite that the R2 increases by 36 percentage points.[32] Column 3 and 4 replicate the estimation of column 1 and 2 but include security and security-bank fixed effects to ensure that our results are not affected by unobserved time-invariant security variables. Results remain similar, yet stronger in magnitude.

Regarding the composition of safe assets, we find that reviewed banks increase their safe securities holdings (column 5), where we allow AQR*Reviewed to vary depending on the rating

---

[30] The standardized approach maps the ECAI's credit assessments to credit quality steps, see for example, https://www.eba.europa.eu/documents/10180/16166/4+Ausust+2006_Mapping.pdf and https://www.bankingsupervision.europa.eu/ecb/pub/pdf/assetqualityreviewphase2manual201403en.pdf. According to the standardized approach of capital adequacy under Basel II and III, this rating bucket has the lowest risk weight.

[31] We find similar results if we do not control for any fixed effect (though identification in this case is weaker). In Table A5 and A6 of the Appendix, we show that our results are similar for alternative specifications with respect to the dependent variable and the estimation method (weighted least squares).

[32] Following Altonji et al. (2005), this implies that our main variable is exogenous to a large set of unobserved security and bank characteristics.

of the security. In the most saturated model in column 6, reviewed banks increase safe securities by 3.46% during the AQR period. Economically, this suggests that reviewed banks together increase their safe securities holdings by EUR 12.25 billion in the period after the AQR announcement (which is large given the capital of banks and given the very short time period).[33] Moreover, there is also a significant reduction in the overall security holdings of reviewed banks (as indicated by the coefficient on AQR*Reviewed), i.e. reviewed banks not only relatively cut the riskier securities, but also downsize their level of securities holdings in general.[34]

For robustness, we also restrict the sample of both reviewed and non-reviewed banks to those whose total value of total assets lies within the range of +/− EUR 10 billion around the EUR 30 billion threshold, i.e., one of the three criteria used to select the reviewed banks as explained in Section II (and the only one applied in Germany). Our results remain qualitatively similar but larger in magnitude (see Table A3 of the Appendix). This suggests that our results are not driven by very large reviewed banks. In addition, in columns 7 and 8 of Table 1, we restrict ourselves to reviewed banks only. We find that reviewed banks on average increase their safe securities holdings by 2.26% after the AQR announcement (note that in column 8 we control for security-bank fixed effects). For robustness, we also show that comparing end of September to end of December 2013 yields very similar results (see columns 1 to 2 of Table 3, Panel A).

Moreover, in Panel A of Table 3, we also show that banks decrease the share of riskier securities measured by (i) high-yield securities (columns 3 and 4), (ii) securities whose issuer is headquartered in GIIPS countries (columns 5 and 6), (iii) long-term securities (columns 7 and 8), and (iv) long-term non-safe securities (columns 9 and 10). Note that based on the last two columns, which are for the riskiest securities, estimated effects imply a reduction of the riskiest securities between 26% and 33%. All in all, these results suggest that reviewed banks increase their safe securities holding after the announcement of the AQR.

As credit was also a major part of the ECB's AQR, in a next step we examine the response in the lending behavior of banks during the AQR. To that aim, we exploit the data at the *borrower-bank-quarter* level and use the following estimation equation:

$$\text{Log(credit)}_{b,j,t} = \beta(\text{Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_b) + \alpha_b + \alpha_j + \alpha_t + \delta'controls + \varepsilon_{b,j,t} \qquad (2)$$

---

[33] The sum of all safe securities holdings of all reviewed banks amounts to a total of EUR 350 billion as at end of September 2013. Using the estimated coefficient on Safe*AQR*Reviewed from Table 1 column 6, results suggest an increase by EUR 12.25 billion, i.e., 3.5%*EUR 350 billion.

[34] If we just run the double interaction *AQR*Reviewed* without the triple with *Safe*, we also find that overall reviewed (vs. non-reviewed) banks cut on their assets.

where the dependent variable is the logarithm of the loan amount by bank b to firm j during quarter t. In analogy to Table 1, we use the same symmetric sample around the AQR announcement, i.e., July, August, and September 2013 vs. October, November, and December 2013.[35] Our binary variables 'AQR' and 'Reviewed' are constructed as before. To assess the riskiness of a given borrower, we resort to the ex-ante probability of default (PD) that any bank assigns to its borrower. Since only a subset of banks (relatively large banks) provide these PDs, this restricts us to only analyzing those banks and borrowers for which we have a PD. That is, once we observe a PD for a given firm in a given time, we will use this information to assess this firm's riskiness across all of its credit relationships. We then define the binary variable 'Safe', which equals the value of one for all borrowers whose PD is below the cross-sectional mean, and zero otherwise. The median PD in this group equals 0.2% and corresponds to PDs observed globally for investment-grade firms that have the lowest risk weights (e.g., Standard and Poor's 2012; Joint Committee of the European Supervisory Authorities, 2014).[36] In comparison, the median PD in the group of riskier firms (i.e., when 'Safe' equals the value of zero) is 4.3%, which refers to PDs observed for below-investment-grade firms.

For identification, we include firm fixed effects to control for firm-level unobserved characteristics (as e.g. firm-level credit demand as in e.g., Khwaja and Mian, 2008) or firm-bank fixed effects to control for any firm-bank specific match such as geographical distance and relationship lending (Petersen and Rajan, 1995). Thus, we compare the level of credit for the same borrower across reviewed and non-reviewed banks depending on the ex-ante risk of the borrower. We cluster standard errors at the bank and firm level.

In column 1 of Table 2, we find that reviewed banks, as compared to non-reviewed banks, decrease their share of supply of credit by 1.76% after the AQR announcement. In column 2, we include firm-bank fixed effects and find that our estimated coefficient on AQR*Reviewed bank remains statistically significant, qualitatively similar. In column 3 and 4, we use firm and firm-bank fixed effects to ensure that our results are not driven by time invariant firm or firm-bank characteristics.[37] Similar to our security analysis, our results remain qualitatively similar.

From columns 5 and 6, we see that reviewed banks increase their share of supply of credit to

---

[35] Recall that our credit data has a quarterly frequency. Therefore, our credit regressions for the sample +/− 3 months around the AQR announcement already compare September 2013 to December 2013.

[36] This credit quality complies with the Eurosystem's credit quality requirements for non-marketable assets as laid down in Article 108 (a) (ECB/2014/60).

[37] Recall that our credit regressions rely already on a subset of non-reviewed banks as not all non-reviewed banks have borrowers with reported PDs.

safer firms, by 2.63% when we include firm-bank fixed effects in column 6, after the AQR announcement when compared to the largest non-reviewed banks. Economically, this corresponds to an increase of credit supply to safer borrowers in the amount of EUR 41.23 billion in total for all reviewed banks in the period after the AQR announcement (again this is large given bank capital and the very short time period).[38] In columns 7 and 8, we restrict ourselves to reviewed banks only and find that on average reviewed banks increased credit to safer firms by 2.45% (with firm fixed effects) and 2.38% (with firm-bank fixed effects) after the AQR announcement (Figure A3 also illustrates similar results without any control).

As a robustness check, we also restrict the sample of both reviewed and non-reviewed banks to those whose total value of total assets lies within the range of $+/-$ EUR 10 billion around the EUR 30 billion threshold. Our results remain qualitatively similar but somewhat larger in magnitude (see Table A3 of the Appendix). In addition, there is also a significant reduction in the overall supply of credit by reviewed banks to firms (coefficient on AQR*Reviewed in Table 2), i.e. reviewed banks not only cut the supply of riskier credit, but also downsize credit supply in general. In Panel B of Table 3, we show that our results are robust to the application of different cut-offs to the ex-ante probability of default and to using the ex-ante continuous probability of default. Different than securities, estimated effects for the riskiest credit are similar than for other less risky thresholds.

In sum, the results (stemming from Figure A2 and A3 without controls, from Table 1, and 2 with controls, Table 3 with different definitions of riskiness and from the Appendix) suggest that, after the announcement of the AQR, reviewed banks increase their share of safe assets, both bonds and loans. Economically, we find for all reviewed banks there is an increase of safe securities by EUR 12.25 billion and an increase of credit supply to safer firms by EUR 41.23 billion, together amounting to an average increase in safe assets (both securities and credit) of EUR 53.48 billion, which is high given the very short period of time (basically two months between announcement and compliance) and accounts for 29% of reviewed banks' overall common equity capital. Moreover, effects are substantially stronger for the riskiest securities as compared to the riskiest credit. Finally, from Table 4 we can see that our results are not due to a general end-of-year effect, but only related to the ECB supervisory audit at the end of the fourth quarter in 2013, as we do not find (statistically or economically) significant effects in the last quarter of 2012 and 2014,

---

[38] The sum of all credit to safer firms of all reviewed banks amounts to a total of EUR 1,568 billion as at end of September 2013. Using the estimated coefficient on Safe*AQR*Reviewed from Table 2 column 6, results suggest an increase by EUR 41.23 billion, i.e., 2.63%*EUR 1,568 billion.

respectively. Importantly, however, we find similar effects for 2015, where end-of-year assets were reported to the ECB for the 2016 stress test exercise (see Table A4 of the Appendix).

IV.2 IMMEDIATE SPILLOVERS ON ASSET PRICES AND FIRM-LEVEL CREDIT AVAILABILITY

We next test whether these results have immediate implications for security-level prices and firm-level credit availability. To examine this hypothesis, we first extend our security analysis using pricing data that we obtain from Eurosystem's CSDB in the following estimation equation:

$$\text{Price}_{s,t} = \beta(\text{Non-Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_s) + \alpha_s + \alpha_t + \delta'controls + \varepsilon_{s,t} \tag{3}$$

where the dependent variable is the price of security s during month t in the period September 2013 and December 2013, i.e., before and after the AQR announcement. 'Non-Safe' is a binary variable that takes the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. 'Reviewed' is a binary variable that equals one when the security is primarily held (i.e., more than 50th percentile) by reviewed banks as at September 2013, and zero otherwise. As in previous regressions, 'AQR' measures the period after the AQR announcement, and security and time fixed effects as well as lower-order interaction terms (where applicable) are included, but not specifically shown in equation 3 for clarity.

Column 1 of Table 5 shows the results for securities prices. Non-safe bonds that were largely held by reviewed banks exhibit lower prices after the AQR. That is, the high demand from reviewed banks for safer bonds propped up the prices of these bonds, or the selling of riskier securities by reviewed banks reduced the price of risky securities over the two-month period after the AQR.

In column 2 of Table 5, we employ a similar approach to credit as follows:

$$\text{Log(firm credit)}_{j,t} = \beta(\text{Non-Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_j) + \alpha_j + \alpha_t + \delta'controls + \varepsilon_{j,t} \tag{4}$$

where the dependent variable is the logarithm of loan amount borrowed by firm j during quarter t in the period September 2013 and December2013. 'Non-Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) above the cross-sectional mean PD of all borrowers' PDs in time t-1, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as at September 2013, and zero otherwise. As in previous regressions, 'AQR' equals the value of one for the month December 2013, and zero otherwise, lower-order interaction terms are included in 'controls' and there are firm and time fixed effects.

The estimated coefficient shown in column 2 of Table 5 indicates that non-safe firms that (pre-AQR) mainly received credit from reviewed banks received lower overall bank credit relative to the other firms. These results suggest that our previously documented reduction in credit at the loan level served as a binding constraint at the firm level, i.e., they were not able to substitute this cut-back. Note that effects are immediately after the AQR, i.e. during the last quarter of 2013.

IV.3 Who is Buying Securities Sold by Reviewed Banks?

To further understand to whom the risk is reallocated that banks are shedding, we examine who buys the securities that reviewed banks sell. To that aim, we run the following empirical analysis:

$$\text{Log(securities holdings)}_{i,s,t} = \beta(\text{Non-Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Exposure to Reviewed}_i) + \alpha_{i,s} + \alpha_t + \delta'controls + \varepsilon_{i,s,t} \quad (5)$$

where the dependent variable refers to the logarithm of the nominal holdings of security s by investment fund i at month t in the period from July 2013 to December 2013, i.e., 3 months before and 3 months after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. 'Exposure to Reviewed' is a binary variable that equals the value of one whenever an investment fund holds a large share of bonds (top 25th percentile) issued by reviewed banks in their ex-ante portfolio, and zero otherwise. As in previous regressions, we exploit 'AQR' and control for different effects: time fixed effects and security-investor fixed effects, which allows us to analyze the same security before and after the AQR, while controlling for intermediary-security specific heterogeneity. Table 6 provides the estimation results.

In columns 1 and 2, the sample includes all purchased securities and results suggest a higher differential buying behaviour of riskier securities by funds with an ex-ante higher exposure to reviewed banks. This holds true also when we use the continuous variable to measure the ex-ante exposure to reviewed banks (column 2). In column 3, we restrict the sample to securities that were not previously sold by reviewed banks; consistently there is *no* differential buying behavior. In columns 4 and 5, the sample is restricted to those securities that were previously sold by reviewed banks. The estimated coefficient in column 4 suggests a differential buying behavior by investment funds with an ex-ante higher exposure to reviewed banks. In column 5, we use ECB's credit quality buckets (ECB CQS) as an alternative definition for riskier assets.[39] 'ECB CQS 2' refers to a dummy variable that equals the value of one if the security has a rating between A- to A+, and zero

---

[39] Refer to https://www.ecb.europa.eu/paym/coll/risk/ecaf/html/index.en.html for more details.

otherwise. 'ECB CQS 3' equals the value of one if the security has a rating between BBB+ to BBB-, and zero otherwise. 'ECB CQS Non-Eligible' is a binary variable that equals the value of one if the security has a rating below BB+, and zero otherwise. We find that the buying behaviour by funds with higher exposure is higher for previously sold securities of lower rating.[40]

These results suggest that investment funds, especially the ones that (pre-AQR) hold securities issued by reviewed banks in their portfolio are the ones that buy the riskier securities sold by reviewed banks. Thus, the risk is being reallocated from the banking sector to nonbanks. In Appendix Table A7 we also find that this differential buying behaviour bears implications for asset prices of purchased bonds. Especially, we can see that riskier securities purchased by funds with low exposure to reviewed banks are associated with smaller price changes as compared to those purchased by funds with ex-ante higher exposure to reviewed banks.

IV.4 DIALING-DOWN OF SAFE ASSETS AFTER THE AQR OVERALL EXERCISE

The second testable hypothesis that we examine in this paper is that, after the AQR compliance exercise is concluded, banks will liquidate the previously acquired safer assets and invest in holdings with a relatively higher risk. To examine this mechanism, we extend our security and credit analysis from the previous section (Equations 1 and 2 respectively) by just adding all the different AQR time periods (following Figure A1), with identical dependent variables and identical asset risk (*safe*) and bank (*reviewed*) variables. We extend our sample but maintain a symmetric window around the AQR period, i.e. nine months before the AQR announcement and nine months after the AQR due date (with the 3 months of the AQR period), yielding a total sample of 21 months covering the period from January 2013 to September 2014 (recall that our sample ends in October 2014, i.e., before the stress test results are released and the ECB becomes the European banking supervisor). This allows us to estimate the differential effects across the different periods related to the overall AQR exercise as depicted in Figure A1.

Table 7 presents the results. 'AQR' is constructed as before and thus equals the value of one only for the months October, November, December 2013, and zero otherwise. 'AQR-Compliance' is a binary variable that equals the value of one for the months January to June 2014, and zero otherwise. 'Post-AQR' refers to a dummy variable that equals the value of one for the months from July 2014 onwards, and zero otherwise. This leaves the period before the AQR announcement as

---

[40] We also examined whether securities are being passed on to investment funds that belong to the reviewed banking holding group, or whether reviewed banks sell riskier securities to their clients. However, we do not find evidence for either one of these channels. This is consistent with the fact that supervision was executed for the whole banking group.

the benchmark period. That is, the three estimated coefficients in Table 7 (of the triple interactions of the three different time periods with asset risk and reviewed bank) measure the effect for each sub-period *relative to the period before the AQR announcement*.

In Table 7 column 1, we find that the increase of safe securities during the AQR period persists during the AQR-compliance period. In the period after the AQR compliance exercise though, the coefficient on Safe*Post-AQR*Reviewed is negative and insignificant, even within reviewed banks only (column 2). That is, the holdings of safe securities after the overall AQR exercise are back to the levels held before the AQR announcement. This suggests that reviewed banks indeed reduce safe securities after temporarily increasing them during the AQR period (see also Figure A2, which graphically illustrates this behavior). In columns 3 and 4, we mimic the security analysis and examine the differential effect on credit supply by reviewed banks versus non-reviewed banks during the AQR cycle. Similar to our security regressions, we find that, during the AQR-compliance period, reviewed banks' credit supply to safer firms remain at elevated levels as compared to the period before the AQR announcement. However, in contrast to the security analysis, in the period after the AQR compliance period we find that these levels continue to be elevated similar to the levels observed during the AQR period (columns 3 and 4, see also Figure A3 without controls, which graphically illustrates this behavior). This result is intuitive as banks need to have opportunities (applications) to lend to riskier borrowers.

As discussed in Section II, the AQR intended to focus especially on the riskiest portfolios on the banks' balance sheets and thus gave special attention to banks with significant trading books. Banks with a larger trading book may therefore feel more pressured to adjust their asset portfolio for the AQR exercise than other banks. Following Abbassi et al. (2016) we exploit banks' trading expertise,[41] and analyze heterogeneous effects based on bank trading expertise.

In Table 8 we interact our main variable 'Safe*AQR' with the binary variable 'Trading bank', which equals the value of one if the reviewed bank has membership to the largest fixed-income platform in Germany (Eurex Exchange), and zero otherwise. In column 1 of Table 8 we find that

---

[41] To proxy for active presence and expertise in securities markets, Abbassi et al. (2016) use the notion that banks that generally engage in trading activities and thus have expertise will have a trading desk in place and the necessary infrastructure, such as direct membership to the trading platforms to facilitate trading activities. Using this line of reasoning, they proxy for trading expertise by direct membership of banks to the largest, fixed-income trading platform in Germany (Eurex Exchange). Supporting this classification, Abbassi et al. (2016) find that the amount of securities traded (as a fraction of total assets) are consistently larger for banks with trading expertise, across all the periods. They also find this measure to be highly correlated with the fraction of trading income to net income (in the pre-crisis period), with a correlation coefficient of 60%. Thus, the trading expertise dummy is highly correlated with banks that have a higher fraction of income generated from trading activities.

during the AQR period there is no additional differential effect for securities holdings within the group of reviewed banks depending on trading expertise (i.e., during the AQR period reviewed banks increase safe securities holdings irrespective of further bank-specific characteristics).[42] However, after the AQR overall exercise, reviewed banks with trading expertise reduce their safe assets to levels below that observed before the AQR period (i.e., the estimated coefficient of 'Safe*Post-AQR*Trading bank' is negative and significant). From column 2, reviewed banks with trading expertise increase credit to safer firms more than other reviewed banks after the AQR announcement. During the post-AQR period though, both reviewed banks with and without trading specialization remain at roughly similar elevated levels of safe credit as observed during the AQR period. All in all, trading banks that are reviewed reduce risk as the other banks in securities but increase it more than other banks during the post-AQR period.

IV.5 MEDIUM-TERM REAL EFFECTS

We now shed light on the medium-term implications of our results for real activity. To that aim, we analyze how firms, which were curtailed credit faired economically according to their balance sheets over the period 2011-2014. We, therefore, run the following regression analysis:

$$\text{Log(real outcome)}_{j,t} = \beta(\text{Non-Safe}_{s,t-1} \cdot \text{AQR}_t \cdot \text{Reviewed}_j) + \alpha_j + \alpha_t + \delta' controls + \varepsilon_{j,t} \qquad (6)$$

where the dependent variable is the logarithm of total firm debt, total assets, profits and losses, tangible assets, investments, sales, and employment, respectively, of firm j during year t in the period 2011-2014, i.e., before and after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one if borrower j has a probability of default (PD) above the cross-sectional mean PD of all borrowers' PDs in t-1, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than the 50th percentile) provided by reviewed banks as at September 2013 (pre-AQR), and zero otherwise. 'AQR' is a binary variable and equals the value of one for the (end of) years 2013 and 2014, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). We further include the logarithm of the firm's equity in t-1 as a time-varying firm control. Our fixed effects strategy follows equation 4.

---

[42] In unreported robustness regressions, we have also tried other bank-specific variables such as the bank's leverage ratio, its Tier-1 capital adequacy ratio, its size, and the share of non-performing loans. Yet, we do not find any further differential heterogeneity at the bank level.

In Table 9, we find that non-safe firms, which received credit predominantly from reviewed banks before the AQR announcement suffer contractions in firm-level total debt and real outcomes across the board over a period of more than a year after the AQR announcement. More precisely, we find that non-safe firms that received credit primarily from reviewed banks before the AQR announcement are associated with 5.1% lower overall firm debt, 6.2% lower asset size, 12.3% higher losses, 7.8% lower tangible assets, 4.8% lower investments, 3.1% lower sales, and 3.2% lower employment in the years following the AQR as compared to their peers. That is, Table 9 provides evidence that the supervision audit generates medium-term real effects, not just immediate spillovers on asset prices and credit supply around the supervisory audit.

V. CONCLUSIONS

Government regulation requires effective supervision, but regulated entities may deviate from regulation by taking unobserved actions to supervisors. For empirical identification, we analyze the banking sector, exploiting a quasi-natural experiment—ECB's 2014 asset quality review (AQR)—in conjunction with the security and credit registers. The banking sector is interesting, not only for empirical identification of risk-masking to supervisors, but also for the difficulties in supervision, as banks hold more liquid assets, which are easy to change relatively fast, and also hold assets that are more opaque than in other industries. Moreover, there has been a substantial increase in banking regulation after the financial crisis of 2008.

Our results show that, after the ECB's announcement of the AQR, reviewed banks increase their share of securities that have top-tier rating and reduce their share of supply of credit to riskier firms. The largest impact of reducing risky assets is on the riskiest securities, not on the riskiest credit. Part of these traded securities are issued by banks or abroad (e.g. GIIPS). Moreover, there are immediate (over a two-month period) negative spillovers on asset prices and firm-level credit availability (via a reduction of bank credit supply). Interestingly, exposed (unregulated) nonbanks buy the shed risk (those nonbanks that hold reviewed bank securities ex-ante). AQR drives the results, not the end-of-year effects.

Moreover, in the period after the AQR compliance though, we find that reviewed banks fully reload back on riskier securities (similar to the pre-ECB announcement level); however, this is not the case for riskier credit. Results are more pronounced for banks with higher trading expertise; in particular, trading banks that are reviewed reduce risk more than others in securities after the ECB

announcement of AQR, but increase it more than other banks during the post-AQR period; in lending, however, trading banks behave similarly than the other banks.

As we find that in the dialing-up of risk, there are no effects on loading up riskier credit (differently from securities), we also analyze whether the (binding) reduction in credit supply after the AQR generates medium-term real effects. Crucially, we find that the effects of supervision on the medium-term reduction on credit supply implies negative strong real effects at the firm level over more than one year after the AQR. That is, the increase in safe assets by banks due to supervision brought by the stress tests' AQR implies strong negative medium-term effects for firm-level investment, output and employment.

Overall, results suggest banks mask risk in supervisory audits, especially on liquid securities that are easier to trade, with not only short-term spillovers on asset prices and credit supply, but also with medium-term implications for the real economy, holding important implications for policy. In particular, the results carry policy implications for stress tests in particular, and for the design of supervision in general. The results suggest that pre-defining the timing and structure of a supervisory exercise incentivizes window-dressing behavior of banks, as it is optimal from a bank's perspective (see e.g., Tarullo, 2014; Goldstein and Sapra, 2014; Coen, 2017). Thus, it might be necessary to have an element of surprise in the supervisory exercise, both with respect to the timing of the audits (either more continuous or random in time) and the degree of transparency over the specific process (i.e., methods and models used, and assets and type of risks assessed). The results also indicate that it is easier for banks to change the composition of liquid assets (securities trading) than illiquid ones (loans to firms). Thus, the results also point out that regulation of banks with substantial volume of marketable assets may pose significant challenges for supervision, with strong consequences for the overall economy. Moreover, effects on credit, though weaker, are also crucial and bring about longer-term negative real effects on the economy, and hence costs of increasing supervision via the associated increase in safe assets.

REFERENCES

Abbassi, P. and Bräuning, F., 2018. The pricing of FX forward contracts: Evidence from banks' dollar hedging, Bundesbank Discussion Paper No. 42-2018.

Abbassi, P., Iyer, R., Peydró, J.L. and Tous, F.R., 2016. Securities trading by banks and credit supply: Micro-evidence from the crisis, *Journal of Financial Economics*, 121(3), 569-594.

Acharya, V., Engle, R. and Pierret, D., 2014. Testing macroprudential stress tests: The risk of regulatory risk weights, *Journal of Monetary Economics*, 65, 36-53.

Acharya, V., Schnabl, P. and Suarez, G., 2013. Securitization without risk transfer, *Journal of Financial Economics*, 107(3), 515-536.

Agarwal, S., Lucca, D., Seru, A. and Trebbi, F., 2014. Inconsistent regulators: Evidence from banking. *Quarterly Journal of Economics*, 129(2), 889-938.

Allen, L. and Saunders, A., 1992. Bank window dressing: theory and evidence, *Journal of Banking and Finance*, 16(3), 585-632.

Altonji, J., E. Todd, and Taber, C., 2005. Selection on observed and unobserved variables: Assessing the effectiveness of catholic schools, *Journal of Political Economy*, 113(1), 151-184.

Amann, M., Baltzer, M. and Schrape, M., 2012. Microdatabase: Securities Holdings Statistics, a flexible multi-dimensional approach for providing user-targeted securities investments data, Bundesbank Technical Documentation.

Anbil, S. and Senyuz, Z., 2018. The regulatory and monetary policy nexus in the repo market, Finance and Economics Discussion Series 2018-027.

Banegas, A. and Tase, M., 2016. Reserve balances, the federal funds market and arbitrage in the new regulatory framework, Finance and Economics Discussion Series 2016-079.

Becker, B. and Opp, M., 2013. Regulatory reform and risk-taking: replacing ratings, National Bureau of Economic Research Working Paper No. 19257.

Bernanke, B., 2013. Stress testing banks: What have we learned? Speech at the "Maintaining Financial Stability: Holding a Tiger by the Tail", Federal Reserve Bank of Atlanta, Georgia.

Boyson, N., Fahlenbrach, R. and Stulz, R.M., 2016. Why don't all banks practice regulatory arbitrage? Evidence from usage of trust-preferred securities. *Review of Financial Studies*, 29(7), 1821-1859.

Buchak, G., Matvos, G., Piskorski, T. and Seru, A., 2018. Fintech, regulatory arbitrage, and the rise of shadow banks, *Journal of Financial Economics*, 130(3), 453-483.

Caballero, R.J. and Farhi, E., 2017. The safety trap. *Review of Economic Studies*, 85(1), 223-274.

Caballero, R.J., Farhi, E. and Gourinchas, P.O., 2016. Safe asset scarcity and aggregate demand. *American Economic Review*, 106(5), 513-18.

Caballero, R.J., Farhi, E. and Gourinchas, P.O., 2017. The safe assets shortage conundrum. *Journal of Economic Perspectives*, 31(3), 29-46.

Coen, W., 2017. Regulatory equivalence and the global regulatory system. Keynote address at the International Financial Services Forum London, Thursday 25 May.

Demirguc-Kunt, A., Detragiache, E. and Merrouche, O., 2013. Bank capital: Lessons from the financial crisis, *Journal of Money, Credit and Banking*, 45(6), 1147-1164.

Dewatripont, M. and Tirole, J., 1994. The prudential regulation of banks. Cambridge, MIT Press.

Duffie, D., 2019. Prone to fail: the pre-crisis financial system, *Journal of Economic Perspectives*, 33(1), 81-106.

Du, W., Tepper, A. and Verdelhan, A., 2018. Deviations from covered interest rate parity, *Journal of Finance*, 73(3), 915-957.

European Central Bank, 2005. The new Basel capital framework and its implementation in the European Union, ECB Occasional Paper Series No. 42.

European Central Bank, 2013. Note comprehensive assessment October 2013.

European Central Bank, 2014. Aggregate report on the comprehensive assessment.

Farhi, E. and Tirole, J., 2017. Shadow banking and the four pillars of traditional financial intermediation, National Bureau of Economic Research Working Paper No. 23930.

Fleming, S., 2017. Fed banking watchdog nominee plans more 'transparency' in stress tests, *Financial Times*.

Fleming, S. and Steen, M., 2013. Draghi says bank tests need failures for credibility; ECB probe. *Financial Times*, London Ed1 (October 24, 2013). Retrieved from Factiva database.

Glaeser, E.L. and Shleifer, A., 2001. A reason for quantity regulation, *American Economic Review*, 91(2), 431-435.

Goldstein, I. and Sapra, H., 2014. Should banks' stress test results be disclosed? An analysis of the costs and benefits, *Foundations and Trends in Finance*, 8(1), 1-54.

Gorton, G., Lewellen, S. and Metrick, A., 2012. The safe-asset share. *American Economic Review*, 102(3), 101-06.

Granja, J. and Leuz, C., 2019. The death of a regulator: Strict supervision, bank lending and business activity, National Bureau of Economic Research Working Paper No. 24168.

Granja, J., Matvos, G. and Seru, A., 2017. Selling failed banks. *Journal of Finance*, 72(4), 1723-1784.

Van Horen, N. and Kotidis, A., 2018. Repo market functioning: The role of capital regulation. Bank of England Working Paper No. 746.

He, J., Ng, L., and Wang, Q., 2004. Quarterly trading patterns of financial institutions, *Journal of Business*, 77(3), 493-509.

Hellwig, M.F., 2010. Capital regulation after the crisis: business as usual? Mimeo.

Hirtle, B., Kovner, A. and Plosser, M.C., 2019. The impact of supervision on bank performance, *Journal of Finance*, forthcoming.

Irani, R.M., Iyer, R., Meisenzahl, R.R. and Peydro, J.L., 2019. The rise of shadow banking: Evidence from capital regulation, unpublished manuscript.

Joint Committee of the European Supervisory Authorities, 2014. Mapping of Standard & Poor's ratings services' credit assessments under the standardized approach.

Khwaja, A.I. and Mian, A., 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *American Economic Review*, 98(4), 1413-1442.

Kotomin, V. and Winters, D., 2006. Quarter-end effects in banks: preferred habitat or window dressing? *Journal of Financial Services Research*, 29(1), 61-82.

Laffont, J-J. and Tirole, J. 1993. A theory of incentives in procurement and regulation, Cambridge, MA: MIT Press.

Lakonishok, J., Shleifer, A., Thaler, R. and Vishney, R., 1991. Window dressing by pension fund managers, *American Economic Review*, 81(2), 227-231.

Lucca, D., Seru, A. and Trebbi, F., 2014. The revolving door and worker flows in banking regulation. *Journal of Monetary Economics*, 65, 17-32.

Martinez-Miera, D. and Repullo, R., 2019. Markets, Banks, and Shadow Banks, ECB WP 2234.

Morgan, D., 2002. Rating banks: Risk and uncertainty in an opaque industry, *American Economic Review*, 92(4), 874-888.

Munyan, B., 2017. Regulatory arbitrage in repo markets, *Office of Financial Research WP*.

Musto, D., 1999. Investment decisions depend on portfolio disclosures, *Journal of Finance*, 54(3), 935-952.

Myers, S.C. and Rajan, R.G., 1998. The paradox of liquidity, *Quarterly Journal of Economics*, 113(3), 733-771.

Ng, L. and Wang, Q., 2004. Institutional trading and the turn-of-the-year effect, *Journal of Financial Economics*, 74(2), 343-366.

Owens, E. and Wu, J., 2015. Quarter-end repo borrowing dynamics and bank risk opacity, *Review of Accounting Studies*, 20(3), 1164-1209.

Petersen, M.A. and Rajan, R.G., 1995. The effect of credit market competition on lending relationships, *Quarterly Journal of Economics*, 110(2), 407-443.

Plantin, G., 2014. Shadow banking and bank capital regulation, *Review of Financial Studies*, 28(1), 146-175.

Posner, R.A., 1975. The social costs of monopoly and regulation, *Journal of Political Economy*, 83(4), 807-827.

Schild, C.-J., Schultz, S. and F. Wieser, 2017. Linking Deutsche Bundesbank Company Data using Machine-Learning-Based Classification, Deutsche Bundesbank Technical Report 2017-01.

Standard & Poor's Ratings Services, 2012. Default, transition, and recovery: 2012 annual global corporate default study and rating transitions. Available online: https://www.nact.org/resources/NACT_2012_Global_Corporate_Default.pdf.

Stigler, G.J., 1971. The theory of economic regulation, *Bell Journal of Economics and Management Science*, 3-21.

Tarullo, D.K., 2014. Stress testing after five years. Speech given at the Federal Reserve Third Annual Stress Test Modelling Symposium, Boston, Massachusetts. Available online: https://www.federalreserve.gov/newsevents/speech/tarullo20140625a.htm.

Tirole, J. 2014. Market failures and public policy. Nobel Prize Lecture, December 8, 2014.

The White House, 2015. Occupational licensing: A framework for policymakers. The Council of Economic Advisers, July.

TABLE 1
DIALING-UP OF SAFE SECURITIES AFTER THE AQR ANNOUNCEMENT
+/− 3 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable: Log(securities holdings)							
	Reviewed vs. largest non-reviewed banks						Within reviewed banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe*AQR*Reviewed					0.0397***	0.0346***	0.0191***	0.0226***
					(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR					-0.0202***	-0.0121***		
					(0.01)	(0.00)		
Safe					-0.0113	-0.0308		
					(0.05)	(0.04)		
AQR*Reviewed	-0.0168***	-0.0208***	-0.0215***	-0.0291***	-0.0370***	-0.0428***		
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)		
Safe*Reviewed					0.0628*	0.0489	0.0376	0.0193
					(0.03)	(0.06)	(0.05)	(0.04)
AQR control	Y	Y	-	-	-	-	-	-
Reviewed control	Y	-	-	-	-	-	-	-
Security FE	N	N	Y	-	Y	-	Y	-
Bank FE	N	Y	Y	-	Y	-	Y	-
Security*Bank FE	N	N	N	Y	N	Y	N	Y
Time FE	N	N	Y	Y	Y	Y	Y	Y
Observations	316,221	316,221	316,221	316,221	316,221	316,221	191,066	191,066
R-squared	0.085	0.444	0.611	0.987	0.611	0.987	0.553	0.978

The dependent variable is the logarithm of securities nominal holdings by each bank b of security s during month t in the period July 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November and December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 to 6, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 7 and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y'), not included ('N'), or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and security level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 2
DIALING-UP OF SAFE CREDIT AFTER THE AQR ANNOUNCEMENT
+/− 3 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable: Log(credit)							
	Reviewed vs. largest non-reviewed banks						Within reviewed banks	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Safe*AQR*Reviewed					0.0422***	0.0263**	0.0245***	0.0238***
					(0.02)	(0.01)	(0.01)	(0.01)
Safe*AQR					-0.0159	-0.0026		
					(0.01)	(0.01)		
Safe					0.0027	0.0062		
					(0.05)	(0.02)		
AQR*Reviewed	-0.0176***	-0.0177***	-0.0177***	-0.0182***	-0.0500***	-0.0378***		
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)		
Safe*Reviewed					-0.0310	-0.0293	-0.0283	-0.0231**
					(0.06)	(0.02)	(0.02)	(0.01)
AQR control	Y	Y	-	-	-	-	-	-
Reviewed control	Y	-	-	-	-	-	-	-
Firm FE	N	N	Y	-	Y	-	Y	-
Bank FE	N	Y	Y	-	Y	-	Y	-
Firm*Bank FE	N	N	N	Y	N	Y	N	Y
Time FE	N	N	Y	Y	Y	Y	Y	Y
Observations	160,624	160,624	160,624	160,624	160,624	160,624	141,774	141,774
R-squared	0.001	0.125	0.899	0.977	0.899	0.977	0.903	0.977

The dependent variable is the logarithm of loan amount by each bank b to borrower j during quarter t in the period September 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs in time t-1. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 to 6, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 7 and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y'), not included ('N'), or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and firm level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 3 PANEL A
DIALING-UP OF SAFE SECURITIES AFTER THE AQR ANNOUNCEMENT
OTHER RISK MEASURES

	Dependent variable: Log(securities holdings)									
Variable:	Safe		High Yield		GIIPS		Long-Term		Long-Term Non-Safe	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Variable *AQR*Reviewed	0.0204**	0.0132*	-0.0660***	-0.0552***	-0.0375***	-0.0194*	-0.0434***	-0.0419***	-0.2590***	-0.3259***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)	(0.06)
Variable *AQR	-0.0072		0.0108		0.0181**		0.0015		-0.0669***	
	(0.01)		(0.01)		(0.01)		(0.01)		(0.01)	
Variable	-0.0132		-0.0335***				-0.3178***		-0.1455	
	(0.05)		(0.01)				(0.08)		(0.11)	
AQR*Reviewed	-0.0388***		-0.0315***		-0.0253***		-0.0262***		-0.0277***	
	(0.01)		(0.01)		(0.00)		(0.00)		(0.00)	
Variable *Reviewed	-0.0005	-0.0138	0.0298	-0.0037			0.1452	-0.1726**	0.3717**	0.2263**
	(0.08)	(0.06)	(0.02)	(0.02)			(0.11)	(0.08)	(0.15)	(0.09)
Security*Bank FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	106,952	63,414	78,526	45,044	106,952	63,414	106,952	63,414	106,952	63,414
R-squared	0.989	0.982	0.988	0.979	0.989	0.982	0.989	0,983	0.989	0,983

This table replicates Table 1, but restricts the sample to September 2013 and December 2013. The dependent variable is the logarithm of securities nominal holdings by each bank b of security s during month t. 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. 'High Yield' is a dummy variable that equals the value of one whenever the security has a higher yield than the cross-sectional mean of all yields in t-1, and zero otherwise. 'GIIPS' is a dummy variable that equals the value of one whenever the issuer of the security is headquartered in Greece, Ireland, Italy, Portugal, or Spain, and zero otherwise. 'Long-Term' is a dummy variable that equals the value of one whenever the security has a residual maturity of higher than 10 years, and zero otherwise. 'Long-Term Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating *and* a residual maturity of higher than 10 years, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1, 3, 5, 7, and 9 we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2, 4, 6, 8, and 10 we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are included ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and security level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 3 PANEL B
DIALING-UP OF SAFE CREDIT AFTER THE AQR ANNOUNCEMENT
OTHER RISK CUT-OFFS

					Dependent variable: Log(credit)			
Variable:	Median		75%		90%		Continuous	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable *AQR*Reviewed	0.0172[a]	0.0248***	0.0231**	0.0262***	0.0279**	0.0287***	0.0393**	0.0447***
	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
Variable *AQR	0.0076		0.0031		0.0008		0.0054	
	(0.01)		(0.01)		(0.01)		(0.01)	
Variable	0.0091		0.0259		0.0329		-0.0137	
	(0.03)		(0.02)		(0.02)		(0.03)	
AQR*Reviewed	-0.0248***		-0.0329***		-0.0401***		-0.0132**	
	(0.00)		(0.00)		(0.01)		(0.00)	
Variable *Reviewed	-0.0135	-0.0044	-0.0575**	-0.0315***	-0.0414	-0.0085	-0.0345	-0.0483*
	(0.03)	(0.01)	(0.02)	(0.01)	(0.03)	(0.01)	(0.04)	(0.02)
Firm*Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y	Y
Observations	161.328	142.436	161.328	142.436	161.328	142.436	161.328	142.436
R-squared	0,978	0,977	0,978	0,977	0,978	0,977	0,978	0,977

This table replicates Table 2, but uses different cut-offs to compute 'safe' credit. The dependent variable is the logarithm of loan amount by each bank b to borrower j during quarter t in the period September 2013 to December 2013, i.e., +/− three months around the AQR announcement. 'Median' ('75%' and '90%', respectively) is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional median (75th percentile and 90th percentile, respectively) PD of all borrowers' PDs in time t-1. 'Continuous' equals the probability of default (PD) of borrower j in time t-1. For the sake of convenient presentation, we multiplied in columns 7 and 8 each coefficient that involves 'Continuous' with (-1). 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1, 3, 5, and 7 we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2, 4, 6, and 8, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are included ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and firm level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level; [a]: Significant at 12% level.

TABLE 4
PLACEBO TEST: *2012 AND 2014*

	Reviewed vs. largest non-reviewed			
Placebo:	*Sept 2012 vs. Dec 2012*		*Sept 2014 vs. Dec 2014*	
	Dependent variable:			
	Log(securities holdings)	Log(credit)	Log(securities holdings)	Log(credit)
	(1)	(2)	(3)	(4)
Safe*Placebo*Reviewed	-0.0080	-0.0031	-0.0031	0.0042
	(0.02)	(0.01)	(0.01)	(0.01)
Safe*Placebo	Y	Y	Y	Y
Safe	Y	Y	Y	Y
Placebo*Reviewed	Y	Y	Y	Y
Safe*Reviewed	Y	Y	Y	Y
Security*Bank FE	Y	-	Y	-
Firm*Bank FE	-	Y	-	Y
Time FE	Y	Y	Y	Y
Observations	168,380	190,376	400,972	150,530
R-squared	0.982	0.978	0.997	0.977

This table replicates our main estimation (column 6) from Table 1 and 2, but for 2012 and 2014, respectively. The dependent variable in columns 1 and 3 is the logarithm of securities nominal holdings by each bank b of security s during month t. The dependent variable in column 2 and 4 is the logarithm of loan amount by each bank b of borrower j during quarter t. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. 'Placebo' is a dummy variable that equals the value of one for October, November, and December 2012 (and 2014, respectively), and zero otherwise. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. Lower-order interaction terms are included ('Y'), but coefficients are left unreported for clarity. Fixed effects are either included ('Y') or not applicable ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 5
SPILLOVERS AFTER THE AQR ANNOUNCEMENT

	Dependent variable:	
	Price	Credit
	(1)	(2)
Non-Safe*AQR*Reviewed	-1.1171***	-0.0572**
	(0.32)	(0.02)
Non-Safe*AQR	Y	Y
Non-Safe	Y	Y
AQR*Reviewed	Y	Y
Non-Safe*Reviewed	Y	Y
Securities FE	Y	-
Firm FE	-	Y
Time FE	Y	Y
Observations	9,618	133,336
R-squared	0.987	0.981

The dependent variable in column 1 is the price of security s during month t in the period September 2013 and December 2013, i.e., before and after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. 'Reviewed' is a binary variable that equals one when the security is primarily held (i.e., more than 50th percentile) by reviewed banks as at September 2013, and zero otherwise. The dependent variable in column 2 is the logarithm of loan amount borrowed by firm j during quarter t in the period September 2013 and December2013. 'Non-Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) above the cross-sectional mean PD of all borrowers' PDs in time t-1, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as at September 2013, and zero otherwise. 'AQR' is a binary variable and equals the value of one for the month December 2013, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). Lower-order interaction terms are included ('Y'), but coefficients are left unreported for clarity. Fixed effects are either included ('Y') or not applicable ('-'). Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 6
WHO IS BUYING SECURITIES THAT REVIEWED BANKS SELL?

| | Dependent variable: Log(securities holdings) | | | | |
| | All securities | | Unsold securities | Sold securities | |
	(1)	(2)	(3)	(4)	(5)
Non-Safe*AQR*Exposure to Reviewed	0.0396**	0.1972*	-0.0009	0.0415**	
	(0.02)	(0.11)	(0.02)	(0.02)	
ECB CQS 2*AQR*Exposure to Reviewed					0.0389**
					(0.02)
ECB CQS 3*AQR*Exposure to Reviewed					0.0472**
					(0.02)
ECB CQS Non-Eligible*AQR*Exposure to Reviewed					0.0696
					(0.04)
Investor*Security FE	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Observations	96,137	96,137	4,903	91,234	91,234
R-squared	0.980	0.980	0.987	0.979	0.979

This table shows the buying behaviour of investment funds with exposure to reviewed banks conditional on buying. The dependent variable is the logarithm of the securities holdings (in nominal value) by investment fund i of security s during month t in the period July 2013 and December 2013, i.e., 3 months before and 3 months after the AQR announcement. In columns 1 and 2, results refer to the sample including all purchased securities. In column 3, the sample restricted to securities that are purchased, but not sold by reviewed banks. In columns 4 and 5, the sample is restricted to purchased securities that sold by reviewed banks. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. ECB CQS refers to the ECB's credit quality steps (https://www.ecb.europa.eu/paym/coll/risk/ecaf/html/index.en.html). 'ECB CQS 2' refers to a dummy variable that equals the value of one if the security has a rating between A- to A+, and zero otherwise. 'ECB CQS 3' equals the value of one if the security has a rating between BBB+ to BBB-, and zero otherwise. 'ECB CQS Non-Eligible' is a binary variable that equals the value of one if the security has a rating below BB+, and zero otherwise. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November December 2013, and zero before. In columns 1, 3, 4, and 5,'Exposure to Reviewed' is a binary variable that equals the value of one whenever an investment fund holds a large share of bonds (top 25th percentile) issued by reviewed banks, and zero otherwise. In column 2, 'Exposure to Reviewed' refers to the continuous share of bonds issued by reviewed banks (as opposed to an indicator variable). Fixed effects are included accordingly ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at fund and security level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 7
DIALING-DOWN OF SAFE ASSETS AFTER THE AQR OVERALL EXERCISE
+/− 9 MONTHS AROUND AQR ANNOUNCEMENT

	Dependent variable:			
	Log(securities holdings)		Log(credit)	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed banks	Within reviewed banks
	(1)	(2)	(3)	(4)
Safe*AQR*Reviewed	0.0149**	0.0152**	0.0355***	0.0329***
	(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR-Compliance*Reviewed	0.0180	0.0103	0.0453***	0.0553***
	(0.01)	(0.01)	(0.01)	(0.01)
Safe*Post-AQR*Reviewed	-0.0058	-0.0087	0.0426***	0.0559***
	(0.02)	(0.01)	(0.02)	(0.01)
Safe*AQR	0.0022		-0.0026	
	(0.01)		(0.01)	
Safe*AQR-Compliance	-0.0056		0.0100	
	(0.01)		(0.01)	
Safe*Post-AQR	-0.0012		0.0134	
	(0.01)		(0.01)	
Safe	-0.0223		-0.0070	
	(0.03)		(0.01)	
AQR*Reviewed	-0.0442***		-0.0540***	
	(0.01)		(0.01)	
Safe*Reviewed	0.0131	-0.0120	-0.0234*	-0.0303***
	(0.05)	(0.04)	(0.01)	(0.01)
AQR-Compliance*Reviewed	-0.0734***		-0.0733***	
	(0.01)		(0.01)	
Post-AQR*Reviewed	-0.1012***		-0.0712***	
	(0.01)		(0.01)	
Security*Bank FE	Y	Y	-	-
Firm*Bank FE	-	-	Y	Y
Time FE	Y	Y	Y	Y
Observations	1,075,282	648,889	572,421	505,667
R-squared	0.961	0.940	0.946	0.945

The dependent variable in columns 1 and 2 is the logarithm of securities nominal holdings by each bank b of security s during month t in the period January 2013 to September 2014, i.e., +/− nine months around the AQR. The dependent variable in columns 3 and 4 is the logarithm of loan amount by each bank b to borrower j during quarter t in the period January 2013 to September 2014, i.e., +/- nine months around the AQR. 'AQR' equals the value of one for the months October, November, December 2013, and zero otherwise; 'AQR-Compliance' equals the value of one for the months January to June 2014, and zero otherwise; 'Post-AQR' equals the value of one for the months from July 2014 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. In columns 1 and 3, we compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. In columns 2 and 4, we restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one for all banks. Fixed effects are either included ('Y') or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 8
DIALING-DOWN OF SAFE ASSETS AFTER THE AQR OVERALL EXERCISE
DEPENDING ON TRADING EXPERTISE
+/− 9 MONTHS AROUND AQR ANNOUNCEMENT

	Within reviewed banks	
	Dependent variable:	
	Log(securities holdings)	Log(credit)
	(1)	(2)
Safe*AQR	0.0280**	0.0171**
	(0.01)	(0.01)
Safe*AQR*Trading bank	-0.0176	0.0255**
	(0.02)	(0.01)
Safe*AQR-Compliance	0.0366*	0.0307***
	(0.02)	(0.01)
Safe*AQR-Compliance*Trading bank	-0.0344	0.0323***
	(0.02)	(0.01)
Safe*Post-AQR	0.0309	0.0273**
	(0.02)	(0.01)
Safe*Post-AQR*Trading bank	-0.0463*	0.0348**
	(0.03)	(0.01)
Safe	0.0349	0.0229***
	(0.07)	(0.01)
AQR*Trading bank	0.0175*	-0.0477***
	(0.01)	(0.01)
Safe*Trading bank	-0.0407	-0.0634***
	(0.08)	(0.01)
AQR-Compliance*Trading bank	0.0032	-0.0254***
	(0.01)	(0.01)
Post-AQR*Trading bank	-0.1100***	-0.0006
	(0.01)	(0.01)
Securities*Bank FE	Y	-
Firm*Bank FE	-	Y
Time FE	Y	Y
Observations	663,380	524,731
R-squared	0.941	0.947

The dependent variable in column 1 is the logarithm of securities nominal holdings by each bank b of security s during month t in the period January 2013 to September 2014, i.e., +/− nine months around the AQR. The dependent variable in column 2 is the logarithm of loan amount by each bank b to borrower j during quarter t in the period January 2013 to September 2014, i.e., +/- nine months around the AQR. 'AQR' equals the value of one for the months October, November, December 2013, and zero otherwise; 'AQR-Compliance' equals the value of one for the months January to June 2014, and zero otherwise; 'Post-AQR' equals the value of one for the months from July 2014 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. We restrict our sample to reviewed banks only, i.e., when 'Reviewed' equals the value of one. 'Trading bank' is a binary variable that equals one when the reviewed bank has membership to the largest-fixed income platform in Germany (Eurex Exchange), and zero otherwise, which proxies for banks with higher trading expertise. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB, i.e., when 'Reviewed' equals the value of one. Fixed effects are either included ('Y') or spanned by another set of fixed effects ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE 9: REAL EFFECTS

	Dependent Variable:						
	Total Firm Debt	Total Assets	Profits&Loss	Tangible Assets	Investments	Sales	Employment
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Safe*AQR*Reviewed	-0.0506***	-0.0616***	-0.1229*	-0.0782***	-0.0480***	-0.0312**	-0.0324***
	(0.01)	(0.01)	(0.07)	(0.02)	(0.01)	(0.02)	(0.01)
Firm FE	Y	Y	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y	Y	Y
Firm*Time Controls	Y	Y	Y	Y	Y	Y	Y
Observations	82.851	82,855	55,636	82,280	82,728	52,672	80,395
R-squared	0,968	0.988	0.854	0.979	0.984	0.980	0.985

The dependent variables in columns 1, 2, 3, 4, 5, 6, and 7 are the logarithm of total firm debt, total assets, profits and losses, tangible assets, investments, sales, and employment, respectively, of firm j in year t in the period 2011-2014, i.e., before and after the AQR announcement. 'Non-Safe' is a dummy variable that equals the value of one if borrower j has a probability of default (PD) above the cross-sectional mean PD of all borrowers' PDs in t-1, and zero otherwise. 'Reviewed' is a binary variable that equals one when the firm's total credit is primarily (i.e., more than 50th percentile) provided by reviewed banks as at September 2013, and zero otherwise. 'AQR' is a binary variable and equals the value of one for the years 2013 and 2014, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). We further include the logarithm of firm's equity in t-1 as time-varying firm control. Fixed effects are included ('Y'). Standard errors are clustered at firm and year level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

ONLINE APPENDIX

FIGURE A1
TIMELINE OF THE ASSET QUALITY REVIEW
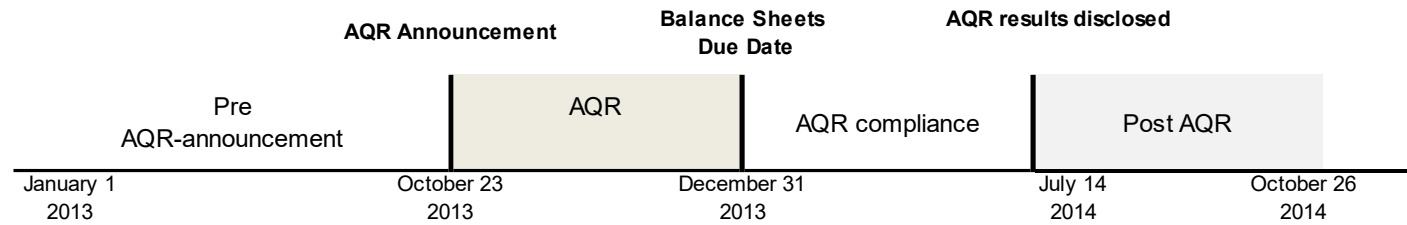
This figure displays the timeline of the comprehensive asset quality review (AQR) by the European Central Bank (ECB). For more information, please refer to Section II and https://www.bankingsupervision.europa.eu/banking/comprehensive/2014/html/index.en.html.

FIGURE A2
FRACTION OF SAFE SECURITIES BEFORE AND AFTER THE AQR
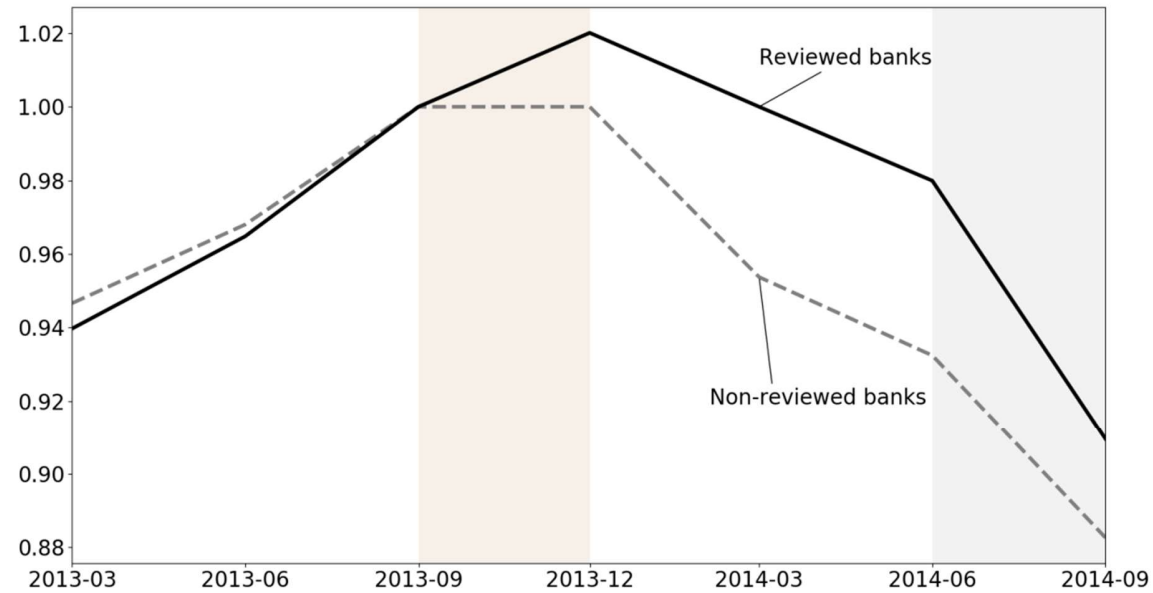
This figure shows the level of safe securities as a fraction of total assets by reviewed and non-reviewed banks during the period of the ECB's AQR cycle (normalized to September 2013). We define a security as safe when the security has a rating between AAA to AA-, which corresponds to the Eurosystem's harmonized rating scale for the definition of safe assets (ECB CQS 1). 'Reviewed banks' refers to all banks that were reviewed under the AQR by the ECB. 'Non-reviewed banks' defines all banks that were not reviewed by the ECB under the AQR. The first shaded area refers to the period after the AQR announcement in October 2013 until the AQR due date, i.e., end of December 2013, and the second shaded area denotes the period after the AQR concluded in July 2014 until the end of our sample, i.e., end of September 2014.

FIGURE A3
FRACTION OF SAFE CREDIT BEFORE AND AFTER THE AQR
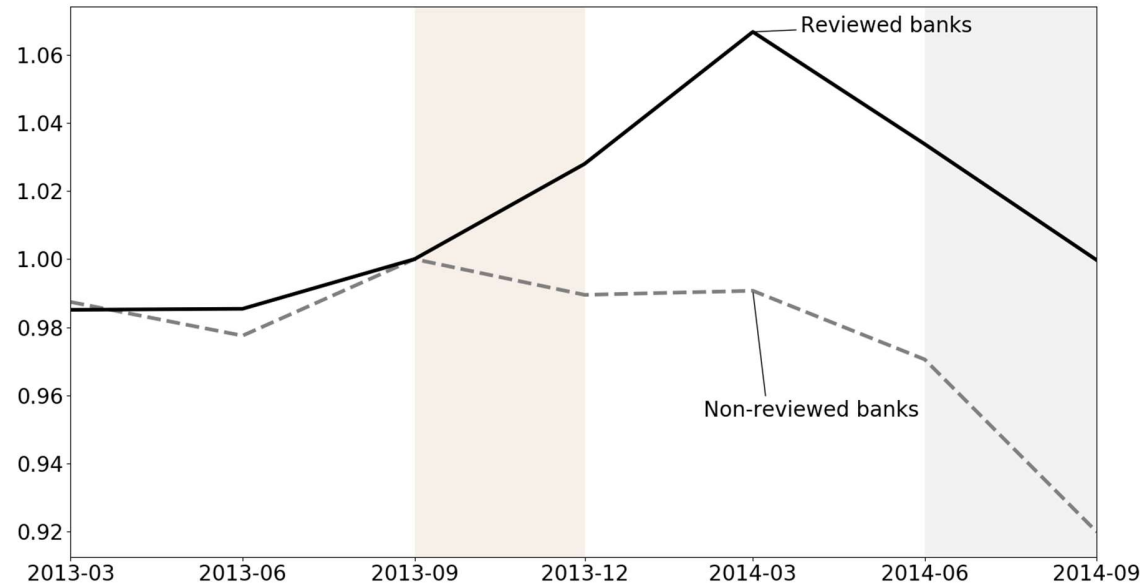
This figure shows the level of safe credit as a fraction of total assets by reviewed and non-reviewed banks during the period of the ECB's AQR cycle (normalized to September 2013). We define a credit as safe when the borrower has a lower one-year probability of default (PD) than the cross-sectional mean of all borrowers' PDs. 'Reviewed banks' refers to all banks that were reviewed under the AQR by the ECB. 'Non-reviewed banks' defines all banks that were not reviewed by the ECB under the AQR. The first shaded area refers to the period after the AQR announcement in October 2013 until the AQR due date, i.e., end of December 2013, and the second shaded area denotes the period after the AQR concluded in July 2014 until the end of our sample, i.e., end of September 2014.

TABLE A1
VARIABLE DEFINITION

Variable name	Definition
Log(securities holdings)	Logarithm of nominal holdings of security s by bank b at month t.
Log(credit)	Logarithm of the loan amount by bank b to firm j during quarter t.
Reviewed	Binary variable that equals the value of one if the bank is a financial institution reviewed as part of the Asset Quality Review (AQR), and zero otherwise.
AQR	Binary variable that equals the value of one for the months October, November, and December 2013, and zero otherwise.
AQR-Compliance	Binary variable that equals the value of one for the months January to June 2014, and zero otherwise.
Post-AQR	Binary variable that equals the value of one for the months July to September 2014, and zero otherwise.
Safe	For securities analysis: binary variable that equals the value of one if the security s has a rating of AAA to AA- in t-1, and zero otherwise. For credit analysis: binary variable that equals the value of one if loan j has a probability of default below the cross-sectional average probability of default of all loans in time t-1.
High yield	Binary variable that equals the value of one whenever the security has a higher yield than the cross-sectional mean of all yields in t-1, and zero otherwise.
GIIPS	Binary variable that equals the value of one whenever the issuer of the security is headquartered in Greece, Ireland, Italy, Portugal, or Spain, and zero otherwise.
Long-term	Binary variable that equals the value of one whenever the security has a residual maturity of higher than 10 years, and zero otherwise.
Trading bank	Binary variable that equals the value of one if bank b has membership to the largest fixed-income platform in Germany (Eurex Exchange), and zero otherwise.
Exposure to Reviewed	Binary variable that takes the value of one if investment fund i is among the top-25th percentile funds holding bonds as part of their securities investments where the issuer is a reviewed bank, and zero otherwise. We construct this measure on the basis of investment fund's asset holdings as at end of August 2013.
Low Exposure to Reviewed	Binary variable that equals the value of one if the security is associated with the lowest-75th percentile of funds that hold the security as investments where the issuer is a reviewed bank, and zero otherwise. We construct this measure on the basis of investment fund's asset holdings as at end of August 2013.
ECB CQS 2/3/Not Qualify	Binary variable that takes the value of one if the security qualifies for one of the three buckets of the ECB's credit quality steps (https://www.ecb.europa.eu/paym/coll/risk/ecaf/html/index.en.html). ECB Tier 2 refers to a dummy variable that equals the value of one if the security has a rating between A- to A+, and zero otherwise. ECB Tier 3 equals the value of one if the security has a rating between BBB+ to BBB-, and zero otherwise; and Not Qualify equals the value of one if the security has a rating below BB+, and zero otherwise.

TABLE A2
SUMMARY STATISTICS

Panel A: +/- 3 months around AQR announcement

	Mean	Std.	Obs.
Securities holdings:			
Log(securities holdings) [in € th.]	13.88	2.54	316,221
Securities/TA	0.18	0.10	316,221
Safe	0.39	0.49	316,221
Reviewed	0.60	0.49	316,221
Trading bank	0.50	0.50	316,221
AQR	0.51	0.50	316,221
Credit:			
Log(credit) [in € th.]	7.78	2.01	160,624
Credit/TA	0.43	0.18	160,624
Safe	0.77	0.42	160,624
Reviewed	0.88	0.32	160,624
Trading bank	0.76	0.43	160,624
AQR	0.50	0.50	160,624

Panel B: +/- 9 months around AQR period

	Mean	Std.	Obs.
Securities holdings:			
Log(securities holdings) [in € th.]	13.87	2.55	1,075,282
Securities/TA	0.18	0.10	1,075,282
Safe	0.40	0.49	1,075,282
Reviewed	0.60	0.49	1,075,282
Trading bank	0.50	0.50	1,075,282
AQR	0.15	0.36	1,075,282
AQR-Compliance	0.27	0.45	1,075,282
Post-AQR	0.16	0.37	1,075,282
Credit:			
Log(credit) [in € th.]	7.79	2.02	572,421
Credit/TA	0.43	0.18	572,421
Safe	0.76	0.43	572,421
Reviewed	0.88	0.32	572,421
Trading bank	0.75	0.43	572,421
AQR	0.15	0.35	572,421
AQR-Compliance	0.27	0.45	572,421
Post-AQR	0.13	0.33	572,421

This table reports the summary statistics of the main variables used in the paper. In Panel A, the variables refer to the regressions from Table 1 and 2, respectively, covering the period +/− 3 months before and after the AQR announcement in October 2013, i.e., end of July, August, September, October, November, and December. Panel B reflects the variables for the sample used in Table 7 (and 8) covering the sample +/− 9 months before and after the AQR period, i.e. from January 2013 to September 2014. 'Log(securities holdings) is the logarithm of the notional security holdings (in EUR thousands) by a bank in a given month. 'Log(credit)' refers the logarithm of the loan amount (in EUR thousands) to a borrower by a bank in a given quarter. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. 'Safe' for securities measures the percentage share of 'safe' securities to all securities. 'Securities/TA' measures the total investment in securities as a fraction of total assets. 'Safe' for credit measures the percentage share of 'safe' borrowers to all credit. 'Credit/TA' measures the total loan amount as a fraction of total assets.

TABLE A2
SUMMARY STATISTICS
(CONT'D)

Panel C: Other key variables

	Mean	Std.	Obs.
High yield	0.15	0.36	78,526
GIIPS	0.15	0.35	106,952
Long-term	0.10	0.30	106,952
Long-term non-safe	0.02	0.14	106,952
Price	102.94	11.92	9,618
Credit	7.73	2.11	133,336
Exposure to reviewed	0.06	0.05	96,137
Total firm-debt [in € log.]	15.90	1.52	82,851
Total assets [in € log.]	16.61	1.51	82,855
Profit&Loss [in € log.]	13.35	1.78	55,636
Tangible assets [in € log.]	14.79	2.25	82,280
Investments [in € log.]	15.26	2.16	82,728
Sales [in € log.]	17.03	1.68	52,672
Employment [in log.]	4.39	1.50	80,395

This table extends the summary statistics to further main variables used in the paper. The variables 'High yield', 'GIIPS', 'Long-term', and 'Long-term non-safe' refer to the regressions from Table 3 Panel A. 'High Yield' measures the percentage share of high yield securities. 'GIIPS' denotes the fraction of securities issued by entities headquartered in Greece, Ireland, Italy, Portugal, or Spain. 'Long-Term' refers to the percentage share of securities with a residual maturity of higher than 10 years and 'Long-Term Non-Safe' denotes the fraction of securities with below-investment-grade issuer credit rating *and* a residual maturity of higher than 10 years. 'Price' and 'Credit' refer to variables used in the regressions shown in Table 5. While 'Price' measures the security price, 'Credit' denotes the logarithm of loan amount borrowed by any given firm. 'Exposure to reviewed' refers to the variable used in Table 6 and the percentage share of bonds issued by reviewed banks held by a given investment fund. The variables 'Total firm-debt', 'Total assets', 'Profit&Loss', 'Tangible assets', 'Investments', 'Sales', and 'Employment' are used in regressions presented in Table 9.

TABLE A3
DIALING-UP OF SAFE ASSETS AFTER THE AQR ANNOUNCEMENT
ROBUSTNESS: COMPARING BANKS OF SIMILAR ASSET SIZE

	20bn ≤ total assets≤ 40bn	
	Dependent variable:	
	Log(securities holdings)	Log(credit)
	(1)	(2)
Safe*AQR*Reviewed	0.1124***	0.0484**
	(0.03)	(0.02)
Safe*AQR	-0.0205**	-0.0083
	(0.01)	(0.01)
Safe	0.0032	0.0091
	(0.02)	(0.02)
AQR*Reviewed	-0.1200***	-0.0552***
	(0.02)	(0.02)
Safe*Reviewed	-0.0522	-0.0724
	(0.05)	(0.05)
Security*Bank FE	Y	-
Firm*Bank FE	-	Y
Time FE	Y	Y
Observations	45,647	25,216
R-squared	0.984	0.988

This table replicates column 6 of Table 1 and 2, respectively, but restricts the sample to all banks (both reviewed and non-reviewed) with a total asset size of +/− EUR 10 billion around the EUR 30 billion threshold that the ECB imposed to select the reviewed banks. In column 1 the dependent variable is the logarithm of securities nominal holdings by each bank b of security s during month t in the period July 2013 to December 2013. In column 2 the dependent variable is the logarithm of loan amount by each bank b to borrower j during quarter t in the period July 2013 to December 2013. In column 1 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. In column 2 'Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs in time t-1. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November December 2013, and zero before. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. Fixed effects are either included ('Y') or not applicable ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE A4
DIALING-UP SAFE ASSETS BEFORE NEXT REVIEW
ROBUSTNESS: REVIEW FOR 2016 STRESS TEST

	Dependent variable:			
	Log(securities holdings)		Log(credit)	
	Reviewed vs. largest non-reviewed banks	Within reviewed banks	Reviewed vs. largest non-reviewed	Within reviewed banks
	(1)	(2)	(3)	(4)
Safe*2015*Reviewed	0.0430***	0.0360***	0.0136*	0.0134***
	(0.01)	(0.01)	(0.01)	(0.00)
Safe*2015	-0.0070**		-0.0003	
	(0.00)		(0.01)	
Safe	-0.0450		0.0340	
	(0.05)		(0.03)	
2015*Reviewed	-0.0634***		-0.0339***	
	(0.01)		(0.01)	
Safe*Reviewed	0.0599	0.0168	-0.0318	0.0022
	(0.08)	(0.06)	(0.03)	(0.01)
Security*Bank FE	Y	Y	Y	Y
Time FE	Y	Y	Y	Y
Observations	122,306	97,014	78,526	186,634
R-squared	0.950	0.945	0.988	0.977

This table replicates our main estimation (columns 6 and 8) from Table 1 and 2, respectively, but for 2015, i.e., the year that serves for the 2016 stress test exercise by the ECB's SSM. The dependent variable in columns 1 and 2 is the logarithm of securities nominal holdings by each bank b of security s during month t. The dependent variable in column 3 and 4 is the logarithm of loan amount by each bank b of borrower j during quarter t. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. '2015' is a dummy variable that equals the value of one for October, November, and December 2015, and zero otherwise. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. Fixed effects are either included ('Y'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE A5
SAFE ASSETS BEFORE AND AFTER THE AQR ANNOUNCEMENT
ROBUSTNESS: WEIGHTED LEAST SQUARES REGRESSIONS

	Dependent variable:			
	Log(securities holdings)		Log(credit)	
	+/- 3 months around AQR announcement	+/- 9 months around AQR period	+/- 3 months around AQR announcement	+/- 9 months around AQR period
	(1)	(2)	(3)	(4)
Safe*AQR*Reviewed	0.0349***	0.0152*	0.0302***	0.0383***
	(0.01)	(0.01)	(0.01)	(0.01)
Safe*AQR-Compliance*Reviewed		0.0177		0.0421***
		(0.01)		(0.01)
Safe*Post-AQR*Reviewed		-0.0073		0.0339**
		(0.02)		(0.02)
Safe*AQR	-0.0126***	0.0019	-0.0110	-0.0064
	(0.00)	(0.01)	(0.01)	(0.01)
Safe*AQR-Compliance		-0.0069		0.0118
		(0.01)		(0.01)
Safe*Post-AQR		-0.0045		0.0183
		(0.01)		(0.01)
Safe	-0.0322	-0.0235	0.0026	-0.0047
	(0.04)	(0.03)	(0.01)	(0.01)
AQR*Reviewed	-0.0430***	-0.0445***	-0.0455***	-0.0583***
	(0.00)	(0.01)	(0.01)	(0.01)
Safe*Reviewed	0.0456	0.0091	-0.0163	-0.0248**
	(0.06)	(0.05)	(0.02)	(0.01)
AQR-Compliance*Reviewed		-0.0742***		-0.0789***
		(0.01)		(0.01)
Post-AQR*Reviewed		-0.1024***		-0.0762***
		(0.01)		(0.01)
Security*Bank FE	Y	Y	-	-
Firm*Bank FE	-	-	Y	Y
Time FE	Y	Y	Y	Y
Observations	316,221	1,075,282	160,624	572,421
R-squared	0.987	0.962	0.973	0.937

This table replicates column 6 from Table 1 and 2 and columns 1 and 3 from Table 7, but employs the method of weighted least squares. The dependent variable in columns 1 and 2 is the logarithm of securities nominal holdings by each bank b of security s during month t. The dependent variable in column 3 and 4 is the logarithm of loan amount by each bank b of borrower j during quarter t. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. In columns 1 and 3, the period runs from July 2013 to December 2013, i.e., +/− three months around the AQR announcement. In columns 2 and 4, the sample covers the period January 2013 to September 2014, i.e., +/− nine months around the AQR. 'AQR' equals the value of one for the months October, November, December 2013, and zero otherwise; 'AQR-Compliance' equals the value of one for the months January to June 2014, and zero otherwise; 'Post-AQR' equals the value of one for the months from July 2014 onwards, and zero otherwise, which leaves the period before the AQR announcement as the benchmark period (i.e., each estimated coefficient measures the differential effect during each individual sub-period relative to the period before the AQR announcement). We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. Fixed effects are either included ('Y') or not applicable ('-'). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

TABLE A6
DIALING-UP OF SAFE ASSETS BEFORE THE AQR ANNOUNCEMENT
ROBUSTNESS: DIFFERENT DEPENDENT VARIABLES

	Dependent variable:			
	Securities holdings/Equity		Credit/Equity	
	OLS	WLS	OLS	WLS
	(1)	(2)	(3)	(4)
Safe*AQR*Reviewed	0.0833***	0.0890***	0.0198**	0.0315*
	(0.02)	(0.02)	(0.01)	(0.02)
Safe*AQR	Y	Y	Y	Y
Safe	Y	Y	Y	Y
AQR*Reviewed	Y	Y	Y	Y
Safe*Reviewed	Y	Y	Y	Y
Security*Bank FE	Y	Y	-	-
Firm*Bank FE	-	-	Y	Y
Time FE	Y	Y	Y	Y
Observations	316,221	316,221	158,556	158,556
R-squared	0.955	0.955	0.465	0.991

This table replicates column 6 of Table 1 and 2, but uses different dependent variables. The dependent variable in columns 1 and 2 is the nominal holding of security s by bank b during month t over the bank's equity. The dependent variable in column 3 and 4 is loan amount by each bank b of borrower j during quarter t over bank's equity. Note that our data on securities holdings is available at monthly frequency whereas our data on credit is available at quarterly frequency. In columns 1 and 2 'Safe' is a dummy variable that equals the value of one whenever the security has a rating between AAA and AA-, and zero otherwise. In columns 3 and 4 'Safe' is a dummy variable that equals the value of one if loan j has a probability of default (PD) below the cross-sectional mean PD of all borrowers' PDs in time t-1. 'AQR' is a dummy variable that equals the value of one during the months following the AQR announcement in October 2013 (post), i.e. end of October, November December 2013, and zero before. We classify a bank as 'Reviewed' if it was reviewed under the AQR by the ECB. We compare reviewed banks to the largest (in terms of total assets) non-reviewed banks. We use as many non-reviewed banks as we have reviewed banks in our sample. Fixed effects are either included ('Y') or not applicable ('-'). The definition of the main variables can be found in Appendix Table A1. Columns 1 and 3 are estimated using the method of ordinary least squares, while columns 2 and 4 use weighted least squares. Standard errors are clustered at bank and asset level (security or firm, respectively) and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.

PRICE DIFFERENTIAL OF SECURITIES BOUGHT

	Dependent variable: Price Change		
	ECB CQS 2 (A- to A+)	ECB CQS 3 (BBB+ to BBB-)	ECB CQS Non-Eligible (Below BB+)
	(1)	(2)	(3)
Non-Safe*Low Exposure to Reviewed	-7.6328***	-11.9741***	-23.1795***
	(1.27)	(1.34)	(1.87)
Low Exposure to Reviewed	0.0125	-0.6404	-0.7236
	(0.97)	(0.74)	(0.64)
Non-Safe	-0.5861	0.8723*	-1.2929
	(0.51)	(0.52)	(1.06)
Observations	1,888	1,888	1,888
R-squared	0.05	0.065	0.141

This table shows the effect of buying behaviour of securities by funds depending on their exposure to reviewed banks. The dependent variable is the change in the price of security s from end of September to end of December. 'Non-Safe' is a dummy variable that equals the value of one whenever the security has a below-investment-grade issuer rating, and zero otherwise. 'Low Exposure to Reviewed' is a binary variable that equals the value of one whenever an investment fund holds a smaller (or no) share of bonds (bottom 75th percentile) issued by reviewed banks as at end of September 2013, and zero otherwise. In columns 1, the sample is restricted to security has a rating between A- to A+ (ECB CQS 2). In columns 2, the sample is restricted to security has a rating between BBB+ to BBB- (ECB CQS 3). In columns 3, the sample is restricted to security has a rating below BB+ (ECB CQS Non-Eligible). The definition of the main variables can be found in Appendix Table A1. Standard errors are clustered at security and time level and reported in parentheses. ***: Significant at 1% level; **: Significant at 5% level; *: Significant at 10% level.