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Economic Consequences of the AOCI Filter Removal for Advanced Approaches Banks

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ABSTRACT: We examine economic consequences of U.S. bank regulators' phased removal of the prudential filter for accumulated other comprehensive income for advanced approaches banks beginning on January 1, 2014. The primary effect of the AOCI filter is to exclude unrealized gains and losses on available-for-sale securities from banks' regulatory capital. We predict and find that, to mitigate regulatory capital volatility resulting from the filter removal, advanced approaches banks increased the proportion of investment securities classified as held-to-maturity, thereby limiting their financing and interest rate risk management options, and they decreased securities risk, thereby reducing their interest rate spread. We further predict and find that these banks borrow more under securities repurchase agreements potentially collateralized by held-to-maturity securities and reduce loan supply owing to their reduced financing options, and that they increase loan risk to mitigate the decrease in their interest rate spread.

JEL Classifications: G21; G28; M41; M48.

Data Availability: Data are available from the public sources cited in the text.

Keywords: banks; regulation; regulatory capital; AOCI filter; investment securities.

I. INTRODUCTION

In this study, we document direct and indirect economic consequences of U.S. bank regulators' phased removal of the accumulated other comprehensive income prudential filter (hereafter, the AOCI filter) for advanced approaches (AA) banks beginning on January 1, 2014.[1] The AOCI filter primarily excludes unrealized gains and losses on available-for-sale (AFS) securities recorded in accumulated other comprehensive income under Accounting Standards Codification (ASC) 320[2]

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Supplemental material can be accessed by clicking the link in Appendix B.

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[1] AA banks calculate their risk-based capital requirements for credit risk (operational risk) using internally developed credit ratings and other methodologies (advanced measurement approaches). AA banks have at least $250 billion in consolidated assets or $10 billion in on-balance sheet foreign exposure, or voluntarily elect to use these approaches.

[2] ASC 320 primarily contains Statement of Financial Accounting Standards No. 115, *Accounting for Certain Investments in Debt and Equity Securities* (May 1993), as amended. The literature prior to the 2009 creation of the ASC refers to Financial Accounting Standard (FAS) 115, as do we in discussing this literature and the development of the AOCI filter.

from banks' regulatory capital. Prior research suggests that the AOCI filter removal increases the volatility of AA banks' regulatory capital (Barth, Landsman, and Wahlen 1995).

We predict two direct consequences of the AOCI filter removal. First, we predict that AA banks reclassified investment securities (hereafter, securities) from AFS to held-to-maturity (HTM) or classified newly acquired securities as HTM to mitigate the increase in regulatory capital volatility. Second, we predict that AA banks decreased the risk of their securities for four reasons: to reduce the volatility of unrealized gains and losses on AFS securities and, thus, of regulatory capital; to reduce risk-weighted assets and, thus, increase regulatory capital adequacy; to reduce the need to hedge the interest rate risk of HTM securities, hedges for which ASC 815 prohibits the use of hedge accounting; and to reduce the need to sell or reclassify HTM securities, which generally would "taint" their HTM securities portfolios.

We predict three indirect consequences of the AOCI filter removal. The basis for the first prediction is that the tainting rule reduces banks' ability to raise funds by selling HTM securities. However, banks can raise funds without taint by pledging HTM securities as collateral in repurchase agreements accounted for as secured borrowings. Thus, we predict that AA banks that increase HTM securities more around the filter removal borrow more under repurchase agreements. The basis for the second prediction is that repurchase agreements typically are limited to highly liquid securities and provide much shorter-term funding than securities sales, so the use of these agreements only partly mitigates the reduction of AA banks' financing options. Thus, we predict that AA banks that increase HTM securities more around the filter removal reduce loan supply more. The basis for the third prediction is that decreases in securities risk reduce banks' interest rate spreads. Thus, we predict that AA banks that decrease securities risk more around the filter removal increase loan risk more to mitigate the decrease in their interest rate spread.

Figure 1 depicts our five predictions, as well as the dependencies of the indirect predictions on the direct predictions. These predictions are consistent with, but broader in scope than, the banking industry's opposition to the AOCI filter removal on the grounds that it would lead banks to decrease securities risk and lending (American Bankers Association [ABA] 2012; Becker 2013; Noked 2013; Rudegeair 2013). To our knowledge, banks did not express concerns about increased classification of securities as HTM, reduced financing options, or riskier lending.

We estimate difference-in-differences models to distinguish the consequences of the AOCI filter removal from those of contemporaneous changes in conditions affecting all banks and of other regulations affecting AA banks.[3] These models compare the differences across treatment and control samples of changes in the dependent variables over a six-year period centered around the filter removal.[4] Figure 1 also lists the treatment and control samples used in estimating the difference-in-differences model for each of our five predictions.

In supplemental tests, we use a two-stage least squares (2SLS)/instrumental variable approach to test the two predicted indirect consequences of AA banks' endogenous increase in the classification of securities as HTM around the AOCI filter removal. We use AFS securities at the end of 2011 as an instrument for the change in HTM securities around the filter removal. We provide evidence that this instrument is strong. The instrument is also plausibly exogenous, as it is measured two years before the filter removal.

Our findings are largely consistent with our predictions. Testing our first prediction, we find that AA banks increased HTM securities divided by assets around the AOCI filter removal by substantially more than non-AA banks. AA banks increased HTM securities divided by assets from 1.27 percent at the end of 2011 to 5.83 percent at the end of 2016, a 4.56 percentage point increase. In contrast, non-AA banks increased HTM securities divided by assets by only 0.85 percentage points over this period.

Testing our second prediction, we find that AA banks reduced the credit risk of securities around the AOCI filter removal by substantially more than other banks. AA banks' risk-weighted securities divided by securities decreased from 25.71 percent at the end of 2011 to 15.80 percent at the end of 2016, a 9.91 percentage point decrease. In contrast, non-AA banks' risk-weighted securities divided by securities *increased* by 0.52 percentage points over this period.

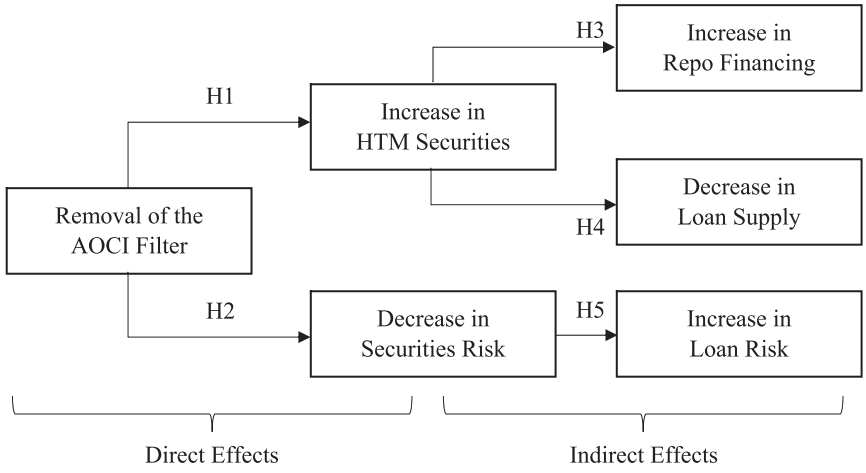
Like Chircop and Novotny-Farkas (2016), we do not find that AA banks reduced the duration of securities around the AOCI filter removal compared to non-AA banks. Possible explanations for this non-finding include (1) AA banks hedge interest rate risk more than non-AA banks, (2) AA banks responded heterogeneously to the filter removal, and (3) the available information about securities duration is crude.[5] Consistent with the heterogeneity explanation, we find that AA banks with

[3] The beginning of the phase-in of the AOCI filter removal on January 1, 2014 is contemporaneous with the first and fairly modest increase in minimum regulatory capital requirements for AA banks under the U.S. implementation of Basel III; however, all banks became subject to the same minimum capital requirements on January 1, 2015. The other significant new regulations affecting AA banks were implemented a year or more afterward, such as the liquidity coverage ratio in 2015 and the supplementary leverage ratio in 2018.

[4] For brevity, we usually refer to the "AOCI filter removal" instead of the fully accurate "beginning of the five-year phase-in of the AOCI filter removal."

[5] Bank regulatory filings include the amounts of total debt securities (i.e., not distinguishing AFS and HTM securities) maturing or next repricing in one year or less, from one to five years, and over five years. Under ASC 320-10-50-3 and 5, public banks are required to disclose the amounts of AFS and HTM securities maturing (i.e., not next repricing) in one year or less, from one to five years, from five to ten years, and over ten years in the notes to the financial statements.

FIGURE 1
Hypotheses and the Corresponding Treatment and Control Samples in the Difference-in-Differences Model Tests



This figure summarizes our two hypotheses of direct effects of the AOCI filter removal and three hypotheses of indirect effects, as well as the logical dependencies of the indirect hypotheses on the direct hypotheses. H1 and H2 predict direct effects: AA banks increase HTM securities and decrease securities risk around the AOCI filter removal. In our tests of H1 and H2, the treatment sample is AA banks and the control sample is non-AA banks. H3 and H4 predict the two indirect effects of AA banks classifying securities as HTM under H1. In our tests of H3 and H4, the treatment (control) sample is AA banks with above-median (below-median) increases in HTM securities. H5 predicts the indirect effect of AA banks reducing securities risk under H2. In our tests of H5, the treatment (control) sample is AA banks with below-median (above-median) increases in the risk of HTM and AFS securities.

above-median increases in AFS securities decreased the duration of their securities by 0.458 years around the filter removal compared to other AA banks, a sizeable decrease given AA banks' securities duration of 2.655 years.

Before testing our third and fourth predictions, we conduct three analyses to address the concern that the increase in AA banks' HTM securities around the AOCI filter removal may not impair the banks' liquidity enough to affect their borrowing under repurchase agreements or loan supply. First, we confirm that AA banks substantially increased the HTM classification of securities deemed "good collateral" (i.e., readily pledgeable in repurchase agreements) around the AOCI filter removal. Second, we confirm that banks' loan growth is strongly positively associated with the net proceeds from sales of AFS securities. Third, we confirm that banks frequently mention sales of AFS securities as significant sources of funding for loan growth in their financial reports and conference calls.

Testing our third prediction, we find that AA banks with above-median increases in HTM securities from 2011 to 2016 increase their borrowings under repurchase agreements around the AOCI filter removal compared to other AA banks. Moreover, we find that the classification of an incremental dollar of securities as HTM, rather than as AFS, increases repurchase agreement borrowings by 34 cents. The latter finding helps ensure that our difference-in-differences results are not attributable to banks pledging AFS securities in repurchase agreements.

In testing our fourth prediction, the issue arises that AA banks that increase HTM securities around the AOCI filter removal may reduce loan supply because they have chosen to invest in securities rather than in loans, not because of diminished liquidity. Hence, in this test, we focus on the incremental effect of classifying a specified amount of securities as HTM, rather than as AFS, on loan supply. We find that AA banks that classify an incremental dollar (1 percent) of assets as HTM securities, rather than as AFS securities, around the filter removal decrease loans by 28 cents (mortgage approval rates by 1.06 percentage points).

Testing our fifth prediction, we find that AA banks with below-median increases in the risk of HTM securities or AFS securities around the AOCI filter removal increase loan risk compared to other AA banks. AA banks with below-median increases in the risk of HTM securities (AFS securities) increase loans with risk weights of at least 100 percent by 15.8 (16.4) percentage points around the filter removal compared to other AA banks.

Our findings regarding HTM security classification, security risk, and loan risk are largely consistent with those of prior studies examining banks' classification of securities upon the adoption of FAS 115 and imposition of the AOCI filter from late 1993 to early 1995 (Beatty 1995; Hodder, Kohlbeck, and McAnally 2002). However, our difference-in-differences models help ensure that the findings are attributable to the removal of the AOCI filter. Our findings regarding borrowing under repurchase agreements are entirely new, and our findings regarding loan supply substantially extend those of Meder (2015). Collectively, our findings that the AOCI filter removal had significant direct effects on the liquidity and risk of AA banks' securities, and

indirect effects on their available financing choices, loan supply, and loan risk differ in significant ways from those of other studies examining the filter removal (Chircop and Novotny-Farkas 2016; Hamilton 2019). Remarkably, our findings all derive from the elimination of a well-known and visible difference between bank regulatory and generally accepted accounting principles (GAAP) accounting requirements.

II. BACKGROUND AND RELATED LITERATURE

Background on Accounting and Capital Requirements for Securities

ASC 320 requires firms to classify each security upon acquisition into one of three categories—trading, AFS, or HTM—based on their intent and ability to hold the security. Firms classify securities as trading when they have the positive intent to trade the securities, and they classify *debt* securities as HTM when they have both the positive intent and the ability to hold the securities to maturity. They recognize HTM securities at amortized cost and, with one exception, do not record unrealized gains and losses on the securities.[6] Firms classify all other securities as AFS. They recognize AFS securities at fair value and record unrealized gains and losses on the securities in accumulated other comprehensive income, an owners' equity account.

Firms may sell or reclassify AFS securities without constraint.[7] In contrast, except in specified circumstances,[8] firms that sell or reclassify even one HTM security "taint" their HTM portfolios, requiring all HTM securities to be reclassified to AFS,[9] and losing the ability to classify securities as HTM for two years under Securities and Exchange Commission (SEC) guidance (Sangiuolo and Seidman 2008). The tainting rule limits banks' ability to raise funds by selling HTM securities. However, firms can pledge HTM securities in repurchase agreements accounted for as secured borrowings without taint.[10]

Background on Capital Requirements for Securities and the AOCI Filter

U.S. bank regulators imposed the AOCI filter in January 1995, approximately one year after FAS 115's effective date. The filter excludes most items recorded in accumulated other comprehensive income—most importantly, unrealized gains and losses on AFS securities—from regulatory capital. Prior research suggests that the filter, on average, reduces banks' regulatory capital volatility (Barth et al. 1995). The filter has minimal effect on HTM securities, and it eliminates regulatory capital-based incentives for banks to classify securities as HTM rather than as AFS.

Basel III eliminates the AOCI filter (Basel Committee on Banking Supervision 2011). U.S. bank regulators initially proposed to remove the filter for all U.S. banks (Department of the Treasury, Federal Reserve System, and Federal Deposit Insurance Corporation 2012). Their stated rationale was to remove incentives for banks to delay selling depreciated AFS securities (Laux 2016). The banking industry lobbied against the Proposed Rule, claiming that the filter removal would (1) ignore banks' use of AFS securities in asset-liability management and, thus, exaggerate the impact of interest rate changes, leading banks to reduce the duration of AFS securities; (2) increase the volatility of banks' regulatory capital, rendering capital planning more difficult; and (3) require banks to increase regulatory capital buffers, reducing lending (ABA 2012).

U.S. bank regulators accepted these concerns for most banks, as the Final Rule removes the AOCI filter only for AA banks (Board of Governors of the Federal Reserve System 2013; Department of the Treasury and Federal Reserve System 2013). The filter removal provides a regulatory capital-based incentive for AA banks to classify securities as HTM rather than as AFS. The Final Rule phases in the filter removal over a five-year period beginning on January 1, 2014, so the incentive increased from 2014 to 2018. It allowed non-AA banks to irrevocably choose to retain the filter by March 31, 2015. Almost all non-AA banks made this choice.

Related Literatures

This study contributes to three literatures. The first examines banks' discretionary classification of securities. Early studies by Beatty (1995) and Hodder et al. (2002) examine banks' classification of securities around three events: (1) the adoption of FAS 115 by January 1, 1994; (2) U.S. bank regulators first announcing and then imposing the AOCI filter from October 1994 to January 1995; and (3) the FASB's November 1995 provision of a one-time option for firms to reclassify HTM securities

[6] Under ASC 320-10-35-34, holders record non-credit losses on other-than-temporarily impaired HTM securities in accumulated other comprehensive income. The AOCI filter affects the regulatory capital treatment of these losses.
[7] ASC 320-10-35-12.
[8] ASC 320-10-25-6 and 9. The specified circumstances are significant deterioration of the issuer's creditworthiness, significant changes in relevant tax laws or regulatory requirements, major business combinations or disruptions, and the security is close to maturity or largely paid off.
[9] ASC 320-10-35-8 and 9.
[10] ASC 320-10-25-18. ASU 2014-11, *Transfers and Servicing* (*Topic 860*), reaffirms this guidance.

without taint exercisable through the end of 1995.[11] Consistent with the tainting rule reducing banks' financing options for HTM securities, Beatty (1995) finds that banks with higher portfolio turnover, return on equity, and realized gains on sales of securities classified fewer securities as HTM upon the adoption of FAS 115. Consistent with the AOCI filter eliminating regulatory capital-based incentives to classify securities as HTM, Hodder et al. (2002) find that banks classified more securities as HTM upon the adoption of FAS 115 than they did during 1996–1998, i.e., after the FASB allowed firms to irrevocably choose to reclassify HTM securities without taint. Similar to our study, Beatty (1995) and Hodder et al. (2002) find that banks reduced the amount and maturity of securities upon the adoption of FAS 115, and Hodder et al. (2002) find that banks increased loan risk to compensate for reduced securities risk.

Our study documents a broader set of economic consequences than these early studies, neither of which examine banks' borrowing under repurchase agreements or loan supply. In addition, in testing the direct effects of the AOCI filter removal, we employ difference-in-differences models that remove the effects of contemporaneous events affecting all banks. In contrast, these early studies examine events that applied to all banks and hence are more difficult to disentangle from contemporaneous events.[12] Similarly, in testing the indirect effects of the filter removal, we employ difference-in-differences designs that compare these effects for AA banks that exhibit above- versus below-median corresponding direct effects.

We expect the classification of securities as HTM to have stronger implications for AA banks subject to the AOCI filter removal than for all banks at the dates examined in these early studies for three reasons. First, banks' initial classifications of securities as HTM upon the adoption of FAS 115 may not have reflected a full appreciation of the downsides of this classification. FAS 115 does not mention any penalty for transferring securities out of HTM. The tainting rule was developed and incorporated into GAAP over approximately two years following the issuance of FAS 115.[13] Second, in 1994, almost immediately after FAS 115 became effective, interest rates rose sharply after having declined strongly since 1981, giving rise to large losses on fixed rate securities and interest rate derivatives, and highlighting the need for banks to manage interest rate risk (Brooks 1995).[14] Third, FAS 133 prohibits hedge accounting for hedges of the interest rate risk of HTM securities as of 2001,[15] limiting banks' interest rate risk management options for these securities.

Three recent studies examine the imposition or removal of AOCI filters on banks' classification of securities. Argimón, Dietsch, and Estrada (2018) examine European country-level regulators' adoption of AOCI filters under Basel II, finding that these filters lead banks to classify more securities as AFS. Chircop and Novotny-Farkas (2016) examine the effect of the AOCI filter removal for AA banks in the U.S. through the third quarter of 2014, finding that the banks did not significantly change their AFS securities holdings over this period. Laux (2016) emphasizes the importance of examining a longer post-treatment period to capture the full effect of the five-year phase-in of the filter removal. Like our study, Hamilton (2019) examines a longer period after the filter removal and finds that AA banks significantly increased HTM securities around the removal. Hamilton (2019) also shows that AA banks' increased classification of fixed income securities as HTM was accompanied by decreased holdings of the securities in dealer inventory, thereby reducing the liquidity of the markets for the securities.

The second related literature examines the impacts of fair value accounting and capital regulation on financial stability (e.g., Plantin, Sapra, and Shin 2008; Laux and Leuz 2010; Badertscher, Burks, and Easton 2012). Many of these studies examine whether fair value accounting exacerbates the procyclicality of financial institutions' lending or investment decisions (Bhat, Frankel, and Martin 2011; Ellul, Jotikasthira, Lundblad, and Wang 2015; Xie 2016; Laux and Rauter 2017), generally finding little evidence of procyclicality. Acharya and Ryan (2016) provide two explanations for this non-finding: (1) banks consider accounting requirements when they acquire assets, hedge asset risks, and issue capital; and (2) AFS securities are the only major financial instrument that is fair valued by most banks, and the AOCI filter excludes unrealized gains and losses on these securities from regulatory capital. We provide new evidence regarding the effect of the filter, finding that its removal leads AA banks directly to take actions that reduce regulatory capital volatility, and indirectly to take actions that mitigate the resulting decreases in their financing options and interest rate spreads.

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[11] Godwin, Petroni, and Wahlen (1998) examine property-casualty insurers' classification of securities around the first and third of these events. Their results are mostly consistent with those of Beatty (1995) and Hodder et al. (2002). An exception is that Godwin et al. (1998) do not find that property-casualty insurers changed their securities portfolios at the adoption of FAS 115, likely because insurers knew their regulatory capital was not affected by the standard.

[12] Beatty (1995) compares early adopters of FAS 115 as of December 31, 1993 versus regular adopters of the standard as of January 1, 1994; this one-day separation does not remove the influence of contemporaneous events.

[13] The first mention of tainting in GAAP is in questions 11–14 of the question and answer guide for FAS 115, which the FASB issued in November 1995. In this guide, "taint" appears in quotes, suggesting that it is not a GAAP term.

[14] A number of well-known risk management failures involving interest rate derivatives occurred during 1994, e.g., Gibson Greetings, Orange County, and Procter & Gamble.

[15] Statement of Financial Accounting Standards (SFAS) No. 133, *Accounting for Derivative Instruments and Hedging Activities* (June 1998), paragraphs 21.d and 29.e (ASC 815-20-25-12d and 15f). Accounting Standards Update (ASU) 2017-12, *Derivatives and Hedging* (*Topic 815*), maintains this prohibition.

The final related literature shows that banks' holdings of liquid assets enable them to lend, particularly during periods when financing is scarce. Kashyap, Rajan, and Stein (2002) show that banks hold large amounts of cash and liquid securities to be able to fund lending commitments when adverse liquidity shocks occur. Loutskina and Strahan (2009) and Cornett, McNutt, Strahan, and Tehranian (2011) provide evidence that lending by banks with greater asset liquidity is less sensitive to economic conditions. Consistent with HTM classification constraining security liquidity, Meder (2015) finds that HTM securities are more negatively correlated with banks' loan growth than other securities, particularly during periods of monetary tightening. We expand on this evidence by showing that increases in AA banks' HTM securities around the AOCI filter removal affect how they raise funds and their loan supply. We also show that AA banks mitigate the decrease in securities risk around the filter removal by increasing loan risk.

III. HYPOTHESES AND EMPIRICAL MODELS

Hypotheses

Prior research finds that banks' recognition of unrealized gains and losses on AFS securities, on average, increases the volatility of owners' equity (Barth et al. 1995). We, thus, expect that the inclusion of unrealized losses in regulatory capital increases the probability that AA banks violate capital requirements, all else equal. Perhaps the easiest way for AA banks to mitigate this incremental regulatory capital volatility is to reclassify existing AFS securities to HTM or to classify newly acquired securities as HTM. Extensive prior research finds that banks classify securities to manage earnings, owners' equity, and regulatory capital.

The business press reported anecdotal evidence of banks reclassifying AFS securities to HTM prior to the AOCI filter removal (e.g., Rudegeair 2013), although Chircop and Novotny-Farkas (2016) find no evidence of such reclassification through the third quarter of 2014. Given the bulk of the prior evidence, and because we examine a longer period after the filter removal than Chircop and Novotny-Farkas (2016), we propose the following hypothesis:

H1: AA banks increase the classification of securities as HTM around the AOCI filter removal.

H1 is consistent with the findings of Hamilton (2019).

To the extent that AA banks do not increase the classification of securities as HTM, as predicted by H1, the banks will hold AFS securities for which unrealized gains and losses yield regulatory capital volatility. We expect AA banks to mitigate this volatility increase by reducing the risk of AFS securities. Consistent with this expectation, Chircop and Novotny-Farkas (2016) find that AA banks reduced Level 3 AFS securities, which typically have higher credit risk than other securities, around the filter removal.

On the other hand, to the extent that AA banks classify securities as HTM, they will be subject to the tainting rule and unable to qualify hedges of the interest rate risk of HTM securities for hedge accounting. We expect AA banks to reduce the risk of their HTM securities and thereby the likelihood that they will want to sell or hedge the interest rate risk of the securities.[16] This expectation is consistent with the findings of Beatty (1995) and Hodder et al. (2002) that banks reduced the maturity of securities upon adoption of FAS 115. It is also consistent with the ABA's (2012) opposition to the Proposed Rule based on the view that it would lead banks to reduce the duration of securities. Hence, we propose the following hypothesis:

H2: AA banks reduce the risk of securities around the AOCI filter removal.

We do not distinguish AFS and HTM securities in H2 because it applies to both security classifications. However, we separately examine the two classifications in our tests of H2.

Our next hypothesis is motivated by the fact that if AA banks classify securities as HTM around the AOCI filter removal, as predicted by H1, the tainting rule substantially impairs their ability to raise funds by selling the securities. Banks that instead classify securities as AFS can meet funding needs by selling any sufficiently liquid AFS security on a timelier basis than is obtainable by issuing (sticky) core and other low-cost deposits, their preferred source of financing. Once banks raise the necessary core and other low-cost deposits, they can reinvest in AFS securities to provide funding for future loan growth.[17] In Section V, we provide evidence that banks rely on the proceeds from sales of AFS securities to fund loan growth.

[16] In response to an analyst's question during the 2013 Q2 earnings conference call about the effect of the AOCI filter removal on BNY Mellon's securities, its chief financial officer responded that the bank would "certainly shorten the duration that would be exposed to the capital." In a comment letter to the Senate Banking Committee on April 14, 2017, BNY Mellon, Northern Trust, and State Street asked for the reinstatement of the AOCI filter, claiming that it would "remove the undue capital penalty on longer duration debt securities."

[17] For example, in a 2004 comment letter to the FASB, U.S. Bancorp (an AA bank) states that "AFS securities are a stored liquidity source that can currently be sold to provide liquidity to fund loan growth. During periods when deposit growth exceeds loan growth, banks add to the AFS securities portfolio and when loan growth accelerates banks sell AFS securities to fund loan growth. This is a function of liquidity and the need to address changing risks that occur as the balance sheet changes." See: https://www.fasb.org/jsp/FASB/CommentLetter_C/ViewCommentLetter&cid=1175802692990

Consistent with Fitch Ratings (2014), we expect AA banks that classify securities as HTM to raise financing without taint by pledging HTM securities as collateral in repurchase agreements accounted for as secured borrowings. We, thus, propose the following hypothesis.

H3: AA banks that classify more securities as HTM around the AOCI filter removal borrow more under repurchase agreements than other AA banks.[18]

The ability to pledge HTM securities in repurchase agreements without taint increases banks' ability to fund loans, all else equal. However, classifying securities as HTM, rather than as AFS, decreases banks' ability to fund loan growth for three reasons. First, repurchase agreements typically provide much shorter-term financing than securities sales and are limited to highly liquid (e.g., governmental and agency) securities, referred to as "good collateral." To maintain financing, banks need to roll over short-term repurchase agreements, which may not be possible during stress periods (Gorton and Metrick 2012) or if their solvency becomes questionable.[19] Second, the amount of financing raised by pledging a security in a repurchase agreement is less than the value of the security by the amount of the "haircut." As a percentage of the value of a pledged security, the haircut typically is small (e.g., 2 percent), but increases with the risk of the security. Third, if banks classify good collateral securities as HTM, rather than as AFS, to ensure the pledgeability of HTM securities, then they reduce the average salability of their AFS securities.

Prior literature shows that banks' liquidity is positively associated with loan supply. Most related to our study, Meder (2015) finds a negative association between banks' holdings of HTM securities and loan supply. Hence, we propose the following hypothesis:

H4: AA banks that classify more securities as HTM around the AOCI filter removal reduce loan supply more than other AA banks.

If AA banks reduce securities risk, as predicted by H2, then bank-level interest rate spread decreases, all else equal. We expect AA banks to increase loan risk to mitigate this decrease. Loans are banks' primary assets, and it is difficult for banks to appreciably reduce the low yields on interest-paying liabilities. Consistent with this expectation, Hodder et al. (2002) find that banks increased loan risk upon their adoption of FAS 115 to compensate for reduced security risk. We, thus, propose the following hypothesis:

H5: AA banks that decrease securities risk more around the AOCI filter removal increase loan risk more than other AA banks.

Figure 1 visually summarizes the direct predictions, H1 and H2, and the indirect predictions, H3–H5, as well as the dependencies of the indirect predictions on the direct predictions.

Empirical Models

We estimate difference-in-differences models to distinguish the consequences of the AOCI filter removal from the effects of contemporaneous changes in conditions affecting all banks and of other regulations affecting AA banks. Each of these models compares the difference across a treatment sample and a control sample of the change in the dependent variable from the three-year period prior to the filter removal to the subsequent three-year period.

We test H1 (re HTM classification) using the following model:

$$Sec\ Class_{i,t} = \beta_1 POST_t \times AABH_i + \gamma X_{i,t} + \delta_t + \lambda_i + \varepsilon_{i,t}. \quad (1)$$

The dependent variable, $Sec\ Class_{i,t}$, stands in for three security classification variables: HTM securities, *HTM;* AFS securities, *AFS;* and AFS securities divided by the sum of AFS and HTM securities, *AFS/Securities*.[20] The explanatory variable of interest

[18] Ideally, in framing and testing H3, we would distinguish whether the borrower classifies the securities pledged in repurchase agreements as HTM; unfortunately, this classification is not observable.

[19] Banks may be able to pledge securities in long-term repurchase agreements. This financing option is attractive for HTM securities, as it involves no opportunity cost. It is less attractive for AFS securities, however, because it removes the option to sell the securities until the agreements terminate, thereby reducing bank liquidity. The Federal Deposit Insurance Corporation (2018) states that long-term repurchase agreements "can negatively affect a bank's liquidity profile by reducing the amount of securities available for sale during period of stress." To the (limited) extent that repurchase agreements have long terms, the greater attractiveness of pledging HTM securities, rather than AFS securities, in such agreements provides further support for H3.

[20] We deflate most continuous financial statement variables by assets. For each of these variables (e.g., *HTM* and *AFS*), we omit the deflator from the variable name and refer to the variable by its numerator in the text. For a continuous variable deflated by another item (e.g., *AFS/Securities*), we either (1) include the deflator in the variable name and refer in the text to both its numerator and denominator, or (2) name and refer to the variable in a way that captures both its numerator and denominator. Appendix A provides complete definitions of all variables.

is the interaction between an indicator for quarters after 2014, $POST_t$, and an indicator for AA banks, $AABH_i$. Equation (1) and subsequent equations control for a number of bank characteristics, $X_{i,t}$, and include year-quarter and bank fixed effects, δ_t and λ_i, respectively. The bank characteristics (bank fixed effects) capture time-varying (time-invariant) heterogeneity across banks. The year-quarter fixed effects capture economic conditions affecting all banks in each sample quarter. The coefficient on $POST_t \times AABH_i$ captures the difference across AA banks and non-AA banks in the change in $Sec\ Class_{i,t}$ around the AOCI filter removal. H1 predicts that this coefficient is positive when $Sec\ Class_{i,t}$ is *HTM* and negative when $Sec\ Class_{i,t}$ is *AFS* or *AFS/Securities*.

We test H2 (re securities risk) using the following model:

$$Sec\ Risk_{i,t} = \beta_1 POST_t \times AABH_i + \gamma X_{i,t} + \delta_t + \lambda_i + \varepsilon_{i,t}. \quad (2)$$

The dependent variable, $Sec\ Risk_{i,t}$, stands in for three measures of the credit risk and one measure of the interest rate risk of securities. The credit risk measures are risk-weighted HTM and AFS securities divided by the sum of HTM and AFS securities, *Securities Risk;* risk-weighted HTM securities divided by HTM securities, *HTM Risk;* and risk-weighted AFS securities divided by AFS securities, *AFS Risk*. The interest rate risk measure is the weighted-average maturity or time to first repricing of securities, *Weighted Maturity*. The right-hand side of Equation (2) is identical to that of Equation (1). H2 predicts that the coefficient on $POST_t \times AABH_i$ is negative for all measures of $Sec\ Risk_{i,t}$.

We test H3 (re borrowings under repurchase agreements) using the following model:

$$Repo\ Borrowed_{i,t} = \beta_1 \Delta HTM\ High_i \times POST_t \times AABH_i + \beta_2 POST_t \times AABH_i + \gamma X_{i,t} + \delta_t + \lambda_i + \varepsilon_{i,t}. \quad (3)$$

The dependent variable is borrowings under repurchase agreements, $Repo\ Borrowed_{i,t}$, which equals the value of the securities pledged in the agreements less the haircuts.[21] The structure of the right-hand side of this equation differs from that of prior equations because H3 compares AA banks with above-median versus below-median increases in *HTM* around the AOCI filter removal. The indicator variable $\Delta HTM\ High_i$ equals 1 for the above-median group, and 0 otherwise. The explanatory variable of interest is the three-way interaction between $\Delta HTM\ High$, *POST,* and *AABH*. The coefficient on $\Delta HTM\ High_i \times POST_t \times AABH_i$ captures the difference across AA banks with above- versus below-median increases in *HTM* in the change in $Repo\ Borrowed_{i,t}$ around the filter removal. H3 predicts that this coefficient is positive.

We primarily test H4 (re loan supply) using bank-level loans as the proxy for loan supply. In untabulated analysis, we also test H4 using loan-level mortgage approval decisions as the proxy. The benefit of the bank-level approach is that it includes all types of loans. The cost of this approach is it does not distinguish the portions of the change in loans attributable to loan supply versus loan demand. The benefit of the loan-level approach is that changes in mortgage-approval rates relatively cleanly reflect changes in loan supply (Loutskina and Strahan 2009; Xie 2016; Acharya and Ryan 2016; Dou, Ryan, and Xie 2018). The cost of this approach is that loan approval data are available only for mortgages. Most mortgages are low-yielding loans, which have become less attractive for large banks owing to the imposition of higher capital requirements under the U.S. implementation of Basel III and other regulatory burdens under the Dodd-Frank Act (D'Acunto and Rossi 2017).

The primary model used to test H4 is:

$$Loan_{i,t} = \beta_1 \Delta HTM\ High_i \times POST_t \times AABH_i + \beta_2 POST_t \times AABH_i + \gamma X_{i,t} + \delta_t + \lambda_i + \varepsilon_{i,t}. \quad (4)$$

The dependent variable is loans, $Loan_{i,t}$. The structure of the right-hand side of this equation is the same as that for Equation (3). The coefficient on $\Delta HTM\ High_i \times POST_t \times AABH_i$ captures the difference across AA banks with above- versus below-median increases in *HTM* in the change in $Loan_{i,t}$ around the AOCI filter removal. H4 predicts that this coefficient is negative.

A drawback of the difference-in-differences models in Equations (3) and (4) is that they do not indicate the size of the effects of the classification of a fixed amount of securities as HTM, rather than as AFS, on repurchase agreement borrowings and loans. To provide a sense for these sizes, we estimate models similar to Equations (3) and (4) replacing the indicator for above- versus below-median increases in HTM securities with the change in HTM securities, ΔHTM, a continuous variable.

We test H5 (re loan risk) using bank-level measures of loan risk and the following model:

$$Loan\ Risk_{i,t} = \beta_1 \Delta HTM\ Risk\ Low_i \times POST_t \times AABH_i + \beta_2 \Delta AFS\ Risk\ Low_i \times POST_t \times AABH_i + \beta_3 POST_t \times AABH_i + \gamma X_{i,t} + \delta_t + \lambda_i + \varepsilon_{i,t}. \quad (5)$$

[21] We measure *Repo Borrowed* using FR Y-9C data item bhckb995, "Securities sold under agreements to repurchase." This data item is reduced by the haircuts in repurchase agreements and, thus, is not a perfect proxy for the securities pledged under the agreements. However, bhckb995 is preferable to bhck0416, "Pledged securities," which includes securities pledged for any reason, such as to secure deposits or other borrowings. We find that 27 percent of our sample bank-quarters have zero bhckb995, but non-zero bhck0416. Using call report data, we find that pledged securities are more positively correlated with municipal deposits (0.62), for which state laws require collateral for amounts excess of $250,000, than with securities sold under agreements to repurchase (0.29).

The dependent variable, $Loan\ Risk_{i,t}$, stands in for two measures of loan credit risk: risk-weighted loans divided by total loans, *Loan Risk;* and all loans with 100 percent or higher risk weights divided by total loans, $Loan \geq 100\%/Loan$. The coefficient on $\Delta HTM\ Risk\ Low_i \times POST_t \times AABH_i$ ($\Delta AFS\ Risk\ Low_i \times POST_t \times AABH_i$) captures the difference across AA banks with below- versus above-median increases in the credit risk of HTM (AFS) securities in the change in $Loan\ Risk_{i,t}$ around the AOCI filter removal. H5 predicts that these coefficients are positive.

We control for a common set of bank characteristics, $X_{i,t}$, in Equations (1)–(5). We control for bank size using $Log(Assets)_{i,t}$; for bank liquidity using $Deposit_{i,t}$, $Cash_{i,t}$, and $Loan\ to\ Deposit_{i,t}$; for loan credit risk using $Loan\ Loss\ Reserve_{i,t}$ and $Non\text{-}Performing\ Loan_{i,t}$; for bank health using $ROA_{i,t}$ and $Tier\ 1\ Capital\ Ratio_{i,t}$; and for net unrealized gains on AFS securities using $AFS\ Unrealized\ Gains\ (Losses)_{i,t}$.

We estimate Equations (1)–(5) using ordinary least squares (OLS). We calculate standard errors correcting for heteroscedasticity and clustering observations by bank. Even though our hypotheses are directional, we report significance levels for two-tailed tests.

2SLS/Instrumental Variable Approach

The U.S. implementation of Basel III developed endogenously and includes provisions other than the AOCI filter removal that apply solely or primarily to AA or other very large banks, e.g., the accelerated increases in minimum regulatory capital ratios in 2014 and the imposition of requirements for the liquidity coverage ratio in 2015, and the supplementary leverage ratio in 2018. In principle, these provisions could affect both the dependent variables and the test variables in our difference-in-differences models.[22]

To ensure that these provisions do not drive our results, we use a 2SLS/instrumental variable approach to conduct supplemental tests of H3 and H4, which predict indirect effects of AA banks' increased classification of securities as HTM around the AOCI filter removal. We use AA banks' AFS securities at the end of 2011, $AFS_{i,2011}$, as the instrument for their change in HTM securities from the end of 2011 to the end of 2016, $\Delta HTM_{i,2011\text{-}16}$.[23] Intuitively, AA banks that held more AFS securities prior to the AOCI filter removal would, if they did nothing, experience larger increases in regulatory capital volatility from the filter removal, and so they should more strongly increase HTM securities. In Section V, we confirm empirically that this instrument is strong. The instrument is also plausibly exogenous, as it is measured several years prior to the AOCI filter removal and so should be uncorrelated with the consequences predicted in H3 and H4. The first-stage model regresses $\Delta HTM_{i,2011\text{-}16}$ on $AFS_{i,2011}$ interacted with $AABH_i$ and changes in control variables from the end of 2011 to the end of 2016, ΔX:

$$\Delta HTM_{i,2011-16} = \beta_0 + \beta_1 AFS_{i,2011} \times AABH_i + \gamma \Delta X_i + \varepsilon_i. \tag{6}$$

The second-stage models are modifications of Equations (3) and (4) in which the variables are changes from the end of 2011 to the end of 2016, and the explanatory variable of interest is the predicted value of $\Delta HTM_{i,2011\text{-}16}$ for AA banks from the first-stage model:

$$\Delta Repo\ Borrowed_{i,2011-16} = \beta_0 + \beta_1 \widehat{\Delta HTM}_{i,2011-16} + \gamma \Delta X_{i,2011-16} + \varepsilon_i, \tag{7}$$

and

$$\Delta Loan_{i,2011-16} = \beta_0 + \beta_1 \widehat{\Delta HTM}_{i,2011-16} + \gamma \Delta X_{i,2011-16} + \varepsilon_i. \tag{8}$$

Equations (7) and (8) capture the changes in AA banks' borrowing under repurchase agreements and loan supply, respectively, that are explained by their predicted change in securities classified as HTM.

IV. SAMPLE AND DESCRIPTIVE STATISTICS

Sample

We obtain financial statement data from bank holding companies' quarterly FR Y-9C filings during 2011–2016. Bank holding companies with total assets of at least $500 million up to the first quarter of 2015 and $1 billion afterward are required

[22] Because AA banks' HTM securities increase from the approval of the Final Rule in July 2013 to the AOCI filter removal in January 2014, it is unlikely that our findings are driven by other provisions of the U.S. implementation of Basel III. For example, the liquidity coverage ratio requirement became effective in 2015, one year after the filter removal. Moreover, the classification of securities as HTM versus AFS has no effect on the calculation of this ratio. The other main provisions of the U.S. implementation of Basel III became effective further after the filter removal.

[23] Our inferences are unaffected by using as the instrument one of two measures of risky AFS securities in 2011 (non-U.S. Treasury securities or Level 2 and 3 securities) or one of two measures of the potential adverse impact of unrealized losses on AFS securities on regulatory capital (unrealized losses on AFS securities in the third quarter of 2008 or the volatility of unrealized gains and losses on AFS securities in the prior 12 quarters).

to file FR Y-9C filings. To maintain sample homogeneity over time, we drop banks with total assets below $1 billion in any quarter. Untabulated analysis indicates that this sample choice and our other choices regarding specific banks discussed below do not affect our inferences.

We identified 16 AA banks potentially subject to the AOCI filter removal based on the Federal Reserve's list of 14 AA banks subject to Comprehensive Capital Analysis and Review (CCAR) (stress testing) in 2014,[24] plus two subsidiaries of foreign banking organizations that petitioned to opt out of advanced approaches under Regulation YY (TD Bank US and MUFG Americas).[25] We retain TD Bank US because the Federal Reserve's approval of the bank's opt-out petition indicates that it remains subject to the AOCI filter removal.[26] We exclude MUFG Americas because it opted out of the AOCI filter removal at the bank holding company level, but accepted the filter removal at the commercial bank level, rendering the proper classification of the bank ambiguous. After this elimination, we classify 15 banks as subject to the AOCI filter removal.[27]

The Final Rule allowed non-AA banks to irrevocably choose to retain the AOCI filter removal by March 31, 2015. Almost all non-AA banks made this choice, as indicated in data item bhcap838 of the FR Y-9C filings. The primary exceptions are four subsidiaries of large foreign banks—Barclays US, Credit Suisse USA, Deutsche Bank Trust, and RBC USA—presumably because their parents are subject to the AOCI filter removal. We exclude these banks. In addition, two non-AA banks indicate in their first-quarter 2015 FR Y-9C filings that they accepted the AOCI filter removal, but these acceptances appear to be trivial or an error. Iteam Companies did not file an FR Y-9C after the second quarter of 2015 and reports zero unrealized gains or losses on AFS securities in the first two quarters of 2015. First NBC Bank Holding Company indicates after the first quarter of 2015 that it elected to retain the filter, inconsistent with the irrevocability of the choice by that date. We retain these banks. The final full sample includes 793 banks (15 AA banks and 778 non-AA banks) and 12,461 bank-quarters. We conduct robustness analyses on a subsample of 30 banks subject to CCAR, 15 of which are non-AA banks.[28]

Panel A of Table 1 reports summary statistics for the full sample. On average, AFS securities are 18.3 percent of assets, HTM securities are 3.0 percent of assets, and loans are 64.6 percent of assets. More than 99 percent of the sample bank-quarters are well-capitalized; the average (25th percentile) Tier 1 capital ratio is 14.6 (11.6) percent, almost three times (over twice) the well-capitalized threshold of 5 percent. The standard deviation of cumulative unrealized gains and losses on AFS securities from the end of 2011 to the end of 2016 is 0.5 percent. Panels B and C report summary statistics separately for AA versus non-AA banks and for high versus low ΔHTM AA banks, respectively.

Parallel Trends Assumption

To generate valid inferences, the dependent variables in our difference-in-differences models must follow parallel trends for the treatment and control groups prior to the AOCI filter removal. We first examine the trends for *HTM,* as this variable is central to our tests of H1 as the dependent variable, and of H3 and H4 as part of the explanatory variable of interest. As depicted in Panel A of Figure 2, *HTM* follows reasonably parallel, gradual upward trends for AA and non-AA banks prior to the filter removal.[29] *HTM* then jumps for AA banks compared to non-AA banks from July 2013, when U.S. bank regulators approved the Final Rule adopting Basel III, to January 2014, the beginning of the phase-in of the filter removal. This non-parallel shift is economically large. To illustrate, AA banks increased their holdings of HTM securities from 1.27 percent in December 2011 to 5.83 percent in December 2016, i.e., 4.56 percentage points. In contrast, over this period, non-AA banks increased their holdings of HTM securities from 2.35 percent to 3.20 percent, i.e., only 0.85 percentage points.

[24] See: https://www.federalreserve.gov/bankinforeg/2014-ccar-banks.htm

[25] See: https://www.federalreserve.gov/bankinforeg/basel/advanced-approaches-capital-framework-implementation.htm

[26] See: https://www.federalreserve.gov/bankinforeg/basel/files/td-bank-advanced-approaches-20141211.pdf

[27] The 15 AA banks are American Express, Bank of America, BNY Mellon, Capital One, Citigroup, Goldman Sachs, HSBC North America, JPMorgan Chase, Morgan Stanley, Northern Trust, PNC Financial, State Street, TD Bank US, U.S. Bancorp, and Wells Fargo. These banks do not include DB US Corporation, Deutsche Bank's U.S. intermediate holding company, which is an AA bank, but commenced operations on July 1, 2016 after the AOCI filter removal.

[28] The 15 non-AA CCAR banks are Ally Financial, BB&T, BBVA Compass, BMO Financial, Citizens Financial, Comerica, Discover, Fifth Third, Huntington, Keycorp, M&T, Regions, Santander, SunTrust, and Zions.

[29] The gradual upward trends in HTM securities for AA and non-AA banks prior to the July 2013 issuance of the Final Rule appear to be attributable to the expectation that U.S. bank regulators would remove the AOCI filter for all but very small banks. Business press articles up to one day prior to that issuance provide no indication that the AOCI filter would be removed only for AA banks (e.g., Reilly 2013). Many non-AA banks reclassified AFS securities to HTM in anticipation of the AOCI filter removal prior to the Final Rule. For example, Rudegeair (2013) discusses Cullen/Frost Banks' reclassification in late 2012. In its Q3 2012 earnings conference call, Comerica warned that "the new proposed Basel III capital rule and the AOCI filter . . . could have a significant impact on capital."

TABLE 1

Descriptive Statistics

Panel A: Full Sample, Bank-Level Variables

	n	Mean	Std. Dev.	P25	Med.	P75
Dependent Variables						
HTM	12,461	0.030	0.057	0.000	0.001	0.035
AFS	12,461	0.183	0.113	0.106	0.161	0.244
AFS/Securities	12,461	0.870	0.210	0.803	0.990	1.000
Securities Risk	12,456	0.239	0.128	0.183	0.211	0.263
HTM Risk	7,365	0.306	0.234	0.198	0.214	0.336
AFS Risk	12,416	0.242	0.147	0.180	0.207	0.266
Weighted Maturity	12,440	3.256	1.158	2.490	3.428	4.182
Repo Borrowed	12,461	0.020	0.031	0.000	0.010	0.028
Loan	12,461	0.646	0.142	0.582	0.668	0.740
Loan Risk	12,461	0.866	0.091	0.825	0.882	0.925
Loan $\geq$ *100%/Loan*	12,461	0.746	0.150	0.667	0.770	0.850
Asset Risk	12,461	0.711	0.126	0.638	0.719	0.796
Explanatory Variables						
Log(*Assets*)	12,461	15.087	1.398	14.126	14.606	15.571
Deposit	12,461	0.786	0.111	0.758	0.809	0.848
Cash	12,461	0.064	0.061	0.025	0.045	0.080
Loans to Deposits	12,461	0.826	0.403	0.698	0.815	0.917
Loan Loss Reserve	12,461	0.010	0.008	0.007	0.009	0.012
Non-Performing Loan	12,461	0.013	0.018	0.004	0.008	0.014
ROA	12,461	0.009	0.017	0.006	0.009	0.011
Tier 1 Capital Ratio	12,461	0.146	0.074	0.116	0.132	0.156
AFS Unrealized Gains (*Losses*)	12,461	0.002	0.005	−0.000	0.001	0.003

Panel B: AA versus Non-AA Banks, Bank-Level Variables

	AA			Non-AA		
Variables	**n**	**Mean**	**Median**	**n**	**Mean**	**Median**
Dependent Variables						
HTM	360	0.033	0.020	12,101	0.030	0.001
AFS	360	0.166	0.151	12,101	0.184	0.162
AFS/Securities	360	0.859	0.896	12,101	0.870	0.992
Securities Risk	360	0.214	0.189	12,096	0.240	0.211
HTM Risk	360	0.189	0.171	7,083	0.311	0.216
AFS Risk	360	0.221	0.211	12,056	0.243	0.207
Weighted Maturity	360	2.655	2.834	12,080	3.274	3.445
Repo Borrowed	360	0.062	0.028	12,101	0.019	0.009
Loan	360	0.385	0.361	12,101	0.654	0.672
Loan Risk	360	0.839	0.846	12,101	0.866	0.883
Loan $\geq$ *100%/Loan*	360	0.738	0.718	12,101	0.746	0.772
Asset Risk	360	0.607	0.591	12,101	0.714	0.721
Explanatory Variables						
Log(*Assets*)	360	20.044	19.699	12,101	14.940	14.579
Deposit	360	0.550	0.655	12,101	0.793	0.811
Cash	360	0.128	0.088	12,101	0.062	0.044
Loans to Deposits	360	0.762	0.729	12,101	0.828	0.817
Loan Loss Reserve	360	0.007	0.007	12,101	0.011	0.009
Non-Performing Loan	360	0.010	0.008	12,101	0.013	0.008
ROA	360	0.010	0.009	12,101	0.009	0.009
Tier 1 Capital Ratio	360	0.135	0.132	12,101	0.146	0.132
AFS Unrealized Gains (*Losses*)	360	0.002	0.001	12,101	0.002	0.001

(continued on next page)

TABLE 1 (continued)

Panel C: High versus Low Δ*HTM* AA Banks, Bank-Level Variables

	High Δ*HTM*			Low Δ*HTM*		
Variables	**n**	**Mean**	**Median**	**n**	**Mean**	**Median**
Dependent Variables						
HTM	168	0.055	0.051	192	0.014	0.006
AFS	168	0.236	0.208	192	0.104	0.126
AFS/Securities	168	0.804	0.842	192	0.906	0.961
Securities Risk	168	0.204	0.195	192	0.224	0.181
HTM Risk	150	0.174	0.146	132	0.206	0.200
AFS Risk	168	0.216	0.229	192	0.226	0.187
Weighted Maturity	168	2.477	2.496	192	2.811	3.029
Repo Borrowed	168	0.017	0.010	192	0.102	0.099
Loan	168	0.403	0.454	192	0.368	0.356
Loan Risk	168	0.861	0.856	192	0.819	0.824
Loan $\geq$ *100%/Loan*	168	0.761	0.741	192	0.718	0.701
Asset Risk	168	0.597	0.602	192	0.617	0.589
Explanatory Variables						
Log(*Assets*)	168	19.586	19.521	192	20.444	20.556
Deposit	168	0.732	0.710	192	0.391	0.438
Cash	168	0.167	0.119	192	0.095	0.087
Loans to Deposits	168	0.543	0.546	192	0.953	0.780
Loan Loss Reserve	168	0.007	0.005	192	0.008	0.008
Non-Performing Loan	168	0.009	0.007	192	0.011	0.008
ROA	168	0.010	0.009	192	0.010	0.008
Tier 1 Capital Ratio	168	0.127	0.125	192	0.142	0.137
AFS Unrealized Gains (*Losses*)	168	0.002	0.002	192	0.001	0.001

This table presents descriptive statistics for the variables in Equations (1)–(5). Panel A reports the bank-level statistics of mean, standard deviation, and first through third quartiles for the full sample. Panel B reports the bank-level statistics of mean and median for AA banks and non-AA banks. Panel C reports the bank-level statistics of mean and median for AA banks with above-median increase in HTM securities and AA banks with below-median increase in HTM securities.
All variables are defined in Appendix A.

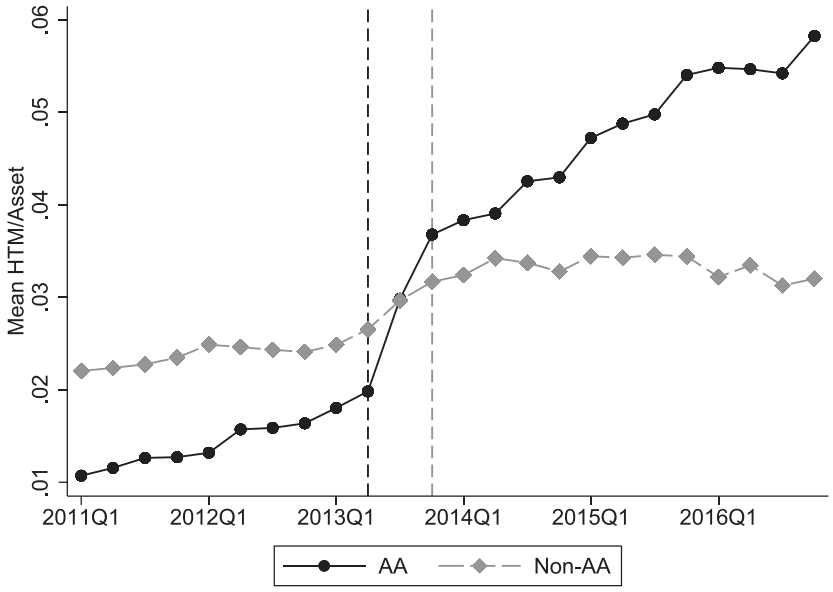
We next examine the trends over the sample period for *Securities Risk,* as this variable is central to our tests of H2 as the dependent variable and of H5 as part of the explanatory variable of interest. As depicted in Panel B of Figure 2, *Securities Risk* decreases for AA banks starting in July 2013, whereas this variable is relatively stable for non-AA banks throughout the sample period. AA banks' risk-weighted securities divided by total securities decreased from 25.71 percent in December 2011 to 15.80 percent in December 2016, a 9.91 percentage point decrease. In contrast, over this period non-AA banks' risk-weighted securities divided by total securities *increased* from 23.48 percent to 24.00 percent, a 0.52 percentage point increase.

In untabulated analysis, we examined the trends in the three other dependent variables for the corresponding treatment and control samples. The dependent variables in Equations (3) and (4) (Equation (5)) exhibit reasonably parallel trends for AA banks with above-median versus below-median increases in *HTM* (*Securities Risk*) during the pre-treatment period. We also examined the changes in asset composition for AA and non-AA banks and for AA banks with above-median and below-median increases in *HTM*. The only perceptible non-parallel or non-gradual changes are the larger increases in HTM securities around the AOCI filter removal for AA banks than for non-AA banks, and for AA banks with above-median increases in *HTM* than for AA banks with below-median increases in *HTM*.[30]

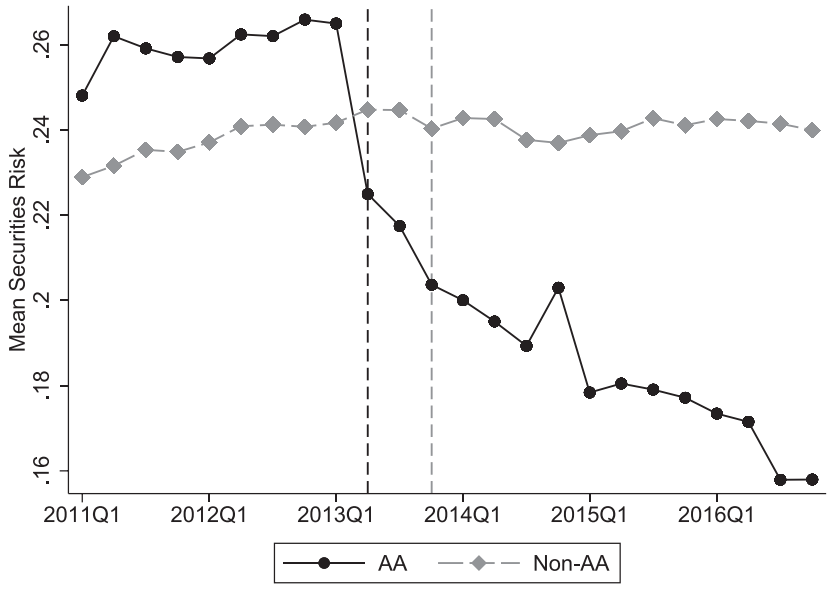
[30] Interestingly, AA banks with below-median increases in *HTM* have much higher trading securities and lower AFS securities than AA banks with above-median increases in *HTM,* both before and after the AOCI filter removal. This difference suggests that the above-median banks classified more securities as HTM around the filter removal because they were less familiar with managing regulatory capital volatility arising from unrealized gains and losses on AFS securities. This possibility does not undercut any of our hypotheses or results. Moreover, most AA banks' trading securities are approximately constant across the sample period, so the bank fixed effects largely capture any effect of trading securities on our dependent variables.

FIGURE 2
Changes in HTM Securities and Securities Risk over the Sample Period

Panel A: ***HTM Securities***



Panel B: ***Securities Risk***



This figure depicts the mean of HTM securities (*HTM*) (Panel A) and the mean of risk-weighted securities divided by total securities (*Securities Risk*) (Panel B) for both AA and non-AA banks during the sample period. The first (second) dashed vertical line indicates the quarter around the Federal Reserve Board's July 2, 2013 approval of the Final Rule (the beginning of the five-year phase-in of the AOCI filter removal for AA banks on January 1, 2014).

V. EMPIRICAL RESULTS

Classification of Securities as HTM

H1 predicts that AA banks increase HTM securities around the AOCI filter removal compared to non-AA banks. To test H1, columns (1) through (3) of Table 2 report OLS estimations of Equation (1) with *HTM, AFS,* and *AFS/Securities* as the dependent variable, respectively. H1 predicts that the coefficient on $POST_t \times AABH_i$ is positive in column (1) and negative in columns (2) and (3).

In the estimation of the *HTM* model reported in column (1) of Table 2, as expected, the coefficient on $POST_t \times AABH_i$ is significantly positive (0.025, $p < 0.01$). This coefficient implies that AA banks increased HTM securities by 2.5 percentage points more than non-AA banks around the AOCI filter removal, all else equal.[31]

In the estimation of the *AFS* model reported in Table 2, column (2), the coefficient on $POST_t \times AABH_i$ is unexpectedly insignificant. This insignificance may be attributable to some AA banks mitigating the effect of the AOCI filter removal by reducing the risk of AFS securities rather than by classifying securities as HTM. Our tests of H2 provide evidence that this alternative form of mitigation occurred. It is also possible that some AA banks held low-risk AFS securities before the filter removal and so did not need to reclassify these securities. In untabulated analysis, we partition AA banks into those with above- versus below-median volatility of unrealized gains and losses on AFS securities before the filter removal. As expected, we find that AA banks with above-median volatility significantly reduced their AFS securities around the filter removal.

In the estimation of the *AFS/Securities* model reported in Table 2, column (3), as expected, the coefficient on $POST_t \times AABH_i$ is highly significantly negative (−0.101, $p < 0.01$). This coefficient implies that AA banks reduced AFS securities divided by securities by 10.1 percentage points more than non-AA banks around the AOCI filter removal, all else equal.

The results reported in Table 2 are consistent with H1 that AA banks classified more securities as HTM and less securities as AFS around the AOCI filter removal. These results differ from Chircop and Novotny-Farkas' (2016) finding of an insignificant change in AA banks' AFS securities through the third quarter of 2014, but are consistent with Hamilton's (2019) findings over a longer post-treatment period.

Securities Risk

H2 predicts that AA banks reduce securities risk around the AOCI filter removal compared to non-AA banks. To test H2, columns (1) through (3) of Table 3, Panel A report OLS estimations of Equation (2) with the credit risk proxies *Securities Risk, HTM Risk,* and *AFS Risk*, respectively, as the dependent variable. Column (1) of Table 3, Panel B reports the OLS estimation of Equation (2) with the interest rate risk proxy *Weighted Maturity* as the dependent variable. H2 predicts that the coefficient on $POST_t \times AABH_i$ is negative in all four columns.

In the estimation of the *Securities Risk* model reported in column (1) of Table 3, Panel A, as expected the coefficient on $POST_t \times AABH_i$ is significantly negative (−0.057, $p < 0.01$). This coefficient indicates that *Securities Risk* decreases by 5.7 percentage points for AA banks around the AOCI filter removal. The corresponding coefficients are similarly negative and significant in the *HTM Risk* model estimation reported in column (2) (−0.071, $p < 0.05$) and the *AFS Risk* model estimation reported in column (3) (−0.060, $p < 0.01$). These coefficients indicate that *HTM Risk* and *AFS Risk* decrease by 7.1 and 6.0 percentage points, respectively, for AA banks around the filter removal. These results are consistent with H2 and with Chircop and Novotny-Farkas' (2016) finding that AA banks reduced their Level 3 AFS securities around the filter removal.

In the estimation of the *Weighted Maturity* model reported in column (1) of Table 3, Panel B, the coefficient on $POST_t \times AABH_i$ is unexpectedly insignificant. Although consistent with the findings of Chircop and Novotny-Farkas (2016), this non-result is inconsistent with H2 and the findings of Beatty (1995) and Hodder et al. (2002) that banks reduced the duration of their securities upon adoption of FAS 115. There are several possible explanations for this non-result, one of which is heterogeneity in AA banks' response to the AOCI filter removal.

Probing this explanation, the remaining columns of Table 3, Panel B report OLS estimations of expansions of Equation (2) that interact $POST_t \times AABH_i$ with the indicators $\Delta HTM\ High$ and $\Delta AFS\ High$ (column (2)) or with the continuous variables ΔHTM and ΔAFS (column (3)). In both columns, the coefficient on the interaction of $POST_t \times AABH_i$ with the AFS variable is significantly negative. For example, the coefficient on $\Delta AFS\ High_i \times POST_t \times AABH_i$ is −0.458 ($p < 0.05$), indicating that AA banks with above-median increases in AFS securities around the AOCI filter removal decreased *Weighted Maturity* by 0.458 years compared to other AA banks, a sizeable decrease given AA banks' weighted-average duration of securities of 2.655 years.

[31] In the empirical analysis, we do not distinguish increases in HTM securities attributable to the reclassification of AFS securities to HTM versus the classification of newly purchased securities as HTM. For AA banks with Form 10-K filings available on EDGAR, we find that, on average, reclassifications constitute about one-third of the increase in HTM securities from 2011 to 2016. We further find that AA banks are more than twice as likely as non-AA CCAR banks to reclassify AFS securities to HTM during this period. AA banks that reclassify AFS securities to HTM typically state in their securities footnote that their motivation is to reduce regulatory capital volatility.

TABLE 2

Classification of Securities as HTM

	(1) *HTM*	(2) *AFS*	(3) *AFS/Securities*
POST × *AABH*	0.025***	−0.002	−0.101***
	(0.008)	(0.013)	(0.025)
Log(Assets)	0.007	−0.005	−0.015
	(0.006)	(0.010)	(0.022)
Deposit	−0.016	−0.061	0.002
	(0.028)	(0.060)	(0.088)
Cash	−0.087***	−0.441***	0.208**
	(0.026)	(0.048)	(0.087)
Loans to Deposits	−0.009	−0.058**	0.005
	(0.006)	(0.028)	(0.011)
Loan Loss Reserve	−0.100	−1.104**	0.147
	(0.268)	(0.522)	(1.293)
Non-Performing Loan	−0.032	−0.269	0.027
	(0.071)	(0.176)	(0.313)
ROA	−0.000	−0.079**	−0.062
	(0.014)	(0.037)	(0.050)
Tier 1 Capital Ratio	0.063*	0.311***	−0.086
	(0.033)	(0.060)	(0.098)
AFS Unrealized Gains (*Losses*)	−0.680**	2.212***	1.801**
	(0.293)	(0.457)	(0.830)
Observations	12,461	12,461	12,456
Year-Quarter FE	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes
Adjusted R^2	0.846	0.905	0.829

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.
This table examines whether and how AA banks changed their classifications of securities as HTM versus AFS around the phase-in of the AOCI filter removal. The dependent variables in columns (1) through (3) are *HTM, AFS,* and *AFS/Securities,* respectively. The explanatory variable of interest is *POST* × *AABH*. Standard errors in parentheses are corrected for heteroscedasticity and clustered by bank holding company.
All variables are defined in Appendix A.

Validations Prior to Testing H3 and H4

We conduct two validations prior to testing H3 and H4. First, we test whether AA banks increased their HTM classification of securities deemed good collateral (i.e., readily pledgeable in repurchase agreements) around the AOCI filter removal. We define good collateral securities narrowly as U.S. Treasuries plus agency-sponsored mortgage-backed securities, as these are the two most common (but by no means only) types of securities pledged in repurchase agreements, and they typically receive the lowest haircuts (Copeland, Duffie, Martin, and McLaughlin 2012). Column (1) of Table 4, Panel A reports the OLS estimation of a regression of *HTM Good Collateral* on $POST_t \times AABH_i$ and the usual control variables and fixed effects. The coefficient on $POST_t \times AABH_i$ is significantly positive (0.020, $p < 0.01$), indicating that the average AA bank increased good collateral securities classified as HTM by 2 percent of assets around the AOCI filter removal. Column (2) of the panel reports the OLS estimation of an expanded model that includes interactions of $POST_t \times AABH_i$ with the indicators $\Delta HTM\ High$ and $\Delta AFS\ High$. The coefficient on $\Delta HTM\ High_i \times POST_t \times AABH_i$ is significantly positive (0.024, $p < 0.01$), indicating that AA banks with above-median increases in HTM securities around the filter removal increased good collateral securities classified as HTM by 2.4 percent of assets compared to AA banks with below-median increases in HTM securities.

We next test whether banks rely on sales of AFS securities to fund loan growth. Table 4, Panel B reports the OLS estimation of a regression of quarterly *Loan Growth* on the quarterly net proceeds from sales of AFS securities, *AFS Net Proceeds,* and the usual control variables and fixed effects. The coefficient on *AFS Net Proceeds* is significantly positive (0.478, $p < 0.05$), indicating that, on average, banks use 47.8 cents per dollar of these proceeds to fund loan growth.[32]

[32] If we include controls for banks' primary other forms of financing (namely, changes in deposits, borrowings under repurchase agreements, federal funds borrowed, and equity capital) in the regression, then the coefficient on *AFS Net Proceeds* becomes smaller, but more significant (0.380, $p < 0.01$).

TABLE 3

Changes in Security Risk

Panel A: Credit Risk

	(1) *Securities Risk*	(2) *HTM Risk*	(3) *AFS Risk*
POST × *AABH*	−0.057***	−0.071**	−0.060***
	(0.021)	(0.034)	(0.021)
Log(*Assets*)	−0.002	−0.005	−0.004
	(0.013)	(0.039)	(0.014)
Deposit	−0.156**	−0.222	−0.122
	(0.069)	(0.168)	(0.081)
Cash	0.098	0.112	0.095
	(0.087)	(0.106)	(0.094)
Loans to Deposits	0.011	0.052	0.015
	(0.008)	(0.085)	(0.010)
Loan Loss Reserve	0.821	0.064	−0.031
	(0.681)	(2.151)	(0.875)
Non-Performing Loan	−0.448***	−0.275	−0.368*
	(0.161)	(0.610)	(0.193)
ROA	0.055	−0.329*	0.073
	(0.045)	(0.192)	(0.048)
Tier 1 Capital Ratio	−0.267***	−0.216	−0.272***
	(0.083)	(0.162)	(0.089)
AFS Unrealized Gains (*Losses*)	−1.422	−2.092*	−1.785
	(1.343)	(1.162)	(1.400)
Observations	12,461	7,365	12,416
Year-Quarter FE	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes
Adjusted R^2	0.790	0.799	0.764

Panel B: Interest Rate Risk

	(1) *Weighted Maturity*	(2) *Weighted Maturity*	(3) *Weighted Maturity*
Δ*HTM High* × *POST* × *AABH*		−0.036	
		(0.197)	
Δ*AFS High* × *POST* × *AABH*		−0.458**	
		(0.206)	
Δ*HTM* × *POST* × *AABH*			−2.070
			(4.338)
Δ*AFS* × *POST* × *AABH*			−2.493**
			(1.174)
POST × *AABH*	0.091	0.321*	0.083
	(0.125)	(0.171)	(0.267)
Log(*Assets*)	0.181	0.180	0.179
	(0.117)	(0.118)	(0.117)
Deposit	0.627	0.639	0.637
	(0.512)	(0.514)	(0.513)
Cash	−1.060**	−1.076**	−1.097**
	(0.487)	(0.487)	(0.490)
Loans to Deposits	−0.100	−0.101	−0.101
	(0.112)	(0.112)	(0.112)
Loan Loss Reserve	−1.589	−1.556	−1.752
	(5.942)	(5.957)	(5.962)

(continued on next page)

TABLE 3 (continued)

	(1) *Weighted Maturity*	(2) *Weighted Maturity*	(3) *Weighted Maturity*
Non-Performing Loan	−2.024	−2.038	−2.005
	(1.704)	(1.703)	(1.703)
ROA	0.258	0.258	0.253
	(0.427)	(0.427)	(0.427)
Tier 1 Capital Ratio	−0.601	−0.598	−0.604
	(0.627)	(0.628)	(0.627)
AFS Unrealized Gains (*Losses*)	−0.983	−0.830	−0.662
	(3.822)	(3.786)	(3.791)
Observations	12,430	12,430	12,430
Year-Quarter FE	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes
Adjusted R^2	0.828	0.828	0.828

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.
This table examines whether and how AA banks changed the risk of their HTM and AFS securities around the AOCI filter removal. In Panel A, the dependent variables in columns (1), (2), and (3) are *Securities Risk, HTM Risk,* and *AFS Risk,* respectively. The explanatory variable of interest is *POST* × *AABH*. In Panel B, the dependent variable in columns (1) through (3) is *Weighted Maturity*. The explanatory variables of interest are *POST* × *AABH* in column (1), Δ*AFS High* × *POST* × *AABH* in column (2), and Δ*AFS* × *POST* × *AABH* in column (3). Standard errors in parentheses are corrected for heteroscedasticity and clustered by bank holding company.
All variables are defined in Appendix A.

Consequences of Increased Classification of Securities as HTM

Borrowing under Repurchase Agreements

H3 predicts that AA banks that classify more securities as HTM around the AOCI filter removal increase borrowings under repurchase agreements compared to other AA banks. To test H3, column (1) of Table 5 reports the OLS estimation of Equation (3) with $Repo\ Borrowed_{i,t}$ as the dependent variable. As expected, column (1) reports that the coefficient on $\Delta HTM\ High_i \times POST_t \times AABH_i$ is significantly positive (0.023, $p < 0.05$). This coefficient indicates that AA banks with above-median increases in *HTM* around the filter removal increased borrowings under repurchase agreements by 2.3 percentage points more than other AA banks, all else equal. In contrast, the coefficient on $\Delta AFS\ High_i \times POST_t \times AABH_i$ is significantly negative (−0.025, $p < 0.05$). The opposing signs of these coefficients are consistent with AA banks increasing the classification of good collateral securities as HTM around the filter removal, and also with these banks primarily raising financing based on AFS securities through sales of the securities. These opposing signs are inconsistent with the increased borrowing under repurchase agreements being attributable to decreased securities risk, given that Table 3, Panel A reports that the credit risk of *both* classifications of securities significantly decreases around the filter removal. Moreover, Table 3, Panel B reports that the interest rate risk of securities decreases for AA banks with above-median increases in (saleable) AFS securities around the filter removal.[33]

To provide a sense for the proportion of the incremental HTM securities that AA banks pledge in repurchase agreements, column (3) of Table 5 reports the estimation of a variant of Equation (3) in which Δ*HTM High* and Δ*AFS High* are replaced

[33] We conduct four untabulated analyses to show the robustness and increase the interpretability of our tests of H3. First, we estimate an expansion of Equation (3) that includes interactive controls for changes in banks' securities risk, with no effect on our inferences. Second, we estimate Equation (3) replacing Δ*HTM High* with Δ*HTM Good Collateral High* and Δ*HTM Other Collateral High*. The coefficient on $\Delta HTM\ Good\ Collateral\ High_i \times POST_t \times AABH_i$ is significantly positive (0.021, $p < 0.05$). In contrast, the coefficient on $\Delta HTM\ Other\ Collateral\ High_i \times POST_t \times AABH_i$, while only about a quarter less positive (0.016), is insignificant, consistent with HTM other collateral containing less good collateral. This analysis, thus, provides weak evidence that our findings for borrowings under repurchase agreements are stronger when AA banks' incremental HTM securities are better collateral. Third, we estimated banks' expected loan growth in the current quarter as a linear function of its loan growth and funds raised from deposits, borrowings under repurchase agreements, and equity in the prior quarter. We find that in the subsample of bank-quarters with current-quarter loan growth above its expected value, AA banks that increase HTM securities more around the AOCI filter removal increase borrowings under repurchase agreements more. This result supports our argument that AA banks pledge the incremental HTM securities around the filter removal in repurchase agreements to help fund loan growth. Last, we find that borrowings under repurchase agreements increase gradually for Δ*HTM High* AA banks after the AOCI filter removal, consistent with the banks entering into the agreements as their liquidity needs arise over time.

TABLE 4

Validation Tests for Repurchase Agreement Borrowing and Loan Supply Analyses

Panel A: Changes in U.S. Treasuries Classified as HTM around the AOCI Filter Removal

	(1) *HTM* *Good Collateral*	(2) *HTM* *Good Collateral*
$\Delta HTM\ High \times POST \times AABH$		0.024***
		(0.007)
$\Delta AFS\ High \times POST \times AABH$		−0.018***
		(0.007)
$POST \times AABH$	0.020***	0.017***
	(0.005)	(0.006)
Log(*Assets*)	0.004	0.003
	(0.005)	(0.005)
Deposit	−0.025	−0.023
	(0.022)	(0.022)
Cash	−0.058***	−0.058***
	(0.020)	(0.020)
Loans to Deposits	−0.006*	−0.006*
	(0.004)	(0.004)
Loan Loss Reserve	−0.097	−0.122
	(0.203)	(0.204)
Non-Performing Loan	−0.056	−0.054
	(0.054)	(0.054)
ROA	0.002	0.002
	(0.010)	(0.010)
Tier 1 Capital Ratio	0.045*	0.045*
	(0.026)	(0.026)
AFS Unrealized Gains (*Losses*)	−0.360*	−0.341*
	(0.192)	(0.190)
Observations	12,461	12,461
Year-Quarter FE	Yes	Yes
BHC FE	Yes	Yes
Adjusted R^2	0.841	0.842

(continued on next page)

with the continuous changes in *HTM* (ΔHTM) and *AFS* (ΔAFS), respectively. The coefficient on $\Delta HTM_i \times POST_t \times \times AABH_i$ is weakly significantly positive (0.318, $p < 0.10$), consistent with the result in column (1), and indicating that AA banks pledge a substantial 31.8 percent of their incremental HTM securities in repurchase agreements. This high percentage likely reflects AA banks classifying good collateral securities as HTM, consistent with the results for U.S. Treasuries reported in Table 4, Panel A. In contrast, the coefficient on $\Delta AFS_i \times POST_t \times AABH_i$ is insignificantly negative. To the best of our knowledge, our finding that increased classification of securities as HTM induces banks to rely more on borrowings under repurchase agreements is entirely new in any context.

Loan Supply: Loan Growth

H4 predicts that AA banks that classify more securities as HTM around the AOCI filter removal reduce loan supply more than other AA banks. To test H4, column (2) of Table 5 reports the OLS estimation of Equation (4) with $Loan_{i,t}$ as the dependent variable. Consistent with H4, column (2) reports that the coefficient on $\Delta HTM\ High_i \times POST_t \times AABH_i$ is significantly negative (−0.027, $p < 0.05$).

To provide a sense for the proportionate decrease in loans that results from banks' classification of securities as HTM, column (4) of Table 5 reports the estimation of Equation (4) replacing $\Delta HTM\ High$ and $\Delta AFS\ High$ with the continuous variables ΔHTM and ΔAFS, respectively. The coefficient on $\Delta HTM_i \times POST_t \times AABH_i$ is significantly negative (−0.609, $p <$

TABLE 4 (continued)

Panel B: Funding Loan Growth through Sale of AFS Securities

Variables	*Loan Growth*
AFS Net Proceeds	0.478**
	(0.205)
Log(*Assets*)	0.048**
	(0.021)
Deposit	0.139**
	(0.058)
Cash	−0.105*
	(0.054)
Loans to Deposits	0.006
	(0.014)
Loan Loss Reserve	−2.352***
	(0.704)
Non-Performing Loan	0.233
	(0.370)
ROA	−0.229
	(0.515)
Tier 1 Capital Ratio	−0.193
	(0.122)
AFS Unrealized Gains (*Losses*)	−0.393
	(0.282)
Observations	597
Year-Quarter FE	Yes
BHC FE	Yes
Adjusted R^2	0.221

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.
Panel A establishes that AA banks increased their classification of good collateral securities as HTM around the AOCI filter removal. The dependent variable is *HTM Good Collateral*. The explanatory variables of interest are $POST \times AABH$ in column (1), and $\Delta HTM\ High \times POST \times AABH$ in column (2). Panel B establishes that banks fund loan growth using the net proceeds from sales of AFS securities. The dependent variable is quarterly *Loan Growth*. The explanatory variable of interest is *AFS Net Proceeds*. Because cash flow statement data on sales and purchases of AFS securities must be hand-collected from banks' financial reports, we limit the sample to public CCAR banks. Standard errors in parentheses are corrected for heteroscedasticity and clustered by bank holding company.
All variables are defined in Appendix A.

0.01), consistent with the result reported in column (2). This coefficient is also significantly more negative (by −0.276, $p < 0.05$) than the coefficient on $\Delta AFS_i \times POST_t \times AABH_i$ (−0.333, $p < 0.01$), indicating that the classification of $1 of securities as HTM, rather than as AFS, reduces lending by 27.6 cents.[34]

2SLS/Instrumental Variable Approach

We also test H3 and H4 using the alternative 2SLS/instrumental variable approach described in Section III. Column (1) of Table 6 reports the estimation of the first-stage model with dependent variable $\Delta HTM_{i,2011\text{-}16}$, instrumental variable $AFS_{i,2011} \times AABH_i$, and the control variables in the form of changes from 2011 to 2016. The instrument is strong, with a highly significant partial F-statistic (16.57, $p < 0.01$). Testing H3, column (2) of Table 6 reports the estimation of the second-stage model with $\Delta Repo\ Borrowed_{i,2011\text{-}16}$ as the dependent variable. The explanatory variable of interest is the predicted value of $\Delta HTM_{i,2011\text{-}16}$

[34] As reported in columns (1) and (3) of Table 5, increased classification of securities as HTM is associated with increased borrowings under repurchase agreements. These borrowings enable increased loan growth, all else equal. In untabulated analysis, we provide evidence of this increased loan growth by replicating the loan growth analysis in column (2) of Table 5 adding $\Delta Repo\ High_i \times POST_t \times AABH_i$ and $\Delta Repo\ High_i \times \Delta HTM\ High_i \times POST_t \times AABH_i$ to the model. We find that the coefficient on $\Delta Repo\ High_i \times POST_t \times AABH_i$ is significantly negative (−0.040, $p < 0.05$), consistent with increased borrowings under repurchase agreements not fully mitigating the decrease in AA banks' financing options associated with increased classification of securities as HTM. We find that the coefficient on $\Delta Repo\ High_i \times \Delta HTM\ High_i \times POST_t \times AABH_i$ is weakly significantly positive (0.036, $p < 0.10$), however, consistent with increased borrowings under repurchase agreements enabling increased loan growth, all else equal.

TABLE 5

Effects of Classification of Securities as HTM

	(1) *Repo Borrowed*	(2) *Loan*	(3) *Repo Borrowed*	(4) *Loan*
$\Delta HTM\ High \times POST \times AABH$	0.023**	−0.027**		
	(0.011)	(0.011)		
$\Delta AFS\ High \times POST \times AABH$	−0.025**	−0.024**		
	(0.011)	(0.011)		
$\Delta HTM \times POST \times AABH$			0.318*	−0.609***
			(0.174)	(0.188)
$\Delta AFS \times POST \times AABH$			−0.022	−0.333***
			(0.073)	(0.084)
$POST \times AABH$	−0.004	0.010	−0.021*	0.000
	(0.010)	(0.011)	(0.012)	(0.009)
Log(*Assets*)	−0.001	−0.010	−0.001	−0.010
	(0.002)	(0.011)	(0.002)	(0.011)
Deposit	−0.162***	0.197***	−0.164***	0.199***
	(0.058)	(0.074)	(0.058)	(0.074)
Cash	0.004	−0.385***	0.005	−0.389***
	(0.007)	(0.039)	(0.007)	(0.039)
Loans to Deposits	−0.011*	0.077**	−0.011*	0.077**
	(0.006)	(0.036)	(0.006)	(0.037)
Loan Loss Reserve	−0.123	2.610***	−0.123	2.583***
	(0.126)	(0.520)	(0.129)	(0.518)
Non-Performing Loan	−0.030	−0.137	−0.030	−0.133
	(0.030)	(0.148)	(0.030)	(0.148)
ROA	−0.016	0.032	−0.017	0.031
	(0.015)	(0.045)	(0.015)	(0.045)
Tier 1 Capital Ratio	−0.015	−0.429***	−0.016	−0.430***
	(0.020)	(0.074)	(0.020)	(0.074)
AFS Unrealized Gains (*Losses*)	0.084	−1.033***	0.087	−1.007***
	(0.080)	(0.306)	(0.081)	(0.303)
F-test of $\Delta HTM \times POST \times AABH = \Delta AFS \times POST \times AABH$			5.102**	4.355**
Observations	12,461	12,461	12,461	12,461
Year-Quarter FE	Yes	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.876	0.953	0.875	0.953

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.
This table examines the effects of above- versus below-median increases in AA banks' classification of securities as HTM around the AOCI filter removal. The dependent variables are *Repo Borrowed* in columns (1) and (2), and *Loan* in columns (3) and (4). The explanatory variable of interest is $\Delta HTM\ High \times POST \times AABH$ in columns (1) and (2), and $\Delta HTM \times POST \times AABH$ in columns (3) and (4). Standard errors in parentheses are corrected for heteroscedasticity and clustered by bank holding company.
All variables are defined in Appendix A.

from the first-stage model. Consistent with H3 and the results in column (1) of Table 5, the coefficient on the predicted value of $\Delta HTM_{i,2011\text{-}16}$ is weakly significantly positive (0.236, $p < 0.10$). This coefficient implies that a one-standard-deviation increase in the predicted value of ΔHTM yields a 1.2 percentage point increase in Δ*Repo Borrowed*.[35]

Testing H4, column (3) of Table 6 reports the estimation of the second-stage model with $\Delta Loan_{i,2011\text{-}16}$ as the dependent variable. The explanatory variable of interest is the predicted value of $\Delta HTM_{i,2011\text{-}16}$ from the first-stage model. Consistent with H4 and the results in column (2) of Table 5, the coefficient on the predicted value of $\Delta HTM_{i,2011\text{-}16}$ is significantly negative

[35] We obtain this estimate by multiplying the standard deviation of ΔHTM (0.049) by the coefficient on the predicted value of ΔHTM from column (2) of Table 6 (i.e., $0.049 * 0.236 = 0.012$).

TABLE 6

Effects of Classification of Securities as HTM—Alternative 2SLS/Instrument Variable Approach

	(1) 1st Stage ΔHTM	(2) $\Delta Repo\ Borrowed$	(3) $\Delta Loan$
IV: $AFS_{2011} \times AABH$	0.230***		
	(0.056)		
EV: Predicted Value of ΔHTM		0.236*	−0.630**
		(0.134)	(0.299)
$\Delta Log(Assets)$	0.001	0.001	−0.012
	(0.008)	(0.004)	(0.014)
$\Delta Deposit$	0.017	−0.230***	0.195**
	(0.048)	(0.080)	(0.098)
$\Delta Cash$	−0.138**	0.024	−0.277***
	(0.053)	(0.031)	(0.101)
$\Delta Loans\ to\ Deposits$	−0.006	−0.015*	0.067**
	(0.007)	(0.008)	(0.032)
$\Delta Loan\ Loss\ Allowance$	−0.507	0.141	3.106***
	(0.534)	(0.323)	(0.891)
$\Delta Non\text{-}Performing\ Loan$	0.115	−0.058	−0.240
	(0.182)	(0.090)	(0.269)
ΔROA	−0.051	−0.098	−0.135
	(0.237)	(0.133)	(0.565)
$\Delta Tier\ 1\ Capital\ Ratio$	0.022	−0.034	−0.558***
	(0.054)	(0.029)	(0.126)
$\Delta AFS\ Unrealized\ Gains\ (Losses)$	−1.157**	0.461	−1.362*
	(0.462)	(0.299)	(0.709)
Constant	−0.001	−0.007***	0.057***
	(0.005)	(0.003)	(0.009)
Observations	384	384	384
R^2	0.073	0.088	0.362
Partial F-Statistics	16.57***		

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.

This table examines consequences of AA banks' classification of securities as HTM around the AOCI filter removal, using an alternative 2SLS/instrument variable approach. In the first-stage model whose estimation is reported in column (1), AA banks' ratio of AFS securities to assets at the end of 2011, $AFS_{2011} \times AABH$, is the instrument for the change in the ratio of HTM securities divided by assets, ΔHTM, around the beginning of the phase-in of the AOCI filter removal. The dependent variables in the second-stage models reported in columns (2) and (3) are $\Delta Repo\ Borrowed$ and $\Delta Loan$, respectively. The explanatory variable of interest in these models is the predicted value of ΔHTM from the estimation of the first-stage model. Robust standard errors are reported in parentheses.

All variables are defined in Appendix A.

(−0.630, $p < 0.05$). This coefficient implies that a one-standard-deviation increase in the predicted value of ΔHTM yields a 3.1 percentage point decrease in $\Delta Loan$.[36]

Consequences of Decreased Securities Risk

Loan Risk

H5 predicts that AA banks that decrease securities risk more around the AOCI filter removal increase loan risk to mitigate the reduction of their interest rate spread. To test H5, columns (1) and (2) of Table 7 report the OLS estimation of Equation (5) with $Loan\ Risk_{i,t}$ and $Loan \geq 100\%/Loan_{i,t}$, respectively, as the dependent variable. Consistent with H5, the coefficients on $\Delta HTM\ Risk\ Low_i \times POST_t \times AABH_i$ and $\Delta AFS\ Risk\ Low_i \times POST_t \times AABH_i$ are significantly positive in both column (1) (0.093, $p < 0.05$; 0.118, $p < 0.05$) and column (2) (0.158, $p < 0.01$; 0.164, $p < 0.01$). The coefficients reported in column (1)

[36] We obtain this estimate by multiplying the standard deviation of ΔHTM (0.049) by the coefficient on the predicted value of ΔHTM from column (3) of Table 6 (i.e., $0.049 * -0.630 = -0.031$).

TABLE 7

Changes in Loan and Asset Credit Risk

	(1) *Loan Risk*	(2) *Loan ≥ 100%/Loan*	(3) *Asset Risk*
ΔHTM Risk Low × POST × AABH	0.093**	0.158***	0.003
	(0.046)	(0.060)	(0.017)
ΔAFS Risk Low × POST × AABH	0.118**	0.164***	−0.011
	(0.048)	(0.060)	(0.017)
POST × AABH	−0.061	−0.108*	0.013
	(0.044)	(0.061)	(0.011)
Log(Assets)	−0.015	−0.013	−0.019
	(0.012)	(0.016)	(0.013)
Deposit	−0.031	−0.015	0.087
	(0.053)	(0.073)	(0.063)
Cash	0.072*	0.087	−0.381***
	(0.042)	(0.054)	(0.056)
Loans to Deposits	0.003	0.009	0.053**
	(0.009)	(0.010)	(0.021)
Loan Loss Reserve	1.914***	2.823***	2.314***
	(0.533)	(0.736)	(0.544)
Non-Performing Loan	−0.905***	−1.014***	−0.738***
	(0.190)	(0.232)	(0.175)
ROA	0.001	−0.008	−0.010
	(0.036)	(0.046)	(0.044)
Tier 1 Capital Ratio	−0.537***	−0.645***	−0.689***
	(0.082)	(0.104)	(0.091)
AFS Unrealized Gains (Losses)	0.683**	0.781*	−0.890**
	(0.328)	(0.451)	(0.391)
Observations	12,461	12,461	12,461
Year-Quarter FE	Yes	Yes	Yes
BHC FE	Yes	Yes	Yes
Adjusted R^2	0.872	0.912	0.925

***, **, * Denote significance at the 1 percent, 5 percent, and 10 percent levels, respectively, in two-tailed tests.
This table examines how AA banks changed the credit risk of their loans and assets around the AOCI filter removal. The dependent variables in columns (1) through (3) are *Loan Risk, Loan ≥ 100%/Loan,* and *Asset Risk,* respectively. The explanatory variable of interest is *ΔHTM Risk Low × POST × AABH*. Standard errors in parentheses are corrected for heteroscedasticity and clustered by bank holding company.
All variables are defined in Appendix A.

imply that AA banks with below-median increases in *HTM Risk* (*AFS Risk*) around the filter removal increased *Loan Risk* by 9.3 (11.8) percentage points more than other AA banks, all else equal. Similarly, the coefficients reported in column (2) imply that AA banks with below-median increases in *HTM Risk* (*AFS Risk*) increased loans with risk weights of at least 100 percent divided by loans by 15.8 (16.4) percentage points more than other AA banks around the filter removal, all else equal.

Asset Risk

As discussed above, we find that AA banks decreased the risk of their securities, but increased the risk of their loans, around the AOCI filter removal. To get a sense for whether one of these effects dominates the other, column (3) of Table 7 reports the OLS estimation of a regression of a measure of total asset risk, *Asset Risk,* on the explanatory variables of interest, $\Delta HTM\ Risk\ Low_i \times POST_t \times AABH_i$ and $\Delta AFS\ Risk\ Low_i \times POST_t \times AABH_i$, and the usual control variables. The coefficients are insignificantly different from zero, suggesting that the decrease in securities risk and increase in loan risk largely offset.[37]

[37] In untabulated analysis, we also examine the changes in the volatilities of AA banks' unrealized gains and losses on AFS securities and regulatory capital around the AOCI filter removal. We find the volatility of these banks' unrealized gains and losses on AFS securities significantly decreases and the volatility of their regulatory capital does not change, again consistent with offsetting changes in these banks' securities risk and loan risk.

Alternative Tests for Loan Supply and Risk: Loan-Level Mortgage Approval Rates[38]

In untabulated alternative tests of H4, we estimate an OLS (i.e., linear probability model) loan-level model akin to the loan growth model reported in column (4) of Table 5, but with a binary variable for mortgage approval as the dependent variable. Consistent with H4 and the results for loan growth, we find that the coefficient on the explanatory variable of interest $\Delta HTM \times POST_t \times AABH_i$ is both significantly negative (-1.917, $p < 0.01$) and significantly more negative (by 1.062, $p < 0.01$) than the coefficient on $\Delta AFS \times POST_t \times AABH_i$, consistent with the AA banks' classification of an incremental 1 percent of assets as HTM, rather than AFS, securities reducing mortgage approval rates by 1.062 percentage points.

We expect that AA banks decrease origination of lower-margin mortgages to compensate for their reduced yield on securities, consistent with H5, and perhaps also because of the imposition of increased regulatory capital requirements under the U.S. implementation of Basel III and increased regulatory costs of mortgage lending under the Dodd-Frank Act (D'Acunto and Rossi 2017). To test this expectation, we estimated an OLS loan-level model akin to the loan risk model in column (1) of Table 7, but with a binary variable for mortgage approval as the dependent variable, and with an indicator for either low credit risk governmental or low debt-to-income ratio mortgages interacted with the explanatory variables of interest. Consistent with H5 and the results for loan risk, we find that AA banks that reduce their securities risk more decrease origination of lower-risk mortgages by significantly more than they decrease origination of other mortgages.

Robustness Test: Controlling for the Level and Risk of AFS Securities

A possible explanation for our results for H3–H5 is that AA banks that increase HTM securities around the AOCI filter removal take other actions to reduce the probability that unrealized losses on the remaining AFS securities cause them to violate regulatory capital requirements. To rule out this possibility, in untabulated analysis, we replicate our primary tests of H3–H5 controlling for AFS securities and the historical volatility of unrealized gains and losses on AFS securities. While the coefficients on the two new control variables usually are significant, our inferences are unaffected.

Robustness Test: Restricted Sample of CCAR Banks

Although our full sample only includes banks with at least $1 billion in assets, sample heterogeneity may remain that is not captured by the bank characteristics and bank fixed effects in our empirical models. To ensure that such heterogeneity does not drive our primary results, in untabulated analysis, we replicate the primary analyses using a restricted control sample of 15 non-AA banks subject to CCAR. Owing to the loss of statistical power, the significance of the coefficients on most of the explanatory variables of interest slightly decline. In the models testing H1, H2 using our interest rate risk proxy, and H3–H5, these coefficients retain their signs and are significant. However, in the models testing H2 using our credit risk proxies, these coefficients are insignificant. Further analysis indicates that these non-results are attributable to non-AA CCAR banks increasing (zero risk weight) Ginnie Mae mortgage-backed securities and decreasing (20 percent risk weight) other agency mortgage-backed securities more than AA banks, likely owing to the more favorable treatment of Ginnie Mae securities than of other agency securities under the liquidity coverage ratio imposed in 2015 (Ihrig, Kim, Kumbhat, Vojtech, and Weinbach 2018; Roberts, Sarkar, and Shachar 2018). Consistent with this explanation and H2, we find that AA banks significantly increased U.S. Treasuries compared to other CCAR banks around the AOCI filter removal. These results provide further assurance that our primary results are not driven by other contemporaneous regulations targeting very large banks.[39]

VI. CONCLUSION

Our study contributes insights to the literature examining the consequences of the AOCI filter removal for AA banks, a controversial provision of the U.S. implementation of Basel III. Along with Hamilton (2019), we provide the first evidence that AA banks increased their HTM securities around the filter removal compared to non-AA banks. We expand Chircop and Novotny-Farkas' (2016) evidence that AA banks reallocated more securities to safer types around the AOCI filter removal than non-AA banks. Last, we provide the first evidence of the following indirect consequences of the filter removal: AA banks with above-median increases in HTM securities around the filter removal increased borrowings under repurchase agreements and

[38] For brevity, we do not tabulate the remaining tests discussed in the paper or describe the construction of the sample and variables for the tests using loan-level mortgage approval rates, which are drawn from the Home Mortgage Disclosure Act (HMDA) database. We provide these tabulations and the descriptions of the HMDA sample and variables in the Online Appendix (see Appendix B for the link to the downloadable file).

[39] For example, the domestic systemically important bank (D-SIB) designation cannot explain our results because all CCAR banks except TD Bank US are D-SIBs. Global systemically important bank (G-SIB) designation also is unlikely to drive our full set of results. Although eight of the 15 AA banks and none of the non-AA banks are G-SIBs, only three of the seven AA banks with above-median ΔHTM are G-SIBs.

reduced loan supply compared to other AA banks, and AA banks with below-median increases in securities risk around the filter removal increased loan risk more than other AA banks.

Our paper also contributes insights to the literature examining banks' discretionary classification of securities. Similar to early studies by Beatty (1995) and Hodder et al. (2002) that examine banks' initial adoption of FAS 115 and the imposition of the AOCI filter from 1993 to 1995, but employing difference-in-differences research designs, our evidence suggests that HTM classification reduces banks' financing and interest rate risk management options. These adverse consequences explain why some banks are reluctant to classify securities as HTM even when this classification increases the level and reduces the volatility of regulatory capital.

We document these effects in the relatively stable, gradually improving period around the AOCI filter removal in 2014. Our evidence suggests that the combination of the filter removal and the HTM security tainting rule suppresses AA banks' securities risk and loan growth, but increases the banks' loan risks, overall tamping down on the banks' procyclical behavior. An open question for future research is whether these effects will persist in downturns and, if so, whether the effects will accentuate the banks' procyclical behavior in those periods.

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APPENDIX A

Variable Definitions

Variable	Description
Dependent Variables	
HTM	(Amortized cost of) HTM securities divided by total assets, bhck1754/bhck2170.
AFS	(Fair value of) AFS securities divided by total assets, bhck1773/bhck2170.
AFS/Securities	AFS securities divided by combined HTM and AFS securities, bhck1773/(bhck1753 + bhck1773).
Weighted Maturity	Weighted average of securities maturity or time to first repricing, (bhck0384 + 5 * bhck0387)/(bhck0383 + bhck0384 + bhck0387).
HTM Good Collateral	U.S. Treasuries plus agency-sponsored mortgage-backed securities classified as HTM divided by total assets, (bhck0211 + bhckg300 + bhckg304 + bhckg312 + bhckg316 + bhckk142 + bhckk150)/bhck2170.
Loan Growth	Quarterly change in loans divided by total assets, Δbhck2122/bhck2170.
Repo Borrowed	Borrowings under repurchase agreements divided by total assets, bhckb995/bhck2170.
Loan	Total loans and leases (net of unearned income) divided by total assets, bhck2122/bhck2170.
HTM Risk	Risk-weighted HTM securities divided by total HTM securities, *before 2014 (2015) for AA (non-AA) banks:* (bhc01754 * 0.00 + bhc21754 * 0.20 + bhc51754 * 0.50 + bhc91754 * 1.00)/(bhck1754 − bhce1754), and *after:* (bhckd962 * 0.00 + bhckd963 * 0.20 + bhckd964 * 0.50 + bhckd965 * 1.00 + bhcks400 * 1.50)/(bhckd961 − bhcks399).
AFS Risk	Risk-weighted AFS securities divided by total AFS securities, *before 2014 (2015) for AA (non-AA) banks:* (bhc01773 * 0.00 + bhc21773 * 0.20 + bhc51773 * 0.50 + bhc91773 * 1.00)/(bhck1773 − bhce1773), and *after:* (bhckd967 * 0.00 + bhckd968 * 0.20 + bhckd969 * 0.50 + bhckd970 * 1.00 + bhcks403 * 1.50 + bhcks405 * 3.00 + bhcks406 * 6.00 + bhckh272)/(bhckd966 − bhcks402).
Securities Risk	Risk-weighted combined HTM and AFS securities divided by total combined HTM and AFS securities, *before 2014 (2015) for AA (non-AA) banks:* (bhc01754 * 0.00 + bhc21754 * 0.20 + bhc51754 * 0.50 + bhc91754 * 1.00 + bhc01773 * 0.00 + bhc21773 * 0.20 + bhc51773 * 0.50 + bhc91773 * 1.00)/(bhck1754 − bhce1754 + bhck1773 − bhce1773), and *after:* (bhckd962 * 0.00 + bhckd963 * 0.20 + bhckd964 * 0.50 + bhckd965 * 1.00 + bhcks400 * 1.50 + bhckd967 * 0.00 + bhckd968 * 0.20 + bhckd969 * 0.50 + bhckd970 * 1.00 + bhcks403 * 1.50 + bhcks405 * 3.00 + bhcks406 * 6.00 + bhckh272)/(bhckd961 − bhcks399 + bhckd966 − bhcks402).
Loan Risk	Risk-weighted loans divided by total loans and leases (net of unearned income), *before 2014 (2015) for AA (non-AA) banks:* (bhc05369 * 0.00 + bhc0b528 * 0.00 + bhc25369 * 0.20 + bhc2b528 * 0.20 + bhc55369 * 0.50 + bhc5b528 * 0.50 + bhc95369 * 1.00 + bhc9b528 * 1.00)/(bhck5369 − bhce5369 + bhckb528 − bhceb528), and *after:* [(bhckh173 + bhckh174 + bhcks425 + bhcks433 + bhckh178 + bhckh179 + bhcks451 + bhckh459) * 0.00 + (bhcks415 + bhckh175 + bhcks426 + bhcks434 + bhcks441 + bhckh180 + bhcks452 + bhcks460) * 0.20 + (bhcks416 + bhckh176 + bhcks427 + bhcks435 + bhcks442 + bhckh181 + bhcks453 + bhcks461) * 0.50 + (bhcks417 + bhckh177 + bhcks428 + bhcks436 + bhcks443 + bhckh182 + bhcks454 + bhcks462) * 1.00 + (bhcks421 + bhcks429 + bhcks437 + bhcks447 + bhcks455 + bhcks463) * 1.50 + (bhckh274 + bhckh276 + bhckh278 + bhckh280 + bhckh282 + bhckh284 + bhckh286, bhckh288)]/(bhcks413 − bhcks414 + bhcks419 − bhcks420 + bhcks423 − bhcks424 + bhcks431 − bhcks432 + bhcks439 − bhcks440 + bhcks445 − bhcks446 + bhcks449 − bhcks450 + bhcks457 − bhcks459).
Loan ≥ 100%/Loan	Loans with 100 percent or higher risk weights divided by total loans and leases (net of unearned income), *before 2014 (2015) for AA (non-AA) banks:* (bhc95369 + bhc9b528)/(bhck5369 − bhce5369 + bhckb528 − bhceb528), and *after:* (bhcks417 + bhckh177 + bhcks428 + bhcks436 + bhcks443 + bhckh182 + bhcks454 + bhcks462 + bhcks421 + bhcks429 + bhcks437 + bhcks447 + bhcks455 + bhcks463)/(bhcks413 − bhcks414 + bhcks419 − bhcks420 + bhcks423 − bhcks424 + bhcks431 − bhcks432 + bhcks439 − bhcks440 + bhcks445 − bhcks446 + bhcks449 − bhcks450 + bhcks457 − bhcks459).
Asset Risk	Risk-weighted assets divided by total assets, *before 2014 (2015) for AA (non-AA) banks:* bhcka223/bhck2170, and *after:* bhcaa223/bhck2170.

(continued on next page)

APPENDIX A (continued)

Variable	Description
ΔRepo Borrowed	Change in *Repo Borrowed* from December 2011 to December 2016.
ΔLoan	Change in *Loan* from December 2011 to December 2016.
Securities Treasury	Treasuries divided by combined HTM and AFS securities, (bhck1287 + bhck1773)/(bhck1753 + bhck1773).
Explanatory Variables	
POST	An indicator variable equal to 1 for quarters from the first quarter of 2014 to the fourth quarter of 2016, and 0 otherwise.
AABH	An indicator variable equal to 1 for AA banks, and 0 otherwise.
Log(*Assets*)	Natural logarithm of total assets, log(bhck2170).
Deposit	Deposits divided by total assets, (bhdm6631 + bhdm6636 + bhfn6631 + bhfn6636)/bhck2170.
Cash	Cash divided by total assets, (bhck0081 + bhck0395 + bhck0397)/bhck2170.
Loans to Deposits	Loans and leases (net of unearned income and allowance) divided by total deposits, bhckb529/(bhdm6631 + bhdm6636 + bhfn6631 + bhfn6636).
Loan Loss Reserve	Allowance for loan and lease losses divided by total assets, bhck3123/bhck2170.
Non-Performing Loan	Loans not accruing interest or accruing interest, but 90 days or more past due (net of debt securities and other assets), divided by total assets, (bhck5525 + bhck5526 − bhck3506 − bhck3507)/bhck2170.
ROA	Annualized net income divided by total assets, 4 ∗ bhck4340/bhck2170.
Tier 1 Capital Ratio	Tier 1 capital divided by risk-weighted assets, *before 2014 (2015) for AA (non-AA) banks:* bhck8274/bhcka223, and *after:* bhca8274/bhcaa223.
AFS Unrealized Gains (*Losses*)	Difference of the fair value and amortized cost of AFS securities divided by total assets, (bhck1773 − bhck1772)/bhck2170.
AFS Net Proceeds	Net proceeds from AFS purchases, sales, paydowns, and maturity, divided by total assets, collected from 10-Q and 10-K filings.
ΔHTM	Change in HTM from December 2011 to December 2016.
ΔHTM High	An indicator variable equal to 1 if an AA bank's change in HTM from December 2011 to December 2016 is above the median for AA banks, and 0 otherwise.
ΔHTM Risk Low	An indicator variable equal to 1 if an AA bank's change in HTM Risk from December 2011 to December 2016 is below the median for AA banks, and 0 otherwise.
ΔAFS	Change in AFS from December 2011 to December 2016.
ΔAFS High	An indicator variable equal to 1 if an AA bank's change in AFS from December 2011 to December 2016 is above the median for AA banks, and 0 otherwise.
ΔAFS Risk Low	An indicator variable equal to 1 if an AA bank's change in AFS Risk from December 2011 to December 2016 is below the median for AA banks, and 0 otherwise.
ΔLog(*Assets*)	Change in *Log*(*Assets*) from December 2011 to December 2016.
ΔDeposit	Change in *Deposit* from December 2011 to December 2016.
ΔCash	Change in *Cash* from December 2011 to December 2016.
ΔLoans to Deposits	Change in *Loans to Deposits* from December 2011 to December 2016.
ΔLoan Loss Reserve	Change in *Loan Loss Reserve* from December 2011 to December 2016.
ΔNon-Performing Loan	Change in *Non-Performing Loan* from December 2011 to December 2016.
ΔROA	Change in *ROA* from December 2011 to December 2016.
ΔTier 1 Capital Ratio	Change in *Tier 1 Capital Ratio* from December 2011 to December 2016.
ΔAFS Unrealized Gains (*Losses*)	Change in *AFS Unrealized Gains* (*Losses*) from December 2011 to December 2016.
AFS_{2011}	*AFS* in December 2011.

APPENDIX B

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