

Historical Cost vs. Fair Value Accounting: Impairment Choice and Trading Incentives

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Preliminary draft – please do not distribute.

Abstract

We examine how circuit breakers designed to suspend the application of fair value accounting affect financial institutions' trading and investment behavior. An unexpected amendment to the 2013 Volcker Rule announced a prohibition of bank ownership in collateralized debt obligations backed by other financial institutions' trust preferred securities (TruPS CDOs). We observe that in the pre-Volcker period, some banks strategically avoided impairments on these distressed assets, and, consequently, were less likely to dispose of their TruPS CDO holdings. Banks with large implied losses also reacted less to the announcement of the Volcker rule, which otherwise triggered wide-spread divestments of TruPS CDOs. Our results suggest that a suspension of fair value accounting can delay corrective action and creates distorted incentives to inefficiently hold on to distressed assets in times of crisis.

1. Introduction

This paper explores how the strategic utilization of accounting provisions designed to serve as fair value circuit breakers has the potential to affect regulated financial institutions' trading and investment decisions. The 2007/2008 financial crisis raised concerns about the procyclical effects of fair value accounting, in particular regarding the possibility of fire sales and contagion effects in illiquid security markets (Allen and Carletti, 2008; Heaton, Lucas, and McDonald, 2010; Kanodia and Sapra, 2016; Plantin, Sapra, and Shin, 2008). Empirical evidence corroborating such procyclical effects, however, remains sparse (Badertscher, Burks, and Easton, 2012; Bhat, Frankel, and Martin, 2011; Merrill, Nadauld, Stulz, and Sherlund, 2014). One important reason for this lack of empirical support is that, in practice, fair value accounting rules differ substantially from pure mark-to-market accounting. Various accounting provisions allow firms to deviate from market prices and, at least temporarily, to shield accounting profits and book equity from fair value volatility. While such circuit breakers may reduce the risk of fire sales, they can themselves cause problems. In particular, *ex ante*, they plausibly create distorted incentives to invest in excessively risky assets (Chircop and Novotny-Farkas, 2016; Kim, Kim, and Ryan, 2019). *Ex post*, they allow firms to engage in selective gains trading, and to delay corrective asset disposals (Bleck and Liu, 2007; Cantrell and Yust, 2019; Diamond and Rajan, 2011; Ellul, Jotikasthira, Lundblad, and Wang, 2014, 2015). However, despite its potentially important destabilizing effects, there is a dearth of empirical research on the latter mechanism in the banking industry (Bischof, Laux, and Leuz, 2021).

Following the call by Kanodia and Sapra (2016), we use an unexpected shock to the regulatory treatment of a specific class of financial instruments as a laboratory to explore the real effects of fair value circuit breakers and their interaction with banks' capital regulation and other managerial incentives. Our setting is centered around the introduction of the Volcker Rule, which was part of the broader Dodd-Frank Act. The final version of the Volcker Rule was published on December 10, 2013, and was scheduled to go into effect on April 1, 2014. It included an unexpected amendment that prohibited bank ownership in collateralized debt obligations backed by other financial institutions' trust preferred securities (TruPS

CDOs) (Stovall, 2013). TruPS CDOs were a popular investment security in the 2000s, but became distressed and illiquid after the financial crisis. Banks typically held the CDOs in their held-to-maturity (HTM) or available-for-sale (AFS) portfolios, which allowed them to defer the recognition of substantial losses in market value as long as they claimed to have the “intent and ability” to hold assets until maturity, and that it was more likely than not that they would not be required to sell the securities before the recovery of their amortized cost basis.¹ As the Volcker Rule required banks to divest their TruPS CDO holdings by July 21, 2015 (with a possible extension until 2017), maintaining this assumption was no longer possible, implying write-offs to current market value and the future recognition of fair value changes in profit or loss. The announcement of the Volcker Rule in December 2013 immediately triggered both significant divestments and impairments of TruPS CDO exposures even before coming into force.

The Volcker amendment was received with strong industry opposition. For instance, the Independent Community Bankers of America (ICBA) called the requirement to divest TruPS CDOs a “*critical threat*” to American community banks that would “*in many cases [...] wipe out earnings and impair capital*”. In particular, the ICBA stated that “*because the divestment requirement would immediately drive down the fair value of these instruments, the write downs would be based on fire sale prices that bear no relation to their true long-term value*” (ICBA, 2014). Some industry commentators even expressed concerns that the forced impairment and sale of TruPS CDOs might trigger a banking crisis (Devine, 2014). Others, however, characterized such criticisms of the Volcker Rule as a “blame game” against the fiction of historical cost accounting for TruPS CDOs (Alloway, 2013; Weil, 2013). On December 24, 2013, the American Bankers Association (ABA) sued the federal regulators over the TruPS CDO treatment to prevent the

¹ As an illustration, in 2010, Riverside National Bank of Florida failed due to unsustainable losses on its TruPS CDO portfolio, causing a USD 240 million loss to the Deposit Insurance Fund. The corresponding audit report by the Department of Treasury’s Office of the Inspector General states that “*we noted that Riverside’s Tier 1 capital in its call reports consisted entirely or almost entirely of unrealized losses on available-for-sale debt securities during 2009 and 2010. This was because of the regulatory capital treatment of unrealized gains and losses on such securities.*” (OIG, 2012)

implementation of the Volcker Rule. As a consequence, on January 14, 2014, an “Interim Final” Volcker Rule was announced that effectively repealed the prohibition of (most) TruPS CDOs.

The December 2013 announcement of the Volcker Rule did not affect the economic characteristics of banks’ TruPS CDO holdings, but changed expectations about the possibility of avoiding impairments and created regulatory pressure for asset sales. It therefore provides an attractive laboratory to examine the effects of fair value circuit breakers on banks’ investment and trading behavior. The underlying argument is as follows. Under pure mark-to-market accounting, banks facing a decline in the market value of an asset would be indifferent between selling the asset and keeping it, as the corresponding loss would have to be recognized in both cases (Kanodia and Sapra, 2016).² However, under U.S. GAAP accounting rules, fair value losses on assets in the HTM or AFS category only trigger accounting impairments that affect income and regulatory capital where the loss is deemed to be “other than temporary”, i.e., if a firm does not expect to hold the asset until the eventual recovery of the asset’s amortized cost basis. While this provision is supposed to shield financial statements from temporary fluctuations in the market value of long-term assets, for myopic managers it can create incentives to hold on to assets privately expected to be permanently impaired in order to protect regulatory capital and accounting income.³ This can happen strategically from the inception of the first decline in market value, but also as a consequence from a straightforward ratcheting effect when the accumulated amount of supposedly temporary fair value losses is substantial and turns out to be permanent, implying material losses when sold. This mechanism is amplified by the accounting rules’ requirement to document the “intent and ability” to hold securities with unrealized losses, which discourages stepwise sell-offs to distribute the recognition of losses over time (Cantrell and Yust, 2019). To the extent that the cash and the equity capital tied up in the asset could be reinvested at a higher risk-adjusted rate of return, the accounting treatment can lead to an economically inefficient allocation of firms’ resources.

² Because of higher regulatory risk weights for low-quality assets, from a capital perspective it would generally even be beneficial to sell the distressed asset to fund the acquisition of different assets with a lower risk weight.

³ These incentives can be amplified by strategic illiquidity seeking as suggested by Diamond and Rajan (2011).

On the one hand, for banks that did not expect a timely recovery of the troubled TruPS CDOs, the Volcker Rule announcement removed such myopic incentives to hold on to the investment because the recognition of accumulated unrealized losses would likely become inevitable. In addition, despite the Volcker Rule's generous transitional provisions, firms had to face the potential risk of a further deterioration of the market value of the TruPS CDOs given what was perceived as a limited number of specialized investors that could accurately value and potentially buy these securities. These expectations could create incentives for accelerated sell-offs in line with a standard fire sale model.⁴ Against this backdrop, banks' trading and impairment behavior around the Volcker announcement could be used to unravel an opportunistic utilization of the fair value circuit breaker as a veil to mask poor economic performance in the Pre-Volcker period. This feature distinguishes our setting from prior literature, which relies on cross-sectional differences in accounting rules between different firm types to isolate the effect of fair value circuit breakers (Ellul et al., 2014, 2015).

On the other hand, analogous to Diamond and Rajan (2011), the Volcker Rule announcement created unexpected regulatory pressure for banks to dispose of their TruPS CDO holdings. While banks that had recognized economic losses on their TruPS CDOs in a timely manner could react flexibly and without serious impact to the new regulatory environment, less timely banks plausibly had incentives to gamble on the revocation of the TruPS CDO related provisions to avoid a substantial hit to earnings and capital, which eventually proved to be successful. As such, the Volcker Rule setting allows insights on how fair value circuit breakers can create market frictions as they entice investors to stick to an overhang of distressed asset exposure in periods of crisis.

⁴ Alternatively, banks might conveniently pretend fire sale concerns caused by the Volcker Rule using the regulatory treatment as a scapegoat to justify losses incurred in the course of an overdue clean-up of their distressed TruPS CDO portfolio. For instance, upon the sale of its USD 8.3 million TruPS portfolio in December 2013 at a loss of USD 850,000 (compared with a previously estimated write-off of \$2.5 million), the CEO of Cape Bancorp stated that *"The pain wasn't as bad as we thought it would be. We would have sold even at \$2.5 million, just to resolve the issue."* (Childs and Dexheimer, 2014).

We begin our analysis by exploring the determinants of the timeliness of banks' recognition of losses on their TruPS CDO holdings for a sample of 462 banks during the period from Q2 2009 to Q4 2016 using data available from regulatory filings. While previous studies focus mostly on the regulatory capital channel (Beatty and Liao, 2014), we explore a broader set of incentives to delay loss recognition. We find that in general, banks with a larger TruPS CDO exposure are less forthcoming in recognizing losses. Regarding other firm characteristics, less profitable banks and banks subject to higher levels of capital market pressure are also more likely to delay the recognition of TruPS CDO losses. We observe a similar effect for banks whose management has a higher proportion of stock-based compensation. Taken together, these findings suggest that banks strategically exploited the possibility to delay the recognition of fair value losses by claiming the ability and intent to hold their TruPS CDOs until an eventual recovery. Against this background, the announcement of the Volcker Rule led, across the board, to a substantial shift in recognizing TruPS CDO losses, indicating that despite never being in force, the regulation immediately triggered either OTTIs or sales of securities with implied losses.

We corroborate our results on the strategic delay of TruPS CDO losses by examining impairment behavior in the earlier financial crisis period for a subsample of publicly listed banks using hand-collected data from SEC filings. We exploit the fact that, in the first and second quarter of 2009, the issuance of Financial Staff Position (FSP) FAS 115-2 and FAS 124-2 allowed the reversal of earlier OTTIs if they were based on market prices that reflected temporarily illiquid securities markets rather than a deterioration of the affected securities' credit risk. In line with our earlier results, we find that banks with a larger TruPS CDO exposure, weaker capitalization and stronger capital market pressure record lower levels of OTTIs on their TruPS CDO holdings throughout 2008. However, in the first two quarters of 2009, several banks, especially those with lower capitalization and a higher level of analyst monitoring, exploit the option provided by the FSP FAS 115-2 and FAS 124-2 to revert a large portion of these OTTIs. But, these reversals of supposedly temporary fluctuations in market values are not permanent. For the vast majority of reversal banks,

cumulative OTTI on TruPS CDOs reach their pre-reversal level again after, on average, two quarters. Again, these findings point at the strategic utilization of fair value circuit breakers.

Next, we analyze how the timeliness of TruPS CDO loss recognition shapes associated trading behavior before and in response to the announcement of the Volcker Rule. Both in terms of the magnitude of proportional sales and the likelihood to exit their TruPS CDO portfolio altogether, we find robust evidence that less timely banks with larger implied losses are less likely to dispose of their TruPS CDO holdings. This result is in line with the conjecture that fair value circuit breakers can induce market frictions as they create distorted incentives to hold on to distressed assets. During the Volcker Rule announcement period from the fourth quarter of 2013 to the first quarter of 2014, there is a significant increase in disposals of TruPS CDOs. However, we observe that this effect is significantly less pronounced for banks with less timely loss recognition in the pre-Volcker period. We interpret this result as evidence that rather than resolving earlier incentives for delaying security sales through the removal of the fair value circuit breaker, uncertainty surrounding the final outcome of the Volcker Rule implementation led deeply exposed banks to gamble on the eventual revocation of the TruPS CDO related provisions, while timely banks flexibly reacted to the changed regulatory environment. As such, the differential trading behavior around the Volcker announcement showcases how the (non-)application of fair value accounting shapes investor behavior in an asset crisis, potentially inhibiting prompt trading reactions.

Our study contributes to research on the real effects of accounting regulation by analyzing how fair value circuit breakers affect investments in a specific class of financial instruments (TruPS CDOs) (Leuz and Wysocki, 2016; Kanodia and Sapra, 2016). Focusing on a single, homogenous asset class allows a granular analysis of the role of accounting for trading decisions, which is difficult to uncover when investigating aggregate portfolios (e.g., Bhat, Frankel, and Martin, 2011; Badertscher, Burks, and Easton, 2012; Cantrell and Yust, 2019).⁵ Specifically, we add to the limited literature on the effect of accounting regulations for

⁵ One of the key features of the financial crisis was that it evolved in waves, with certain asset classes being affected at different times (Ryan, 2008). In addition, even within individual asset classes, the impact of the financial crisis

structured financial products that were at the heart of the 2007/2008 Global Financial Crisis. In the spirit of Bertomeu, Beyer, and Taylor (2016) and Glaeser and Guay (2017), the distinct and well-identified setting of our analysis provides context to assess the generalizability of earlier research on the role of fair value accounting for distressed assets, a persistently critical issue in bank accounting.⁶

Our findings provide evidence that circuit breakers that shield banks from recognizing fair value losses can distort risk-taking incentives and trading behavior (Acharya and Ryan, 2016; Bischof, Laux, and Leuz, 2021). Extant empirical research on this mechanism is limited and relies on statutory data from the insurance sector and cross-sectional differences in the relevance of mark-to-market measurement across life and P&C insurers (Merrill, Nadauld, Stulz, and Sherlund, 2014; Ellul, Jotikasthira, Lundblad, and Wang, 2014, 2015). Our paper also indirectly speaks to the debate whether the (non-)application of fair value accounting might cause or amplify fire sales (e.g, Cifuentes, Ferrucci, and Shin, 2005; Allen and Carletti, 2008; Plantin, Sapra, and Shin, 2008; Merrill, Nadauld, Stulz, and Sherlund, 2014).⁷

Further, our analysis points at the broader effects of the accounting regime on asset liquidity (Acharya and Ryan, 2016). The picture that emerges from our study is that during the financial crisis, trading in distressed TruPS CDOs halted as by holding on to these securities banks could use fair value circuit breakers to avoid the realization of losses. Once the circuit breakers were, in expectation, removed, trading was resumed and fair values recovered quickly, which suggests that the suspension of fair value accounting for fundamentally distressed assets created or amplified illiquidity problems in the first place. This novel finding complements standard theory on the perilous interaction of asset illiquidity and fair value accounting.

varied significantly across different vintages. In contrast, all TruPS CDO vintages were affected uniformly and simultaneously.

⁶ For instance, following the Covid-19 pandemic, a multitude of supervisory interventions allowed to temporarily suspend the recognition of loan losses, which for some banks created similar incentives to postpone the divestment of their distressed loan portfolio (Sullivan, 2020).

⁷ In fact, opponents of the amended Volcker rule expressly mentioned concerns about fire sales (Zawacki, 2013), which appear plausible given that in the pre-Volcker period TruPS CDOs were thinly traded and perceived as intransparent (Acharya and Ryan, 2016).

Finally, we also contribute to the literature on the consequences of regulatory uncertainty (Calomiris and Nissim, 2014) and the anticipatory reaction to regulation (Hendricks, Neilson, Shakespeare, and Williams, 2021).

2. Background

2.1. The market for Trust Preferred Security CDOs

Trust Preferred Securities (TruPS) are hybrid cumulative preferred securities that combine features of both equity and liabilities. TruPS were a cheap source of financing that allowed the deferral of dividend payments up to five years, and that were considered debt for tax purposes. The market for TruPS was initiated by the Federal Reserve System's decision in 1996 to allow bank holding companies (BHCs) to use TruPS for up to 25% of core capital as Tier 1 regulatory capital. In 2000, investment bank Salomon Smith Barney started to pool TruPS into collateralized debt obligations (CDOs) that were financed by issuing tranches of senior and subordinated debt securities and equity securities, most of which were rated investment grade by rating agencies. The creation of TruPS CDOs also provided small and unrated banks access to the TruPS market. Notably, TruPS CDOs were the first single industry transactions issues with unregistered status under SEC 144A rules, which allowed CDO issuers to provide very limited disclosure about the underlying collaterals. The market for TruPS CDOs grew rapidly to USD 60 billion of issuances from 2000 to 2007, with overall 1,813 bank and thrift holding companies being placed into these structures (Cordell, Hopkins, and Huang, 2011).⁸ Importantly, investment grade ratings and high yields enticed banks to become the primary investors into the mezzanine tranches of TruPS CDOs (Cordell, Hopkins, and Huang, 2011; French, Plante, Reither, and Sheller, 2010). This implicit cross-ownership of banks became a relevant source of systemic risk. Investments in TruPS CDOs effectively represented deeply subordinated debt of small and unrated banks whose principal asset was commercial real estate (CRE).⁹ Because of the

⁸ The underlying issuance of Tier 1-qualified TruPS reached its peak of \$120 billion in 2008 (Boyson, Fahlenbrach, and Stulz, 2016).

⁹ Often TruPS from the same banks were packaged into a number of different CDOs, which was not noticeable for investors and regulators until after banks started failing. For example, TruPS from Indy Mac, one of the most

limited disclosures, investors could not assess the riskiness of the underlying collateral and therefore had to rely on credit ratings and monitoring by CDO dealers. The build-up of TruPS CDOs exposures initially went undetected by bank regulators, as for purposes of regulatory reporting they were grouped together with other investment grade debt securities (Onaran and Shenn, 2010). Only starting from the second quarter of 2009, regulators required banks to separately disclose their TruPS CDOs in their regulatory filings.

Once the CRE market hit a bump, TruPS issuers began to defer or default on their dividend payments. In turn, the credit risk of TruPS CDOs substantially increased and trading in the TruPS CDO market halted by the second quarter of 2008.¹⁰ We illustrate the economic performance of TruPS CDOs over time in Figure 1. In Panel A, we plot the proportion of Trust Preferred Securities pledged as collateral for TruPS CDOs included in the Fitch Bank TruPS CDO Index that were either in default or that were deferring payments. Beginning at zero, deferral rates increase sharply from the second quarter of 2008, with the cumulative default and deferral rate peaking at nearly 33% of the original collateral value in the first quarter of 2011. Against this background, rating agencies adjusted their rating methodologies for TruPS CDOs, which resulted in a large number of downgrades. Panel B of Figure 1 indicates that Fitch Ratings, which effectively covered the entire TruPS CDO universe (up to 733 tranches from 116 CDOs), downgraded 536 tranches in the second quarter of 2009, with the average rating dropping from AA-/A+ (investment grade) to BB+, and CCC+ shortly after.¹¹ Unlike in other structured finance markets, *all* vintages of TruPS CDOs were adversely and simultaneously affected by the financial crisis (Cordell et al., 2011). The rating

prominent failed thrifts, was included as collateral in 28 separate TruPS CDOs, i.e., in ca. 25% of all CDOs issued (Cordell, Hopkins, and Huang, 2011).

¹⁰ For instance, referring to data from FTN Financial Capital Markets, the number one dealer of TruPS CDOs, Southern National Bancorp in its third quarter 2008 10-Q filing reports that “*secondary market trading activity was robust through the first quarter of 2008 (with \$242.9 million traded) but fell precipitously in the second quarter (to \$71.2 million) and fell further in the third quarter (\$25.8 million). This is indicative of very little liquidity in the market.*” Similarly, First United Corporation reports in its first quarter 2009 10-Q filing that “*trading activity for this class of securities (buy side) shows only three total trades during the first quarter of 2009 compared to a high of 116 trades in the first quarter of 2008. The volume has declined from a high of \$376 million in the first quarter of 2007 to only \$1 million during the first quarter of 2009.*”

¹¹ The timing of the downgrades varied across the agencies. E.g., Moody’s started downgrading numerous TruPS CDO tranches already from August 2008 (Cordell, Hopkins, and Huang, 2011).

downgrades put further pressure on banks holding TruPS CDOs. First, they led to substantial increases in regulatory risk weights and the resulting capital charges against TruPS CDOs, which could multiply by up to 60 times (Onaran and Shenn, 2010).¹² Second, the downgrades suggested banks would have to recognize other-than-temporary impairments (OTTIs) on TruPS CDOs, which would depress profits and regulatory capital.

*** *Insert Figure 1 around here* ***

On December 10, 2013, five U.S. financial regulators, including the Federal Reserve and the Office of the Comptroller of the Currency (OCC), adopted the Final Rules implementing the Volcker Rule. An unexpected provision in the Final Rule prohibited banks from owning specific “covered funds”, which included TruPS CDOs, and to dispose of them by July 21, 2015. The implementation of this provision would have forced banks to immediately recognize unrealized losses in earnings because the disposal requirement compromised banks’ “intent and ability” to hold TruPS CDOs until maturity. For instance, on December 16, 2013, Zions Bancorporation, a Utah bank with the overall largest TruPS CDO exposure, announced Volcker-induced write-downs of \$387 million, an amount larger than what the bank had earned for any calendar year since 2007 (Alloway, 2013). The prospect of such write-downs unleashed a heated debate closely resembling that on the role of fair value accounting during the Financial Crisis. Opponents argued that write-downs to fair value would induce fire sales and further price pressure that could potentially trigger a new banking crisis. Other commentators had long criticized accounting rules that helped banks to “maintain a fiction”, and argued that the Volcker provision would finally force banks to adjust the inflated book values of toxic assets to their “true” market values (Alloway, 2013; Weil, 2013). Among intense lobbying activity, the alleged adverse impact on U.S. community banks led the American Bankers’

¹² For example, Rainier Pacific Bank, which later failed because of its TruPS CDO exposure, reported in its second quarter 2009 10-Q filing that the downgrade of “*all of our trust preferred CDO securities to a highly speculative grade*” resulted in an increase of “*risk-weighted assets for these securities to \$418.2 million as of June 30, 2009, well above the \$108.4 million in par value held by the Company, in calculating the Bank’s regulatory capital ratios, thereby diluting such ratios*”.

Association (ABA) to file a lawsuit challenging the TruPS CDO-related provision against the regulators on December 24, 2013. As a consequence of this fierce opposition, on January 14, 2014, U.S. financial regulators issued an “Interim Rule” effective as of April 1, 2014, which effectively exempted most TruPS CDOs from the Volcker Rule.¹³

2.2. Accounting for Trust Preferred Security CDOs

Measurement and impairment rules before crisis-related amendments

TruPS CDOs were primarily held in the available-for-sale (AFS) and, to a much lesser extent, the held-to-maturity (HTM) category. Under SFAS 115, AFS securities are carried at fair value, with unrealized gains and losses being recognized in other comprehensive income (OCI). For the determination of fair values, SFAS 157 establishes a hierarchy that requires fair value measurements to be classified as Level 1 (observable quoted prices in active markets), Level 2 (observable inputs including quoted market prices for similar items in active markets), and Level 3 (unobservable inputs supplied by the firm).¹⁴ HTM securities are measured at amortized cost, and unrealized fair value gains and losses on HTM securities are recognized neither in OCI nor in net income.

When the fair value of a debt security held in AFS or HTM falls below cost, banks must assess whether the impairment is other-than-temporary, with other-than-temporary impairments (OTTIs) being recognized in earnings. Prior to the crisis-related fair value accounting relaxations, US GAAP had two different models for determining whether the impairment of a debt security was other-than-temporary. Specifically, TruPS CDOs downgraded to below-investment grade fell under Emerging Issues Task Force (EITF) 99-20, while

¹³ More specifically, TruPS CDOs could be exempted if (a) the CDO was established prior to May 19, 2010, (b) a bank reasonably believed that the offering proceeds of the CDO were used to invest primarily in TruPS issued by banks with less than \$15 billion in assets, and (c) the bank had acquired the CDO on or before December 10, 2013.

¹⁴ The SFAS 157 hierarchy requires entities to maximize observable inputs. As long as secondary markets showed sufficient trading activity, TruPS CDOs were measured using Level 2 inputs, meaning that banks relied on broker quotes, prices compiled by third party vendors using observable market data, or quoted prices in active markets for similar pooled TruPS CDOs. As liquidity dried up from the second quarter of 2008, banks began switching to Level 3 measurement using, e.g., discounted cash flow methods with unobservable inputs such as the loss of severity of deferrals and defaults, prepayment rates, and discount rates.

investment grade-rated TruPS CDOs were within the scope of SFAS 115.¹⁵ EITF 99-20 required the use of market participants' assumptions about future cash flows, which could not be overruled by management judgement. As such, it prescribed an automatic OTTI to fair value. In contrast, SFAS 115 did not require exclusive reliance on market participant's assumptions, but allowed the use of reasonable judgement of the probability that the holder of the debt security would be unable to collect all contractual payments.

Crisis-related relaxation of fair value accounting

During the Financial Crisis it was argued that the emphasis of SFAS 157 on observable inputs (Level 1 and Level 2) made it difficult to deviate from market prices and required entities to mark illiquid assets to fire sale prices (e.g., Laux and Leuz, 2009). While the original accounting rules provided sufficient room to deviate from distressed market prices, litigation risk, SEC enforcement and auditors' incentives might have pressured reporting firms to rely on observable transaction prices, even when those transactions were not orderly (e.g., Laux and Leuz 2009; Ronen and Ryan 2011). In response to this criticism, on October 10, 2008, the FASB issued Financial Staff Position (FSP) FAS 157-3, which provided additional guidance for fair value measurement in inactive markets and clarified when and how to determine fair values using unobservable Level 3 inputs. However, the FSP still stressed that even in dislocated markets entities would have to consider market information and make adjustments for non-performance and liquidity risks that market participants would make. For many of our sample banks, FSP FAS 157-3 led to transfers of TruPS CDOs from Level 2 to Level 3 in the third quarter of 2008, which some of them indicated to have an impact on the amount of OTTIs recognized.

On January 12, 2009, the FASB additionally issued FSP EITF 99-20-1, effective for reporting periods after December 15, 2008, to address the concern that EITF 99-20 automatically triggered OTTIs whenever fair values fell below cost. The FSP removed the "market participant" concept from EITF 99-20 and required

¹⁵ The scope of EITF 99-20 includes beneficial interests in securitized assets that (i) are not of high quality and (ii) can contractually be prepaid or otherwise settled in such a way that the holder would not recover substantially all of their recorded investment.

adverse changes in expected cash flows to be “probable” before recognizing an OTTI, thus aligning the impairment model in EITF 99-20 with that in SFAS 115.

Despite these clarifications, criticism continued that investors would have to inappropriately consider illiquidity discounts in fair value measurement and consequently mark-down illiquid assets below fundamental value through earnings, even when they did not have the intention to sell these assets (Ronen and Ryan, 2011). In response, on April 9, 2009, the FASB issued two additional FSPs. FSP FAS 157-4 provides additional guidance in determining whether a market for a financial asset is not active and further relaxed conditions for transferring securities into Level 3. FSP FAS 115-2 and FAS 124-2 contains a far more consequential change. Specifically, if an entity has the intent and ability to hold a debt security until the fair value recovers, only the credit-related portion of the OTTI would have to be recognized in earnings, while the non-credit-related portion reflecting illiquidity discounts is recognized and accumulated in OCI. Under the previous rule, the entire difference between amortized cost and fair value had to be recognized in earnings.¹⁶ FSP FAS 115-2 and FAS 124-2 allowed early adoption in the first quarter of 2009, and additionally allowed the reversal of the non-credit-related portion of previously recognized OTTIs by increasing the opening balance of retained earnings, with a corresponding adjustment to accumulated OCI and the amortized cost basis of affected securities.

We summarize the key economic, regulatory and accounting events affecting TruPS CDOs in Figure 2.

**** Insert Figure 2 around here ****

¹⁶ The issuance of FSP FAS 115-2 and FAS 124-2 was highly controversial. Two FASB members publicly dissented due to concerns that it might lead to delayed OTTI recognition, potentially exacerbating the length and the cost of the crisis and undermining investor confidence. Specifically, they did not support the idea of isolating credit losses from the non-credit loss portion, as, in dislocated markets, “liquidity risk is inextricably intertwined with credit risk, representing the discount associated with uncertainty about the collectability of contractual cash flows in the security” (FASB 2009, FSP FAS 115-2 and 124-2, p. 17).

Regulatory capital treatment of unrealized fair value gains and losses in OCI

Under previous U.S. regulatory capital guidelines effective until 2013, unrealized fair value gains and losses recorded in OCI were filtered out of regulatory capital. The implementation of the Basel III recommendations through the Final Rule, effective from 2014, removed this prudential filter for the very largest “advanced approaches” banks (i.e., with asset size greater than \$250 billion). For all other banks, the Final Rule provides an irrevocable option for most banks to include unrealized fair value gains and losses in OCI in regulatory capital or to continue apply the filter. Almost all banks chose to maintain the filter (e.g., Chircop and Novotny-Farkas 2016). The filter shields regulatory capital from fair value changes recorded in OCI, and thus, effectively acts as another circuit breaker.

3. Conceptual underpinnings and empirical predictions

Theoretical research suggests that in illiquid markets, the interaction of fair value accounting and prudential capital regulation can lead to inefficient trading in the form of fire sales (e.g., Cifuentes, Ferrucci, and Shin, 2005; Allen and Carletti, 2008; Heaton, Lucas, and McDonald, 2010). The argument is based on the notion that fair value accounting can force financial institutions to mark securities to market prices below their fundamental value. Because such write-downs deplete regulatory capital, illiquidity-induced shocks to asset prices can trigger a contagious downward spiral where managers have incentives to sell these assets at fire sale prices in order to pre-empt sales by other market participants that would require further write-downs.¹⁷ A focus on short-term profit measures (e.g., because compensation contracts are based on earnings) can create similar incentives even in the absence of capital concerns (Plantin, Sapra, and Shin, 2008).

Empirical evidence on the above-suggested mechanisms is scarce. Bhat, Frankel, and Martin (2011) find a modest positive association between banks’ changes in non-agency mortgage-backed securities (MBS)

¹⁷ In addition, if the market value of assets falls below the value of a bank’s liabilities, even if otherwise solvent it may be declared insolvent by regulators forcing it to sell long-term assets, which further worsens the illiquidity problem (Allen and Carletti, 2008).

and liquidity-related changes in MBS prices. This positive relation is attenuated following the issuance of FSP FAS 157-4, 115-2 and FAS 124-2, which indirectly corroborates that fair value accounting accentuated a feedback between MBS trading and MBS prices. However, it is unclear to what extent these findings are actually attributable to fair value accounting versus banks' plausible desire to avoid economic losses from holding MBS at the peak of the financial crisis (Acharya and Ryan, 2016).¹⁸ Badertscher, Burks, and Easton (2012) directly investigate claims that fair value accounting-related losses, i.e., OTTI charges, were excessive and procyclical. They show that overall, OTTIs only had minimal impact on regulatory capital, and do not find consistent evidence that fair value accounting induced wide-spread selling of investment securities at fire sale prices.

Ellul, Jotikasthira, Lundblad, and Wang (2014, 2015) focus on the interaction of prudential and accounting regulation as a primary driver of financial institutions' trading incentives. They exploit that insurers' statutory accounting principles (SAP) require life insurers and property and casualty (PC) insurers to account differently for below-investment grade AFS debt securities. SAP requires PC insurers to account for these securities at the lower of cost or market value with unrealized losses immediately recognized in statutory surplus, while life insurers may measure them at amortized cost and have significant flexibility in whether and to what extent they recognize unrealized losses. Ellul, Jotikasthira, Lundblad, and Wang (2014, 2015) find that the PC insurers are more likely to sell debt securities that experience large price drops than life insurers, consistent with the argument that mark-to-market accounting could trigger fire sales. However, they also document that PC insurers invest significantly less in risky assets in the years leading up to the crisis, consistent with mark-to-market accounting providing ex ante incentives for more prudent portfolio decisions.¹⁹

¹⁸ In this regard, Acharya and Ryan (2016) note that the easing of the mark-to-market and OTTI rules coincides with the nadir of the financial crisis.

¹⁹ To mitigate the concern that the results are driven by the differential business model of PC and life insurers, Ellul et al. (2014, 2015) conduct within-insurance type analyses by exploiting heterogeneity across US states in the levels of discretion in requiring the use of mark-to-market accounting, and find that life insurers from states with a stronger emphasis on mark-to-market accounting are more likely to sell downgraded securities during the crisis, confirming the primary findings.

The lack of conclusive evidence can be attributed to the fact that US accounting rules do not require pure mark-to-market accounting, but include several circuit breakers designed to prevent write-downs to distorted market prices (Laux and Leuz, 2010). First, FAS 157 allows entities to deviate from recording distressed market values and instead rely on their own unobservable inputs for the determination of fair values. Second, with most securities subject to fair value accounting being classified as AFS or HTM, unrealized fair losses do not affect earnings and regulatory capital unless they are sold or deemed other-than-temporary (i.e., when banks cannot provide evidence of their “intent and ability” to hold the securities until their fair value eventually recovers). In addition, banks can, under strict conditions, reclassify assets from other categories into the held-to-maturity categories.

While these circuit breakers dampen procyclical tendencies of fair value accounting, they allow to avoid timely loss recognition, and potentially provide incentives to hold on to economically distressed assets. Recent studies suggest that financial institutions make opportunistic use of circuit breakers to inflate fair values or to avoid loss recognition (Vyas 2011; Hanley, Jagonlinzer, and Nikolova, 2018; Khan, Ryan, and Varma, 2019). Hodder and Sheneman (2022) document that the opportunistic application of the subjective “intent and ability” criteria related to OTTI is the primary means of loss avoidance, while discretionary fair value measurement seems to be less relevant. Other papers indicate that circuit breakers also affect financial institutions’ trading incentives. Cantrell and Yust (2019) argue that the requirement to document the “intent and ability” to hold securities provides disincentives to sell securities with unrealized losses to avoid “tainting” the remaining portfolio of securities. In line with this argument, they find that securities sales are associated with larger OTTI charges, and that banks with larger unrealized losses sell fewer securities. Ellul, Jotikasthira, Lundblad, and Wang (2015) show that the application of historical cost accounting incentivized life insurers to engage in selective gains trading.

We reexamine the impact of fair value circuit breakers on loss recognition and trading behavior of banks using the specific setting of TruPS CDOs in the banking industry. A heightened level of scrutiny from regulators and investors following the severe downgrades of TruPS CDOs in late 2008 plausibly disciplined

fair value measurement (Hodder and Sheneman, 2022; Goncharov, Riedl, and Sellhorn, 2014; Chung, Goh, Ng, and Yong, 2017).²⁰ Nonetheless, banks had significant scope for discretion in the timing and magnitude of OTTI recognition, and market commentators had long criticized accounting rules that allowed banks to carry impaired assets at inflated book values. Myopic managers concerned about regulatory capital and short-term profitability were likely inclined to strategically delay the recognition of losses from their inception, especially since the maturity of TruPS CDOs (of up to 30 years) was significantly longer than managers' tenure. Alternatively, managers could have initially believed that the drop in TruPS CDO market prices would be temporary. When it later became clear that the decline in value was permanent, unrealized losses accumulated in other comprehensive income had become material, providing even greater disincentives to realize losses. Such a ratcheting effect reflects a path-dependency of managerial decisions in that the initial decision to avoid write-downs incentivizes managers to delay the recognition of subsequent OTTIs even further. Against this backdrop, we formulate our first hypothesis as follows:

H1. Banks use fair value circuit breakers to strategically delay OTTIs on TruPS CDOs.

The extent to which managers used the flexibility to record timely OTTIs afforded by the subjective "intent and ability" criterion likely affected banks' TruPS CDO trading decisions. Timely OTTI recognition would per se make banks indifferent between holding and selling distressed TruPS CDOs, since fair value losses have to be recognized in both scenarios. From a regulatory perspective, selling these assets is even beneficial, because it would reduce risk-weighted assets and thus improve regulatory capital ratios. In contrast, untimely OTTI recognition results in an accumulation of unrealized losses that amplifies incentives to hold on to the distressed TruPS CDOs to shield both earnings and regulatory capital (Ellul, Jotikasthira, Lundblad, and Wang, 2015). The disincentives to sell TruPS CDOs to avoid loss realization

²⁰ For instance, in September 2009, Rainier Pacific Bank received a Cease and Desist order from the FDIC explicitly requesting "accurate and realistic" models for OTTI recognition on its CDO portfolio. A review of the most highly exposed sample banks' earnings announcements and conference call transcripts further reveals that the valuation of TruPS CDO was a recurring discussion topic beginning from the early sample period in 2008.

are likely even stronger than for OTTI recognition because such sales would “taint” the remaining CDO portfolio and potentially trigger additional OTTIs.

These arguments suggest that accounting discretion through fair value circuit breakers can distort trading decisions and create incentives to delay economically optimal divestments of distressed assets. The announcement of the Volcker Rule eliminated a crucial circuit breaker—or at least created such an expectation for a short period of time—by removing the opportunity to claim the “intent and ability” to hold TruPS CDOs until maturity. Prospectively, it required banks to write down TruPS CDOs to their market values. As such, for banks that believed TruPS CDOs to be permanently impaired, selling them would be preferable both for regulatory reasons (i.e., to reduce risk weights) and to avoid additional write-downs due to future losses in market value driven by the anticipated sales by other banks (Cifuentes, Ferrucci, and Shin, 2005; Ellul, Jotikasthira, Lundblad, and Wang, 2015; Plantin, Sapra, and Shin, 2008). From this point of view, the Volcker announcement might unravel banks’ earlier opportunistic utilization of circuit breakers. On the other hand, given the uncertainty about the ultimate implementation of the Volcker Rule’s TruPS CDO provisions, deeply exposed banks might have been enticed to gamble on their revocation, while banks with timely loss recognition in the pre-Volcker period could flexibly adjust their portfolio to the changed regulatory environment. Against this backdrop, we formulate our second hypothesis as follows:

H2a. Banks that delay loss recognition have a lower propensity to sell TruPS CDOs in the pre-Volcker period.

H2b. Banks’ trading reaction to the announcement of the Volcker Rule depends on the magnitude of the implied losses on their TruPS CDO holdings.

4. Sample and research design

4.1. Sample

Our main sample period extends from the second quarter of 2009 to the fourth quarter of 2016. We collect banks' financial information from S&P Market Intelligence, which covers data from banks' regulatory filings with their supervisors (Y-9C reports for BHCs and call reports for commercial banks) in the U.S. Regulated Depository Institutions database. The second quarter of 2009 is the first quarter when disclosures on TruPS CDOs were required in the regulatory reports. Table 1 presents the sample selection procedure. We can identify 719 BHCs and commercial banks that were exposed to TruPS CDOs at any point during the sample period. We exclude commercial banks that are subsidiaries of exposed BHCs to avoid double counting, resulting in a sample of 462 BHCs and standalone commercial banks with non-missing data. For the subset of publicly listed banks, we can complement the data from the regulatory filings with detailed information on TruPS CDO divestments and impairments hand-collected from the 10-K/10-Q reports filed with the SEC (206 banks).²¹ For this public bank subsample, we can extend the sample period to include data beginning from the first quarter of 2008.

**** Insert Table 1 around here ****

Table 2 presents the descriptive statistics. Panel A shows the full sample over the period from the second quarter of 2009 to the fourth quarter of 2016, and Panel B shows the subsample of listed banks from the first quarter of 2008 to the fourth quarter of 2016. The Table reveals ample variation in the relative magnitude of banks' TruPS CDO holdings. Further, banks generally report TruPS CDO fair values below their amortized cost (median: 60%), indicating a substantial amount of unrealized losses.

**** Insert Table 2 around here ****

²¹ Where we do not observe these detailed disclosures, we infer information on TruPS CDO sales and OTTIs from the regulatory disclosures on overall OTTIs and the development of the reported amortized cost and fair value of banks' TruPS CDO holdings.

We illustrate the relative importance of banks' exposure to TruPS CDOs in the pre-Volcker period in Figure 3. Panel A shows an equal probability histogram of the value of banks' TruPS CDO portfolio (measured at amortized cost) as a fraction of risk-weighted assets. Each bar of the histogram represents ten percent of the observations. While for most sample banks TruPS CDOs represented only a minor exposure, for 30 percent of the observations the TruPS CDO portfolio amounted to more than one percent of risk-weighted assets. In Panel B, we also plot an equal probability histogram of the magnitude of unrealized losses on TruPS CDOs (as captured by the difference between reported fair values and amortized cost) as a fraction of risk-weighted assets. The figure indicates that for 30 percent of pre-Volcker observations, these implied losses are larger than 0.5 percent of risk weighted assets, i.e., an immediate realization of these losses would reduce the Tier 1 capital ratio by 0.5 percent or more.

*** *Insert Figure 3 around here* ***

4.2. Research design

To capture how fair value circuit breakers facilitate strategic loss avoidance, we begin by exploring the determinants of timely loss recognition as measured by the ratio of self-reported TruPS CDO fair values to their carrying amounts. Using this stock measure of timeliness is attractive as it does not require to observe the full timeline of loss realization per firm. As such, it is applicable for banks that do not disclose OTTIs or sales of TruPS CDOs before the second quarter of 2009 (when detailed information was required in regulatory reports), or that drop out of the sample early. Further, it allows us to isolate the opportunistic application of the “intent and ability” criterion that was removed by the introduction of the Volcker rule, while discretionary fair value measurement remained unaffected. Our baseline regression model is as follows:

$$TruPS\ CDO\ FV/Cost\ Ratio_{it} = \beta_0 + \beta_1 PostVolcker_t + \beta_2 Trend_t + \delta Incentives_{it} + \varepsilon, \quad (1)$$

where *PostVolcker* is a binary indicator variable equal to one for all observations from the fourth quarter of 2013 and later, and *Trend* is a linear time trend. To test for the strategic utilization of the fair value circuit breaker, we include the following variables to capture *Incentives* to delay the realization of fair value losses: *TruPS CDO Exposure* is the ratio of the amortized cost of a bank's TruPS CDO portfolio to the bank's total assets. *Low Capital* is a binary indicator variable equal to one if a bank's ratio of tangible capital to total assets is lower than the sample median. *Low Profitability* is a binary indicator variable equal to one if a bank's quarterly return on assets is below the sample median. *Failed/Merged* is a binary indicator variable equal to one for banks that cease to exist during or after the sample period, capturing overall business risk. *Listed* is a binary indicator variable equal to one for banks listed on a public stock exchange that reflects overall capital market pressure. *Short-Term Funding* is the ratio of net short-term liabilities to total assets, and reflects reporting incentives driven by refinancing needs. For the subsample of listed banks, we additionally include the following variables: *Cost of Debt* is total quarterly interest expense divided by average liabilities and captures the market assessment of a bank's credit risk. Analogously, *Market-to-Book Ratio* is the ratio of the market value of a bank's equity to its book value and represents the market assessment of a bank's business outlook. *Return Volatility* is the quarterly standard deviation of a bank's daily stock returns. *Analyst Following* is the number of analysts covering a bank's stock on I/B/E/S. *Institutional Ownership* is the proportion of equity ownership by institutional investors as reported in the Thomson Reuters 13-f database. All three variables reflect the level of monitoring by market participants. Finally, *Equity Incentives* is the ratio of equity awards to total compensation and captures reporting incentives from stock-based compensation. We further include $\text{Log}(\text{Total Assets})$, the natural logarithm of a bank's total assets, to control for a general size effect.

In the next step, we separately analyze how banks made use of the controversial circuit breaker introduced by FSP FAS 115-2 and FAS 124-2 in early 2009. While earlier research has used the introduction of the FSP as a time indicator (Bhat, Frankel, and Martin, 2011; Cantrell and Yust, 2019), no systematic evidence exists on its impact on OTTIs. To address this issue, we examine the incidence of OTTIs and OTTI

reversals in the early crisis period from the first quarter of 2008 to the second quarter of 2009. We first use the magnitude of quarterly *OTTIs* on TruPS CDOs (relative to their lagged cost) in 2008 as the dependent variable. For the analysis of the impact of the FSP, the dependent variable is the magnitude of *OTTI Reversals* in the first and second quarter of 2009 relative to earlier *OTTIs* accumulated over 2008:

$$\text{TruPS CDO OTTIs}_{it} = \beta_0 + \delta \text{Incentives}_{it} + \varepsilon, \quad (2)$$

$$\text{TruPS CDO OTTI Reversal}_i = \beta_0 + \delta \text{Incentives}_i + \varepsilon \quad (3)$$

We include the same variables capturing reporting incentives as in Eq. (1), and additionally control for the level of *Cumulative Earlier OTTIs* (relative to a bank's TruPS CDO exposure in the first quarter of 2008) over the preceding quarters.

Finally, we examine how fair value circuit breakers affect banks' sales of TruPS CDOs before and after the issuance of the amended Volcker Rule. As dependent variable, we use the quarterly proportion of TruPS CDOs sold by a bank relative to the bank's TruPS CDO exposure in the second quarter of 2009 (at historical cost). Alternatively, we also examine the timing of TruPS CDO exits (i.e., disposals of a bank's entire TruPS CDO portfolio) as the most pronounced form of TruPS CDO disposal. For a simultaneous test of hypotheses 2a and 2b, we include *Volcker* as a binary indicator variable equal to one for all observations from the fourth quarter of 2013 and the first quarter of 2014 to capture the immediate effect of the Volcker rule announcement:

$$\begin{aligned} \text{TruPS CDO Sales}_{it} = & \beta_0 + \beta_1 \text{TruPS CDO Implied Loss}_{it} + \beta_2 \text{Volcker}_t + \beta_3 \text{Volcker}_t \times \text{TruPS CDO Implied} \\ & \text{Loss}_{it} + \beta_4 \text{Trend}_t + \delta \text{Incentives}_{it} + \varepsilon, \end{aligned} \quad (4)$$

$$\begin{aligned} \text{TruPS CDO Exit}_{it} = & \beta_0 + \beta_1 \text{TruPS CDO Implied Loss}_{it} + \beta_2 \text{Volcker}_t + \beta_3 \text{Volcker}_t \times \text{TruPS CDO Implied} \\ & \text{Loss}_{it} + \beta_4 \text{Trend}_t + \delta \text{Incentives}_{it} + \varepsilon, \end{aligned} \quad (5)$$

where *TruPS CDO Implied Loss* represents the difference between the fair value and the amortized cost of a bank's TruPS CDO portfolio scaled by the bank's risk-weighted assets, and *Trend* is a linear time trend.

We include the same incentive variables as in Eq. (1). In addition, we separately estimate Eq. (4) and Eq. (5) for the pre-Volcker period from the second quarter of 2009 to the third quarter of 2013, and the Volcker uncertainty period from the fourth quarter of 2013 to the first quarter of 2014.

5. Results

5.1. Graphical analyses

In Figure 4, we illustrate the development of banks' TruPS CDO investments over the period from the second quarter of 2009 to the fourth quarter of 2016. In Panel A, we plot the aggregate historical cost and fair value of TruPS CDO holdings over time. The figure indicates a general downward trend over time, reflecting gradual divestments of and recognition of OTTIs on TruPS CDOs. More to the point, banks enter the post-crisis sample period with a substantial differential between the reported fair value and amortized cost of their TruPS CDO holdings, which persists throughout the pre-Volcker period. However, immediately upon announcement of the amended Volcker Rule, there is a significant drop in the aggregate amortized cost and—to a lesser extent—in the aggregate fair value of TruPS CDOs in the fourth quarter of 2013 and the first quarter of 2014, reflecting a large number of sales and OTTIs on these securities. As a consequence, earlier implied losses are nearly fully realized, and TruPS CDOs are carried at about their fair values in the post-Volcker period.

**** Insert Figure 4 around here ****

Panel B of Figure 4 illustrates the evolution of delayed loss recognition as suggested by the differential between the reported fair value and amortized cost of banks' TruPS CDO holdings on the firm-level. By Q3 2013, the reported fair value of its TruPS CDO portfolio stood at ca. 70 percent of its amortized cost for the median sample bank, and at about 40 percent for the bottom quartile. Again, there is a substantial reduction of this differential following the announcement of the Volcker Rule across the entire sample distribution. For the top quartile of banks, from the first quarter of 2014, the amortized cost is equal to the fair value for TruPS CDOs, and for the bottom quartile the ratio increases to more than 60%. Panel C of

Figure 4 shows the development of the firm-level amortized cost of banks' TruPS CDO holdings (relative to their magnitude in the second quarter of 2009) over the sample period. Consistent with Panel A, we observe a negative time trend representing gradual sales and impairments. However, while the median bank had reduced its holdings by the third quarter of 2013 by about 60 percent relative to its exposure in the second quarter of 2009, there is a further steep decrease immediately following the announcement of the amended Volcker Rule in the fourth quarter of 2013, resulting in a median exposure of only about five percent at the end of the first quarter of 2014, and of zero shortly after. Panel C of Figure 4 also indicates the number of TruPS CDO exits (i.e., disposals of a bank's entire remaining TruPS CDO portfolio). In line with the overall development of TruPS CDO holdings, the number of exits has a peak in the Volcker announcement period.

The picture that emerges from these graphical illustrations is that in the aftermath of the Global Financial Crisis, many banks had not recognized manifest losses on their TruPS CDO portfolio, but instead used the discretion inherent in SFAS 115 to maintain that these losses would be recovered in the future. The announcement of the Volcker Rule made it impossible to sustain this earlier treatment and removed the incentives to hold on to their TruPS CDO portfolio. Observing a large number of TruPS CDO sales and exits as an immediate reaction to the Volcker announcement supports this conjecture.

5.2. Timeliness of Trust Preferred Security CDO loss recognition

To test these patterns formally, we estimate various specifications of Eq. (1) to explore the determinants of the timeliness of loss recognition as indicated by the ratio of the reported fair value to the amortized cost of banks' TruPS CDO holdings. We report the results in Table 3. Moving from left to right, in column (1) we begin by limiting the sample to the pre-Volcker period from the second quarter of 2009 to the third quarter of 2013. We initially only include a linear time trend and banks' *TruPS CDO Exposure*, the core variable of interest, as any potential impact of recognizing TruPS CDO losses is determined by the magnitude of the corresponding portfolio holdings. A highly significant negative coefficient indicates that banks with larger exposures are indeed more reluctant to recognize the losses in market value of their TruPS

CDO portfolio. In column (2), we add additional incentive variables. We find that, in particular, less profitable banks and banks that are more subject to capital market pressure because they are publicly listed or more reliant on short-term financing are less timely in realizing TruPS CDO losses. In column (3), we extend the sample period to include observations up to the fourth quarter of 2016. We now add *PostVolcker* to capture the effect of the publication of the amended Volcker Rule on banks' loss recognition behavior. While our earlier results prevail, the highly significant positive coefficient for *PostVolcker* indicates that the Volcker Rule triggered a substantial shift in recognizing TruPS CDO losses, increasing the FV/Cost ratio by about 16 percentage points. Finally, in column (4), we use only the subsample of listed firms and include additional variables to reflect market pressure, investor monitoring, and compensation incentives. Most of these variables are insignificant, with the exception of *Equity Incentives*, suggesting that managers with a higher proportion of equity based compensation have a stronger inclination to delay the recognition of accounting losses.

*** *Insert Table 3 around here* ***

In sum, the results reveal uneven timeliness in the recognition of losses in the market value of banks' TruPS CDO holdings. Banks with a larger TruPS exposure, less profitable banks, and banks subject to a higher level of market pressure are more likely to delay the recognition of losses through OTTIs or sales of impaired assets. As such, the evidence suggests that bank managers strategically exploit the opportunity to defer losses through the usage of fair value circuit breakers.

Next, we specifically examine the recognition of OTTIs in the early Financial Crisis period, and the subsequent utilization of the opportunity to reverse earlier OTTIs following the issuance of FSP FAS 115-2 and FAS 124-2, using our hand-collected data. Panel A of Table 4 presents some descriptive insights for a sample of 124 listed banks for which we can track accounting for TruPS CDOs from the first quarter of 2008. At the end of 2008, these banks had, on average, recorded OTTIs amounting to 19.8% of their

original TruPS CDO exposure in the first quarter of 2008.²² The 39 banks that would later use the FSP FAS 115-2 and FAS 124-2 reversal option had been more forthcoming in recognizing losses, with an average cumulative OTTI of 39.3% of their original TruPS CDO exposure in the first quarter of 2008. These banks revert, on average, 55.1% of their earlier OTTIs. Tellingly, while FSP FAS 115-2 and FAS 124-2 were intended to shield banks from recognizing temporary illiquidity discounts, 31 of the 39 reach their pre-reversal OTTI levels after only 2.29 quarters, on average, highlighting the permanent nature of TruPS CDO losses.

**** Insert Table 4 around here ****

In Panel B of Table 4 we explore the determinants of recognizing and later reversing early TruPS CDO OTTIs. Corroborating our results from Table 3, in column (1) we find that banks with a larger TruPS CDO exposure record lower OTTIs. Further, OTTIs are lower for banks with lower capital ratios or higher funding costs. In contrast, they are higher when banks' stock returns are more volatile, which potentially points at the role of market monitoring disciplining banks' reporting behavior. In column (2), the regression coefficients mostly switch their sign when explaining the magnitude of OTTI reversals in the first and second quarter of 2009. In particular, while the low number of observations likely reduces the power of this test, we observe that banks with a lower capital ratio have significantly higher reversals of their earlier OTTIs. In addition, OTTI reversals are higher for banks with a higher level of capital market pressure, as captured by the number of analysts covering their stock. Overall, our results on TruPS CDO loss recognition in the immediate Financial Crisis period is consistent with the notion that banks strategically exploit the reporting discretion facilitated by fair value circuit breakers.

²² 60 of the 124 banks did not record any OTTIs on their TruPS CDO portfolio throughout 2008. As such, the median cumulative OTTI at the end of 2008 stands at only 2.9%.

5.3. Trust Preferred Security CDO sales and exits

In this section, we conduct tests to investigate the determinants of TruPS CDO divestitures. We present the results in Table 5. In columns (1) to (3), the dependent variable is the quarterly amortized cost of TruPS CDOs sold relative to a bank's TruPS CDO exposure in the second quarter of 2009. In column (1), we cover the full sample period from the second quarter of 2009 to the fourth quarter of 2016. The results yield the following insights: First, in line with the graphical analyses, a highly significant coefficient for the indicator variable capturing the *Volcker* uncertainty period confirms that banks sold off a substantial portion of their TruPS CDO holdings as a reaction to the announcement of the amended Volcker Rule during the fourth quarter of 2013 and the first quarter of 2014. Second, before and after this Volcker uncertainty period, banks with higher implied losses sold significantly less of their TruPS CDO holdings, which is in line with the strategic avoidance of loss recognition. Third, the interaction effect of the Volcker uncertainty period indicator and banks' implied losses on TruPS CDOs is significantly negative as well, suggesting that the Volcker effect was attenuated for banks that entered the Volcker uncertainty period with a higher level of implied losses. These findings are also apparent when estimating the model separately for the pre-Volcker period in column (2), and for the Volcker uncertainty period in column (3). In columns (4) to (6), we use a linear probability model to explain the likelihood of banks exiting their TruPS exposure altogether (either through write-offs or sales). The results are similar to those of the sales analysis, and indicate that delayed loss recognition generally reduces the likelihood of TruPS CDO disposals, and, in particular, attenuates the reaction to the announcement of the Volcker Rule. Taken together, our evidence suggests that the Volcker announcement did not uniformly remove the fair value circuit breaker, but rather enticed banks deeply exposed to implied TruPS CDO losses to gamble on the revocation of the new regulation. In contrast, banks that had realized TruPS CDO losses in a more timely manner in the pre-Volcker period swiftly reacted to the changed regulatory environment. This observation more generally highlights how the (non-)application of fair value accounting can affect investor behavior in an asset crisis, and potentially inhibits prompt trading reactions.

6. Conclusion

In this study, we use an unexpected amendment to the Volcker Rule, which was published in December 2013 and which announced the prohibition of bank ownership in CDOs collateralized by other banks' trust preferred securities (TruPS CDOs), as a laboratory to examine how fair value circuit breakers have the potential to shape banks' trading and investment behavior. We first observe that in the pre-Volcker period, banks strategically delayed the recognition of losses inherent to their TruPS CDO holdings by claiming the ability and intent to hold these securities until an eventual recovery of their fair values, thus avoiding timely impairments and protecting their regulatory capital and accounting profits. Next, we find that banks that had correspondingly built up substantial implied losses were less likely to dispose of their TruPS CDO holdings. Specifically, while the announcement of the Volcker Rule triggered wide-spread divestments of TruPS CDOs, this effect is attenuated for those banks with less timely loss recognition in the pre-Volcker period, who instead gambled on the ultimate revocation of the regulation. The evidence points at the potentially problematic role of fair value circuit breakers, which can create distorted incentives to delay corrective asset disposals and plausibly inhibit prompt trading reactions to asset crises.

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Appendix A – Industry Comments on the Volcker Rule TruPS Provision

American Bankers Association (ABA)

“To the shock of community banks, the Final Rule unexpectedly requires banks to divest their holdings in a commonly held debt instrument known as a “TruPS-backed CDO” by 2015 and, under Generally Accepted Accounting Principles (“GAAP”), to take an immediate and irrevocable hit to earnings and capital as a result. [...] The consequences of these errors will be grave. The Final Rule will impact over 275 banks and cause an estimated \$600 million in capital to vanish overnight. These capital losses will immediately subject small banks to increased regulatory scrutiny, increase the cost of acquiring funds, and adversely affect the banks’ ability to make loans and to provide other services to members of their communities. Unless this portion of the Final Rule is suspended by the courts prior to December 31, 2013, moreover, the earnings and capital losses that these banks will experience as a result of the Final Rule will be irreparable. [...] Based on ABA’s analysis, 37 banks would suffer losses so great that – as a result of the Final Rule – more than an entire year of earnings would be wiped out instantly. In some cases, these losses would be so large they are greater than five times (year-to-date) earnings. [...] This in turn may materially impact the bank’s on-going operations in several ways. [...] The actual loss to these institutions may ultimately be even greater. The Final Rule requires all banks (including several large banks with substantial TruPS investments) to sell their holdings in these debt instruments within 19 months. The flood of TruPS-backed CDOs into the market, while dramatically reducing the number of typical investors in these instruments, will depress the market value of these investments, effectively requiring the banks to sell their TruPS-backed CDOs at fire-sale prices. Accordingly, it is likely that banks will face additional earnings and capital losses in 2014 as the market value for these debt instruments falls.” (Am. Bankers Ass’n v. Bd. of Governors of the Fed. Reserve Sys., court filing)

Independent Community Bankers of America (ICBA)

“The final Volcker Rule, as issued on December 10, would have a harsh and immediate impact on some 300 community banks that hold collateralized debt obligations (CDOs) backed by trust preferred securities (TruPS). The December 10 rule would cause an irreversible impact on the earnings and capital of these banks. We know of several community banks that would literally be put out of business if this rule stands. (...) When the final rule was issued, community bankers were frankly shocked to learn that it required them to divest their holdings of CDO TruPS by July 2015. This unanticipated requirement was not included in the proposed Volcker Rule. What’s worse, the divestment requirement, though not immediate, would require that these investments be immediately impaired through earnings and regulatory capital under “other-than-temporary-impairment” (OTTI) accounting standards. Because the divestment requirement would immediately drive down the fair value of these instruments, the write downs would be based on fire sale prices that bear no relation to their true long-term value. In many cases, this would wipe out a bank’s earnings and impair capital. As noted above, it would cause the failure of several community banks that we are aware of.” (ICBA, 2014)

Zions Bank

“We therefore, thought that they would become a source of speculation that we would have to raise capital, because the OCI marks would become very negative on these securities and we wanted to avoid that artificial pressure. So we transferred them to held-to-maturity that has the effect of freezing in place, the OCI mark, in OCI on those securities at that date. And that OCI mark then accretes back over the remaining life of the security. So long as the security does not go OTTI. Any future changes in valuation in the security that are not permanent, then go, are disclosed as we have here pursuant to FAS 157 but do not affect capital or earnings again unless the security goes OTTI. For any security that does, it might be

deemed in the future to be OTTI, we recognized then the full fair value mark both that which is in OCI and then either does not through income at the time take the loss to the income statement and then back out that piece of OCI. And that's purely, and simply why we did it." (Doyle L. Arnold, Vice Chairman & CFO, 2008 Q2 Earnings Call,)

*"Banks such as Zions are counting the costs of legacy investments made in the leadup to the financial crisis. "We haven't bought any CDOs really since precrisis... **and certainly wouldn't touch any today,**" Mr Arnold said. [...] The move by Zions also highlights the importance of accounting classification when tabulating the value of banks' securities portfolios, which have been growing as some banks seek out higher yielding assets to offset lower profit margins from lending. "I don't think others are too far behind," said one lawyer for regional banks. "There could be a ground swell and this could become a real problem." **A fire sale of TruPS CDOs would further depress prices of the assets, potentially leading to more charges and regulatory capital hits for regional lenders.** "We're not going to just go out and dump those things tomorrow," Mr Arnold told analysts. Regulators said they would watch for possible negative effects on the economy and markets because of the Volcker rule and could go back and revise certain aspects if they agree that is necessary." (Alloway and Hall, 2013)*

Community Bank Systems

*"In late December, the company sold its entire portfolio of bank and insurance trust preferred collateralized debt obligation securities or CDOs in response to the uncertainties created by the announcement of the final regulations implementing the Volcker Rule. [...] Despite recent regulatory clarifications on certain securities which have been determined to be exempt from disposition, including the CDOs we sold, we still believe it was in the best long-term interest of the company and our shareholders to proceed as we did. We clearly recognized the potential for additional regulatory commentary at the time we made the decision to dispose the CDOs, **but concluded the qualitative improvement to our balance sheet and the elimination of the uncertainty surrounding these types of securities wasn't prudent.**" (Community Bank Systems Q4 2013 Earnings Call, January 22, 2014)*

Appendix B: Coding procedure for missing TruPS CDO data

TruPS CDO exposures are reported in items G348 to G351 of BHCs' quarterly Y-9C reports and commercial banks' call reports. Data inspection suggests occasional data entry errors, which we address as follows:

Case 1: Interrupted time series

Where a singular observation or a series of observations indicates a zero exposure to TruPS CDOs for firms with an otherwise uninterrupted timeseries of observations with nonzero exposure, it is unclear whether this is due to a data entry error or a an actual temporary TruPS CDO exit. For interruptions of up to four quarters we interpolate data from the preceding and following observations. For interruptions of more than four quarters, we drop all of the firm's observations.

Example 1: Susquehanna Bancshares, Inc.: TruPS CDOs classified as available for sale (historical cost in thsd USD)

	2010 Q2	2010 Q3	2010 Q4	2011 Q1	2011 Q2
As reported	24,596	24,643	0	24,717	24,755
Adjusted	24,596	24,643	24,680	24,717	24,755

Example 2: First Hawaiian, Inc.: TruPS CDOs classified as available for sale (historical cost in thsd USD)

	2012 Q2	2012 Q3	2012 Q4	2013 Q1	2013 Q2	2013 Q3	2013 Q4	2014 Q1
As reported	40,221	18,748	0	0	0	0	11,236	6,228
Adjusted	40,221	18,748	17,246	15,743	14,241	12,738	11,236	6,228

Example 3: Kerndt Brothers Savings Bank: TruPS CDOs classified as available for sale (historical cost in thsd USD) – the bank is dropped from the sample

	2009 Q1	2009 Q3	2009 Q4	2010 Q1 – 2012 Q3	2012 Q4	2013 Q1	2013 Q2
As reported	3,450	3,450	3,450	0	3,881	3,886	0

Case 2: Singular observations

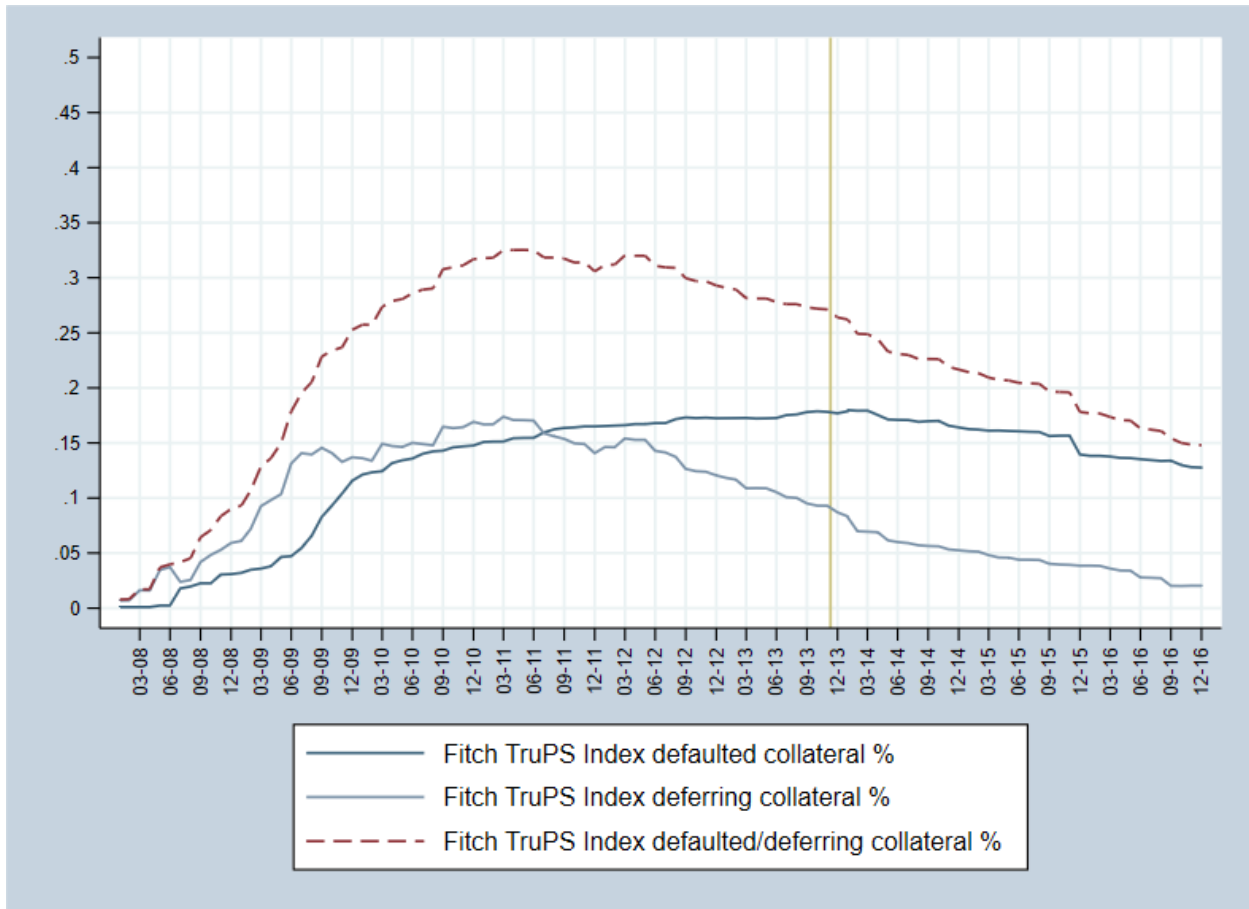
In case a singular observation indicates a nonzero exposure to TruPS CDOs for a firm that otherwise continuously reports a zero exposure, it is unclear whether this is due to an actual TruPS CDO acquisition followed by an immediate exit or a data entry error. We therefore drop all of these firms' observations.

Example 4: Byline Bancorp, Inc.: TruPS CDOs classified as available for sale or held to maturity (historical cost in thsd USD) – the bank is dropped from the sample

	2009 Q2 – 2011 Q4	2012 Q1	2012 Q2 – 2016 Q4
As reported	0	15,143	0

Figure 1: Development of TruPS CDO credit risk over time

Panel A: Fitch TruPS CDO Index - Defaults and deferrals over time

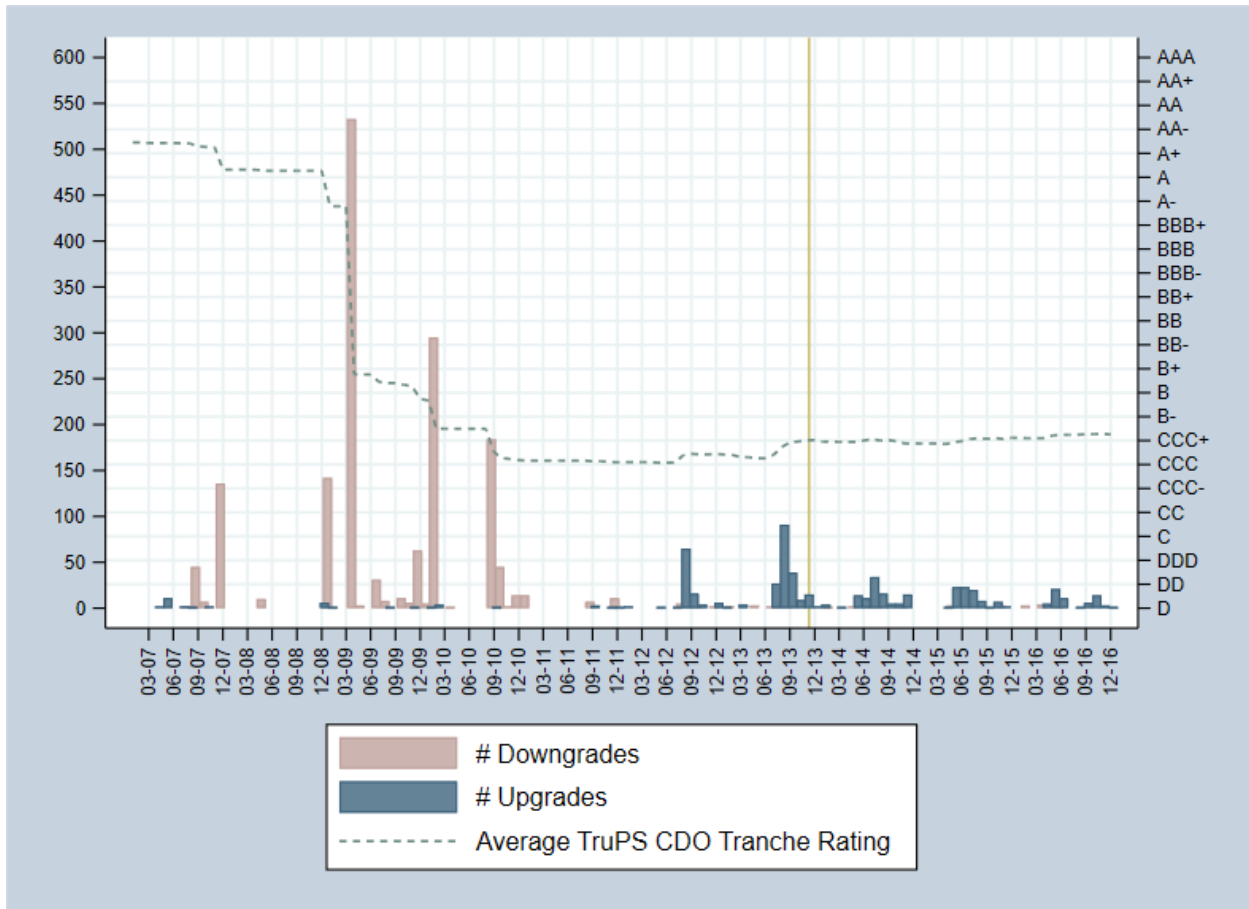


Notes: The figure illustrates the development of the credit risk of CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) over time. Panel A shows the proportion of Trust Preferred Securities pledged as collateral for TruPS CDOs included in the Fitch Bank TruPS CDO Index that are either in default or that are deferring payments. The dashed line represents the sum of TruPS that are in default or deferring payments. The Fitch Bank TruPS CDO index is based on collateral for 116 TruPS CDOs with a notional amount of USD 37.7 billion. The vertical line indicates the date of issuance of the revised Volcker rule on December 10, 2013.

(continued)

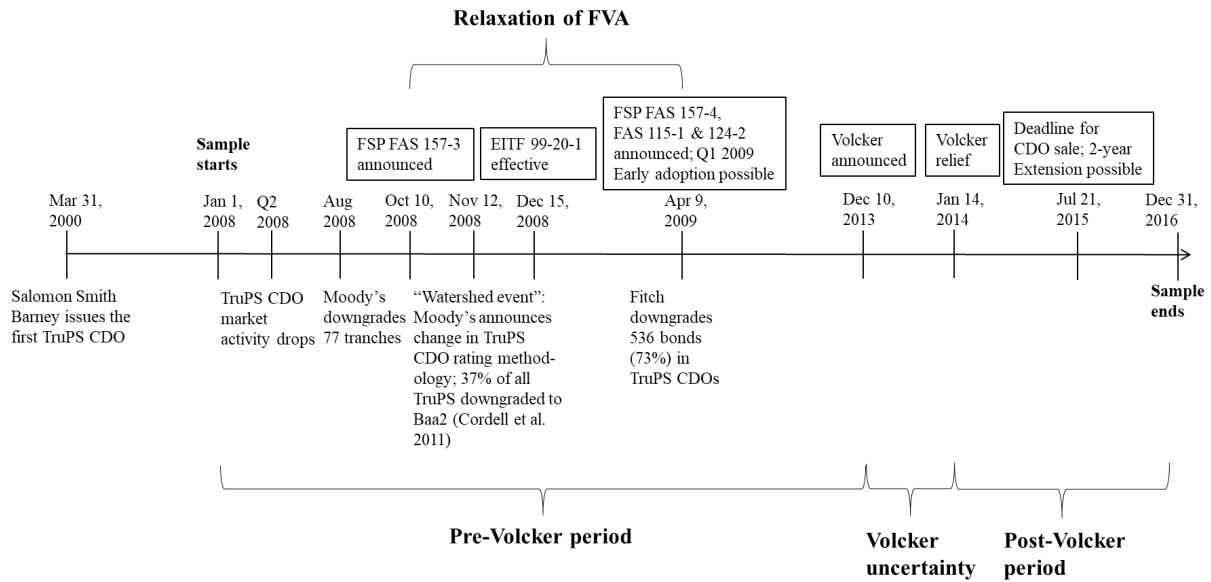
Figure 1 (cont.)

Panel B: Fitch ratings for TruPS CDO tranches over time



Notes: The figure illustrates the development of the credit risk of CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) over time. Panel B indicates the number of rating downgrades and upgrades, and the average rating for the universe of TruPS CDO tranches rated by Fitch Ratings. The sample comprises up to 733 TruPS CDO tranches from 116 different TruPS CDOs. The vertical line indicates the date of issuance of the revised Volcker rule on December 10, 2013.

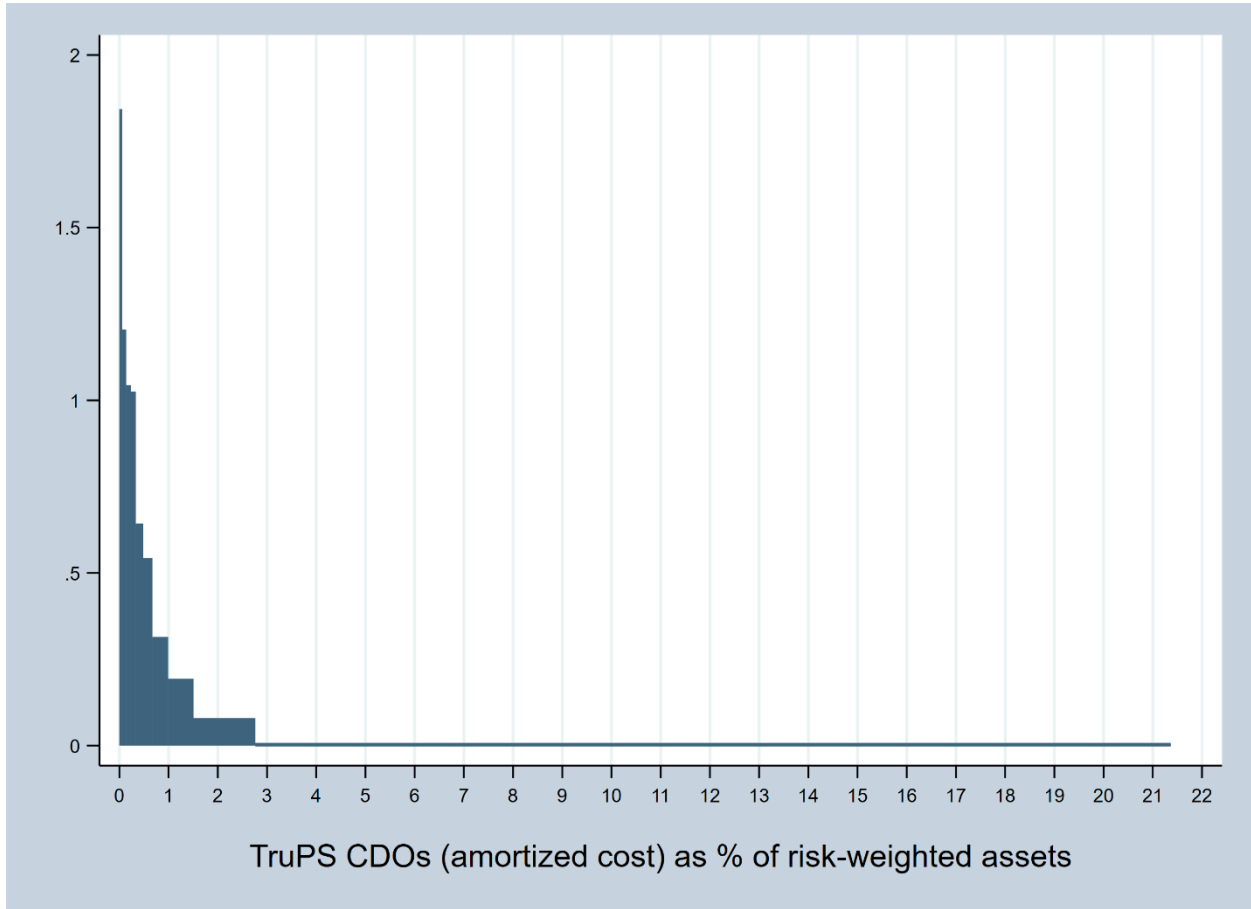
Figure 2: Timeline of regulatory events affecting accounting for TruPS CDOs



Notes: The figure summarizes the sequence of key events affecting financial accounting for CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs).

Figure 3: Relevance of TruPS CDO exposure to exposed firms

Panel A: Equal probability histogram of the ratio of total TruPS CDO exposure (amortized cost) to risk-weighted assets in the pre-Volcker period

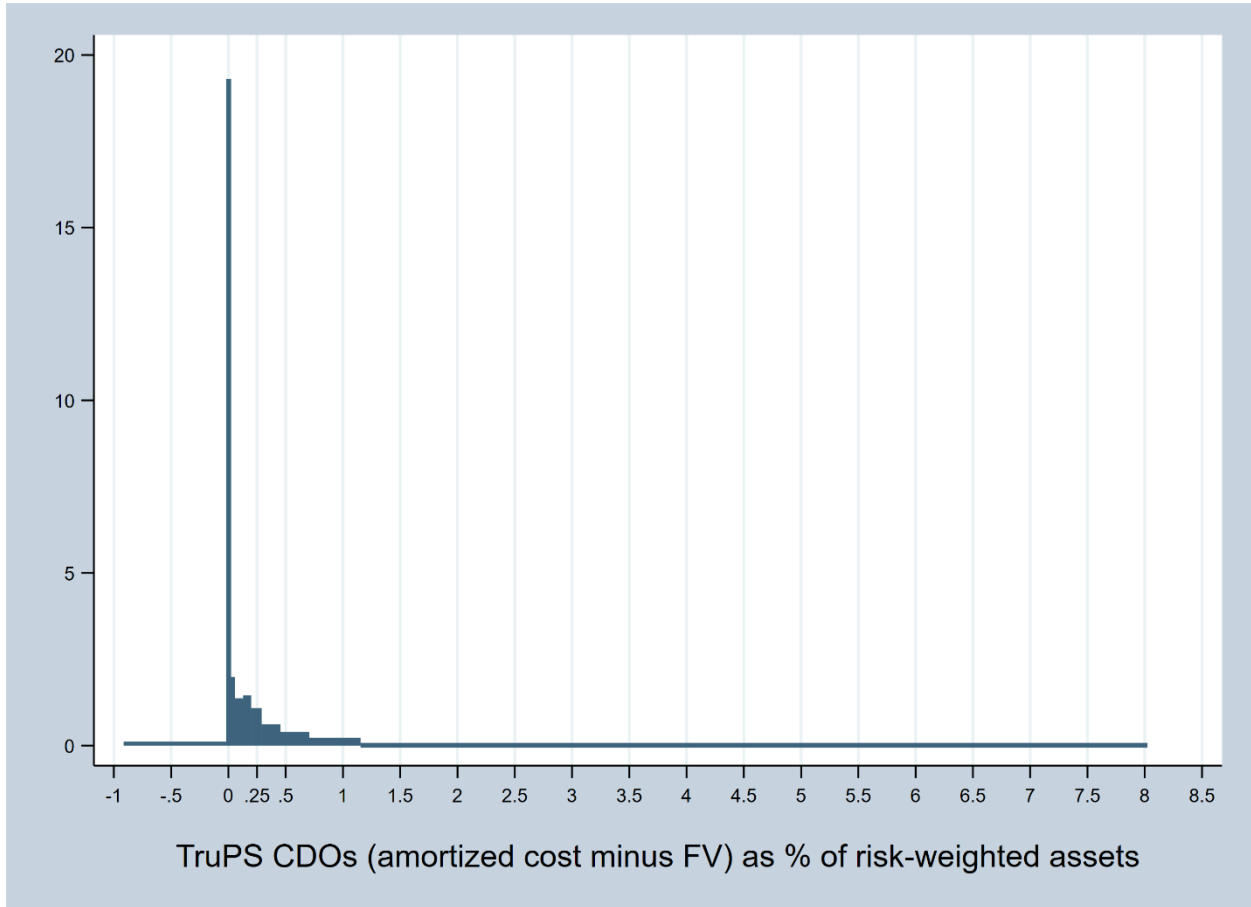


Notes: The figure shows equal probability histograms that represent the magnitude of the exposure of U.S. BHCs and commercial banks to CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) in the period before the issuance of the revised Volcker rule on December 10, 2013. Panel A represents an equal probability histogram of the ratio between the amortized cost of a firm’s total TruPS CDO exposure and its total risk-weighted assets. Each bar of the histogram represents 10% of the observations. The histogram shows that for about 30% of the observations the TruPS CDO exposure is larger than 1% of total risk-weighted assets (i.e., a complete loss on the TruPS CDO portfolio would reduce the Tier 1 capital ratio by more than 1%).

(continued)

Figure 3 (cont.)

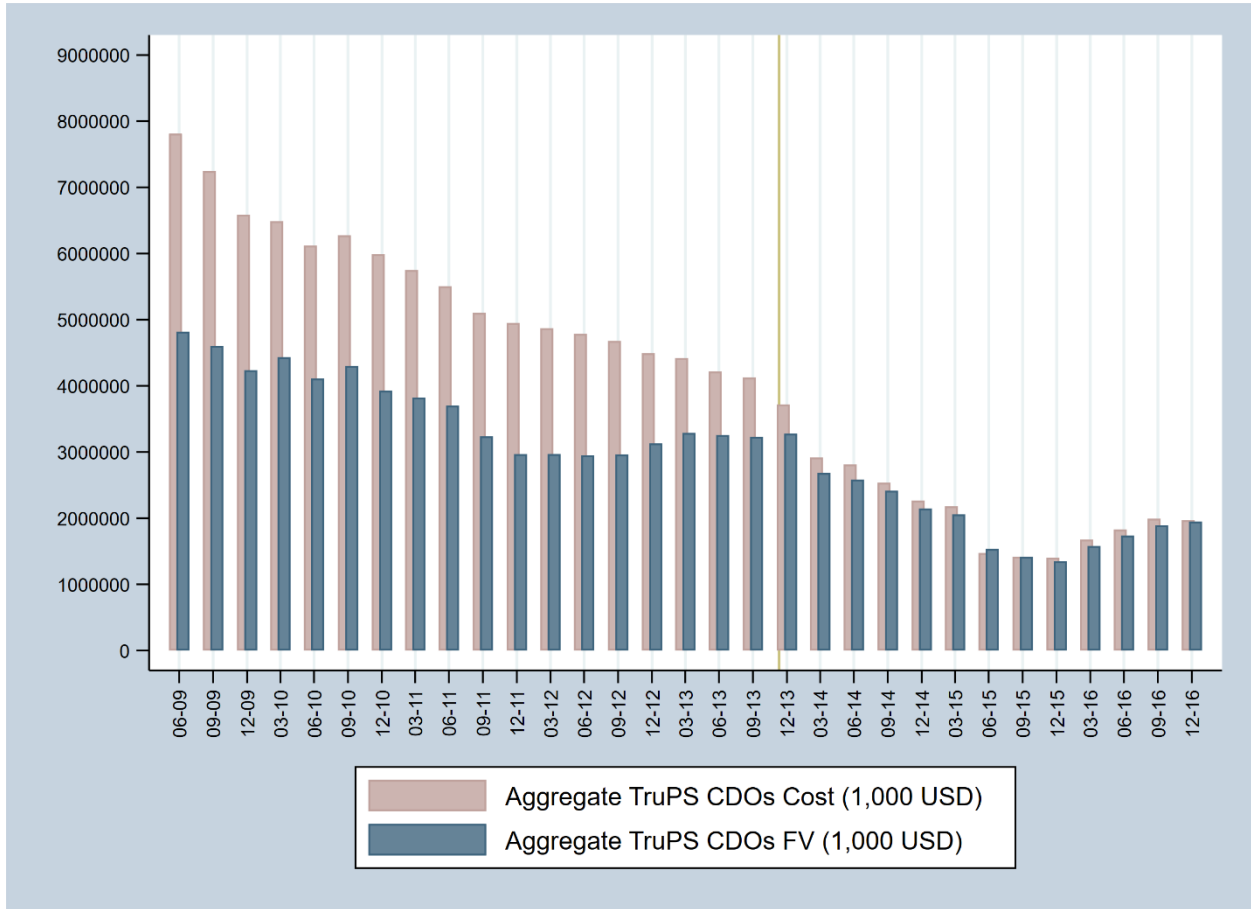
Panel B: Equal probability histogram of the ratio of the difference between the amortized cost and the fair value of the total TruPS CDO exposure to risk-weighted assets in the pre-Volcker period



Notes: The figure shows equal probability histograms that represent the magnitude of the exposure of U.S. BHCs and commercial banks to CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) in the period before the issuance of the revised Volcker rule on December 10, 2013. Panel B represents an equal probability histogram of the ratio between the difference between the amortized cost and the fair value of a firm's TruPS CDO exposure and its total risk-weighted assets. Each bar of the histogram represents 10% of the observations. The histogram shows that for about 30% of the observations, a full realization of losses implied by the current fair value of a firm's TruPS exposure would decrease its Tier 1 capital ratio by more than 0.5 percentage points.

Figure 4: Development of TruPS exposure over time

Panel A: Aggregate TruPS CDO exposure over time (amortized cost vs. fair value)

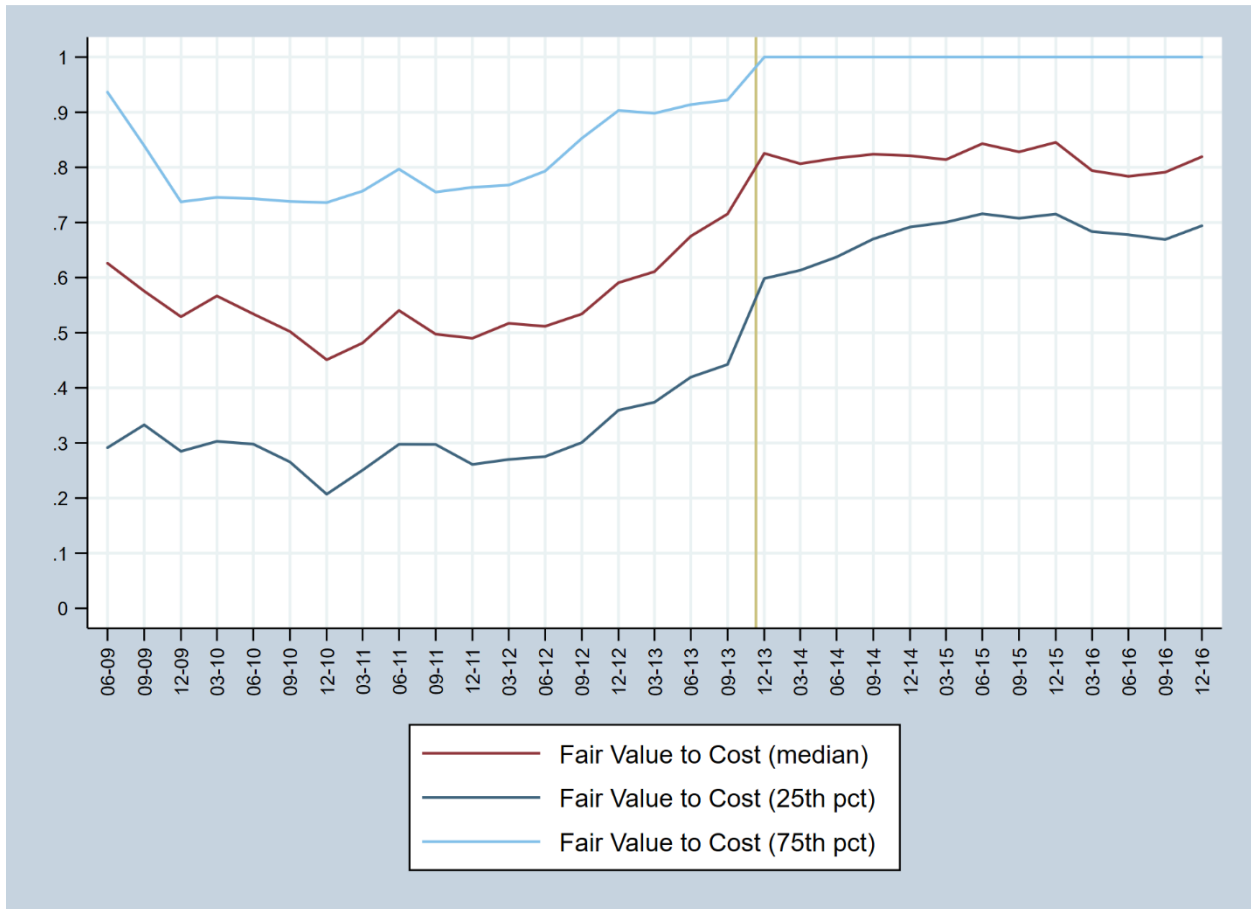


Notes: The figure illustrates the development of the exposure of U.S. BHCs and commercial banks to CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) over the sample period. In Panel A, the bars represent the aggregate fair value and amortized cost of TruPS CDOs. The vertical line indicates the date of issuance of the revised Volcker rule on December 10, 2013.

(continued)

Figure 4 (cont.)

Panel B: Ratio of fair value to amortized cost over time

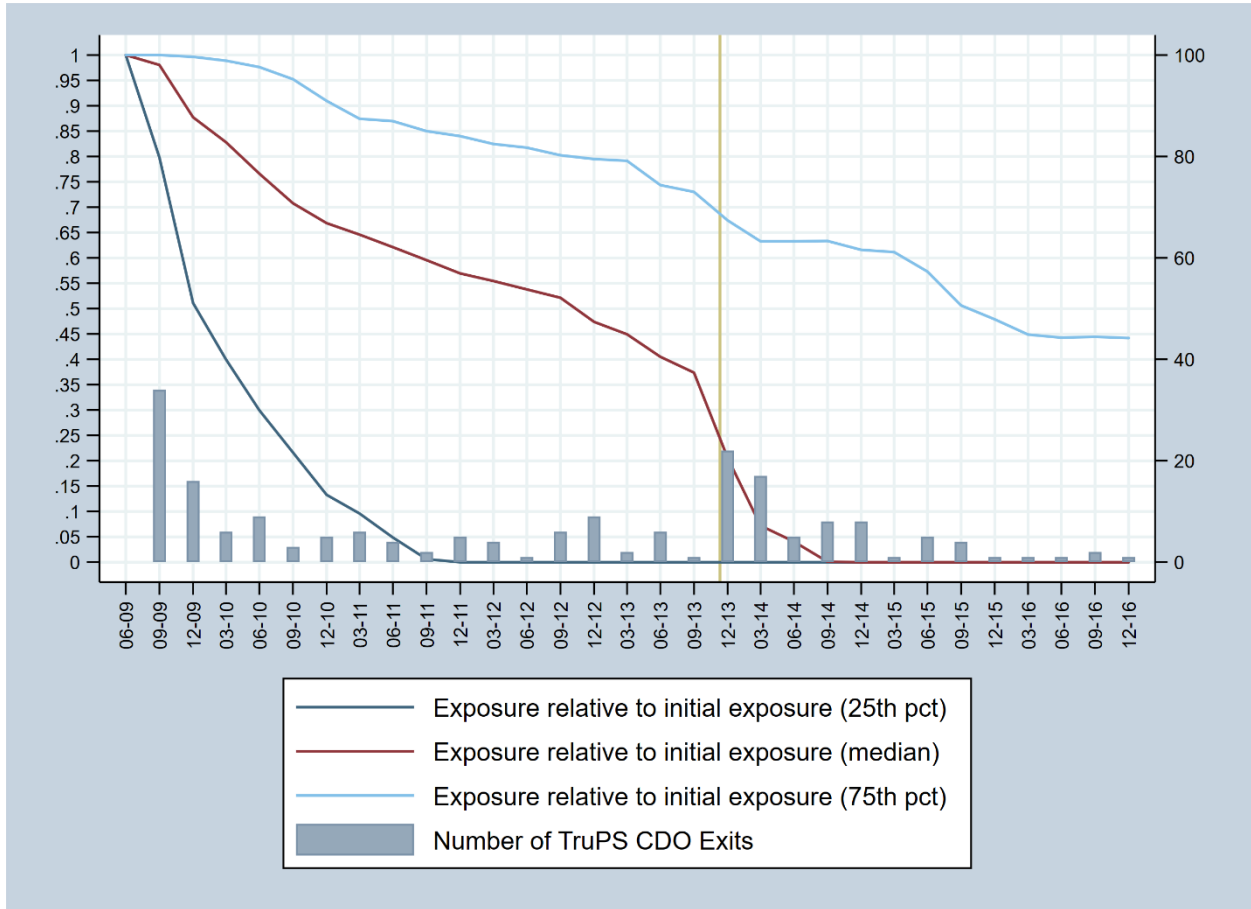


Notes: The figure illustrates the development of the exposure of U.S. BHCs and commercial banks to CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) over the sample period. Panel B shows the first quartile, the median, and the third quartile of the firm-level ratios of the fair value to the amortized cost of TruPS CDO holdings. The vertical line indicates the date of issuance of the revised Volcker rule on December 10, 2013.

(continued)

Figure 4 (cont.)

Panel C: Relative TruPS CDO exposure (amortized cost) over time



Notes: The figure illustrates the development of the exposure of U.S. BHCs and commercial banks to CDOs collateralized by Trust Preferred Securities issued by financial institutions (TruPS CDOs) over the sample period. In Panel C, the graphs represent the first quartile, the median, and the third quartile of the firm-level ratios of the amortized cost of firms' TruPS CDO exposure to their amortized cost in the second quarter of 2009. The bars indicate the number of firms disposing of their TruPS CDO exposure in each quarter. The sample includes only firms with a nonzero TruPS CDO exposure at the beginning of the sample period in the second quarter of 2009 (322 out of 462 sample firms). The vertical line indicates the date of issuance of the revised Volcker rule on December 10, 2013.

Table 1: Overview of Sample Selection Process

Number of commercial banks & BHCs (S&P Market Intelligence)	27,538
Less: Inactive banks	(18,639)
Number of active banks during sample period	8,899
Less: Banks without TruPS CDO exposure	(8,180)
Number of firms with TruPS CDO exposure	719
Less: Commercial banks that are subsidiaries of an exposed BHC	(257)
Number of independent banks with TruPS CDO exposure	462
Of which: Listed banks used for hand-collection	206

Notes: The table provides an overview of the sample selection process. The main sample comprises 462 BHCs and standalone commercial banks exposed to TruPS CDOs over the sample period from the second quarter of 2009 to the fourth quarter of 2016. For 206 listed banks, we can hand-collect detailed TruPS CDO information from their 10-K filings. For these firms, we can extend the sample period to the first quarter of 2008.

Table 2: Summary statistics*Panel A: Main sample (Q2 2009 – Q4 2016, 462 banks)*

	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>P1</i>	<i>P25</i>	<i>Median</i>	<i>P75</i>	<i>P99</i>
<i>TruPS CDO Exposure</i>	8390	0.006	0.010	0.000	0.001	0.003	0.007	0.046
<i>TruPS CDO FV/Cost Ratio</i>	7630	1.268	10.417	0.020	0.393	0.648	0.909	6.223
<i>TruPS CDO Implied Loss</i>	7293	0.373	0.686	-0.395	0.010	0.151	0.465	3.374
<i>Total Assets (million USD)</i>	8678	19135.806	155470.014	55.922	315.372	697.673	2067.750	311462.000
<i>Tier 1 Capital Ratio</i>	8264	0.138	0.060	0.000	0.112	0.130	0.153	0.358
<i>Tangible Equity / Total Assets</i>	8643	0.090	0.038	0.000	0.075	0.088	0.102	0.190
<i>Return on Assets</i>	8635	0.001	0.005	-0.021	0.001	0.002	0.003	0.007
<i>Failed /Merged</i>	10553	0.420	0.494	0.000	0.000	0.000	1.000	1.000
<i>Short-Term Funding</i>	7988	0.038	0.154	-0.347	-0.032	0.045	0.115	0.340
<i>Listed</i>	10553	0.546	0.498	0.000	0.000	1.000	1.000	1.000
<i>AfS / TA</i>	8623	0.209	0.116	0.001	0.123	0.193	0.274	0.544
<i>HtM / TA</i>	8634	0.023	0.052	0.000	0.000	0.000	0.016	0.237

(continued)

Table 2 (cont.)

Panel B: Listed banks for hand-collected sample (Q1 2008 – Q4 2016, 206 banks)

	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>P1</i>	<i>P25</i>	<i>Median</i>	<i>P75</i>	<i>P99</i>
<i>TruPS CDO Exposure</i>	4514	0.005	0.010	0.000	0.001	0.002	0.006	0.045
<i>TruPS CDO FV/Cost Ratio</i>	3997	1.121	7.416	0.028	0.370	0.609	0.864	7.042
<i>TruPS CDO Implied Loss</i>	3625	0.345	0.645	-0.220	0.011	0.129	0.397	3.439
<i>Total Assets</i>	5091	37153.963	221457.601	210.103	760.224	1528.711	4886.120	1737737.000
<i>Tier 1 Capital Ratio</i>	4589	0.135	0.064	0.021	0.108	0.124	0.145	0.384
<i>Tangible Equity / Total Assets</i>	5050	0.086	0.045	0.009	0.068	0.083	0.096	0.205
<i>Return on Assets</i>	5056	0.001	0.005	-0.023	0.001	0.002	0.002	0.007
<i>Failed /Merged</i>	5971	0.451	0.498	0.000	0.000	0.000	1.000	1.000
<i>Short-Term Funding</i>	4244	0.039	0.179	-0.366	-0.035	0.048	0.123	0.332
<i>AfS / TA</i>	5033	0.183	0.098	0.000	0.112	0.170	0.242	0.478
<i>HtM / TA</i>	5045	0.026	0.054	0.000	0.000	0.001	0.025	0.251
<i>Cost of Debt</i>	4780	0.003	0.002	0.001	0.002	0.003	0.005	0.009
<i>Market-to-Book Ratio</i>	4349	0.972	2.455	-0.011	0.680	0.988	1.259	2.857
<i>Return Volatility</i>	5278	0.038	0.151	0.000	0.012	0.020	0.036	0.301
<i>Analyst Following</i>	5971	3.092	5.435	0.000	0.000	0.000	4.000	26.000
<i>Institutional Ownership</i>	5971	0.235	0.291	0.000	0.000	0.076	0.436	0.966
<i>Equity Incentives</i>	3972	0.177	0.314	0.000	0.000	0.093	0.267	0.961

Notes: The table presents descriptive statistics for the variables used in the analyses. In Panel A, the sample comprises quarterly observations from up to 462 BHCs and commercial banks exposed to TruPS CDOs over the main sample period from the second quarter of 2009 to the fourth quarter of 2016. In Panel B, the sample comprises quarterly observations from up to 206 listed banks used for the hand-collection of TruPS CDO data from their 10-K reports over an extended sample period from the first quarter of 2008 to the fourth quarter of 2016. For the summary statistics, we drop observations after a bank has exited its TruPS CDO portfolio. *TruPS CDO Exposure* is the amortized cost of a bank's TruPS CDO holdings divided by its total assets. *TruPS CDO FV/Cost Ratio* is the ratio of the reported fair value of a bank's TruPS CDO holdings to its amortized cost. *TruPS CDO Implied Loss* is the difference between the reported fair value of a bank's TruPS CDO holdings and its amortized cost, divided by the banks total risk-weighted assets. *Total Assets* is total assets denominated in USD million. *Tier 1 Capital Ratio* is the regulatory tier one capital ratio. *Tangible Equity / Total Assets* is the ratio of tangible equity to total assets. *Return on Assets* is the quarterly net income divided by average total assets over the quarter. *Failed /Merged* is a binary indicator variables that is equal to one for banks that cease to exist during or after the sample period. *Short-Term Funding* is the difference between short-term liabilities and short-term assets, divided by total assets. *AfS / TA* is the ratio of securities held as available-for-sale to total assets. *HtM / TA* is the ratio of securities held as held-to-maturity to total assets. For the sample of listed banks, we additionally include the following variables: *Cost of Debt* is total interest expense divided by the sum of average interest bearing liabilities and average noninterest bearing deposits.

Market-to-Book Ratio is the ratio of the market value of a bank's equity to its book value. *Return Volatility* is the quarterly standard deviation of a bank's daily stock returns. We collect the market data to calculate *Market-to-Book Ratio* and *Return Volatility* from Datastream. *Analyst Following* is the mean number of one-year-ahead earnings per share forecasts issued by financial analysts in a quarter as reported in the I/B/E/S monthly files. *Institutional Ownership* is the proportion of equity ownership by institutional investors as reported in the Thomson Reuters 13-f database. *Equity Incentives* is the ratio of equity awards to total compensation as reported by S&P Market Intelligence.

Table 3: Timeliness of loss recognition on TruPS CDOs

Dependent Variable: <i>TruPS CDO FV/Cost Ratio</i>	(1)	(2)	(3)	(4)
<i>PostVolcker</i>	–	–	0.16*** (7.049)	0.15*** (3.064)
<i>TruPS CDO Exposure</i>	-7.09*** (-4.869)	-6.79*** (-5.102)	-7.94*** (-6.286)	-15.3*** (-2.701)
<i>Low Capital</i>	–	-0.022 (-0.741)	-0.032 (-1.127)	-0.074 (-1.286)
<i>Low Profitability</i>	–	-0.045* (-1.861)	-0.042** (-2.154)	0.023 (0.55)
<i>Failed/Merged</i>	–	-0.041 (-1.228)	-0.046 (-1.623)	-0.066 (-1.227)
<i>Listed</i>	–	-0.11*** (-2.789)	-0.074** (-2.232)	–
<i>Short-Term Funding</i>	–	-0.29** (-2.474)	-0.29*** (-3.218)	0.2 (0.821)
<i>Cost of Debt</i>	–	–	–	-54.2 (-1.579)
<i>Return Volatility</i>	–	–	–	0.79 (1.132)
<i>Market-to-Book Ratio</i>	–	–	–	0.093 (1.053)
<i>Analyst Following</i>	–	–	–	-0.0013 (-0.121)
<i>Institutional Ownership</i>	–	–	–	-0.11 (-0.776)
<i>Equity Incentives</i>	–	–	–	-0.29** (-2.389)
<i>Log(Total Assets)</i>	0.018 (1.458)	0.035** (2.374)	0.030* (1.891)	0.11** (2.519)
<i>Trend</i>	0.012*** (8.288)	0.0075*** (4.521)	0.0055*** (4.411)	0.0037 (0.79)
Bank-quarter observations	6575	6415	10402	2948
Adj. R2	0.07	0.096	0.19	0.22

Notes: Throughout the table, the dependent variable is *TruPS CDO FV/Cost Ratio*, the quarterly ratio of the reported fair value of a bank's TruPS CDO holdings to its amortized cost (equal to one after exit). In columns (1) and (2), the sample comprises observations from our main sample of up to 462 banks for the pre-Volcker period from the second quarter of 2009 to the third quarter of 2013. In column (3), the sample period is extended to include observations up to the fourth quarter of 2016. In column (4), the sample includes observations from up to 206 listed banks. *PostVolcker* is a binary indicator variable equal to one for quarterly observations after the third quarter of 2013. *Low Capital* is a binary indicator variable equal to one if a bank's ratio of tangible capital to total assets is lower than the sample median. *Low Profitability* is a binary indicator variable equal to one if a bank's quarterly return on assets is below the sample median. *Trend* is a linear quarterly time trend. For details on the remaining variables see Table 2. The table reports OLS coefficient estimates and (in parentheses) t-statistics based on robust standard errors clustered by bank. *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively (two-tailed).

Table 4: Loss recognition and OTTI reversals in the early crisis period*Panel A: Summary statistics*

	<i>N</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Median</i>
Cum. Losses (2008Q4)/TruPS CDO exposure (2008Q1)	124	0.198	0.279	0.029
Cum. Losses (2008Q4)/TruPS CDO exposure (2008Q1) (adjusters only)	39	0.393	0.263	0.358
FAS 115-2/124-2 Reversal/Cum. OTTI (2008Q4)	39	0.551	0.380	0.546
Time until cum. OTTI is back at pre-adjustment level	31	2.290	2.383	2.000

Panel B: Determinants of OTTIs and OTTI reversals

<i>Dependent Variable:</i>	<i>OTTI</i> (1)	<i>OTTI Reversal</i> (2)
<i>TruPS CDO Exposure</i>	-1.03** (-2.412)	-4.02 (-0.551)
<i>Low Capital</i>	-0.033* (-1.673)	0.31** (2.487)
<i>Low Profitability</i>	-0.012 (-0.569)	0.064 (0.510)
<i>Failed/Merged</i>	0.0097 (0.395)	-0.18 (-1.293)
<i>Short-Term Funding</i>	0.096 (1.281)	-0.45 (-0.904)
<i>Cumulative Earlier OTTIs</i>	0.57*** (2.826)	-0.42* (-1.911)
<i>Cost of Debt</i>	-15.6** (-2.346)	60.2 (1.353)
<i>Return Volatility</i>	1.64*** (3.373)	-5.62 (-1.642)
<i>Market-to-Book Ratio</i>	0.018 (0.859)	-0.071 (-0.643)
<i>Analyst Following</i>	-0.0027 (-0.680)	0.049*** (2.778)
<i>Institutional Ownership</i>	-0.0067 (-0.160)	0.31 (1.006)
<i>Equity Incentives</i>	0.034 (0.681)	-0.15 (-1.388)
<i>Log(Total Assets)</i>	0.011 (0.767)	-0.099 (-1.160)
Bank-quarter observations	340	46
Adj. R ²	0.18	0.29

Notes: Panel A shows summary information on the realization of losses and subsequent reversal of OTTI on TruPS CDOs until the second quarter of 2009 for a sample of 124 banks with TruPS information hand-collected from their annual 10-K reports. In column (1) of Panel B, the sample comprises quarterly observation from the first to the fourth quarter of 2008. The dependent variable is the magnitude of quarterly *OTTIs* scaled by the lagged amount of TruPS holdings (at historical cost). In column (2) of Panel B, the sample comprises observations from 46 firms with earlier OTTI on their TruPS CDO portfolio. The dependent variable is the magnitude of FAS 115-2/124-2 reversals in the first and second quarter of 2009 divided by the cumulative amount of earlier OTTI on the TruPS CDO portfolio. *Low Capital* is a binary indicator variable equal to one if a bank's tier 1 capital ratio (excluding TruPS CDO OTTI/reversals) is below the sample median. *Low Profitability* is a binary indicator variable equal to one if a bank's quarterly return on assets (excluding TruPS CDO OTTI/reversals) is below the sample median. *Cumulative Earlier OTTI* is the amount of cumulative earlier OTTI on TruPS CDOs (scaled by the amortized cost of the TruPS CDO exposure in the first quarter of 2008) until the preceding quarter. For details on the remaining variables see Table 2. In column (2), the explanatory variables are measured in the second quarter of 2009. The table reports OLS coefficient estimates and (in parentheses) t-statistics based on robust standard errors clustered by bank. *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively (two-tailed).

Table 5: TruPS CDO divestments

<i>Dependent Variable:</i> <i>Period:</i>	<i>TruPS CDO Sales</i>			<i>TruPS CDO Exit</i>		
	Full Period (1)	Pre-Volcker (2)	Volcker Uncertainty (3)	Full Period (4)	Pre-Volcker (5)	Volcker Uncertainty (6)
<i>Volcker</i>	0.065*** (5.437)	–	–	0.081*** (4.936)	–	–
<i>TruPS CDO Implied Loss</i>	-0.020*** (-5.473)	-0.022*** (-5.928)	-0.029 (-1.172)	-0.029*** (-7.108)	-0.030*** (-6.961)	-0.085*** (-2.670)
<i>Volcker × TruPS CDO Implied Loss</i>	-0.022** (-2.163)	–	–	-0.025* (-1.681)	–	–
<i>Low Capital</i>	-0.0014 (-0.317)	-0.00069 (-0.154)	0.035 (0.826)	0.0021 (0.460)	-0.0015 (-0.307)	0.055 (1.090)
<i>Low Profitability</i>	-0.0057 (-1.415)	-0.0079* (-1.663)	-0.061 (-1.537)	-0.0035 (-0.731)	-0.0038 (-0.700)	-0.054 (-1.028)
<i>Failed/Merged</i>	0.00099 (0.234)	-0.0034 (-0.733)	0.072* (1.712)	0.0047 (0.925)	-0.0042 (-0.788)	0.11* (1.809)
<i>Listed</i>	-0.011** (-2.364)	-0.014*** (-3.047)	0.084* (1.661)	-0.0035 (-0.719)	-0.0089* (-1.751)	0.13** (2.149)
<i>Short-Term Funding</i>	-0.016 (-0.989)	-0.039** (-1.972)	0.000031 (0.000188)	-0.0084 (-0.438)	-0.025 (-1.099)	-0.093 (-0.416)
<i>Log(Total Assets)</i>	-0.0011 (-0.481)	-0.0043*** (-2.631)	-0.0019 (-0.103)	-0.0038*** (-2.635)	-0.0063*** (-3.627)	-0.020 (-1.417)
<i>Trend</i>	-0.0018*** (-5.599)	–	–	-0.0012*** (-3.572)	–	–
Fixed Effects	–	Quarter	–	–	Quarter	–
Bank-quarter observations	5698	4095	192	6865	4771	240
Adj. R ²	0.028	0.073	0.021	0.021	0.038	0.028

Notes: In columns (1), (2), and (3), the dependent variable is the amortized cost of *TruPS CDO Sales* relative to a bank's TruPS CDO exposure in the second quarter of 2009. In columns (4), (5), and (6), the dependent variable is *TruPS CDO Exit*, a binary indicator variable equal to one if a bank exits its TruPS CDO exposure (through a sale or a full write-off). *Volcker* is a binary indicator variable equal to one for all observations from the fourth quarter of 2013 and the first quarter of 2014. *Low Capital* is a binary indicator variable equal to one if a bank's ratio of tangible capital to total assets is lower than the sample median. *Low Profitability* is a binary indicator variable

equal to one if a bank's quarterly return on assets is below the sample median. *Trend* is a linear quarterly time trend. For details on the remaining variables see Table 2. In columns (1) and (4), the sample comprises quarterly observations from the second quarter of 2009 to the fourth quarter of 2016, and the explanatory variables are lagged by one quarter. In columns (2) and (5), the sample comprises quarterly observations from the second quarter of 2009 to the third quarter of 2013, and the explanatory variables are lagged by one quarter. In columns (3) and (6), the sample comprises joint observations for the fourth quarter of 2013 and the first quarter of 2014 for the dependent variables. The explanatory variables are measured in the third quarter of 2013. The table reports OLS coefficient estimates and (in parentheses) t-statistics based on robust standard errors clustered by bank. *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively (two-tailed).

Online Appendix to

**“Historical Cost vs. Fair Value Accounting:
Impairment Choice, Trading Incentives, and Fire Sales”**

Table OA-1: Aggregate TruPS CDO losses over time*Panel A: Full sample (Q2 2009 – Q4 2016)*

<i>Quarter</i>	<i>TruPS CDOs (cost)</i>	<i>TruPS CDOs (FV)</i>	<i>FV/Cost Ratio</i>	<i>Tot. OTTI</i>	<i>Tot. Sales</i>	<i>Tot. Loss on Sales</i>	<i>Cum. Tot. Loss</i>	<i>No. of Exits</i>
2009q2	7,088,258	4,389,788	0.619	194,727	3,917	8,065	110,019	–
2009q3	6,418,385	4,079,031	0.636	602,668	169,669	48,815	761,651	35
2009q4	5,785,941	3,779,547	0.653	504,021	154,462	24,720	1,290,392	15
2010q1	5,641,729	3,925,574	0.696	137,454	39,265	16,094	1,443,940	7
2010q2	5,563,791	3,808,445	0.685	82,315	23,224	3,330	1,529,585	9
2010q3	5,797,455	4,054,166	0.699	148,528	51,794	17,583	1,695,696	3
2010q4	5,602,921	3,745,402	0.668	57,575	219,922	62,442	1,815,713	5
2011q1	5,302,748	3,603,577	0.680	24,068	231,209	42,033	1,881,814	6
2011q2	5,109,446	3,513,077	0.688	21,530	187,291	14,037	1,917,381	4
2011q3	4,990,237	3,164,597	0.634	27,457	72,358	21,895	1,966,733	3
2011q4	4,883,002	2,754,006	0.564	23,425	74,246	9,164	1,999,322	5
2012q1	4,824,303	2,997,598	0.621	26,079	21,034	5,048	2,030,449	4
2012q2	4,752,974	2,967,585	0.624	31,148	21,171	4,261	2,065,858	1
2012q3	4,641,782	2,998,567	0.646	23,341	75,644	29,891	2,119,090	6
2012q4	4,485,654	3,174,769	0.708	86,600	54,800	21,615	2,227,305	9
2013q1	4,422,272	3,303,542	0.747	15,163	20,967	19,003	2,261,471	2
2013q2	4,317,184	3,294,927	0.763	6,185	77,314	56,297	2,323,953	5
2013q3	4,241,117	3,349,997	0.790	10,388	54,834	14,247	2,348,588	1
2013q4	3,810,842	3,322,515	0.872	138,860	270,048	204,818	2,692,265	25
2014q1	3,013,201	2,726,948	0.905	1,117	796,215	-19,892	2,673,490	17
2014q2	2,890,163	2,626,584	0.909	737	95,358	-2,753	2,671,474	7
2014q3	2,597,728	2,435,432	0.938	1,578	245,093	37,690	2,710,742	9
2014q4	2,319,050	2,155,963	0.930	1,813	243,433	-14,742	2,697,813	8
2015q1	2,246,198	2,127,461	0.947	78	46,979	4,564	2,702,455	1
2015q2	1,513,873	1,583,761	1.046	136	716,659	156,742	2,859,333	5
2015q3	1,409,686	1,411,173	1.001	2,560	68,462	-72,160	2,789,733	7
2015q4	1,394,944	1,341,743	0.962	424	12,749	1,812	2,791,969	1
2016q1	1,663,430	1,566,943	0.942	70	16,817	11,098	2,803,137	1
2016q2	1,816,437	1,727,560	0.951	106	29,552	6,703	2,809,946	1
2016q3	1,968,351	1,876,939	0.954	117	30,736	-10,442	2,799,621	2
2016q4	1,948,751	1,929,968	0.990	6,708	8,192	2,252	2,808,581	1

Table OA-1 (cont.)*Panel B: Hand-collected sample (Q1 2008 – Q4 2016)*

<i>Quarter</i>	<i>TruPS CDOs (cost)</i>	<i>TruPS CDOs (FV)</i>	<i>FV/Cost Ratio</i>	<i>Tot. OTTI</i>	<i>Tot. Adj.</i>	<i>Tot. Sales</i>	<i>Tot. Loss on Sales</i>	<i>Cum. Tot. Loss</i>	<i>No. of Exits</i>
2008q1	5,072,446	–	–	1,211	0	2,472	0	6,741	0
2008q2	5,033,925	–	–	71,863	0	2,453	0	78,604	0
2008q3	4,958,344	–	–	92,935	0	0	0	171,539	0
2008q4	4,059,787	–	–	939,005	0	1,405	0	1,110,544	1
2009q1	4,562,209	–	–	104,468	188,341	14,316	5,593	1,032,264	0
2009q2	4,493,563	2,760,243	0.614	191,662	92,773	3,917	8,065	1,139,218	0
2009q3	4,110,345	2,535,342	0.617	362,667	-149	19,673	11,675	1,513,709	2
2009q4	3,787,864	2,388,987	0.631	296,457	0	44,069	15,877	1,826,043	2
2010q1	3,684,697	2,365,577	0.642	97,469	0	7,006	52	1,923,564	2
2010q2	3,637,649	2,313,758	0.636	45,462	0	234	0	1,969,026	1
2010q3	3,573,445	2,203,129	0.617	57,484	0	2,168	427	2,026,937	0
2010q4	3,568,254	2,160,935	0.606	39,773	0	10,901	5,012	2,071,722	1
2011q1	3,497,581	2,157,437	0.617	13,142	0	5,482	444	2,085,308	3
2011q2	3,367,039	2,047,555	0.608	9,330	0	132,002	-10,282	2,084,356	2
2011q3	3,303,252	1,788,727	0.542	22,014	0	580	-1,424	2,104,946	1
2011q4	3,224,419	1,534,461	0.476	21,446	0	36,681	3,876	2,130,268	1
2012q1	3,194,420	1,760,699	0.551	14,750	0	1,840	95	2,145,113	1
2012q2	3,157,136	1,711,526	0.542	11,874	0	7,448	-276	2,156,711	0
2012q3	3,121,650	1,771,876	0.568	10,112	0	8,063	1,098	2,167,921	1
2012q4	2,941,768	1,775,689	0.604	86,061	0	19,693	5,018	2,259,000	3
2013q1	2,893,802	1,840,093	0.636	14,749	0	5,511	-902	2,272,847	0
2013q2	2,828,254	1,801,526	0.637	5,881	0	30,700	7,268	2,285,996	3
2013q3	2,770,974	1,860,165	0.671	9,079	0	26,689	18,901	2,313,976	0
2013q4	2,398,708	1,838,662	0.767	132,563	0	230,253	188,433	2,634,972	15
2014q1	1,728,872	1,333,053	0.771	893	0	670,994	-38,069	2,597,796	7
2014q2	1,685,934	1,324,878	0.786	473	0	19,067	9,888	2,608,157	3
2014q3	1,431,472	1,146,590	0.801	1,540	0	213,448	27,564	2,637,261	3
2014q4	1,234,641	970,148	0.786	881	0	189,133	15,613	2,653,755	2
2015q1	1,210,255	977,926	0.808	78	0	14,028	2,668	2,656,501	0
2015q2	582,714	535,730	0.919	26	0	612,115	148,299	2,804,826	2

2015q3	505,234	469,217	0.929	2,560	0	42,477	-6,894	2,800,492	3
2015q4	493,082	456,637	0.926	162	0	9,871	153	2,800,807	0
2016q1	473,194	422,469	0.893	70	0	14,654	11,686	2,812,563	0
2016q2	457,648	390,951	0.854	76	0	28,950	6,386	2,819,025	0
2016q3	431,361	360,403	0.836	117	0	25,304	-13,429	2,805,713	1
2016q4	429,475	370,399	0.862	456	0	4,604	2,487	2,808,656	0

Notes: The table presents an overview of the development of TruPS CDO holdings and loss realization over time. Panel A shows data for the period from 2009Q2 to 2016Q4 for a sample of up to 361 commercial banks and BHCs that held TruPS CDOs in 2009Q2 and that did not drop out of the sample before 2014Q1. Panel B shows data for an extended sample period from 2008Q1 to 2016Q4 for up to 103 banks that held TruPS CDOs in 2009Q2 and that did not drop out of the sample before 2014Q1.