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Chenyu Shan, Dragon Yongjun Tang and Hong Yan

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Credit Default Swaps and Bank Regulatory Capital

Chenyu Shan[*]
Shanghai University of Finance and Economics

Dragon Yongjun Tang
The University of Hong Kong

Hong Yan
Shanghai Advanced Institute of Finance, SJTU

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Abstract

We find banks' total assets increase after they start using credit derivatives, such as credit default swaps (CDS), while their risk-weighted assets decrease. This contrasting result is an unintended consequence of bank capital regulations that allow banks to use CDS to convert high-risk-weight assets into low-risk-weight assets. Through the use of CDS, banks can hold less capital while cosmetically complying with regulatory capital ratio requirements. CDS-using banks generate higher returns on capital from the lower-risk-weight assets they hold than their counterparts not using CDS. Our findings suggest that, apart from risk management motives, capital relief is another important driver for banks' prolific use of credit derivatives. Such regulation-induced financial innovations can weaken the effectiveness of bank regulations.

Keywords: Credit default swaps; CDS; bank capital; financial innovation

JEL classification: G21

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[*] Email addresses: Shan: shan.chenyu@mail.sufe.edu.cn, Tang: yjtang@hku.hk and Yan: hyan@saif.sjtu.edu.cn.

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1. Introduction

The famed free market advocate Milton Friedman proclaimed bank regulation was the only form of government intervention that was necessary.[1] Bank capital regulation is important because the shareholder perspective on the optimal capital structure of a bank can differ from society's perspective (Thakor, 2014). However, banks do not passively comply with government regulations. To maximise returns on capital, they may exploit regulatory loopholes, use financial innovations to circumvent rules, and even lobby politicians to enact rules to their advantage. If banks engage in manipulative practices to counteract regulatory measures, the effectiveness of bank regulations will be eroded. Aside from industry anecdotes and public commentaries, the empirical evidence on how banks eschew regulations is scarce. In this paper, we provide direct evidence of how banks use credit derivatives, especially credit default swaps (CDS), to manage capital requirement compliance, the most important component of bank regulations, to maximise shareholder value.

Despite a relatively short history of about two decades, the CDS market has experienced dramatic development and attracted much public attention. The most evident role of CDS in the bank capital regulation is reflected in the second Basel Capital Accord, ie, "Basel II". For example, Gary Gensler, the former chairman of the US Commodity Futures Trading Commission, said "the reliance on CDS, enabled by the Basel II capital accords, allowed many banks to lower regulatory capital requirements".[2] If regulations recognise the role of CDS, banks should take advantage of such an opportunity as long as the cost of using CDS is justifiable. CDS, as a "credit risk mitigant", can be used to lower risk weights of assets and regulatory capital in banking and trading books. If the cost of CDS use is sufficiently lower than the benefit from capital savings, arbitrage opportunities exist when assets are assigned to the category with lower capital requirements via CDS use. If, in practice, such a capital relief role of CDS is operational, the incentives for banks to use credit derivatives to circumvent capital requirements should be stronger when banks are more capital constrained.[3]

[1] http://delong.typepad.com/sdj/2013/08/why-did-milton-friedman-think-a-modern-economy-needed-heavy-handed-government-regulation-in-the-liquidity-services-industry-a.html

[2] http://www.cftc.gov/PressRoom/SpeechesTestimony/opagensler-32

[3] In fact, banks are actively practising so, as reported by *Wall Street Journal*: http://www.wsj.com/articles/the-hot-thing-for-wall-street-banks-capital-relief-trades-1439852844

We compile a comprehensive dataset on US banks' credit derivatives positions and other financial information for our empirical analysis. Even though the US did not formally adopt Basel II, US banks were among the most active users of credit derivatives, as the role of CDS is still recognised in US capital regulations.[4] In fact, it was a US bank (JPMorgan) that invented CDS and pushed for its recognition in bank regulation. While many banks in our sample do not trade CDS, we find that, among CDS-using banks, which are typically large, CDS has a significant effect on their asset composition and capital levels. This is because CDS facilitates the reduction of banks' total risk-weighted assets, although the amount of total assets increases. This finding is the first piece of evidence to demonstrate that banks effectively use CDS to manage their risky asset portfolios with respect to capital regulations. Such actions have real consequences on banks' capital management because the prevailing bank capital regulation is applied to the ratio of capital over risk-weighted assets.[5]

We then examine the specific ways in which banks use CDS to reduce risk-weighted assets. Banks report assets under different risk weight categories. We find that they use CDS to shift assets from high-risk-weight categories, which consume more capital, to low-risk-weight categories. Some bank assets are in the zero-risk weight category for which no capital is needed to support those assets. We find substantial increases in the zero-risk-weight assets relative to the total on-balance-sheet assets for CDS-using banks, while their assets in the higher-risk-weight categories decrease. In other words, CDS-using banks move more assets out of the coverage of regulatory capital than non-CDS-using banks. The increase in the proportion of capital-free assets is robust to the consideration of the endogenous selection of bank CDS use, and to different measures of bank CDS positions and alternative samples of banks. The effect is mainly from the purchase of CDS contracts, rather than the sale of CDS contracts. This is consistent with the notion that CDS is used to lessen capital burden by reducing asset risk weights.

A larger number of low-risk-weighted assets would result in a higher risk-weighted capital ratio if a bank holds the same amount of capital. However, we find that banks also reduce their capital base at the same time they reduce the number of risk-weighted assets. Consequently, their risk-weighted

[4] See Fed "supervision and regulation" letter: http://www.federalreserve.gov/boarddocs/srletters/2011/sr1101.pdf

[5] The basic requirement is on the ratio of the sum of Tier 1, Tier 2 and Tier 3 capital to total risk-weighted assets (both on-balance-sheet items and the equivalent amount of off-balance-sheet items). There are also requirements on Tier 1 capital and unweighted leverage ratios. We provide more details on the regulatory capital ratios in Section 2.

capital ratios remain roughly the same. We find that the regulatory capital ratios for CDS-using banks are less sensitive to the changes in the level of bank capital, suggesting that CDS helps these banks manage capital ratios.

Bank managers' ultimate goal is to increase the bank's return-on-capital and profitability. We find that, while bank profitability increases with the risk-weighted asset ratio, such a positive relationship between bank risk-taking and profitability is weaker for CDS-using banks. This suggests that banks may be able to increase profitability without increasing measured risk when they can use CDS. We also find that banks' returns on equity and returns on capital decrease with the amount of capital-free assets, but banks' CDS positions attenuate this relationship. These findings indicate that, for CDS-using banks, the observed risks based on the reported risk-weighted assets may not adequately represent the banks' true risks. When banks can manage their obligations with CDS in accordance to capital regulations, their profitability is only weakly associated with reported risk.

Finally, we find that the return on equity increases with the capital ratio for CDS-using banks, but not for banks that do not use CDS. This finding sheds light on possible benefits that banks gain from CDS use: CDS-using banks' capital raising can lead to a greater increase in profit-earning assets, and therefore to a greater increase in bank profitability. This is consistent with our previous finding that CDS enables banks to use less capital to support the same or larger amounts of risky assets. Therefore, one interpretation of banks' incentives for using CDS in capital management is to maximise shareholder value.

Consistent with the view that banks have strong incentives to reduce their required regulatory capital, we show evidence that banks use CDS to manage their regulatory capital, in addition to their use of CDS for hedging.[6] Our findings corroborate anecdotal observations. For example, insurance company AIG disclosed that 72% of the CDS it sold in 2007 was used by banks for capital relief. Our empirical documentation of banks using CDS for capital relief adds to the literature that demonstrates the effect CDS trading has on borrowers in terms of cost of debt, leverage and bankruptcy risk (see, Ashcraft

[6] Minton, Stulz, and Williamson (2009) use data from an early sample and find some, but not pervasive, evidence that banks use CDS to hedge their credit risk exposures.

and Santos (2009), Bolton and Oehmke (2011), Saretto and Tookes (2013), Subrahmanyam, Tang, and Wang (2014)).[7]

Our paper contributes to a growing literature on financial institutions' activities that circumvent regulatory requirements (eg, Acharya, Schnabl, and Suarez (2013), Duchin and Sosyura (2014), Acharya and Steffen (2014), Begley, Purnanandam, and Zheng (2015), Demyanyk and Loutskina (2015), Ellul, Jotikasthira, Lundblad, and Wang (2015), Boyson, Fahlenbrach, and Stulz (2016)). This literature shows that banks strategically manage their balance sheet variables to appear in compliance with regulatory requirements while helping them to achieve their business goals. While previous papers mostly focus on the implications for the asset side,[8] we examine how banks manage their risky portfolios from the perspective of the capital side. We present direct evidence on how banks' capital management incentive is affected by the regulatory forbearance afforded by CDS, which is of great concern to bank supervisors.[9]

The rest of the paper proceeds as follows. Section 2 provides the motivational background and puts our study in the relevant context. Section 3 describes our datasets and sampling procedure. Section 4 presents the empirical results on the effect of banks' CDS use on their risk-weighted assets, capital holding and profitability. Section 5 concludes.

2. Institutional Background

The allowance of capital relief prompted by credit derivatives is an important development in bank capital regulation. After completing the first CDS deal in 1994, JPMorgan soon communicated with receptive US regulators about allowing banks to reduce their capital reserves by hedging credit risk exposure through CDS protection at a time when US bank regulators were calling for revisions to the 1988 Basel capital accord ("Basel I"). In August 1996, the Federal Reserve Board issued a statement

[7] See Augustin, Subrahmanyam, Tang, and Wang (2014). Klingler and Lando (2015) discuss related issues from the angle of CDS pricing. A review of the relevant literature is provided in Section 2.

[8] For example, Ellul and Yerramilli (2013) discuss how bank holding companies' risk management affects the measures of their asset risks, such as non-performing loans.

[9] See, eg, http://www.bis.org/publ/bcbs_nl16.htm

suggesting that banks should be allowed to reduce capital requirements by using credit derivatives.[10] In June 1997, the Federal Reserve Board released a document providing guidance on how credit derivatives held in the trading account should be treated under the market risk capital requirement that was approved by the Basel Committee a year earlier.[11] In December 1997, JPMorgan marketed the Broad Index Secured Trust Offering (Bistro), a synthetic collateralised loan obligation (CLO) structured in three tranches. When JPMorgan failed to move the "super senior" tranche it kept on its trading books, it received permission from the Federal Reserve in early 1998 to use a much lower risk weight on the security that remained on its banking books protected by CDS.[12] That was the first incident of CDS recognition in bank capital requirement and the practice has since gained traction.

Meanwhile, the International Swaps and Derivatives Association (ISDA) also advocated for credit derivatives to be included in bank capital regulations in a March 1998 white paper, entitled *Credit Risk and Regulatory Capital*. Consequently, in June 1999, with the confluence of US regulatory actions, it was proposed that credit derivatives be counted as credit exposure hedges that were similar to guarantees, either in full or in part, in the first Basel II consultative paper. It recognised that "the development of credit risk mitigations such as credit derivatives has enabled banks to substantially improve their risk management".[13] The proposal eventually became a part of Basel II, which was approved in 2004.

The Basel capital accord is rather flexible in recognising CDS as a hedge for banks. For example, a mismatch between the underlying obligation and the reference obligation under CDS is permissible if the reference obligation is junior to the underlying obligation. In other words, bond CDS can be counted as a hedge for loan risk. The capital accord also allows for a maturity mismatch and partial hedging (for credit event definitions and coverage). The role of CDS in bank capital regulation is maintained in "Basel III", which was approved in 2010, albeit with certain modifications. We note that,

[10] "Supervisory Guidance for Credit Derivatives", Division of Banking Supervision and Regulation, Board of Governors of the Federal Reserve System, August 12, 1996: http://www.federalreserve.gov/boarddocs/srletters/1996/sr9617.htm
For a detailed historical account of how credit derivatives became part of bank capital regulations, see Tett (2009).

[11] "Application of Market Risk Capital Requirements to Credit Derivatives", June 13, 1997: http://www.federalreserve.gov/boarddocs/srletters/1997/sr9718.htm

[12] The Fed indicated that "such transactions allow economic capital to be more efficiently allocated, resulting in, among other things, improved shareholder returns". See "Capital Treatment for Synthetic Collateralized Loan Obligations", November 17, 1999: http://www.federalreserve.gov/boarddocs/srletters/1999/SR9932.HTM

[13] See http://www.bis.org/publ/bcbs50.pdf

although the US did not officially adopt Basel II, it is the country with the most active CDS trading and is the most accommodative of CDS for capital relief.

The use of CDS for capital purposes is indirectly confirmed by statements from protection sellers. For example, AIG disclosed in its 2007 annual report that 72% of the CDS protection it sold was used by banks for capital relief.[14] It is necessary for protection sellers to make such claims for credit derivatives to be counted for capital relief for protection buyers. However, CDS is not regulated as an insurance policy under the US Commodity Futures Modernization Act of 2000. Therefore, although banks can obtain capital relief using CDS contracts, sellers of these contracts are not required to hold additional capital to provide the protection because they are typically non-bank financial institutions, such as insurance companies (eg, AIG), and are therefore outside the reach of bank regulators.

Minton, Stulz, and Williamson (2009) find surprisingly little CDS use by US banks for hedging purposes in an earlier sample. Their finding is based on banks' voluntary disclosure. Arguably, banks are less forthcoming with their activities for capital relief trades.[15] Banks tend to use basket or index CDS to more effectively satisfy capital requirements. These banks may first securitise loans to generate CDO tranches and then buy CDS by referencing the pool of loans to obtain capital relief because they may have to retain those tranches or provide implicit guarantees to outside investors on those tranches, as demonstrated by Acharya, Schnabl and Suarez (2013). However, bank statements in early periods may only contain a single-name CDS on individual loans. Furthermore, banks have little incentive to publicise their use of CDS for capital relief to avoid negative perceptions of their capital adequacy.

Theoretical models, including that of Parlour and Winton (2013), suggest that the cost of holding capital can be a motive for banks to use CDS to transfer credit risk. Allen, Carletti, and Marquez (2011) show in a general equilibrium model that bank capital is costly relative to deposits as a funding source. Although these theoretical predictions and the historical development of capital rules leading up to Basel II suggest that capital relief can be an important motive for banks to use CDS, empirical documentation on whether and how banks manage to exploit the capital relief opportunity is scarce.

[14] http://www.aig.com/Chartis/internet/US/en/2007-10k_tcm3171-440886.pdf

[15] The Office of Financial Research of the US Department of Treasury wrote that "more transparency is needed for bank capital relief trade". https://financialresearch.gov/briefs/files/OFRbr-2015-04-bank-capital-reflief-trades.pdf

If banks take advantage of the capital relief with CDS, they can appear to be in proper compliance with regulatory requirements with less capital, and therefore achieve a higher return on capital.[16] In this regard, we examine CDS effects on risk-weighted regulatory capital ratios. Our examination of CDS effects starts with the denominator of the regulatory capital ratio: the risk-weighted assets. The use of CDS may change risk weights and modify the quantity of credit risk and the positions of market risk. This is because CDS facilitates the process of moving assets to categories with lower risk weights, effectively increasing bank size without increasing regulatory capital.[17]

3. Data Sources and Sample Description

Our primary source of bank CDS position data for the 1997-2014 period is the Federal Reserve Consolidated Financial Statements for Holding Companies (FR Y-9C).[18] Banks with more than US$150 million in assets are required to file FR Y-9Cs (the threshold increased to US$500 million in 2006). The FR Y-9C documents the first CDS use by banks in 1997Q1. CDS position data for US subsidiaries of foreign banks is not available from FR Y-9C filings. We collect additional bank CDS position data from the Quarterly Report on Bank Derivatives prepared by the Office of the Comptroller of the Currency (OCC), which includes US subsidiaries of large foreign banks. The OCC reports list the top banks with the largest credit derivative positions every quarter from 1998. The FR Y-9C filings and the OCC reports provide aggregate CDS positions and separate positions held by banks as beneficiaries (CDS bought) or guarantors (CDS sold). In the FR Y-9C report, the amount of CDS bought is represented by the data item (BHCKC969 or BHCKA535), and the amount of CDS sold is represented by the data item (BHCKC968 or BHCKA534). We crosscheck the CDS position data covered by the two datasets and find they are consistent. Based on the quarterly CDS positions held by banks reported in the FR Y-9C and OCC reports, we define banks that have a non-zero CDS

[16] Kisin and Manela (2016) provide a specific example of how banks exploit regulatory loopholes to maximise returns on capital.

[17] The denominator for the risk-based capital ratio also includes the credit equivalent amount of off-balance-sheet items. CDS may help banks move assets off the balance sheet and obtain a lower credit equivalent amount.

[18] http://www.chicagofed.org/webpages/banking/financial_institution_reports/bhc_data.cfm.
Our sample does not include thrifts, which are regulated differently from bank holding companies in the US.

position in a given quarter, either a long position or a short position, as "CDS-using banks".[19] Banks with no CDS positions in a given quarter are denoted as "non-CDS-using banks".

FR Y-9C contains information on banks' unweighted assets, risk-weighted assets (RWA) and the amount of assets by risk category. Following guidelines in the bank capital accord, the FR Y-9C reports that banks typically hold four categories of assets: assets with a risk weight of 0%, 20%, 50% or 100%. Assets assigned into the 0% category are essentially assets that are excluded from calculating regulatory capital. We scale the amount of capital-free assets by the on-balance-sheet total assets in the empirical analysis. Further breakdown items under this category are also available from the FR Y-9C. We extract other bank characteristic variables that describe bank size, lending and funding strategies, growth opportunities, profitability, volatilities, market share and securitisation activities from the FR Y-9C to construct the control variables.

To form the sample, we keep banks that have total assets of more than US$150 million.[20] We further delete banks that lack information on total assets, risk-weighted assets (RWA), regulatory capital ratio (Tier 1 capital/RWA, total capital/RWA), and return-on-equity. This leaves us a sample of banks that include 2877 distinct bank holding companies, out of which 126 banks have never taken a non-zero CDS position in a given quarter ("CDS-using banks"). Panel A of Table I lists the number of CDS-using banks by year. For each year, we keep only CDS-using banks that have non-missing CDS position information in the FR Y-9C and the OCC reports. This leaves us 39 banks in 1997. This number increased to 83 in 2005 and slightly declined during the 2008 crisis. Columns 2 and 3 present the mean CDS position taken by banks. *CDS Total* position is the sum of the dollar amount of CDS protection bought and sold by a bank in a given quarter. *CDS Bought* refers to the dollar amount of CDS protection bought by a bank in a given quarter. The average CDS total position of our sample CDS-using banks increased from US$1.9 billion in 1997 to more than US$1 trillion in 2014, and the average amount of *CDS bought* increased from US$1.3 billion in 1997 to US$568 billion in 2014.

Panel B of Table I presents the summary statistics of the CDS position held by sample banks in more detail. For the CDS-using banks sample, the mean amount of CDS contracts bought and sold by

[19] The banks act as the beneficiary for long positions, which are specified by the variable BHCKC969 in the FR Y-9C report and the "CDS bought" column in the OCC report. The banks act as the guarantor for the short positions, which are specified by the variable BHCKC968 in the FR Y-9C report and the "CDS sold" column in the OCC report.

[20] Although the threshold of assets for banks that are required to file for the FR Y-9C is US$150 million, some banks that have smaller assets also exist in the original sample.

banks over the sample period is US$215.3 billion and US$207.9 billion, respectively. The CDS positions are highly skewed across banks over years. The largest CDS long position (CDS bought) is more than US$5 trillion, and the smallest is US$10 million. Panel B of Table I also presents summary statistics of key variables of our sample banks. The average on-balance sheet total asset is US$8.9 billion. Adding together the credit equivalent amount of derivatives and off-balance sheet items, the total unweighted assets ("*All Unweighted Assets*"), including on-balance sheet total assets and off-balance sheet items, amounts to US$10.5 billion. Summing up all unweighted assets across each risk category, multiplied by their corresponding risk weights, we obtain a bank's risk-weighted assets (RWA).[21] We double-checked the calculated RWA with the RWA numbers documented in FR Y-9C reports and found they were identical. The mean RWA of our sample is US$5.7 billion, which is smaller than the *All Unweighted Assets*. This suggests that a substantial portion of banks' assets take a risk weight lower than 100%. We are particularly interested in the assets that take a risk weight of 0% (*Capital-Free Assets*), because assets in this category are fully excluded from calculating regulatory capital. The ratio of capital-free assets relative to total assets varies from 0% to 6.02%, with the sample mean of 6%. Note that this ratio could be larger than one because the numerator includes on and off-balance-sheet items, while the denominator refers to total assets on the balance sheet only.[22] A breakdown of capital-free assets shows that this category is comprised of cash and cash equivalents, securities held to maturity, securities held for sale, loans, federal funds sold or purchased under the agreement to resell, and other assets.

The means of the total risk-weighted capital ratio (sum of Tier 1, Tier 2 and Tier 3 capital divided by total risk-weighted assets), the Tier 1 risk-weighted capital ratio (Tier 1 capital divided by the total risk-weighted assets) and the Tier 1 leverage ratio (Tier 1 capital divided by the average adjusted assets) are 15%, 13% and 9%, respectively. The means of the risk-weighted and unweighted regulatory capital ratios for the whole sample of banks are higher than the regulatory minimums.[23] The mean

[21] That is, total risk-weighted assets are calculated as 0%* amount of assets with 0% risk weight +20%* amount of assets with 20% risk weight +50%* amount of assets with 50% risk weight +100%* amount of assets with 100% risk weight.

[22] An alternative way to scale the capital-free assets is to use *All Unweighted Assets* as the denominator. A concern is that the off-balance-sheet items are usually applied as a conversion factor to be converted to the credit equivalent amount. To avoid potential complications caused by the conversion factor, we use the on-balance-sheet assets to do the scaling. Nevertheless, we also use this alternative measure in our analysis and find consistent results.

[23] Basel II requires an 8% minimum total risk-weighted capital ratio and a 4% minimum Tier 1 risk-weighted capital ratio. Basel III increases the minimum Tier 1 capital ratio to 6% (the minimum common equity capital ratio is 4.5%). For US banks, the requirements are 10% and 6%, respectively, during our sample period. The level of equity capital measures the extent to which a bank is prepared to internalise the cost of bank failure, rather than rely extensively on deposit-based financing (Allen, Carletti, and Marquez, 2011).

return-on-equity (ROE) is 5.8%. On average, 21.8% of the total operating income is non-interest income. Market share, the ratio of a bank's deposits out of all deposits aggregated across sample banks in the same quarter varies from 0.001 to 0.142. Summary statistics of other financial and operational characteristics are comparable to those reported in Loutskina (2011).

4. Empirical results

4.1 Bank Capital and Motives for Using CDS

The bank capital accord enables banks to apply a lower risk weight to the claims they hold if they use credit risk mitigants such as credit derivatives to hedge the credit risk exposure from a higher-rated counterparty.[24] Put differently, credit derivatives allow banks to "rent" another institution's credit rating to reduce required capital.[25] If banks use CDS for capital relief purposes, we should expect more capital-constrained banks to use CDS.

We use the Tier 1 capital ratio (Tier 1 Capital/RWA) to measure bank capital adequacy. Compared with the total capital, which includes reserves, general provisions and subordinated term debt, Tier 1 capital is a better measure of core capital and a core measure of a bank's financial strength. Specifically, we examine the hypothesis that banks which have a lower Tier 1 capital ratio in the previous quarter are more likely to use CDS in the next quarter by estimating the following specification:

$$\begin{aligned} \text{CDSUsage}_{it} = {} & \alpha + \beta \text{Tier 1 Capital Ratio}_{it-1} + \gamma_1 \text{Bank Characteristics}_{it-1} \\ & + \gamma_2 \text{Year Fixed Effects}_t + \gamma_3 \text{Bank Fixed Effects}_i + \varepsilon_{it} \end{aligned} \quad (1)$$

We use discrete and continuous variables to measure banks' CDS use. Table II reports the regression results. In column 1, the dependent variable is *CDSUsage,* a dummy taking the value of one if the bank takes a non-zero CDS position in quarter t. The coefficient of the lagged-one-quarter Tier 1

[24] Basel II specifies detailed operational requirements for credit derivative contracts and their eligible counterparties. Only CDS contracts used for explicit and direct credit mitigation can be qualified for the capital relief.

[25] http://www.cftc.gov/PressRoom/SpeechesTestimony/opagensler-32

capital ratio is -0.028, statistically significant at the 1% level. The result shows that lower capital adequacy is associated with a higher likelihood of using CDS in the next quarter.

In column 2, we control for other variables that may affect a bank's incentives to use credit derivatives, including bank size, funding structure, market share, growth opportunities, liquidity, volatility, operating performance and securitisation activities. With these factors being controlled for, the lagged Tier 1 capital ratio still shows significant and negative impact on the probability of future CDS use. The empirical specifications in columns 1 and 2 capture the effects of time-series and cross-section differences in capital adequacy on the likelihood of CDS use. However, what we are ultimately interested in is the over-time change only, i.e., we are interested in understanding how changes in a bank's capital adequacy over time affect the same bank's CDS-using choice. To this end, we include bank fixed effects in column 3. In this specification, a one-standard deviation decrease in its Tier 1 capital ratio is associated with a 0.11% increase in the probability that it starts to use CDS in the next quarter.

We replace the CDS indicator with continuous variables that measure the amount of banks' CDS position in columns 4 and 5. To adjust for the skewness of CDS positions across banks and over time, we take the logarithm of the CDS positions. Similar to the results in columns 1 to 3, the coefficient of the lagged Tier 1 capital ratio remains negative and significant in column 4. A one-standard deviation decrease in the Tier 1 capital ratio leads to a 1.05% increase in the bank's CDS total position in the next quarter. The CDS total position refers to the sum of the bought (long) and sold (short) CDS positions by a bank. As the role of CDS in capital relief is more relevant with the CDS contracts bought by the bank, we separately conduct the regression with the logarithm of the amount of CDS bought in column 5. The coefficient of the lagged Tier 1 capital ratio is still negative and significant, suggesting that a lower core capital ratio may have induced banks to buy more CDS.

Banks may use credit derivatives for various reasons, including trading, hedging or liquidity provision. However, banks are not obliged to, and are not incentivised to, disclose the detailed purposes of using CDS. Our analysis shown in Table I sheds some light on this issue. The significant effect of the lagged Tier 1 capital ratio on the use of CDS and the amount of CDS position indicates that banks indeed use CDS for capital-related purposes. That means banks may start to use CDS to alleviate concerns resulting from a shortage of core capital.

4.2 Banks' CDS-Use, Unweighted Assets and Risk-Weighted Assets (RWA)

Under the risk-based framework, the denominator used to calculate the regulatory capital ratio is the sum of the amount of assets in each category multiplied by its corresponding risk weight. As the risk weight is usually smaller than one, the risk-weighted assets (RWA) are smaller than the unweighted assets most of the time. Therefore it becomes possible for banks to achieve smaller RWA by assigning lower risk weights to their existing assets or new assets while expanding their unweighted asset base. Therefore, the capital motive of CDS use by banks leads to the hypothesis that CDS-using banks may have lower risk-weighted assets (RWA), although they hold the same level or larger amount of unweighted risky assets.

We test this hypothesis by examining the consequence of CDS use on the amount of unweighted assets and risk-weighted assets of banks. The amount of unweighted assets gives us a sense of how large a bank's asset base is, and the RWA measures the observable riskiness of a bank's assets. The dependent variables *All Unweighted Assets* and *Risk-Weighted Assets* include asset items on and off-balance sheet. Contrasting the effects of CDS on the two measures of assets helps understand how a bank's risk-weighting of its assets changes after the bank starts using CDS. We test the hypothesis in a multivariate framework:

$$\begin{aligned}\text{All Unweighted Assets or RWA}_{it} = {} & \alpha + \beta \text{CDSUsage}_{it} + \gamma_1 \text{Bank Characteristics}_{it-1} \\ & + \gamma_2 \text{Year Fixed Effects}_t + \gamma_3 \text{Bank Fixed Effects}_i + \varepsilon_{it}\end{aligned} \quad (2)$$

The key independent variable is the indicator *CDSUsage*, which equals one if the bank takes a non-zero CDS position in a given quarter and zero otherwise (see the variable definitions in the Appendix for details). The control variables include banks' net income growth and market share. These variables are lagged one quarter when entering the regressions. To account for the possibility that banks with different funding strategies or sources of revenue may have different allocations of assets across risk categories, we also control for the deposits-to-liabilities ratio and the non-interest income-to-total operating income ratio. These variables describe bank operating strategies (business model) and act as controls for bank types. One may be concerned that banks which use CDS are also involved in other non-banking activities, such as securitisation, and potential effects from securitisation may contaminate our results. We include the notional amount of securitised assets

(*Securitised Assets)* as control variables to mitigate this concern. Last, but not least, to ensure the specification captures the before and after change for the same bank, we control for bank fixed effects in all specifications.

Column 1 of Table III shows that, unconditionally and on average, the *All Unweighted Assets* increase by US$9.4 billion after a bank starts using CDS. The increase in the unweighted assets suggests that banks start to expand their asset base, both on and off-balance sheet, when they use CDS. This is consistent with the finding of Shan, Tang and Yan (2015), that CDS-using banks engage in more risky lending by extending more commercial and industrial loans. Other bank activities may also contribute to the increase in the amount of unweighted assets. If we include in the regressions bank characteristics that may affect the size of bank assets, the average increase in all unweighted assets for CDS-using banks becomes US$4.2 billion, as column 2 shows. In all specifications, we control for year fixed effects to isolate possible time trends in banks' unweighted assets.

In contrast, column 3 shows that the risk-weighted assets for our sample banks see a sharp decline after they start using CDS with bank characteristic variables being controlled for. The decline in RWA is US$1.3 billion (or 23% relative to the mean RWA of our sample banks). The contrasting effects of CDS on unweighted and risk-weighted assets suggest that CDS-using banks expand the size of risky assets while reducing the risk weights assigned to their risky assets. To mitigate the concern that our sample includes many small banks which may not be comparable to CDS-using banks whose size is usually large, we divide all non-CDS-using banks into three groups based on the 30% and 70% cut-offs of total assets, and examine the CDS effects for each size group. Therefore, the sample we use for the regression in column 4 is composed of all banks that use CDS, and banks that never use CDS and have total assets smaller than the 30% cut-off. The samples medium and large are constructed in a similar way. Presumably, non-CDS-using banks in the large group are closest to CDS-using banks in size and the specification in column 6 should control for the size effects relatively well. As columns 4 to 6 show, the negative effects of CDS use on the risk-weighted assets remain significant across all size groups, confirming that bank size may not be a driving factor for the observed CDS effects.

Alternatively, we construct a new variable, *RWA/Unweighted Assets* in Table IV to measure the size of risk-weighted assets relative to the amount of all unweighted assets. This ratio variable ensures that we identify CDS effects on unweighted and weighted assets for the same bank. Consistent with

the results in Table III, column 1 of Table IV shows that CDS-using banks see a smaller ratio of RWA out of total unweighted assets, confirming that a bank indeed moves its existing assets to a lower-risk category or assign a risk weight lower than the average risk weight of its existing assets to the bank's new assets. On average, banks see the ratio of RWA relative to all unweighted assets lowered by 0.009 (or 1.3% relative to the sample mean of *RWA/All Unweighted Assets*) after they start using CDS.

Interpretation of the results could be contaminated by possible spurious relationships between a bank's decision to start using CDS and a coincidental declining trend of the RWA ratio, because the CDS use dummy only captures the one-time change around CDS introduction. To mitigate the concern, we examine the consecutive measures of CDS use by replacing the CDS dummy with the amount of CDS position as the independent variable. Column 2 shows a negative correlation between the amount of total CDS contracts outstanding and the RWA ratio. If banks are allowed to reduce their risk-weighted assets using CDS, then the effects should be more relevant to CDS bought than CDS sold. Column 3 shows there is a negative relationship between the amount of CDS bought and the RWA ratio. Therefore, in addition to the finding of the declining RWA around first CDS use, we also find comovement of RWA with CDS position. This observation largely reduces the possibility that the finding of the declining RWA is coincidental. Instead, the changing RWA is related, to the extent that a bank relies on the use of credit derivatives, especially the position that the bank takes as a beneficiary (rather than guarantor).

4.3 Robustness of CDS Effect on Risk-Weighted Asset: Matched Sample Results

We are mindful that the whole sample of banks that filed for the Financial Statements for Consolidated Bank Holding Companies ("FR Y-9C") include some small banks that have a much smaller size than the large CDS-using banks, such as JPMorgan and Bank of America. To mitigate the concern that our findings of the RWA ratio are driven by these large CDS players, our first strategy is to exclude the largest CDS dealers from the sample and see whether our results remain. Internet Appendix Table IA1 shows the results using the sample that excluded the largest 14 derivative dealers (G14). We obtain the list of the G14 banks from the International Swaps and Derivatives Association. It includes: Bank of America-Merrill Lynch, Barclays Capital, BNP Paribas, Citi, Credit Suisse, Deutsche Bank AG, Goldman Sachs & Co, HSBC Group, JPMorgan, Morgan Stanley, The Royal Bank of Scotland Group, Société Générale, UBS AG, and Wachovia Bank, NA. As Table IA1

shows, the negative relationship between CDS use and the RWA/unweighted assets ratio remains for this restricted sample. The results strongly support the view that the effects of CDS in reducing risk-weighted assets are not merely driven by the largest CDS dealers. It also suggests that the role of CDS in capital reduction should be more profound when the bank is an end-user of CDS. If a bank acts purely as a dealer in derivatives markets, the CDS positions it holds change quickly, and any effects from holding the protection contracts are smaller. Our findings strengthen the interpretation that effects on RWA are related to banks' holdings and CDS use.

For further robustness checks, we conducted the matching techniques to form a sample in which the non-CDS-using banks are similar to CDS-using banks in major characteristics. We match on bank size, which is a key variable that may determine differences in other characteristic variables. For each CDS-using bank, we select from the banks that never use CDS the one that has the closet total assets to the CDS-using bank in the year before the CDS-using bank's first CDS use. All of the 126 CDS-using banks can find a matching bank. We conduct the same analysis on the *RWA/All Unweighted Assets* ratio for the matched sample. The results are reported in Table V. In column 1, the coefficient of the CDS use dummy is of the same sign and similar magnitude as we observe for the whole sample. In columns 2 and 3, the effects of the CDS position measures are much larger than those obtained from the whole sample, showing that those small banks in our sample tend to drive the CDS effects to be indistinguishable from zero. Meanwhile, the coefficients of the logarithm of bank total assets in the RWA ratio regressions become positive, suggesting that bank size and CDS use have opposite effects on the RWA ratio. This goes against conventional wisdom that the observed CDS effect merely captures bank size effect. Effects of other characteristic variables, such as total deposits-to-total liabilities, are smaller than in the baseline regression. The R-squared in columns 2 and 3 are higher than in the corresponding columns in Table IV, suggesting a higher explanatory power of the model for the matched sample.

We improved the matching results by requiring the ratio of the total assets of the treatment bank (CDS-using bank) to the total assets of the matched bank (non-CDS-using bank) to be within the range (0.8, 1.2). In this way, we ensure that the asset size of the matched pairs is as close to each other as possible. Table IA2 reports the regression results of the restricted matched sample. The negative relation between CDS use and the RWA ratio remains qualitatively unchanged.

4.4 Bank CDS Use and Capital Relief

The FR Y-9C reports include the breakdown of bank assets in each risk category. Most of the assets fall into the four risk-weight categories: 0%, 20%, 50% and 100%. A lower risk weight means the same amount of unweighted assets consumes less capital. Differently put, assigning a lower risk weight to its asset portfolio allows a bank to use less capital to support the same size of risky businesses. By doing so, banks still comply with the capital regulation, which focuses on the risk-weighted capital ratios. We are particularly interested in the effects of CDS use on the Capital-Free Assets, ie, assets that belong to the zero-risk category. This is because the assets in this category are converted to zero when calculating the RWA, which means they are outside the coverage of regulatory capital and consume zero capital. We scale the amount of Capital-Free Assets by the bank's contemporaneous on-balance-sheet total assets.

We examine how the share of the Capital-Free Assets is affected by banks' use of CDS, and report the regression results in Table VI. Column 1 shows that, all else equal, banks record a 0.008 increase in the ratio *Capital-Free Assets/Total Assets* after they start using CDS. The effect is economically large as the increase is approximately 13.3% relative to the mean *Capital-Free Assets/Total Assets*. This echoes our previous findings of declining RWA after CDS use. One explanation of the lower RWA is that banks use CDS to move or generate more assets outside capital coverage. We conduct similar regressions for the share of assets in other risk categories (20%, 50%, and 100%) and do not find any increase in them after CDS use.

The increase in the capital-free assets can be a result of banks' use of credit derivatives for capital relief purposes. The Basel capital accord enables banks to substitute its original risk weight with the CDS counterparty's (seller) risk weight on the hedged part of the exposure, if the counterparty is better rated (that is why the AAA-rated AIG was often chosen as the CDS seller by banks). Therefore, if a zero-risk weight applies to the protection sellers, as we discuss below, then the bank that buys the CDS protection can substitute a zero-risk weight for the original risk weight of the exposure for the portion that is hedged.

Usually OECD governments and agencies receive a zero-risk weight but they are unlikely to be significant CDS sellers. However, we note that Basel II allows many exceptions in assigning risk

weights to CDS-related transactions. Although most of the credit exposures are subject to the 20% risk floor, collateralised OTC transactions, such as CDS, in many circumstances, are allowed to take a zero-risk weight. For instance, Basel II specifies that transactions which fulfil certain operational criteria and with a "core market participant" receive a risk weight of zero.[26] Banks and insurance companies, the major participants in the CDS market, can be listed as "core market participants" at the supervisor's discretion and qualify for the zero-risk weight, even if these entities are only eligible for a 20% risk weight in the standardised approach. A zero-risk weight also applies when the CDS seller is a multilateral development bank,[27] as long as the protection seller carries AAA long-term issuer ratings and satisfies other requirements on shareholder structure, level of capital, liquidity, lending requirements and financial policies. Furthermore, "OTC-derivative transactions subject to daily mark-to-market, collateralised by cash and characterised by no currency mismatch, should receive a 0% risk weight".[28] This constitutes another opportunity for a bank to use CDS to create capital-free assets.

Basel is fairly flexible in recognising risk mitigants via CDS. A partial hedge is allowed. For example, if a bank extends a US$100 million loan to a BB+-rated corporation, then a 100% risk weight would apply. If the bank buys CDS with US$80 million of notional amount on the same name from some AAA-rated counterparty that qualifies for the zero-risk weight to hedge the exposure, then the US$80 million exposure will be assigned a zero-risk weight, and the remaining US$20 million still takes the risk weight of 100%. Similar treatment applies to claims on sovereigns and their central banks. Our data on bank CDS position include CDS on single-name corporates, portfolios of credit derivatives (CDS index), and sovereign CDS, which means CDS bought by our sample banks could be used to mitigate risks of claims to corporates and sovereigns.

CDS held on banking and trading books can be used for capital relief purposes. Basel II allows netting positions across trading and banking books. CDS held on a bank's trading book is allowed to hedge credit risk in the bank's banking book. When the protection is bought and recognised as a hedge of a

[26] See page 44 of the "International Convergence of Capital Measurement and Capital Standards – A revised framework" by the Basel Committee on Banking Supervision published in June 2006, for details.

[27] For example, the European Bank for Reconstruction and Development (EBRD) is credited as the counterparty that sold the first CDS contract to JPMorgan in 1997, with a line of credit of US$4.8 billion to Exxon Mobil as the underlying debt.

[28] See page 45 of "International Convergence of Capital Measurement and Capital Standards – A revised framework" by the Basel Committee on Banking Supervision published in June 2006.

banking book exposure, the credit derivative hedge is not included in the trading book for regulatory capital purposes.[29]

One caveat is that some of the asset items of the zero-risk weight category, such as cash holdings, are irrelevant to banks' CDS use. Therefore, the observed increase in the zero-risk weight assets could be due to a coincidental increase in the bank's cash holdings during the same time frame. We rule out this possibility by looking into the breakdown of the capital-free assets. Based on the data items in the FR Y-9C report, there are six major categories under the zero-risk weight category: (1) cash and cash equivalents; (2) federal funds sold or held under the agreement to resell; (3) securities held-to-maturity; (4) securities held-for-sale; (5) loans; (6) other assets. We find strong evidence that the items (1) and (2), ie, the ratio of cash and cash equivalents, and the ratio of federal funds sold significantly decrease after CDS use, suggesting that the observed increase in the capital-free assets is not driven by any increase in cash holdings or federal funds sold. Instead, we find that items (3), (4) and (5), ie, the ratio of securities, held-to-maturity and held-for-sale, and the ratio of loans, significantly increase after CDS use. This suggests that the increase in the capital-free assets is mostly attributed to the increase in securities and loans that take a zero-risk weight. Increase in these items is likely related to banks' CDS-using activities. For example, banks may move the hedged part of their exposures via holdings of securities and loans from the originally higher risk-weight category to the zero-risk weight category.

Banks constantly seek opportunities to reduce their capital holdings as capital is expensive (Allen, Carletti and Marquez, 2011). When the risk-weighted assets are reduced by banks' use of CDS, and banks can reduce the dollar amount of capital holdings, the numerator is used to calculate regulatory capital ratios. In this way, banks can save costs associated with holding capital while meeting capital regulation requirements, which puts emphasis on risk-weighted capital ratios. To test this hypothesis, we examine the sensitivity of banks' regulatory capital ratios to the change in the dollar amount of capital that banks hold, and examine how the sensitivity is affected by CDS use. We regress the changes in regulatory capital ratios from quarter t-1 to quarter t on the changes in the dollar amount of capital levels during the same time interval. We also incorporate the interactions of the change in capital levels and CDS measures into the regressions. Column 1 of Table VII shows the coefficient of

[29] See page 159 of "International Convergence of Capital Measurement and Capital Standards – A revised framework" by the Basel Committee on Banking Supervision published in June 2006.

the change in the Tier 1 capital level is positive, showing that, without CDS, a higher Tier 1 capital level (in dollar amount) is associated with a higher Tier 1 capital ratio. However, the coefficient of the interaction of the CDS use indicator and the change in the dollar amount of Tier 1 capital is negative and significant, suggesting CDS use lowers the sensitivity of Tier 1 capital ratio to the change in the Tier 1 capital dollar amount. In columns 2 to 4, we use a continuous measure of CDS use, the amount of *CDS Bought*, and an alternative measure of regulatory capital ratio, *Total Capital/RWA* (total capital ratio), to conduct similar analyses. We find consistent results with these alternative measures.

Overall, our findings suggest that bank CDS use weakens the sensitivity of regulatory capital ratios to changes in the dollar amount of capital holdings. In addition, Table IA4 in the Internet Appendix shows there is no obvious change in capital ratios of banks after they start using CDS. Taken together, our findings suggest that bank capital regulations may induce banks to shift from controlling risks to controlling capital ratios during our sample period through managing risk-weighted assets with the use of CDS.[30] Therefore, investors and regulators may find it harder to detect banks' true risks by observing regulatory capital ratios, which are based on the risk-weighting scheme.

4.5 Bank Capital Relief and Return on Capital

So far, we have shown that banks use CDS to reduce their risk-weighted assets while maintaining the capital ratio. We also show one example of how banks achieve the lower RWA: banks generate and move assets to the zero-risk weight category, which is fully outside the regulatory capital coverage. We next investigate whether banks use CDS to "save" capital, i.e., do banks use less capital to support the same level or more risky assets? Differently put, we are interested in exploring whether CDS-using banks, with a smaller RWA that takes less capital, benefit from such capital relief opportunities. Answering this question may shed light on the deeper concern whether the lower RWA represents a lower riskiness of a CDS-using bank's assets.

This task is difficult because the asset items and associated risk weights disclosed by banks only reflect observable risks, or risks that banks are willing to disclose and identify. There could be risks that are unobservable by the regulator or undisclosed by the bank. If all risks have been correctly

[30] Sheila Bair, former chairman of the US FDIC, has expressed her concern about the calculation of RWA: "The risk weightings are highly variable in Europe and have led to continuing declines in capital levels …There's pretty strong evidence that the RWA calculation isn't working as it's supposed to" (http://www.risk.net/risk-magazine/-news/2081139/europe-lax-rwa-calculations-bair).

incorporated in the risk weights, then the reduction of RWA following CDS use would be natural, and there would be no additional capital saving from using CDS. However, if the true risks are not fully incorporated by the observed risk weights and risk-weighted assets, then the reduction in RWA could be problematic. To test the hypothesis, our strategy is to examine the change in the return-on-capital after banks' CDS use. The risk-return relation suggests that a higher return-on-capital should be associated with higher real business risks taken by the bank.

We start from examining the relationship between return-on-equity (ROE) and the ratio *RWA/All Unweighted Assets*. Column 1 of Table VIII shows a significant and positive coefficient of *RWA/All Unweighted Assets* in the regression of ROE, meaning that a riskier asset portfolio generates higher ROE and that the risk-return relationship generally holds for bank assets. Column 2 examines the relationship between bank CDS use and profitability. The coefficient of *CDSUsage* is positive, suggesting that CDS-using banks are more profitable than their counterparts not using CDS on average. How do CDS-using banks generate higher ROE? We interact the CDS variables (the *CDSusage* dummy and the logarithm of CDS positions) and the RWA ratio, and add the interaction terms into the regressions. Columns 3 to 5 show that the use of CDS changes the relation between ROE and RWA. Column 5 shows that, when banks use CDS as a protection buyer, a decrease in the RWA ratio is associated with an increase in ROE, reversing the risk-return relationship. This suggests that CDS-induced reduction in RWA does not necessarily reduce the riskiness of the bank's assets. Differently put, the RWA of CDS-using banks may appear lower, however, the true riskiness of the banks' assets is higher than observed, evidenced by the higher return of the banks' assets.

We re-examine the hypothesis by zooming in on the category of capital-free assets. We employ a similar empirical design and regress ROE on the amount of capital-free assets scaled by total assets. Column 1 of Table IX shows that an increase in the ratio of capital-free assets is associated with a lower ROE. Presumably, capital-free assets are risk-free and do not need capital coverage. Therefore, this result is conceivable because the risk-return relationship predicts that a larger share of risk-free assets in a bank's portfolio should lead to a lower profitability. However, column 3 shows that banks' use of CDS weakens the relationship between ROE and capital-free assets. The coefficient of the interaction of CDS use and capital-free assets is positive and statistically significant, suggesting that, if the assets are assigned with a zero-risk weight due to CDS use, then the assets still generate

higher return, which means they may not be truly risk-free. Columns 4 and 5 show similar results. For banks that take a long position in CDS contracts, an increase in the capital-free assets is associated with a higher ROE. Conditional on a bank taking a CDS long position, the more assets moved outside regulatory capital coverage, the higher the bank's profitability. We use an alternative measure, return-on-capital, to conduct the analysis and report the results in Table IA3. We find similar results using this measure.

How does banks' CDS use affect the relationship between bank capital holdings and profitability? Theory papers make mixed predictions. Allen, Carletti, and Marquez (2011) and Mehran and Thakor (2011) suggest a positive relation between bank capital level and profitability, while the classical view from Modigliani and Miller (1963) is that higher capital should mechanically lead to lower return-on-equity. We separately examine the relationship between bank capital holdings and return-on-equity for CDS-using banks and non-CDS-using banks. For each CDS-using bank, we find from all non-CDS-using banks the one with the closet book assets in the quarter before the bank's first CDS use as the matching bank. We also require the ratio of book assets of the CDS-using bank relative to the book assets of the non-CDS-using bank to be within the range (0.8, 1.2). 97 out of 126 CDS-using banks are matched following this approach. We conduct the ROE regression using this sample of matched banks.

Table X shows a negative correlation between ROE and Tier 1 capital ratio (Tier 1 Capital/RWA) for the matched non-CDS-using banks. This finding is consistent with the view that a higher capital level should mechanically lead to a lower return-on-capital. Interestingly, we find this relation becomes positive and significant for CDS-using banks. As we have noted before, the likelihood of CDS use is associated with a lower RWA, which is measured by dollar amount and the ratio relative to unweighted assets. The positive coefficient of the Tier 1 capital ratio suggests that, when a CDS-using bank experiences a negative shock to its RWA (Tier 1 capital ratio increases in this case), then the bank's net income will increase. Again, the inconsistency of the change in RWA and the change in net income shows that CDS-using banks can generate more profits from a smaller amount of RWA. Differently put, the use of CDS leads to a higher average return for each unit of the bank's observable risk-weighted assets. Again, based on the risk-return relationship, this finding indicates that some of the bank's profits may not be captured by the risk weights disclosed by the bank.

Overall, the results can be interpreted as evidence that banks save capital by using CDS. The amount of RWA can only reflect the riskiness of assets disclosed by banks. The true risks of assets may not be observed by the public, especially the true risks of assets exempted from regulatory capital coverage due to bank CDS use may not be correctly reflected in the RWA. With a smaller RWA, banks can reduce their capital holding while appearing to comply with capital regulation, which focuses on the risk-based capital ratios. The results in Table VIII to Table X suggest that a lower RWA may not necessarily represent a smaller asset base, nor indicate a less risky portfolio. If a bank buys CDS protection from a AAA-rated seller that enables the covered assets to qualify for a zero-risk weight, the risk-based regulatory capital ratio may underestimate the risk if the true risk weight is larger than it appears, especially when the counterparty risk and the risk of credit contagion are considered.

One implication of these findings is that regulators may not be able to detect real differences in capital ratios across banks when banks take advantage of the capital relief brought by CDS if the regulators only look at capital ratios. The true risks of assets that are outside regulatory capital coverage may be underestimated. From the banks' perspective, however, this outcome may be desirable because they may save the cost of having to raise and hold more capital and improve their financial performance. Therefore, our findings may have pointed out one adverse side of banks' use of financial innovation, i.e., reduce the effectiveness of banking regulation, in particular capital regulation.[31]

5. Conclusion

Since JPMorgan invented credit default swaps (CDS) two decades ago, banks have been the largest users of these credit derivatives. We show how banks take advantage of the forbearance in capital regulations afforded by credit derivatives by moving risky assets out of the coverage of regulatory capital, while the true risk of banks' assets may not be lowered. Once banks are able to lower the risk

[31] In this regard, our work is related to studies that document the dark side of financial innovations, such as Henderson and Pearson (2011).

weights on some of their assets, they decrease capital holdings, while maintaining regulatory capital ratios at levels similar to those of non-CDS-using banks.

Bank capital regulations are important but also hotly debated, with many proposing more stringent capital requirements (Thakor (2014)). Our study highlights the capital relief role of bank CDS use, which allows banks to evade regulatory scrutiny, and provides a rationale for banks to hold a substantial amount of credit derivatives. While banks can choose their optimal capital structure, such a choice is affected by regulations. When banks can use CDS to comply with regulatory capital requirements, regulations can become less effective than perceived.

Our findings suggest that the risk exposure calculation under the Basel rules may not reflect the actual risk of the banks that use CDS, as the category of capital-free assets does not necessarily represent zero risk when counterparty risk and credit contagion are considered. Indeed, many of the banks that were rescued during the 2008 global financial crisis appeared to be in compliance with capital requirements shortly before and during the crisis. Our study provides a clue to the question "why did the Fed not prohibit banks from reducing regulatory capital via CDS?" posed by Levine (2012): as banks appeared in full compliance with regulations, regulators only observed similarly adequate capital ratios across banks without understanding the change in asset composition and capital holdings caused by CDS.

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Appendix: Variable Definitions

Variable Name	Description
CDS-Using Bank (CDSUsage)	A dummy equal to one if the bank takes a non-zero CDS long (CDS bought) or short (CDS sold) position in a quarterly observation, and zero otherwise. The CDS data for US banks is extracted from Federal Reserve Consolidated Financial Statements of Holding Companies (FR Y-9C report), in which the amount of CDS bought is reported by variable BHCKC969 or BHCKA535 (the bank as the beneficiary) and the amount of CDS sold is reported by variable BHCKC968 or BHCKA534 (the bank as the guarantor). The CDS data for US subsidiaries of foreign banks is extracted from the OCC report, in which the amount of CDS bought is reported as "CDS bought" and the amount of CDS sold is reported as "CDS sold".
CDS Total	The sum of dollar notional amount of CDS protection bought and sold by a bank in a given quarter.
CDS Bought	The dollar notional amount of CDS protection bought by a bank in a given quarter.
Non-CDS-Using Bank	Banks that never use CDS in the sample period.
All Unweighted Assets	The sum of unweighted amount of total on-balance sheet assets, derivatives, and off-balance-sheet items across all risk categories. In FR Y-9C, the amount of assets with 0%, 20%, 50% and 100% risk weight is represented by data item BHCKB696, BHCKB697, BHCKB698 and BHCKB699, respectively.
Risk-Weighted Assets (RWA)	The sum of risk-weighted assets across all risk categories, i.e., 0%* Amount of Assets in the 0% Category + 20%* Amount of Assets in the 20% Category + 50%* Amount of Assets in the 50% Category + 100% *Amount of Assets in the 100% Category. Using the FR Y-9C report data, it is also reported as BHCKB700+BHCKB701+BHCKB702+BHCKB703.
Total Assets	Total on-balance-sheet assets.
Capital-Free Assets	The amount of assets that take a zero-risk weight, ie, assets excluded from calculating regulatory capital.
Total Risk-Weighted Capital Ratio (Total Capital Ratio)	The ratio of total capital (Tier 1+Tier 2+Tier 3) over risk-weighted total assets (RWA).
Tier 1 Risk-Weighted Capital Ratio (Tier 1 Capital Ratio)	The ratio of Tier 1 capital over risk-weighted total assets (RWA).
Tier 1 Capital/Average Assets (Tier 1 Leverage Ratio)	The ratio of Tier 1 capital relative to the average adjusted assets, which is calculated as total assets less intangible assets.
Total Deposits/Total Assets	The ratio of the sum of domestic deposits and foreign deposits relative to the bank's total assets in the same quarter.
Total Deposits/Total Liabilities	The ratio of the sum of deposits and foreign deposits relative to the bank's total liabilities.
Total Loans/Total Assets	A bank's total outstanding loan amount relative to the bank's total assets.
Market Share	The percentage of a bank's total deposits relative to the total deposits aggregated across all sample bank holding companies in the same quarter.
Non-Interest Income/Total Operating Income	The ratio of non-interest income relative to the bank's total operating income.
Liquidity	The ratio of cash and cash equivalents relative to total deposits.
ROA	The ratio of earnings before extraordinary items relative to total assets.
ROE	The ratio of net income relative to relative to book equity.
ROC	The ratio of net income relative to total capital (the sum of Tier 1, Tier 2 and Tier 3 capital).
ROA Volatility	The standard deviation of quarterly ROA.
Net Income Growth	The ratio of the change in net income from quarter t-1 to quarter t, scaled by total assets in quarter t-1.
Securitised Assets	Notional outstanding amount of securitised assets (sum of BHCKB705, BHCKB706, BHCKB707, BHCKB708, BHCKB709, BHCKB710 and BHCKB711).

Tables

Table 1. Summary Statistics of Sample Banks

This table presents sample distribution by year and descriptive statistics for the key variables of our sample banks. Panel A presents the distribution of CDS-using banks in our sample by year. Panel B presents summary statistics of bank assets, regulatory capital and other bank characteristic variables. We keep banks that have total assets of more than US$150 million in any given year. *CDS-Using Banks* refers to banks that take non-zero CDS position in a given year. *CDS Total* is the outstanding dollar amount of CDS contracts bought and sold by a bank in a given quarter. *CDS Bought* is the sum of outstanding dollar amount of CDS contracts bought by a bank in a given quarter. *Total Assets* refers to the total on-balance-sheet book assets. Banks are required to report the summed amount of total on-balance-sheet assets, derivatives and other off-balance sheet items by risk category. *All Unweighted Assets* refers to the sum of all unweighted assets, including on-balance sheet assets, derivatives and other off-balance sheet items across all risk categories. *Risk-Weighted Assets (RWA)* is calculated as the amount of total on-balance-sheet assets, derivatives and other off-balance sheet items multiplied by corresponding risk weight, summed across all risk categories, ie, 0%* Amount of Assets in the 0% Category + 20%* Amount of Assets in the 20% Category + 50%* Amount of Assets in the 50% Category + 100%* Amount of Assets in the 100% Category. *Capital-Free Assets/Total Assets* refers to the amount of assets with 0% risk weight divided by total assets. All bank-level variables are extracted on a quarterly basis. Bank CDS position data is from Federal Reserve Consolidated Financial Statements for Bank Holding Companies (FR Y-9C) and the Office of the Comptroller of the Currency (OCC) Quarterly Report on Bank Derivatives Activities. See Appendix for detailed variable definitions.

Panel A. Distribution of CDS-Using Banks and CDS Position by Year			
year	Number of CDS-Using Banks	CDS Total (US$ Billion)	CDS Bought (US$ Billion)
	(1)	(2)	(3)
1997	39	1.91	1.31
1998	42	7.64	4.40
1999	51	11.98	7.12
2000	53	16.70	9.91
2001	61	15.78	8.43
2002	64	27.32	14.29
2003	69	35.70	19.00
2004	78	73.86	38.22
2005	83	167.31	89.23
2006	80	464.08	231.91
2007	78	812.15	409.33
2008	76	993.28	505.16
2009	77	1503.11	765.47
2010	76	1308.59	664.62
2011	73	1302.76	660.97
2012	72	1331.16	672.84
2013	72	1181.65	596.45
2014	72	1122.29	568.11

Panel B. Summary Statistics of Sample Banks				
Bank CDS Use for CDS-using Banks				
Variable	Mean	Std Dev	Minimum	Maximum
CDS Total ($ Billion)	423.18	1246.37	0.01	10189.10
CDS Bought ($ Billion)	215.32	632.15	0.01	5187.21
CDS Sold ($ Billion)	207.85	614.51	0.01	5001.89
Unweighted Assets, Risk-Weighted Assets, and Regulatory Capital				
Variable	Mean	Std Dev	Minimum	Maximum
Total Assets ($Billion)	8.90	86.79	0.03	2463.31
Total Assets, Derivatives and Off-BS Items (All Unweighted Assets, $Billion)	10.51	101.45	0.03	3024.50
Risk Weighed Assets (RWA, $Billion)	5.74	50.89	0.01	1576.16
RWA/All Unweighted Assets	0.69	0.11	0.02	0.98
Capital-Free Assets/Total Assets	0.06	0.14	0.00	6.02
Tier 1 Capital/RWA	0.13	0.06	0.00	1.00
Total Capital/RWA	0.15	0.06	0.00	1.00
Tier 1 Leverage Ratio	0.09	0.03	0.00	0.93
Breakdown of Capital-Free Assets				
Variable	Mean	Std Dev	Minimum	Maximum
Cash/Total Assets	0.024	0.036	0.000	0.561
Securities Held-to-Maturity/Total Assets	0.003	0.019	0.000	0.681
Securities Held-for-Sale/Total Assets	0.022	0.041	0.000	0.563
Loans/Total Assets	0.002	0.012	0.000	0.412
Federal Funds Sold/Total Assets	0.001	0.016	0.000	0.709
Other Assets/Total Assets	0.001	0.006	0.000	0.257
Other Bank Characteristic Variables				
Variable	Mean	Std Dev	Minimum	Maximum
Total Deposits/Total Assets	0.669	0.122	0.000	0.859
Total Loans/Total Assets	0.653	0.133	0.000	0.888
Total Deposits/Total Liabilities	0.677	0.158	0.000	0.978
ROE	0.058	0.088	-0.996	0.963
Net Income/Total Assets	0.005	0.007	-0.120	0.291
Non-Interest Income/Total Operating Income	0.218	0.164	0.000	0.769
ROA	0.005	0.007	-0.120	0.291
Liquidity	0.024	0.035	0.000	0.561
Market Share	0.001	0.005	0.000	0.142
Securitised Assets ($ Billion)	1.081	18.641	0.000	972.037

Table 2. Determinants of Bank CDS Use

This table reports the estimation results of panel regressions that examine the determinants of banks' use of CDS. The dependent variables are (1) CDSUsage: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) Log (1+CDS Total): the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) Log (1+ CDS Bought): the logarithm of the dollar amount of CDS bought plus one in a given quarter. CDS position data for US banks is extracted from the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C") and those for US subsidiaries of non-US banks are extracted from the Office of the Comptroller of the Currency (OCC) quarterly report on bank derivatives activities. The sample is composed of quarterly observations of bank holding companies that filed for the FR Y-9C report and have book assets of more than US$150 million for the period 1994-2014. The independent variable of interest is Lagged Tier 1 Capital/RWA, the ratio of Tier 1 capital relative to total risk-weighted assets in the past quarter. We control for other determinants that may affect a bank's choice to use CDS, including bank size, lending and funding strategies, growth, market share, non-interest income and securitisation activities. Net Income Growth is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. All explanatory variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in most specifications. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Whether Banks Use CDS			Bank CDS Position	
	CDS Using Indicator	CDS Using Indicator	CDS Using Indicator	Log (1+CDS Total)	Log (1+CDS Bought)
Variable	(1)	(2)	(3)	(4)	(5)
Lagged Tier 1 Capital/RWA	-0.028***	-0.050***	-0.019**	-0.175*	-0.319***
	(0.009)	(0.015)	(0.009)	(0.097)	(0.097)
Log (Total Assets)		0.037***	0.009***	0.203***	0.142***
		(0.006)	(0.002)	(0.018)	(0.018)
ROE		-0.012	0.008**	0.069*	0.065*
		(0.009)	(0.004)	(0.037)	(0.037)
ROA Volatility		-0.943***	-0.056	-1.303	-2.087**
		(0.242)	(0.090)	(0.941)	(0.939)
Liquidity		0.005	-0.044***	-0.093	-0.144
		(0.024)	(0.010)	(0.103)	(0.102)
Market Share		8.785***	0.873***	58.651***	60.802***
		(1.495)	(0.156)	(1.636)	(1.632)
Net Income Growth		-0.079***	0.001	-0.002	-0.001
		(0.031)	(0.000)	(0.004)	(0.004)
Non-Interest Inc/Total Oper Inc		0.025***	0.003	0.02	0.008
		(0.011)	(0.002)	(0.024)	(0.024)
Total Deposits/Total Liabilities		0.352***	-0.012	1.485***	0.903***
		(0.068)	(0.015)	(0.162)	(0.162)
Log (1+Securitised Assets)		0.463***	0.083***	0.723***	0.661***
		(0.170)	(0.017)	(0.180)	(0.180)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	No	Yes	Yes	Yes
R-squared (%)	70.51	40.52	70.63	82.71	86.56
Observations	76692	76692	76692	76692	76692

Table 3. Bank CDS Use, Unweighted Assets and Risk-Weighted Assets (RWA)

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects the amount of its risk-weighted assets (RWA). We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C") and have book assets of more than US$150 million. The dependent variables are (1) the unweighted sum of total assets, derivatives and off-balance-sheet items ("*All Unweighted Assets*"); (2) the *Risk-Weighted Assets (RWA)*. Both are in billion dollar amount. The independent variable of interest is *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter. In all specifications we control for major bank characteristic variables that may affect a bank's quantity and risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. *Non-Interest Inc/Total Oper Inc* is the ratio of non-interest income relative to total operating income in the same quarter. *Securitised Assets* is the notional amount of securitised assets. All control variables are extracted at the end of the previous quarter. Columns 1 to 3 report regression results of all sample banks. Columns 4 to 6 report regressions results of subsamples. We divide all non-CDS-using banks into three categories by the 30% and 70% cut-offs in total assets: small, medium and large. In column 4, the Small sample includes all banks that use CDS, and banks that never use CDS and have total assets smaller than then 30% cut-off. The sample Medium includes all banks that use CDS, and banks that never use CDS with total assets between the 30% and 70% cut-offs. The sample Large includes all banks that use CDS, and banks that never use CDS with total assets larger than the 70% cut-off. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	All Unweighted Assets (US$ Billion)		Risk-Weighted Assets (RWA, US$ Billion)			
	All	All	All	Small	Medium	Large
Variable	(1)	(2)	(3)	(4)	(5)	(6)
CDSUsage	9.359***	4.229***	-1.323***	-1.029***	-1.112***	-1.146***
	(1.944)	(1.567)	(0.210)	(0.374)	(0.325)	(0.376)
All Unweighted Assets ($Billion)			0.532***	0.292***	0.293***	0.294***
			(0.001)	(0.001)	(0.001)	(0.001)
Total Deposit/Total Liabilities		4.877***	-1.284**	-7.233***	-15.529***	-20.447***
		(0.472)	(0.629)	(1.841)	(2.778)	(7.191)
Net Income Growth		0.084	0.023	0.042	0.034	0.053
		(0.138)	(0.018)	(0.057)	(0.043)	(0.058)
Non-Interest Inc/Total Oper Inc		-3.499***	0.300**	-0.005	-0.043	0.04
		(0.939)	(0.125)	(0.310)	(0.357)	(0.428)
Market Share		3.384***	3.476***	3.822***	3.804***	3.753***
		(0.232)	(0.276)	(0.293)	(0.256)	(0.289)
Securitised Assets		0.001***	0.001***	0.001***	0.001***	0.001***
		(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared (%)	89.01	92.87	97.16	96.17	96.45	96.47
Observations	76692	76692	76692	76692	76692	76692

Table 4. Bank CDS Position and Risk-Weighted Assets (RWA) Ratio: Baseline Results

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects the amount of its risk-weighted assets (RWA). We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C") and have book assets of more than US$150 million. The dependent variable is *RWA/All Unweighted Assets*, the risk-weighted assets scaled by the unweighted sum of total assets, derivatives and off-balance-sheet items ("*All Unweighted Assets*"). The independent variables of interest are (1) *CDSUsage*: a dummy taking one if the bank takes a non-zero CDS position in a given quarter; (2) *Log (1+ CDS Total):* the logarithm of the total dollar amount of CDS bought and sold plus one in a given quarter; (3) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. We control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

RWA/All Unweighted Assets			
Variable	(1)	(2)	(3)
CDSUsage	-0.009***		
	(0.003)		
Log (1+CDS Total)		-0.001***	
		(0.000)	
Log (1+CDS Bought)			-0.002***
			(0.000)
Log (Total Assets)	-0.002**	-0.002**	-0.002*
	(0.001)	(0.001)	(0.001)
Total Deposits/Total Liabilities	0.069***	0.069***	0.072***
	(0.009)	(0.009)	(0.009)
Market Share	-1.064***	-1.000***	-0.920***
	(0.104)	(0.105)	(0.106)
Net Income Growth	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	-0.023***	-0.023***	-0.023***
	(0.002)	(0.001)	(0.001)
Log (1+ Securitised Assets)	0.023**	0.024**	0.024**
	(0.012)	(0.012)	(0.012)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	83.87	83.87	83.87
Observations	76692	76692	76692

Table 5. CDS Use and Risk-Weighted Assets (RWA) Ratio: Matched Sample Results

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects the amount of its risk-weighted assets (RWA). We use a sample of CDS-using banks and their one-to-one matched non-CDS-using banks that have the closest book assets. The dependent variable is *RWA/All Unweighted Assets*, risk-weighted assets scaled by the unweighted sum of total assets, derivatives and off-balance-sheet items ("*All Unweighted Assets*"). The independent variables of interest are (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+CDS Total):* the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) *Log (1+ CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. We control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

RWA/All Unweighted Assets			
Variable	(1)	(2)	(3)
CDSUsage	-0.008***		
	(0.002)		
Log (1+CDS Total)		-0.011***	
		(0.001)	
Log (1+CDS Bought)			-0.011***
			(0.002)
Log (Total Assets)	0.039***	0.035***	0.040***
	(0.005)	(0.005)	(0.005)
Total Deposits/Total Liabilities	0.032***	0.036***	0.040***
	(0.011)	(0.012)	(0.014)
Market Share	-0.197***	-0.963***	-0.567***
	(0.082)	(0.106)	(0.169)
Net Income/Total Assets Growth	0.001***	0.001***	0.020***
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	-0.024***	-0.024***	-0.023***
	(0.002)	(0.001)	(0.002)
Log (1+ Securitised Assets)	0.023**	0.023**	0.023
	(0.012)	(0.012)	(0.018)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	83.88	91.36	91.61
Observations	3150	3150	3150

Table 6. Bank CDS Use and Capital-Free Assets

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects its capital relief activities. We use the whole sample of banks that filed for the FR Y-9C report and have book assets of more than US$150 million. The dependent variable is the amount of assets excluded from calculating the regulatory capital ("*Capital-Free Assets*") scaled by on-balance-sheet total assets measured in the same quarter The independent variables of interest are (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+ CDS Total):* the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. We control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. Data on assets by category are extracted from the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C"). All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Capital-Free Assets/Total Assets			
Variable	(1)	(2)	(3)
CDSUsage	0.008**		
	(0.003)		
Log (1+CDS Total)		0.001***	
		(0.000)	
Log (1+CDS Bought)			0.009***
			(0.000)
Log (Total Assets)	-0.018***	-0.018***	-0.019***
	(0.002)	(0.002)	(0.001)
Total Deposits/Total Liabilities	-0.077***	-0.076***	-0.088***
	(0.012)	(0.012)	(0.012)
Market Share	0.309**	0.258*	-0.324**
	(0.145)	(0.146)	(0.146)
Net Income/Total Assets Growth	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	0.007***	0.007***	0.006***
	(0.002)	(0.002)	(0.002)
Log (1+Securitised Assets)	0.099***	0.098***	0.094***
	(0.016)	(0.016)	(0.016)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	80.18	80.19	80.39
Observations	76692	76692	76692

Table 7. Bank CDS Use and Sensitivity of Regulatory Capital Ratio

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects its capital relief activities. We use the whole sample of banks that filed for the FR Y-9C report and have book assets of more than US$150 million. The dependent variables are the changes in regulatory capital ratios: (1) Δ Tier 1 Capital/RWA is calculated as Tier 1 Capital/RWA in quarter t - Tier 1 Capital/RWA in quarter t-1. (2) Δ Total Capital/RWA is calculated as Total Capital/RWA in quarter t - Total Capital/RWA in quarter t-1. The independent variables of interest are the interaction terms of CDS-using variables and changes in regulatory capital holdings. We use two CDS-using variables: (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. We use two measures of changes in the dollar amount of regulatory capital holdings: (1*) Δ Tier 1 Capital*, calculated as Tier 1 Capital in quarter t – Tier 1 Capital in quarter t-1; (2) *Δ Total Capital*, calculated as Total Capital in quarter t – Total Capital in quarter t-1. Total Capital is the sum of Tier 1, Tier 2 and Tier 3 capital. Both Tier 1 Capital and Total Capital are in billion US dollar. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Δ Tier 1 Capital/RWA		Δ Total Capital/RWA	
Variable	(1)	(2)	(3)	(4)
Δ Tier 1 Capital	0.021***	0.022***		
	(0.006)	(0.006)		
Δ Total Capital			0.020***	0.019***
			(0.006)	(0.006)
CDSUsage*Δ Tier 1 Capital	-0.020***			
	(0.006)			
Log (1+CDS Bought)*Δ Tier 1 Capital		-0.001***		
		(0.000)		
CDSUsage*Δ Total Capital			-0.020***	
			(0.006)	
Log (1+CDS Bought)*Δ Total Capital				-0.001***
				(0.000)
CDSUsage	0.001		0.001	
	(0.007)		(0.008)	
Log (1+CDS Bought)		0.001		0.001
		(0.001)		(0.001)
Log (Total Assets)	-0.003	-0.003	-0.003	-0.003
	(0.003)	(0.003)	(0.004)	(0.004)
Total Deposits/Total Assets	0.011	0.011	0.011	0.011
	(0.008)	(0.008)	(0.010)	(0.010)
Liquidity	0.054***	0.054***	0.059***	0.058***
	(0.019)	(0.019)	(0.022)	(0.021)
Market Share	0.053	0.094	0.075	0.136
	(0.296)	(0.300)	(0.341)	(0.346)
Net Income Growth	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Non-Interest Inc/Total Oper Inc	0.007	0.007	0.007	0.007
	(0.006)	(0.006)	(0.006)	(0.006)
ROE	0.012*	0.012*	0.01	0.01
	(0.007)	(0.007)	(0.008)	(0.008)
Total Loans/Total Assets	0.019**	0.019**	0.021**	0.021**
	(0.009)	(0.009)	(0.010)	(0.010)
Total Deposits/Total Liabilities	0.029	0.028	0.034	0.033
	(0.030)	(0.030)	(0.035)	(0.035)
Log (1+Securitised Assets)	-0.079**	-0.079**	-0.086**	-0.086**
	(0.033)	(0.033)	(0.039)	(0.039)
ROA Volatility	-0.073	-0.073	-0.075	-0.075
	(0.169)	(0.169)	(0.195)	(0.195)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	4.56	4.56	4.89	4.89
Observations	73009	73009	73009	73009

Table 8. Bank CDS Use, Risk-Weighted Assets (RWA) Ratio and Bank Profitability

This table reports the estimation results of panel regressions that examine how a bank's CDS use for capital-relief purposes affects its profitability. We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C") report and have book assets of more than US$150 million. The dependent variable is return-on-equity (ROE). The independent variables of interest are RWA/All Unweighted Assets, CDSUsage, and interactions of CDS variables and RWA/All Unweighted Assets. RWA/All Unweighted Assets is the ratio of total risk-weighted assets scaled by all unweighted assets. We use three CDS variables: (1) CDSUsage: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) Log (1+CDS Total): the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) Log (1+CDS Bought): the logarithm of the dollar amount of CDS bought plus one in a given quarter. In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. Net Income Growth is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. Non-Interest Inc/Total Oper Inc refers to the ratio of non-interest income out of total operating income. The coefficients of Log (1+ Securitised Assets) are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Return-on-Equity (ROE)					
Variable	(1)	(2)	(3)	(4)	(5)
RWA/All Unweighted Assets	0.067***		0.068***	0.068***	0.070***
	(0.006)		(0.006)	(0.006)	(0.006)
CDSUsage		0.010**	0.020		
		(0.004)	(0.013)		
CDSUsage*RWA/All Unweighted Assets			-0.016		
			(0.020)		
Log (1+CDS Total)				0.002**	
				(0.001)	
Log (1+ CDS Total)*RWA/All Unweighted Assets				-0.002	
				(0.002)	
Log (1+CDS Bought)					0.004***
					(0.001)
Log (1+CDS Bought)*RWA/All Unweighted Assets					-0.006***
					(0.002)
Log (Total Assets)	0.028***	0.027***	0.027***	0.028***	0.027***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Deposits/Total Liabilities	0.030*	0.035**	0.031*	0.031*	0.028*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Market Share	-0.440***	-0.522***	-0.465***	-0.526***	-0.568***
	(0.163)	(0.163)	(0.164)	(0.166)	(0.166)
Net Income Growth	0.027***	0.027***	0.027***	0.027***	0.027***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-Interest Income/Total Operating Income	0.059***	0.058***	0.059***	0.059***	0.059***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log (1+Securitised Assets)	-0.002	-0.003	-0.003	-0.003	-0.002
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared (%)	37.81	37.64	37.8	37.81	37.81
Observations	76692	76692	76692	76692	76692

Table 9. Bank CDS Use, Capital-Free Assets and Bank Profitability

This table reports the estimation results of panel regressions that examine how a bank's CDS use for capital-relief purposes affects its profitability. We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies ("FR Y-9C") report and have book assets of more than US$150 million. The dependent variable is return-on-equity (ROE). The independent variables of interest are *Capital-Free Assets/TA, CDSUsage*, and interactions of CDS variables and *Capital-Free Assets/TA*. *Capital-Free Assets/TA* refers to the ratio of assets that are excluded from calculating regulatory capital relative to on-balance-sheet total assets. We use three CDS variables: (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+CDS Total):* the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter. (3) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. *Non-Interest Inc/Total Oper* Inc refers to the ratio of non-interest income out of total operating income. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Return-on-Equity (ROE)					
Variable	(1)	(2)	(3)	(4)	(5)
Capital-Free Assets/TA	-0.074***		-0.076***	-0.076***	-0.138***
	(0.004)		(0.004)	(0.004)	(0.006)
CDSUsage		0.010***	0.008*		
		(0.004)	(0.004)		
CDSUsage*Capital-Free Assets/TA			0.017***		
			(0.006)		
Log (1+CDS Total)				0.001**	
				(0.000)	
Log (1+CDS Total)*Capital-Free Assets/TA				0.001***	
				(0.000)	
Log (1+CDS Bought)					-0.001*
					(0.000)
Log (1+CDS Bought)*Capital-Free Assets/TA					0.007***
					(0.000)
Log (Total Assets)	0.025***	0.026***	0.025***	0.025***	0.024***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Deposits/Total Liabilities	0.040***	0.045***	0.041***	0.041***	0.033**
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Market Share	-0.519***	-0.554***	-0.543***	-0.596***	-0.608***
	(0.166)	(0.166)	(0.166)	(0.167)	(0.168)
Net Income Growth	0.027***	0.026***	0.027***	0.025***	0.025***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Non-Interest Inc/Total Oper Inc	0.059***	0.059***	0.059***	0.059***	0.060***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log (1+Securitised Assets)	0.023	0.013	0.022	0.021	0.037**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared (%)	38.68	38.43	38.71	38.71	38.92
Observations	76692	76692	76692	76692	76692

Table 10. Bank Capital and Profitability: CDS-using Bank vs. Non-CDS-Using Bank

This table reports the estimation results of panel regressions that examine how a bank's CDS use for capital-relief purposes affects its profitability. We use a sample of CDS-using banks and their one-to-one matched non-CDS-using banks that have the closet on-balance-sheet book assets in the year that the treatment bank starts to use CDS for the first time. We require the ratio of the total assets of the CDS-using bank relative to the total assets of its matched non-CDS-using bank to be within the range (0.8, 1.2). 97 matched pairs of banks meet this requirement. The dependent variable is return-on-equity (ROE). The independent variables of interest are *Tier 1 Capital/RWA and Total Capital/RWA.* In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. *Non-Interest Inc/Total Oper* Inc refers to the ratio of non-interest income out of total operating income. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Return-on-Equity (ROE)				
Variable	CDS-using Bank	Matched Non-CDS-Using Bank	CDS-using Bank	Matched Non-CDS-Using Bank
Tier 1 Capital/RWA	0.219**	-0.028		
	(0.102)	(0.090)		
Total Capital/RWA			0.204**	-0.081
			(0.095)	(0.087)
Log (Total Assets)	0.032**	0.003	0.029**	0.002
	(0.013)	(0.009)	(0.012)	(0.009)
Total Deposits/Total Liabilities	0.051***	0.032**	0.052***	0.031**
	(0.013)	(0.016)	(0.012)	(0.015)
Market Share	-0.151	-15.411***	-0.127	-15.272***
	(0.243)	(2.400)	(0.242)	(2.403)
Net Income Growth	6.357***	4.649***	6.374***	4.651***
	(0.305)	(0.207)	(0.305)	(0.207)
Non-Interest Inc/Oper Inc	0.501	-5.049	0.451	-5.098
	(4.891)	(3.232)	(4.893)	(3.226)
Log (1+Securitised Assets)	-0.015	0.084	-0.015	0.081
	(0.020)	(0.063)	(0.020)	(0.063)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	79.66	42.75	79.66	42.78
Observations	1318	1321	1318	1321

Internet Appendix for Additional Results

Table IA1. Bank CDS Use and Risk-Weighted Assets (RWA) Ratio: Excluding Largest CDS Dealers

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects the ratio of its risk-weighted assets (RWA). We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies (FR Y-9C) and have book assets of more than US$150 million, excluding the largest CDS dealers. The largest CDS dealers are identified based on the list of the largest 14 derivatives dealers (G14) including Bank of America-Merrill Lynch, Barclays Capital, BNP Paribas, Citi, Credit Suisse, Deutsche Bank AG, Goldman Sachs & Co., HSBC Group, JPMorgan, Morgan Stanley, The Royal Bank of Scotland Group, Société Générale, UBS AG, and Wachovia Bank, NA.[32] The dependent variable is RWA/All Unweighted Assets, the risk-weighted assets scaled by the unweighted sum of total assets, derivatives and off-balance-sheet items ("All Unweighted Assets"). The independent variables of interest are (1) CDSUsage: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) Log (1+ CDS Total): the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) Log (1+CDS Bought): the logarithm of the dollar amount of CDS bought plus one in a given quarter. In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. Net Income Growth is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of Log (1+ Securitised Assets) are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

RWA/All Unweighted Assets			
Variable	(1)	(2)	(3)
CDSUsage	-0.012***		
	(0.003)		
Log (1+CDS Total)		-0.001***	
		(0.000)	
Log (1+CDS Bought)			-0.003***
			(0.000)
Log (Total Assets)	-0.002	-0.002	-0.002
	(0.001)	(0.001)	(0.001)
Total Deposits/Total Liabilities	0.083***	0.082***	0.086***
	(0.010)	(0.010)	(0.010)
Market Share	-0.689***	-0.625***	-0.495***
	(0.151)	(0.152)	(0.153)
Net Income/Total Assets Growth	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	-0.023***	-0.023***	-0.023***
	(0.001)	(0.001)	(0.001)
Log (1+ Securitised Assets)	0.020*	0.020*	0.017
	(0.012)	(0.012)	(0.012)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	83.62	83.63	83.64
Observations	75898	75898	75898

[32] http://www.isda.org/researchnotes/pdf/ConcentrationRN_4-10.pdf

Table IA2. Bank CDS Use and Risk-Weighted Assets (RWA) Ratio: Alternative Matched Sample Results

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects the ratio of its risk-weighted assets (RWA). We use a sample of CDS-using banks and their one-to-one matched non-CDS-using banks that have closest book assets. We also require the ratio of the book assets of the CDS-using bank relative to the book assets of its matched non-CDS bank to be within the range (0.8, 1.2). 97 out of 126 matched pairs meet this requirement. The dependent variable is *RWA/All Unweighted Assets*, the risk-weighted assets scaled by the unweighted sum of total assets, derivatives and off-balance-sheet items ("*All Unweighted Assets*"). The independent variables are (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+ CDS Total):* the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. We control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

RWA/All Unweighted Assets			
Variable	(1)	(2)	(3)
CDSUsage	-0.007***		
	(0.003)		
Log (1+CDS Total)		-0.004***	
		(0.000)	
Log (1+CDS Bought)			-0.005***
			(0.001)
Log (Total Assets)	0.022***	0.026***	0.028***
	(0.005)	(0.005)	(0.005)
Total Deposits/Total Liabilities	0.024***	-0.239***	-0.214***
	(0.008)	(0.084)	(0.084)
Market Share	-0.804***	-0.596***	-0.760***
	(0.163)	(0.175)	(0.165)
Net Income/Total Assets Growth	0.001***	0.001**	0.001**
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	-0.031*	-0.033*	-0.034*
	(0.019)	(0.019)	(0.019)
Log (1+ Securitised Assets)	0.022*	0.021**	0.020**
	(0.011)	(0.009)	(0.010)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	88.04	88.08	88.06
Observations	2660	2660	2660

Table IA3. Bank CDS Use, Capital Relief and Bank Profitability: Return-on-Capital (ROC)

This table reports the estimation results of panel regressions that examine how a bank's CDS use for capital-relief purposes affects its profitability. We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies (FR Y-9C) report and have book assets of more than US$150 million. The dependent variable is return-on-capital (ROC). The denominator is the sum of Tier 1, Tier 2 and Tier 3 capital (total capital). The independent variables of interest are *Capital-Free Assets/TA, CDSUsage*, and interactions of CDS variables and *Capital-Free Assets/TA*. *Capital-Free Assets/TA* is the ratio of assets that are excluded from calculating regulatory capital scaled by on-balance-sheet total assets. We use three CDS variables: (1) *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter; (2) *Log (1+CDS Total):* the logarithm of the dollar amount of CDS bought and sold plus one in a given quarter; (3) *Log (1+CDS Bought):* the logarithm of the dollar amount of CDS bought plus one in a given quarter. In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. *Non-Interest Inc/Total Oper* Inc refers to the ratio of non-interest income out of total operating income. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

Return-on-Capital (ROC)					
Variable	(1)	(2)	(3)	(4)	(5)
Capital-Free Assets/TA	-0.055***		-0.056***	-0.056***	-0.104***
	(0.004)		(0.004)	(0.004)	(0.005)
CDSUsage		0.011***	0.009**		
		(0.003)	(0.004)		
CDSUsage*Capital-Free Assets/TA			0.009*		
			(0.005)		
Log (1+CDS Total)				0.001**	
				(0.000)	
Log (1+CDS Total)*Capital-Free Assets/TA				0.001*	
				(0.000)	
Log (1+CDS Bought)					0.001
					(0.000)
Log (1+CDS Bought)*Capital-Free Assets/TA					0.005***
					(0.000)
Log (Total Assets)	0.028***	0.029***	0.028***	0.028***	0.027***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Total Deposits/Total Liabilities	0.054***	0.058***	0.055***	0.055***	0.047***
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Market Share	-0.492***	-0.520***	-0.510***	-0.552***	-0.587***
	(0.141)	(0.142)	(0.142)	(0.143)	(0.143)
Net Income Growth	0.022***	0.022***	0.022***	0.022***	0.022***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	0.055***	0.055***	0.055***	0.055***	0.055***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log (1+Securitised Assets)	0.018	0.011	0.017	0.017	0.029*
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes	Yes
R-squared (%)	37.23	37.08	37.24	37.24	37.43
Observations	76692	76692	76692	76692	76692

Table IA4. Bank CDS Use and Regulatory Capital Ratio

This table reports the estimation results of panel regressions that examine how a bank's CDS use affects its regulatory capital ratios. We use the whole sample of banks that filed for the Federal Reserve Consolidated Financial Statements for Holding Companies (FR Y-9C) report and have book assets of more than US$150 million. The dependent variables are regulatory capital ratios: *Tier 1 capital/RWA* (Tier 1 Capital Ratio), *Total Capital/RWA* (Total Capital Ratio), and *Tier 1 Capital/Averaged Assets* (Tier 1 Leverage Ratio). The independent variable of interest is *CDSUsage*: a dummy taking one if the bank takes non-zero CDS position in a given quarter. In all specifications we control for bank characteristic variables that may affect a bank's risk-weighting of its assets. *Net Income Growth* is calculated as the net income in quarter t minus net income in quarter t-1, scaled by book assets in quarter t-1. *Non-Interest Inc/Total Oper* Inc refers to the ratio of non-interest income out of total operating income. The coefficients of *Log (1+ Securitised Assets)* are multiplied by 100. All control variables are extracted at the end of the previous quarter. We control for year and bank fixed effects in all regressions. Standard errors are reported in the parentheses. ***, ** and * denote statistical significance at 1%, 5% and 10% levels, respectively.

	Tier 1 Capital /RWA	Total Capital /RWA	Tier 1 Capital/Averaged Assets
Variable	(1)	(2)	(3)
CDS Usage	-0.002	-0.001	0.001
	(0.002)	(0.001)	(0.001)
Log (Total Assets)	-0.013***	-0.014***	-0.010***
	(0.001)	(0.001)	(0.000)
Market Share	0.286***	0.250***	0.110***
	(0.063)	(0.062)	(0.040)
Net Income Growth	0.001	0.001	0.001***
	(0.000)	(0.000)	(0.000)
Non-Interest Inc/Total Oper Inc	0.015***	0.015***	0.008***
	(0.001)	(0.001)	(0.001)
Total Deposits/Total Liabilities	0.060***	0.052***	0.047***
	(0.006)	(0.006)	(0.004)
Log (1+Securitised Assets)	-0.013*	-0.007	-0.005
	(0.007)	(0.007)	(0.004)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	80.13	79.71	75.22
Observations	76692	76692	76692