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CREDIT DEFAULT SWAPS AND BANK SAFETY

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Abstract

In this analysis we find evidence that credit default swap (CDS) purchases increase bank safety. Specifically, we show banks which were net buyers of CDS had smaller increases in loan loss reserves in response to the COVID-19 crisis. Previous research had speculated that bank CDS purchases caused increased risk-taking by banks which offset the effect of the hedge. This analysis contributes to this literature on the effect of hedging on bank risk taking. Moreover, since our results are consistent with CDS being effectively used to hedge, our results have implications for systemic risk.

JEL Codes: E02; E60; F02; F35; G28

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1. Introduction

Derivatives are an increasingly crucial tool used by banks, and so understanding the way these contracts are used is important to the banks' investors as well as regulatory authorities. Broadly, the purpose of derivative contracts, such as credit default swaps (CDS) and interest-rate swaps (IRS), is to afford a bank's management a tool to lessen risk. If a bank is concerned about the probability of default on a set of bonds it owns, it can purchase CDS on the bonds, and thereby lessen the bank's risk. Similarly, if a bank is concerned interest rates will increase, it can use an IRS to swap fixed-rate debt it owns for floating rate debt.

That said, derivative positions may not reduce bank risk for a number of reasons. First, the bank may simply use the derivative to speculate. In fact, Guettler and Adam (2011) find evidence that U.S. fixed-income mutual funds use CDS primarily to gain exposure to credit risk rather than hedge. Interestingly, the funds which use CDS tend to underperform funds that to not use CDS, which may be due to an inability to time the market.

More subtly, however, the use of a derivative contract to lessen a bank's risk may allow the bank to increase risk in another area. In this case, the derivative simply shifts risks from one place on the bank's balance sheet to another. The goal of this paper is to investigate the latter case and determine whether bank's use CDS purchases to expand risk on further risky loans.

CDS are commonly referred to as 'bond insurance'. The CDS buyer makes regular (usually semi-annual) payments to the CDS seller. If the bond underlying the CDS contract defaults, then the CDS seller (usually) pays the CDS buyer the difference between the face value and the market value of the bond. In case of default, often termed a credit event, the bond can be physically delivered to the CDS seller in return for the face value of the bond. Since CDS are not traded on exchange, specifics of a particular CDS contract can differ from the typical contract.

While functioning as insurance on bonds, CDS have a few important distinctions from standard insurance contracts. CDS are traded in over-the-counter markets, however, are subject to clearing requirements[1]. There is no requirement that the CDS buyer owns the underlying bonds. Thus, CDS purchases can be used to speculate (or short) bonds. Also, while there is no secondary market for CDS, a CDS position can be easily offset by entering a new CDS position on the opposite side. Lastly, while insurance firms must hold reserves against insurance contracts written, there are generally fewer requirements for CDS sales.

1.2 Literature Review

Parlour and Winton (2013) investigate the trade-offs between selling a loan and buying CDS on the loan to reduce risk. The important distinction is by selling the loan ownership rights are transferred, though when buying CDS ownership rights are retained. The latter method, however, leaves the bond owner with no economic incentive to monitor the borrower. They find the optimal solution is a function of the bond owner's credit risk (higher risk implies loan sales are optimal) and the bond's capital cost.

CDS purchases and bond sales also differ in their treatment by regulatory capital calculations. Required regulatory capital is reduced for CDS bought on bonds, however the reduction is greater for bonds held in trading relative to banking books Moser (1998). Therefore, as regulatory capital becomes more costly, there is a preference to sell bonds rather than hedge the credit risk via CDS.

Duffee and Zhou (2001) discuss how imperfect transparency with respect to credit exposure can cause mispricing of risk—specifically under-pricing risk and therefore capital costs. This can be driven by correlations among CDS credit events and can thereby cause systemic risk. Stulz (2010), however, found that CDS did not cause the 2008-2009 credit crisis, and eliminating OTC trading in CDS in favour of exchange listed CDS may be problematic. Alternatively, Bolton and Oehmke (2011) note that while CDS may lower the debtor's probability of strategic default, it may cause a high rate of costly bankruptcy due to a tendency to over-insure via CDS. Subrahmanyam, Tang, and Wang (2014) largely support the prediction of this model, and further find evidence that the increase in credit risk for borrowers is due to CDS protected lenders' hesitance to restructure the loan.

A well-functioning CDS market can have a significant impact on innovation. Chang et al. (2019) found evidence that firms on which there were traded CDS tended to generate more innovations, patents, and real economic value.

Krüger, Rösch, and Scheule (2018) find evidence that loan loss provisioning in accordance with both International Financial Reporting Standards and US Generally Accepted Accounting Principles leans to a reduction in Tier 1 Equity Capital. Importantly, this reduction is exacerbated by economic downturns, and increases the procyclicality of bank capital. Regarding earnings however, Fonseca and Gonzalez (2008) find evidence that the use of loan loss provisions to smooth earnings is increasing in the development level of a given country's financial system, and in the level of market orientation in a country.

1 https://www.fdic.gov/news/financial-institution-letters/2013/fil13025.html

2. Data and Methods

The data set used in this analysis was built from the Federal Deposit Insurance Corporation's (FDIC) Statistics on Depository Institutions (https://www5.fdic.gov/sdi/index.asp) data repository. This repository contains detailed financial information for each FDIC-insured institution. Variables available in the data repository are listed with descriptions here.

To calculate the percent change in loan loss reserves, we used the percent change in the "Loan Loss Allowance" (code: lnatres) account from Q4 2019 to Q1 2020. See figure 1 below for a time-series chart of the lnatres account. All other variables are from Q4 2019. So, our dataset consists of explanatory variables measured in the quarter immediately prior to the COVID-19 outbreak, and the percent change in loan loss reserves in response to the crisis.

2.1. Loan Loss Reserves

Loan-loss reserves appear on both a bank's balance sheet and income statement. On the balance sheet loan loss reserves are a CONTRA-ASSET account which reduces the amount of loan assets by the expected amount of those loans which will not be repaid.

Changes to this CONTRA-ASSET account are recorded in the income statement. If the loan loss reserves account is increased, then the amount of this increase is recorded as an expense on the income statement. Conversely, a reduction of the loan loss reserve account increases income.

Due to the effect on income, loan loss reserves have in the past been used for earnings smoothing and tax mitigation strategies. This effect, however, should potentially only exist for banks with assets less than $500 million. This is because the Tax Reform Act of 1986 specifically linked tax-deductible loan loss provisions to each bank's historical charge-offs for banks with over $500 million in assets. This effectively makes the tax shield offered from loan loss provisions a function of historical data, and thus invariant to expected future losses due to COVID-19. Nonetheless, we test for a relationship between each bank's effective tax rate in Q4 2019 and the percent increase in loan loss reserves in Q1 2020. We estimate separate regressions for banks above, and below, $500 million in assets.

2.2. Summary Statistics

Figure 1 below shows the marked increase in loan loss reserves. The plot is of total loan losses by quarter. From Q4 2019 to Q1 2020 loan loss reserves increased nearly to their peak during the 2008 financial crisis.

Tables 1 through 4 below contain descriptive statistics for all institutions. Many of these institutions have a zero-dollar value position in CDS. We thus also include descriptive statistics for subsets of banks which do, and do not, report CDS positions. Notably, banks which reports CDS positions tend to be larger and have lower risk-based capital ratios.

Yield on Assets is annualized total interest income as a percent of average earning assets, and it controls for bank loan risk. Similarly, Net Interest Margin is bank total interest income minus interest expense as a ratio of average earning assets, which compares this yield on assets to the bank's cost of deposit financing. Other standard control variables are the log of total assets, ROA (NI/Assets), and the Tier 1 Risk-Based Capital Ratio.

Figure 1: Total Loan Loss Reserves by Quarter. Loan loss reserves are the lnatres account from the FDIC's SDI data set. Values are not adjusted for inflation.

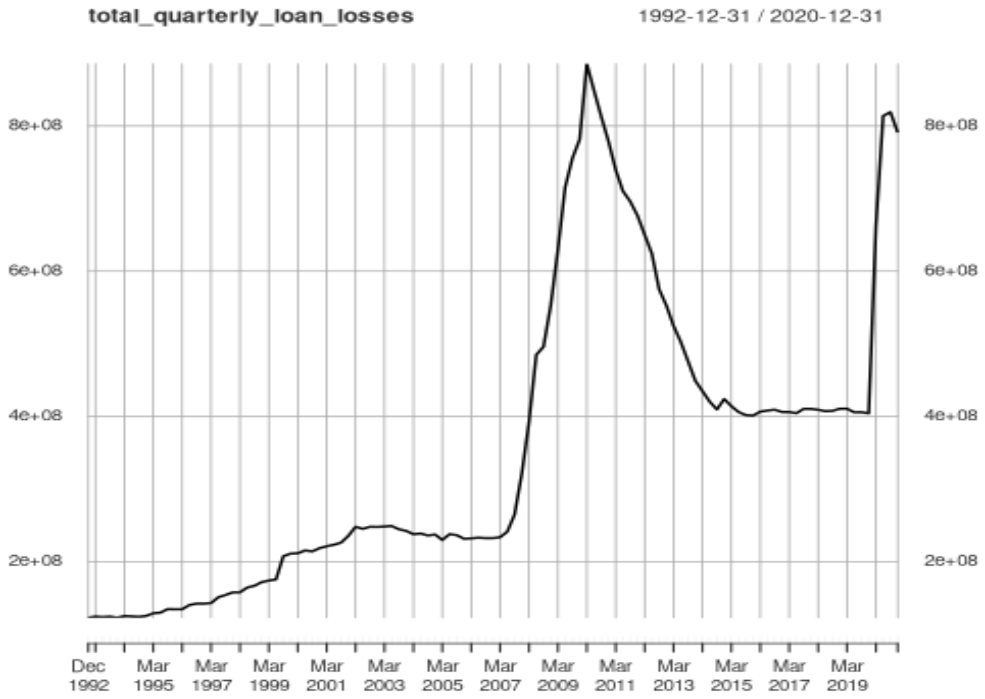

Table 1: All Banks: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Yield on Assets	3,694	4.69	1.14	1.00	4.20	5.04	24.93
Net Interest Margin	3,694	3.82	1.07	0.69	3.35	4.16	23.04
Log of Total Assets	3,694	12.70	1.47	9.13	11.73	13.43	21.59
ROA	3,694	1.22	7.01	−4.05	0.74	1.37	422.88
Net Charge-Offs	3,694	0.14	0.48	−2.30	0.00	0.14	11.23
T1 RBCR	3,694	18.01	9.46	8.54	12.64	19.62	142.70
Deposit Service Charges	3,694	0.002	0.002	0.00	0.001	0.003	0.05
Change in Loan Losses	3,694	0.06	0.15	−1.00	0.001	0.08	1.00
Taxes	3,694	0.05	0.03	0.00	0.02	0.06	0.75
Home Eq. Loans	3,694	0.02	0.02	0.00	0.001	0.03	0.49
Real Est. Loans	3,694	0.18	0.15	0.00	0.08	0.25	0.96
Treasuries	3,694	0.01	0.03	0.00	0.00	0.001	0.51
Small CI Loans	3,694	0.05	0.05	0.00	0.02	0.07	0.81
Net CDS	1,146	0.0000	0.01	−0.05	0.00	0.00	0.10
Long CDS	1,146	0.002	0.02	0.00	0.00	0.00	0.67
Short CDS	1,146	0.002	0.02	0.00	0.00	0.00	0.62
Securities	3,694	0.18	0.14	0.00	0.08	0.26	0.92
Log of Loan Loss Reserves	3,694	7.82	1.53	1.79	6.86	8.67	16.39
Core capital ratio	3,694	11.96	4.17	6.17	9.67	12.91	88.96

Note: The mean Tier 1 Risk Based Capital Ratio for CDS buyers (mean 13.06) is significantly higher than for CDS sellers (mean 12.18) (for a T-TEST p-value of 0.0837).

Table 2: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Yield on Assets	80	4.31	0.88	2.27	4.01	4.52	10.80
Net Interest Margin	80	3.37	0.84	1.13	3.03	3.68	8.73
Log of Total Assets	80	16.77	1.97	12.75	15.45	17.86	21.59
ROA	80	1.19	0.38	0.12	1.05	1.39	2.07
Net Charge-Offs	80	0.23	0.46	−0.05	0.05	0.28	3.95
T1 RBCR	80	12.53	2.03	9.49	11.16	13.05	19.07
Deposit Service Charges	80	0.002	0.001	0.00	0.001	0.003	0.01
Change in Loan Losses	80	0.41	0.31	−0.05	0.10	0.71	1.00
Taxes	80	0.06	0.03	0.004	0.04	0.08	0.14
Home Eq. Loans	80	0.03	0.02	0.00	0.01	0.04	0.07
Real Est. Loans	80	0.14	0.10	0.00	0.08	0.18	0.44
Treasuries	80	0.02	0.03	0.00	0.00	0.03	0.16
Small CI Loans	80	0.02	0.02	0.0000	0.01	0.03	0.07
Net CDS	80	0.0004	0.02	−0.05	−0.01	0.001	0.10
Long CDS	80	0.02	0.09	0.00	0.00	0.01	0.67
Short CDS	80	0.02	0.08	0.00	0.002	0.01	0.62
Securities	80	0.20	0.10	0.004	0.14	0.24	0.50
Log of Loan Loss Reserves	80	11.70	1.90	7.83	10.31	12.67	16.39

Table 3: Banks Net Bought CDS: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Yield on Assets	25	4.35	1.49	2.27	3.72	4.39	10.80
Net Interest Margin	25	3.27	1.33	1.13	2.96	3.40	8.73
Log of Total Assets	25	17.64	2.15	13.20	16.36	18.77	21.59
ROA	25	1.12	0.41	0.19	0.93	1.32	2.07
Net Charge-Offs	25	0.35	0.78	0.00	0.06	0.34	3.95
T1 RBCR	25	13.06	2.18	10.78	11.76	13.03	18.49
Deposit Service Charges	25	0.002	0.001	0.00	0.001	0.003	0.004
Change in Loan Losses	25	0.39	0.28	0.01	0.13	0.68	0.92
Taxes	25	0.06	0.03	0.02	0.04	0.08	0.14
Home Eq. Loans	25	0.02	0.02	0.00	0.01	0.04	0.07
Real Est. Loans	25	0.13	0.10	0.00	0.07	0.16	0.44
Treasuries	25	0.03	0.04	0.00	0.001	0.04	0.16
Small CI Loans	25	0.02	0.02	0.0000	0.01	0.03	0.06
Net CDS	25	0.02	0.03	0.0001	0.001	0.01	0.10
Long CDS	25	0.07	0.15	0.0001	0.003	0.03	0.67
Short CDS	25	0.05	0.14	0	0	0.01	1
Securities	25	0.19	0.09	0.004	0.13	0.25	0.41
Log of Loan Loss Reserves	25	12.43	2.08	8.10	11.20	13.57	16.39

Table 4: Banks Net Sold CDS: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Yield on Assets	53	4.32	0.36	3.58	4.09	4.55	5.56
Net Interest Margin	53	3.46	0.43	2.58	3.18	3.74	4.61
Log of Total Assets	53	16.41	1.79	12.75	15.23	17.61	19.97
ROA	53	1.23	0.36	0.12	1.12	1.41	1.89
Net Charge-Offs	53	0.18	0.17	−0.05	0.04	0.27	0.87
T1 RBCR	53	12.18	1.72	9.49	11.04	12.98	18.84
Deposit Service Charges	53	0.003	0.001	0.0001	0.002	0.004	0.01
Change in Loan Losses	53	0.43	0.32	−0.05	0.10	0.75	1.00
Taxes	53	0.06	0.03	0.004	0.05	0.08	0.13
Home Eq. Loans	53	0.03	0.02	0.0002	0.02	0.04	0.07
Real Est. Loans	53	0.15	0.10	0.01	0.10	0.18	0.44
Treasuries	53	0.01	0.02	0.00	0.00	0.01	0.11
Small CI Loans	53	0.03	0.02	0.003	0.01	0.04	0.07
Net CDS	53	−0.01	0.01	−0.05	−0.01	−0.002	−0.00
Long CDS	53	0.002	0.004	0.00	0.00	0.003	0.02
Short CDS	53	0.01	0.01	0.0002	0.003	0.01	0.05
Securities	53	0.20	0.10	0.01	0.14	0.23	0.47
Log of Loan Loss Reserves	53	11.42	1.74	7.83	10.09	12.55	15.21

3. Results

Regression results are in tables 5 through 7 below. Table 5 estimates the regression over all banks and includes CDS in both as net and by amount long and short. Tables 6 and 7 estimate the regressions for subsamples of banks which do, and do not, have CDS positions. All Standard errors are Heteroskedasticity robust.

There is a negative and significant relationship between the amount of CDS a bank purchases and its increase in loan losses. This is evidence that CDS purchases lower bank risk. Specifically, this is evidence against the hypothesis that banks who buy CDS then make riskier loans.

Regressions on all three data sets find evidence that larger banks had greater percentage increases in loan loss provisions in response to COVID-19. This is consistent with larger banks making riskier non-real-estate loans.

For robustness, in the appendix we include regression results for the percent change in loan loss reserves in Q2 2020 and Q3 2020. These regressions use explanatory variables as of Q1 2020 and Q2 2020 respectively.

3.1. All Banks

The regressions over the full sample of banks are in table 5 below. They explain approximately 32% of the cross-sectional variation in the percent change in loan loss reserves in Q1 2020. The coefficient for Net CDS (long minus short) is negative and significant for each regression. Moreover, when separated into long and short variables, the long variable is negative and significant, and the short variable is positive and significant. This is evidence that CDS purchases lessened loan loss provision increases in response to the COVID-19 crisis, and thereby reduced bank risk.

Table 5: Determinants of the Percent Change in Loan Loss Reserves

	Dependent variable:		
	Percent Change in Loan Loss Reserves		
	(1)	(2)	(3)
Yield on Assets	-0.008 (0.018)		
Net Int. Margin	0.018 (0.016)	0.011 (0.011)	0.012 (0.011)
Total Assets	0.139*** (0.015)	0.139*** (0.015)	0.138*** (0.015)
ROA	-0.010*** (0.004)	-0.010*** (0.004)	-0.011*** (0.004)
Net Charge-Offs	0.034 (0.023)	0.032 (0.022)	0.032 (0.022)
T1 RBCR	-0.0003 (0.001)	-0.0002 (0.001)	-0.0003 (0.001)
Dep. Serv. Chrgs	2.553 (2.057)	2.877 (2.088)	2.625 (2.052)
Taxes	0.002 (0.129)	0.013 (0.133)	0.041 (0.132)
Home Eq. Loans	0.248 (0.266)	0.270 (0.264)	0.290 (0.264)
Real Est. Loans	-0.121** (0.055)	-0.122** (0.055)	-0.123** (0.055)
Treasuries	0.216 (0.173)	0.222 (0.173)	0.195 (0.177)
Small C&I Loans	0.047 (0.125)	0.046 (0.126)	0.034 (0.126)
Net CDS	-3.993*** (1.489)	-4.017*** (1.489)	
Long CDS			-5.386*** (1.599)
Short CDS			6.356*** (1.765)
Securities	-0.190*** (0.051)	-0.181*** (0.046)	-0.180*** (0.046)
Loan Loss Res.	-0.082*** (0.015)	-0.082*** (0.015)	-0.083*** (0.015)
Constant	-1.054*** (0.120)	-1.064*** (0.115)	-1.037*** (0.116)
Observations	1,146	1,146	1,146
R^2	0.330	0.330	0.337
Adjusted R^2	0.321	0.321	0.328

*Note: *p<0.1; **p<0.05; ***p<0.01*

Table 6: Subset of Banks with CDS: Determinants of the Percent Change in Loan Loss Reserves

	Dependent variable:		
	Percent Change in Loan Loss Reserves		
	(1)	(2)	(3)
Yield on Assets	0.023 (0.137)		
Net Int. Margin	0.080 (0.156)	0.096 (0.118)	0.124 (0.118)
Total Assets	0.263** (0.123)	0.264** (0.122)	0.286** (0.124)
ROA	-0.0002 (0.126)	-0.004 (0.120)	-0.042 (0.125)
Net Charge-Offs	-0.0001 (0.238)	0.013 (0.212)	0.005 (0.208)
T1 RBCR	-0.016 (0.021)	-0.016 (0.021)	-0.020 (0.021)
Dep. Serv. Chrgs	-8.387 (30.866)	-10.143 (27.558)	-10.559 (26.151)
Taxes	-1.170 (1.961)	-1.158 (1.933)	-0.773 (1.993)
Home Eq. Loans	5.072** (2.012)	5.053** (2.006)	5.339*** (2.031)
Real Est. Loans	-0.661 (0.421)	-0.670 (0.409)	0.742 *(0.400)
Treasuries	0.963 (1.534)	0.951 (1.517)	0.788 (1.534)
Small C&I Loans	0.799 (2.611)	0.781 (2.584)	0.275 (2.521)
Net CDS	-3.774 (2.744)	-3.757 (2.732)	
Long CDS			-4.681* (2.537)
Short CDS			5.450** (2.617)
Securities	-0.272 (0.496)	-0.304 (0.488)	-0.253 (0.486)
Loan Loss Res.	-0.190 (0.137)	-0.191 (0.134)	-0.224 (0.136)
Constant	-1.889** (0.821)	-1.821** (0.796)	-1.843** (0.769)
Observations	80	80	80
R^2	0.449	0.449	0.474
Adjusted R^2	0.320	0.330	0.351

*Note: *p<0.1; **p<0.05; ***p<0.01*

3.2. Banks with CDS

Table 6 summarizes the regressions over the sub-sample of banks with CDS positions. The regressions explain between 32% and 35% of the cross-sectional variation in the percent change in loan loss reserves in Q1 2020. Again, the coefficients on Net CDS are negative and significant, and the amount of long CDS has a positive coefficient and short CDS has a negative coefficient. Both are significant, though the coefficient on long CDS is only significant at the 10% level. Notably, in these regressions we find evidence that more home equity loans is consistent with larger increases in loan loss provisions.

3.3. Banks without CDS

On the subsample of banks without CDS (table 7), the adjusted-R2 values drop to approximately 19%, and so we are able to explain less of the variation in loan loss provision changes. Consistent with earlier regressions, larger banks had greater increases in loan loss reserves. Also, the change in loan loss reserves is decreasing in securities held, and the previous level of loan loss provisions.

Table 6: Subset of Banks without CDS: Determinants of the Percent Change in Loan Loss Reserves

	Dependent variable:		
	Percent Change in Loan Loss Reserves		
	(1)	(2)	(3)
Yield on Assets	0.009 (0.008)		
Net Int. Margin	0.006 (0.008)	0.015** (0.006)	0.015** (0.007)
Total Assets	0.097*** (0.009)	0.097*** (0.009)	0.096*** (0.009)
ROA	-0.0002 (0.0002)	-0.0002 (0.0002)	-0.0003 (0.0002)
Net Charge-Offs	0.011 (0.012)	0.013 (0.011)	0.011 (0.011)
T1 RBCR	-0.0005 (0.0003)	-0.001 (0.0003)	
Dep. Serv. Chrgs	-0.886 (1.028)	-1.286 (1.076)	-1.264 (1.071)
Taxes	0.016 (0.070)	0.002 (0.074)	-0.017 (0.073)
Home Eq. Loans	-0.117 (0.092)	-0.132 (0.093)	-0.111 (0.093)
Real Est. Loans	-0.030 (0.020)	-0.029 (0.020)	-0.035* (0.020)
Treasuries	0.090 (0.055)	0.081 (0.055)	0.063 (0.053)
Small C&I Loans	0.068 (0.064)	0.070 (0.064)	0.086 (0.064)
Securities	-0.078*** (0.026)	-0.086*** (0.023)	-0.095*** (0.023)
Loan Loss Res.	-0.060*** (0.009)	-0.060*** (0.009)	-0.058*** (0.009)
Constant	-0.743*** (0.074)	-0.731*** (0.070)	-0.745*** (0.070)
Observations	3,614	3,614	3,614
R^2	0.191	0.190	0.189
Adjusted R^2	0.188	0.187	0.187

*Note: *p<0.1; **p<0.05; ***p<0.01*

4. Conclusion

Previous research has disagreed regarding whether CDS are generally used to increase, decrease, or transfer firm risk. In this analysis we attempt to answer this question by testing whether the change in bank loan loss provisions in response to the COVID crisis is conditional on bank CDS positions. We find evidence that banks loan loss provision increases were decreasing in bank net long CDS positions. This is evidence consistent with banks using CDS to reduce risk, rather than transfer that risk among securities.

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