

Credit Default Swaps and Bank Regulatory Capital

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Research Question

- ▶ How do credit derivatives affect bank regulatory capital?
 - ▶ How does the use of CDS affect banks' risk-weighted assets?
 - ▶ Do banks react to capital regulation that recognize credit derivatives for capital relief?
 - ▶ How does the use CDS change banks' incentive to hold capital?
 - ▶ What's the implication on bank capital quality and stability?

Motivation

- ▶ Milton Friedman: “Bank regulation is the only form of necessary government intervention”
- ▶ Capital regulation is the key part of banking regulation
- ▶ However, banks do not passively comply with regulations
- ▶ CDS are allowed for bank capital relief in Basel II and III

CDS-induced Capital Relief

- ▶ Basel II treats CDS and other credit derivatives that are similar to guarantees as instruments of credit risk mitigation

$$\text{Risk-weighted Capital Ratio} = \frac{\text{Total Capital (or Tier 1 Capital)}}{\text{Risk-Weighted Assets (RWA)}}$$

- ▶ Risk-weight of claims on corporate credit (Basel I)

Credit Assessment	Cash and Govt Bonds	Claims on OECD Banks	Residential Mortgages	Corporate Loans and Bonds
Risk Weight	0%	20%	50%	100%

- ▶ AIG's 2007 Form 10-K: 72% of CDS sold by AIG FP were used for capital relief
- ▶ Little empirical research on how banks use CDS for capital relief, and academic documentation is in sharp contrast to industry practice

Main Findings

- ▶ Does CDS affect banks' capital choice?
- ▶ Yes!
- ▶ CDS usage leads to the below effects:
 - ▶ Risk-weighted assets (RWA) shrink
 - ▶ Banks reduce capital holdings
 - ▶ Capital quality deteriorates, although regulatory capital ratios remain unchanged!
 - ▶ CDS-using banks suffer more during crisis and become more procyclical

Literature

- ▶ Theoretical work on credit risk transfer and banking
 - ▶ Allen and Gale (1994)
 - ▶ Duffee and Zhou (2001)
- ▶ Theoretical and empirical work on effects of CDS
 - ▶ Bolton and Oehmke (2011)
 - ▶ Che and Sethi (2012)
 - ▶ Yorulmazer (2013)
 - ▶ Saretto and Tookes (2013)
 - ▶ Subrahmanyam, Tang and Wang (2014)
 - ▶ Shan, Tang and Yan (2015)
 - ▶ Li and Tang (2015)
- ▶ So far, most empirical work is on the underlying firm (CDS-referenced firm)
- ▶ The effects of CDS on credit market are not clear if we don't understand the role of CDS in banking well

Data

- ▶ Banks' CDS usage and position (1994-2012)
 - ▶ FR Y-9C
 - ▶ OCC reports
- ▶ Bank financial information and characteristics
 - ▶ Bank Compustat
- ▶ We link FR Y-9C filing banks to Dealscan lead lenders
 - ▶ 84 banks enter our sample
 - ▶ 43 of which ever use CDS
 - ▶ Our sample is mainly composed of large banks
 - ▶ Syndicate lenders are more likely to use CDS for hedging purpose

Summary Statistics

Panel A. Summary of Sample Banks by Year

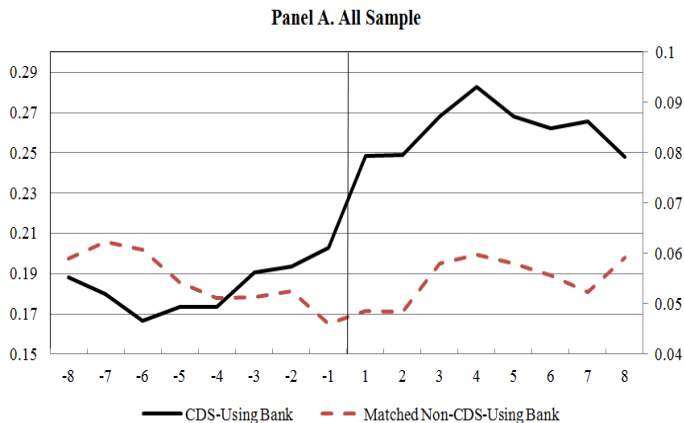
Year	# of Banks	# of CDS-Using Banks	CDS Bank: Total Assets (\$ Billion)	Non-CDS Bank: Total Assets (\$ Billion)
1994	55	.	.	56.15
1995	54	.	.	65.49
1996	52	.	.	76.09
1997	51	13	122.09	80.26
1998	53	17	169.13	104.55
1999	56	20	190.42	120.88
2000	56	19	200.15	142.95
2001	62	19	214.34	170.76
2002	66	18	291.28	174.73
2003	65	20	347.20	189.27
2004	64	19	366.22	238.86
2005	62	20	414.64	305.00
2006	61	18	493.92	350.90
2007	59	18	632.44	452.77
2008	57	16	755.41	542.39
2009	53	15	655.72	621.20
2010	53	15	723.52	615.62
2011	53	13	787.79	714.18
2012	53	13	586.03	786.45
Total	84	43	434.39	350.67

Bank CDS-Usage and Bank Risk-Weighted Assets (RWA)

Variable	(1)	(2)	(3)
CDSUsage	-30.470*** (8.395)	-56.991*** (9.032)	-57.626*** (8.924)
Total Assets		0.545*** (0.088)	0.535*** (0.087)
Sales Growth		45.265*** (10.993)	47.309*** (11.054)
Deposits/Total Liabilities		-97.746*** (15.844)	-101.43*** (15.915)
Loans/Total Assets		312.167*** (67.117)	317.027*** (66.826)
Non-Interest Income/Total Operating Income		-9.764 (12.163)	
Asset Sale and Securitization			28.473*** (8.314)
Intercept	97.745*** (16.13)	106.826 (70.892)	-35.125 (25.579)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	86.30	91.88	92.03
Observations	2878	2878	2878

Bank CDS-Usage and 0%-Category Assets

- Plotted with a larger sample: 86 CDS-using banks (out of 10510 banks that filed for FR Y-9C) and their one-to-one matched non-CDS-using banks

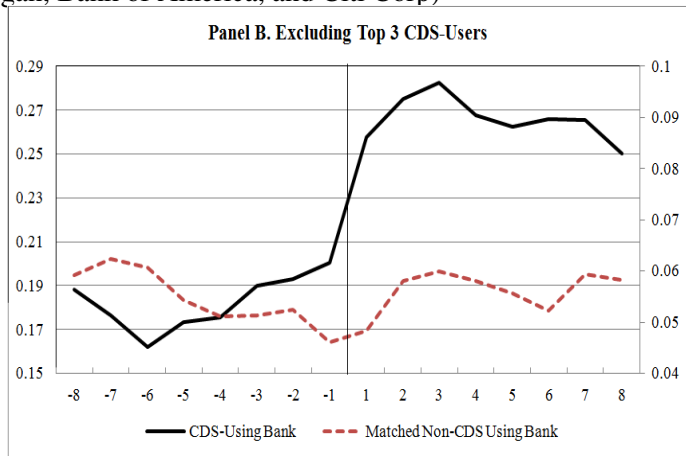


Bank CDS-Usage and Assets by Risk-Category

Variable	Assets of 0% Category (1)	Assets of 20% Category (2)	Assets of 50% Category (3)	Assets of 100% Category (4)
CDSUsage	0.210*** (0.044)	-0.022** (0.011)	-0.019*** (0.005)	-0.005 (0.015)
Total Assets	-0.785*** (0.172)	0.053 (0.042)	0.077** (0.033)	-0.430*** (0.073)
Sales Growth	0.024 (0.042)	0.02 (0.013)	0.003 (0.007)	-0.031** (0.013)
Deposits/Total Liabilities	0.437*** (0.097)	0.050** (0.021)	0.009 (0.008)	-0.077*** (0.016)
Loan/Total Assets	-0.540*** (0.183)	-0.345*** (0.060)	0.216*** (0.044)	0.189** (0.090)
Non-Interest Income /Operating Income	0.037* (0.020)	0.018** (0.009)	-0.001 (0.005)	-0.051*** (0.017)
Securitization	0.0185 (0.015)	0.0137*** (0.004)	0.001 (0.002)	-0.002 (0.004)
Intercept	-0.301*** (0.093)	0.138*** (0.026)	0.181*** (0.014)	0.636*** (0.021)
Year and Bank Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	85.38	78.29	69.54	78.28
Observations	2878	2878	2878	2878

Bank CDS-Usage and 0%-Category Assets: Excluding Largest Banks

- Exclude the Top-3 Largest Banks (Also the top-3 CDS users: J.P. Morgan, Bank of America, and Citi Corp)



The Instruments for Banks' CDS Usage

- ▶ Reverse causality or omitted variables may underscore any significant relation between bank asset category and CDS Usage
- ▶ Instrument 1: Loan concentration ratio
 - ▶ The sum of squared ratios of individual loan amount to the total amount of loan portfolio in which the same bank acts as the lead lender
- ▶ Instrument 2: The ratio of borrowers with bond issuance
 - ▶ The ratio of borrowers with a bond market out of all borrowers that borrow from the same bank

Bank CDS-Usage and 0%-Category Assets: IV

Variable	(1)	(2)	(3)
Instrumented CDSUsage (IV1)	0.358*** (0.125)		
Instrumented CDSUsage (IV2)		0.337*** (0.125)	
Instrumented CDSUsage (IV1, IV2)			0.335*** (0.124)
Intercept	-0.044 (0.114)	-0.034 (0.114)	-0.037 (0.114)
Bank Characteristics Controls	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R-squared (%)	78.96	76.97	86.87
Observations	2878	2878	2878

Bank CDS Position and 0% Category Assets

Variable	(1)	(2)	(3)
Log (CDS Long Position/Total Assets)	0.213*** (0.026)		0.311*** (0.037)
Log (CDS Short Position/Total Assets)		0.143*** (0.017)	-0.049*** (0.010)
Intercept	0.011 (0.100)	-0.026 (0.101)	-0.049 (0.100)
Bank Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
R-squared (%)	85.61	85.21	86.19
Observations	2878	2878	2878

Bank CDS Usage and Bank Capital

- ▶ Dependent variable: Bank Capital Holdings

	Tier 1 Capital	Tier 2 Capital	Total Capital
Variable	(1)	(2)	(3)
CDSUsage	-3.559*** (0.894)	-1.605*** (0.311)	-7.881*** (1.303)
Total Assets	0.065*** (0.007)	0.020*** (0.003)	0.061*** (0.010)
Intercept	-48.738*** (8.548)	-12.390*** (2.837)	-31.191*** (11.302)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	86.73	88.52	89.07
Observations	4280	4280	4280

Bank CDS Usage and Regulatory Capital Ratio

► Dependent variable: Risk-based vs. Non-risk based capital ratio

Variable	Total Risk-Weighted Capital Ratio (1)	Tier 1 Risk-Weighted Capital Ratio (2)	Tier 1 Leverage Ratio (3)
CDSUsage	-0.001 (0.003)	-0.005 (0.003)	-0.012*** (0.002)
Total Assets	-0.018 (0.038)	-0.035 (0.040)	0.038 (0.033)
Sales Growth	0.002 (0.009)	0.005 (0.009)	0.001 (0.003)
Total Loans/Total Assets	-0.182** (0.072)	-0.194*** (0.075)	0.089*** (0.026)
Deposits/Total Liabilities	0.001 (0.001)	0.001 (0.001)	0.021*** (0.007)
Non-Interest Income /Total Operating Income	-0.004 (0.025)	-0.002 (0.010)	-0.013** (0.006)
Intercept	0.237*** (0.057)	0.211*** (0.057)	0.473*** (0.064)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	47.47	57.95	78.65
Observations	4280	4280	4280

Bank CDS Usage and Regulatory Capital Quality

- ▶ Dependent variable: Tier 1 Capital/Total Capital

Variable	(1)	(2)	(3)
CDSUsage	-0.032*** (0.011)		
Instrumented CDSUsage (1)		-0.088** (0.045)	
Instrumented CDSUsage (2)			-0.162*** (0.046)
Intercept	0.875*** (0.044)	0.915*** (0.022)	0.844*** (0.018)
Year Fixed Effects	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes
R-squared (%)	70.54	80.71	76.41
Observations	4280	4280	1766

Bank CDS Usage and Allowance for Off-Balance Sheet Credit Loss

- ▶ Dependent variable: Allowance for Potential Loss of Off-Balance Sheet Credit Exposure/Total Assets
- ▶ The coefficient of CDSUsage is multiplied by 100

Variable	Estimate
CDSUsage	0.026*** (0.003)
Total Assets	0.019 (0.014)
Total Loans/Total Assets	0.029** (0.013)
Deposits/Total Liabilities	0.014** (0.006)
Non-Interest Income /Total Operating Income	0.063 (0.045)
Intercept	0.001 (0.000)
Year Fixed Effects	Yes
Bank Fixed Effects	Yes
R-squared (%)	51.29
Observations	4280

Stock Market Reaction and Assets by Risk Category

► Dependent variable: Buy-and-Hold Return in Quarter t

Variable	BHR (t)	BHR (t)	BHR (t)	BHR (t)
	(1)	(2)	(3)	(4)
0%-Category Assets/TA	0.052*** (0.012)			
20%-Category Assets/TA		0.037 (0.324)		
50%-Category Assets/TA			0.089 (0.248)	
100%-Category Assets/TA				0.059 (0.058)
BHR (t-1)	-0.274*** (0.067)	-0.269*** (0.066)	-0.267*** (0.066)	-0.266*** (0.066)
Total Assets	0.224* (0.123)	0.202* (0.121)	0.194 (0.122)	0.209* (0.121)
Intercept	-0.646*** (0.161)	-0.657*** (0.158)	-0.636*** (0.160)	-0.649*** (0.160)
Year Fixed Effects	Yes	Yes	Yes	Yes
Bank Fixed Effects	Yes	Yes	Yes	Yes
R-squared (%)	16.89	16.24	16.14	16.21
Observations	2878	2878	2878	2878

Stock Market Reaction and Assets by Risk Category

- ▶ Dependent variable: Buy-and-Hold Return in Quarter t+1, t+2

Panel B. Predictability of 0%-Category Assets on Future Stock Returns		
Variable	BHR (t+1)	BHR (t+2)
	(1)	(2)
0%-Category Assets/Total Assets	0.044*** (0.012)	0.042*** (0.015)
BHR (t-1)	-0.143*** (0.047)	0.106** (0.051)
Log (Market Value)	0.052*** (0.017)	0.019 (0.020)
Beta	0.014 (0.016)	-0.008 (0.012)
Total Assets	0.109 (0.123)	0.136 (0.139)
Intercept	-0.556*** (0.145)	0.021 (0.161)
Year Fixed Effects	Yes	Yes
Bank Fixed Effects	Yes	Yes
R-squared (%)	18.14	9.82
Observations	2878	2878

Performance of CDS-Using Bank in Crisis

- ▶ Dependent variable: Buy-and-Hold Return

	2008Q3-2008Q4	2007Q3-2009Q2	2006Q3-2007Q2
Variable	(1)	(2)	(3)
CDS-Using Bank in 2008:Q2	-0.245** (0.106)		
CDS-Using Bank in 2007:Q2		-0.292** (0.136)	
CDS-Using Bank in 2006:Q2			0.100*** (0.039)
Return in Current Year	1.493 (0.920)	0.774 (0.659)	-0.237* (0.127)
Intercept	-1.068 (0.729')	-0.741* (0.398')	0.548*** (0.165')
R-squared (%)	73.87	75.38	77.77
Observations	59	57	61

Summary

- ▶ CDS allow banks to move assets off their book which leads to a small risk-weighted assets
- ▶ It creates incentives for banks to reduce capital holdings
- ▶ *The unintended consequence* is capital quality deteriorates and banks become more procyclical