

# Counterparty Credit Risk and the Credit Default Swap Market

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# Introduction:

- Counterparty credit risk: A major concern during the crisis
- How is it actually priced
- Existing literature:
  - Cooper/Mello (1991); Sorensen/Bollier (1994); Duffie/Huang (1996);
  - Jarrow/Yu (2001); Hull/White (2001)
- Little or no empirical research:
  - Especially for the CDS market
  - Jorion/Zhang (JoF, forthcoming)

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# In this paper:

- First empirical study using a proprietary data-set:
  - Contemporaneous tx prices/quotes for 5-year CDS contracts
  - With a date and time stamp
  - From 14 dealers (e.g. Goldman Sachs, Morgan Stanley,...)
  - On same reference entities - 125 firms in the CDX index
- Dates:
  - March 31, 2008 - January 20, 2009
  - Covers Fall of 2008
- Actual tx prices, augmented by quotes:
  - Over-the-counter markets
  - Typical of empirical fixed income research

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# Methodology:

- How does dealer credit risk affect price of insurance sold?
- Price of insurance sold:
  - Fix the date and the reference entity
  - Select one quote for selling 5-year CDS protection from each dealer
  - Repeat procedure for all dates all firms
- Want quotes to be contemporaneous:
  - All quotes within 11:15 - 11:45
  - May result in less than 14 quotes/firm/day
  - Final data-set: 13383 observation vectors

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## Summary Stats: Transaction/Quotes data: Table 1:

Number of Quotes	Observations	Percentage
2	4907	36.66
3	4518	33.78
4	2566	19.17
5	1012	7.56
6	267	1.99
7	84	0.62
8	21	0.16
9	8	0.06
Total	13383	100.00

## Summary Stats: Transaction/Quotes data: Table 1:

Range of Quotes	Observations	Percentage
0	1175	8.78
$0 < R \leq 1$	1952	14.59
$1 < R \leq 2$	2298	17.17
$2 < R \leq 3$	1925	14.38
$3 < R \leq 4$	1065	7.96
$4 < R \leq 5$	1800	13.44
$5 < R \leq 10$	2209	16.51
$10 < R \leq 20$	748	5.59
$20 < R$	211	1.58
Total	13383	100.00

## Summary Stats: Measure of dealer credit risk: Table 2

Dealer	Mean	$\sigma$	Min	Max	Median	N
Barclays	122.65	43.33	53.27	122.17	261.12	212
BNP Paribas	59.40	13.29	34.24	59.08	107.21	212
Bank of America	121.60	35.77	61.97	119.75	206.85	209
Citigroup	180.67	71.13	87.55	162.90	460.54	207
Credit Suisse	111.66	37.20	57.59	101.40	194.22	212
Deutsche Bank	96.88	29.70	51.92	90.11	172.00	212
Goldman Sachs	230.58	110.62	79.83	232.69	545.14	177
HSBC	75.41	21.94	41.84	67.59	128.30	212
JP Morgan	110.86	27.96	62.54	107.68	196.34	209
Lehman	291.79	89.01	154.04	285.12	641.91	84
Merill Lynch	243.19	71.34	114.35	218.43	472.72	193
Morgan Stanley	355.10	236.22	108.06	244.98	1360.00	187
Royal Bank of Scotland	116.45	45.16	55.17	110.69	304.89	212
UBS	139.09	56.81	55.45	126.24	320.80	212



# Empirical Results:

- We have: The price of CDS contract and A measure of dealer credit risk
- Can test pricing of counterparty risk in a straightforward regression
- Can develop a formal model
- Credit risk of dealer  $\uparrow \Rightarrow$  Value of CDS contract  $\downarrow$
- To test this we run:

$$CDS_{i,j,t} = \alpha' F_{i,t} + \beta Spread_{j,t-1} + \epsilon_{i,j,t}$$

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# Is counterparty credit risk priced:

Variable	Coefficient	t-Statistic
Spread	-0.001548	-7.31**
N		41122

# Why is the magnitude small:

- Cooper/Mello (1991); Duffie/Huang (1996) - for the interest rate market
- Hull/White (2001); Jarrow/Yu (2001); Brigo/Pallavicini (2006), and many others - for the CDS market
- Find that:
  - 7 - 20 basis points
  - Focus only on non-collateralized contracts
  - Full collateralization of mark-to-market liabilities
  - Effect of re-hypothecation and segregation

# Did price of counterparty credit risk change:

- Lehman bankruptcy forced revaluation of counterparty risk
- Split sample:

Variable	Pre-Lehman		Post-Lehman	
	Coefficient	t-Statistic	Coefficient	t-Statistic
Spread	-0.000991	-3.73**	-0.001704	-6.53**
N		32178		8944



# Are there differences across dealers:

- In theory should not matter
- In reality there may be microstructural/legal differences
- We run:

$$CDS_{i,j,t} = \alpha' F_{i,t} + \beta' ISpread_{j,t-1} + \epsilon_{i,j,t}$$

# Are there differences across dealers:

Dummy Variable	Full-Period		Pre-Lehman		Post-Lehman	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Dealer <sub>1</sub>	-0.01288	-4.40**	-0.004550	-0.61	-0.015631	-4.17**
Dealer <sub>2</sub>	0.006164	2.02**	0.008208	1.70*	-0.010393	-1.80*
Dealer <sub>3</sub>	-0.000120	-0.10	-0.001286	-0.66	-0.003488	-1.09
Dealer <sub>4</sub>	-0.000248	-0.32	0.001306	0.89	-0.004139	-2.35**
Dealer <sub>5</sub>	0.000289	0.19	-0.003737	-1.59	-0.001028	-0.27
Dealer <sub>6</sub>	-0.001480	-1.36	-0.004499	-1.84*	0.000530	0.15
Dealer <sub>7</sub>	-0.001470	-2.73**	-0.003037	-2.07**	-0.002475	-2.24**
Dealer <sub>8</sub>	0.005068	1.45	0.002752	0.63	0.004207	0.24
Dealer <sub>9</sub>	0.004099	3.26**	-0.001414	-0.67	0.008266	2.25**
Dealer <sub>10</sub>	-0.002929	-7.06**	-0.003439	-4.76**	—	—
Dealer <sub>11</sub>	-0.001210	-3.12**	-0.000656	-0.86	-0.004595	-3.45**
Dealer <sub>12</sub>	-0.000989	-3.13**	-0.01447	-1.52	-0.01681	-3.00**
Dealer <sub>13</sub>	0.004032	3.58**	0.000975	0.38	0.002114	1.01
Dealer <sub>14</sub>	0.000706	0.48	-0.003079	-1.57	0.018040	2.11**
N		41122		32178		8944

# Does geography matter:

$$CDS_{i,j,t} = \alpha' F_{i,t} + \beta' ISpread_{j,t-1} + \epsilon_{i,j,t}$$

Variable	Full Period		Pre-Lehman		Post-Lehman	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
U.S. Dealer	-0.001417	-5.93**	-0.001344	-4.12**	-0.001363	-4.78**
Non-U.S Dealer	-0.000572	-0.83	-0.002450	-3.01**	0.001765	1.64
N		41122		32178		8944

# Do dealers behave strategically:

$$CDS_{i,j,t} = \alpha' F_{i,t} + \beta' ISpread_{j,t-1} + \epsilon_{i,j,t}$$

Variable	Full Period		Pre-Lehman		Post-Lehman	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
In Top Three	-0.002909	-2.99**	-0.003322	-3.12**	0.001570	0.60
Remaining Dealers	-0.001600	-7.25**	-0.001262	-4.35**	-0.001660	-6.26**
N		41122		32178		8944

# Is there variation across industries:

$$CDS_{i,j,t} = \alpha' F_{i,t} + \beta' ISpread_{j,t-1} + \epsilon_{i,j,t}$$

Dummy Variable	Full Period		Pre-Lehman		Post-Lehman	
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
Consumer	-0.001161	-4.83**	-0.000015	-0.04	-0.001734	-5.45**
Energy	-0.002313	-4.17**	-0.002253	-5.14**	-0.002332	-3.27**
Financial	0.001097	0.77	-0.000910	-0.67	0.002272	1.08
Industrial	-0.001324	-3.61**	-0.001245	-2.42**	-0.001341	-3.11**
Technology	-0.002553	-5.41**	-0.003173	-4.69**	-0.002499	-4.90**
N		41122		32178		8944

# Conclusion:

- First empirical study on counterparty credit risk in CDS markets
- Documented 6 results
  - Significantly priced
  - More significant after Lehman collapse
  - Variation across dealers
  - Variation across geography: Priced more aggressively in US
  - Safest CDS dealers behave strategically
  - Varies across industries: But not priced for finance!