Liquidity and Credit Default Swap Spreads

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Prologue: "Subprime Writedown"

- **As of 8/27/08, $502 Billion writedowns associated with subprime CDOs**
  - **Partially due to revaluation**
  - **More importantly, mark-to-market liquidity dry-up**
- **U.S. Fed injected $360 Billion; Bank of England £50 Billion.**
  - **Alleviate liquidity squeeze**
  - **Funding issue rather than economic fundamental problem (Fed Funds Rate cut to 2.25% from 5.25%**
- **U.S. Fed/J.P. Morgan bailout of Bear Stearns on 3/17/08**
  - **"Too connected to fail"**
  - **Counterparty in large number of credit derivative deals**

⇒ *This paper: liquidity effects in the credit default swaps market.*

Introduction

- **Liquidity affects asset prices**
  - **Evidence from stock, bond, and FX markets**
  - **Sources of liquidity effect: information asymmetry; inventory costs; search costs**
- **Does liquidity affect derivative valuation? and how?**
  - **"***Quantifying liquidity risk is an important missing component in our understanding of the pricing and hedging of derivatives.***" (Jarrow (1997, p 276))**
  - **Derivatives are contracts with zero net supply**
  - **Some evidence from equity and interest rate option markets**
- **We examine the liquidity effect on credit default swap (CDS) price**
  - **Most popular credit derivative securities: protection against default risk**
  - **$62 trillion notional value of CDS contracts outstanding (ISDA)**

Why CDS Liquidity?

- **Increasing use of CDS prices in empirical credit risk research**
  - **Longstaff, Mithal, and Neis (2005); Blanco, Brennan, and Marsh (2005)**
  - **Existing studies largely assume zero liquidity premium**
- **But, the CDS market is illiquid**
  - **Presence of banks and information asymmetry** (Acharya and Johnson (2007))
  - **Hedging by banks lowers information quality due to less monitoring** (Parlour and Plantin (2008))
  - **Transaction volume is low**
- **Liquidity may be related to several empirical observations**
  - **Banks' participation is low because of lack of liquidity** (Minton, Stulz, and Williamson (2008))
  - **CDS spreads are too high without accounting for liquidity premium** (Blanco, Brennan, and Marsh (2005); Berndt et al (2005); Saita (2006); Pan and Singleton (2008))

Our Contributions

- **Demonstrate significant liquidity effects on CDS prices with multiple liquidity proxies**
  - **Search friction, inventory constraint and adverse selection affect CDS liquidity and hence CDS prices**
  - **Liquidity premium in CDS spreads about 13.2 basis points**, comparable to those documented for Treasury bonds and corporate bonds
- **Illustrate cross-sectional variations of liquidity effects**
  - **across search intensity, information asymmetry, and liquidity demand**
  - **tease out offsetting liquidity effects**
- **Examine liquidity risk effects**
  - **first evidence with derivative securities within the Acharya-Pedersen (2005) framework**
  - **Volume as proxy (Johnson (2008))**

Outline

- **The CDS market and data**
- **Liquidity effects**
  - **Four liquidity proxies**
  - **Three subsamples**
- **Liquidity risk effects**
  - **Acharya and Pedersen (2005) beta pricing famework**
  - **Johnson (2008) volume proxy**
- **Summary and Conclusion**

Credit Default Swaps (CDS)

- **Protection against default**
  - **An insurance contract for credit risk transfer**
  - **A tool for credit risk transfer (CRT)**
  - **transacted over the counter (OTC)**
  - **with contract terms:** reference entity; reference issue; amount; maturity; settlement; premium/price/spread
  - **and various default scenarios.**
- **Most significant financial innovation in the past decade**
  - **Corporate and Sovereign**
  - **Buyers: banks (51%), securities houses, hedge funds**
  - **Sellers: banks (38%), insurance companies, securities houses, hedge funds**
  - **A typical contract:** $10 million, 5 years, physical settlement
- **CDS Spreads: roughly equal to corporate bond yield spreads**

CDS Trading

- **Trading mechanisms**
  - **Mainly over-the-counter (OTC)**
  - **Some automated electronic platforms and voice broking offered by interdealer brokerage (IDB) firms,** e.g., GFI, CreditTrade, Creditex, Markit, etc.
  - **Broker maintains an open limit order book**
- **IDB trading process: matching and bargaining during price discovery**
  - **Strategic order submission, usually conservative**
- **Liquidity concerns**
  - **Non-centralized, opaque market, search costs**
  - **Information asymmetry, order imbalance, price impact**
  - *Market participants are sophisticated institutional investors*

CDS Data

- **Trades and quotes from CreditTrade**
- **U.S. corporate senior unsecured, denominated in $, maturity ∼5 years,**
- **June 1997 to March 2006, 27 industries, aggregated to obtain monthly data**

CDS Spreads By Rating Groups

	Rating Groups						
	AAA	AA	A	BBB	BB	B	NR
N	221	758	3773	5503	1312	481	912
Mean	29.72	39.73	62.90	118.04	251.38	349.81	136.58
Std	29.49	33.67	62.30	118.52	189.43	243.16	145.09
Min	3.88	4.68	2.00	7.88	15.00	24.00	7.36
Max	250.00	382.22	558.60	1500.00	1400.00	1350.00	917.86

		AAA	AA	A	BBB	BB	B	NR
1997	N	2	5	19	12	3	1	7
	Mean	32.50	23.00	41.05	38.04	66.67	120.00	38.24
1998	N	4	32	101	49	9	8	25
	Mean	50.42	41.92	33.02	51.88	68.50	28.73	40.21
1999	N	8	64	221	133	13	12	37
	Mean	38.86	31.69	35.85	66.56	55.06	34.31	53.32
2000	N	12	75	298	343	62	25	60
	Mean	49.72	41.28	57.99	125.18	205.26	196.84	132.47
2001	N	17	122	490	551	104	60	112
	Mean	49.89	50.99	84.21	163.36	331.83	372.16	216.06
2002	N	34	170	765	1041	204	64	58
	Mean	56.15	60.20	107.09	209.67	422.03	401.15	216.55
2003	N	53	104	706	1214	238	99	36
	Mean	28.00	31.65	59.35	122.13	344.17	508.78	127.52
2004	N	47	72	518	899	248	79	176
	Mean	15.42	23.56	41.66	72.05	195.01	289.90	116.04
2005	N	31	88	541	1054	360	111	315
	Mean	10.60	18.90	32.55	57.70	151.30	301.94	136.91
2006	N	13	26	114	207	71	22	86
	Mean	7.57	16.38	32.73	61.08	143.61	353.84	98.49

Figure 1: Market Average CDS Spreads

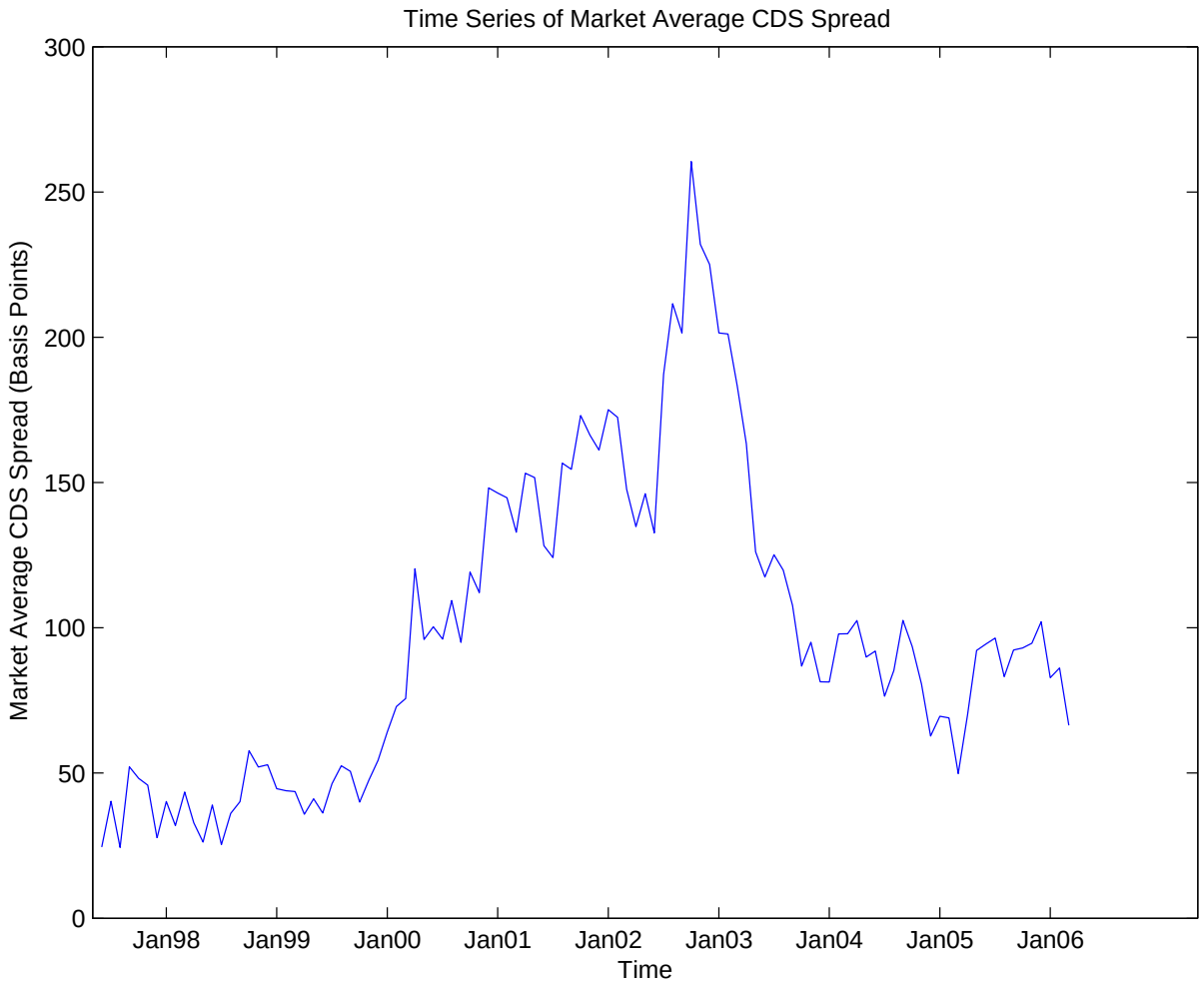
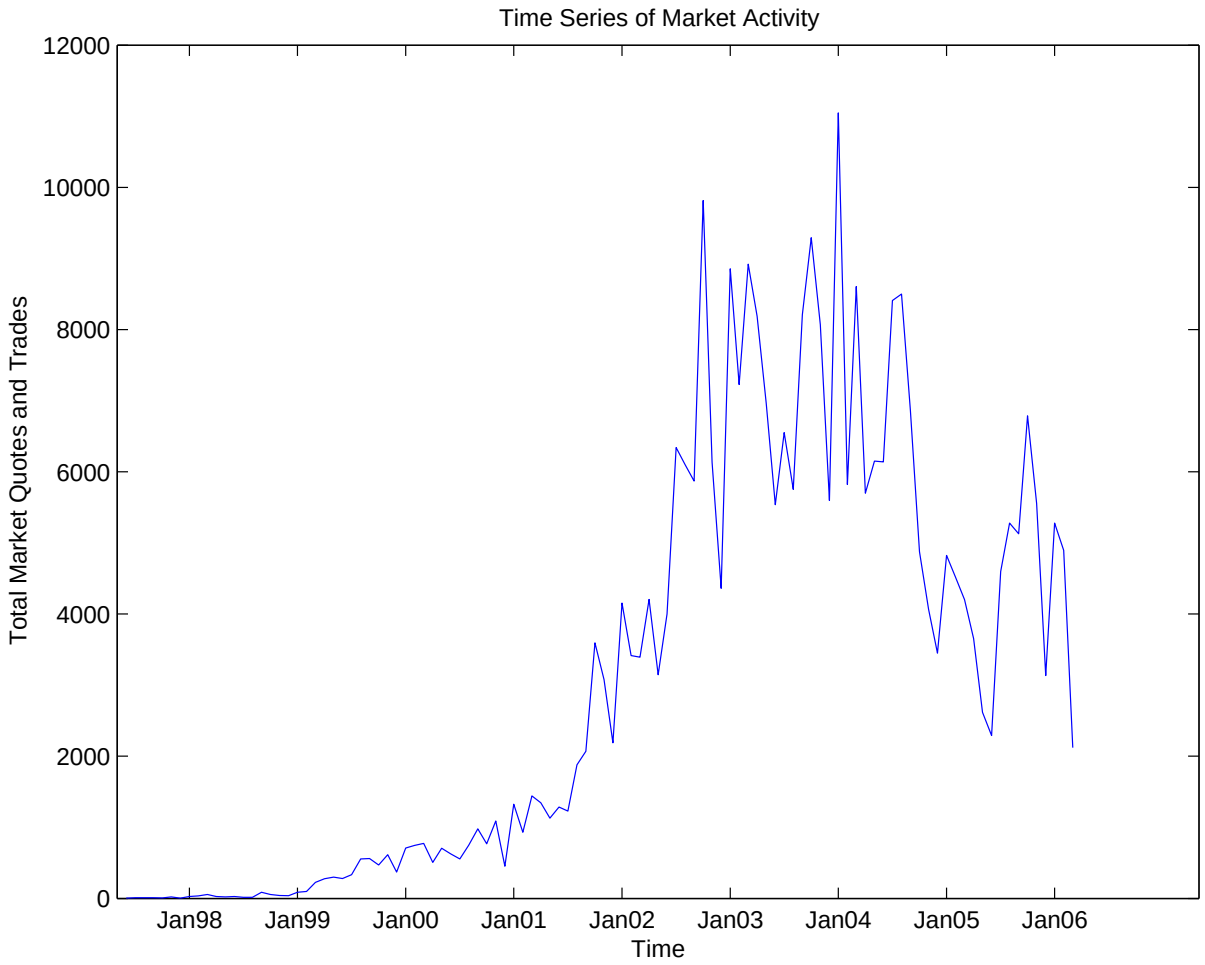


Figure 2: Trading Activity



Empirical Methodology

▶ Panel Regressions

- **Robust standard errors following Petersen (2007)**
- **Using monthly time dummies to control for cross-correlations**
- **Controls for issuer-clustering or time-series correlations**

$$CDSSpread_{it} = a + b \times CDSLiquidity_{it} + c \times CreditRisk_{it} + Controls + \epsilon_{it},$$

▶ Control variables

- **Volatility; jump; leverage; credit ratings; book-to-market; size; analysts forecast dispersion; number of bond issues**
- **Monthly time dummies to control for common macro factors**

CDS Liquidity Proxies

- **Volatility-to-Volume (V2V)**
  - **Measuring price sensitivity to trading, similar to Amihud (2002)**
- **Number of contracts outstanding (NOC)**
  - *When open interest is high, dealers with limited capacity may have inventory burden*
- **Trade-to-Quote Ratio (T2Q)**
  - **Measuring matching intensity**
- **Bid-Ask Spread (BAS)**
  - **Market-making costs for dealers**

Cross-Sectional Variations of Liquidity Effects: Adverse Selection vs Search Costs

- **Acharya and Johnson (2007 JFE):**
  - **Find informed trading, but no liquidity effects**
  - **Sample of most active contracts, search cost may be lower**

- **Three differentiating measures:**
  - **Number of Quotes (NQ)**
  - **Probability of Informed Trading (PIN)**
  - **Order Imbalance (OIB)**

Results: Liquidity and CDS Spreads

	CDS Liquidity Proxied by:							
	V2V		NOC		T2Q		BAS	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Const ($\times 10^2$)	1.82	4.05	1.86	3.41	2.13	4.68	1.95	3.67
OIV ($\times 10^2$)	4.64	11.57	4.61	10.08	4.83	12.07	4.90	10.74
Jump ($\times 10^2$)	6.31	3.05	6.53	2.08	8.22	3.37	9.63	3.84
Credit Rating	-13.26	-8.64	-12.35	-6.81	-13.74	-8.49	-15.11	-8.70
Leverage	49.18	2.69	47.17	1.94	50.27	2.76	57.56	2.97
B/M	34.80	2.45	29.45	1.93	40.15	2.80	31.05	1.97
Ln(ME)	2.85	0.85	-5.25	-1.04	1.21	0.34	3.03	0.79
NBonds	-0.53	-1.89	-0.68	-1.77	-0.64	-2.24	-0.62	-2.04
Forecast Disp	10.11	1.78	5.33	1.43	9.35	1.50	11.94	1.63
CDS Liquidity	4.09	6.96	0.22	4.46	-1.11	-1.41	14.71	1.88
N	6462		2109		7292		5447	
Clusters	364		261		371		345	
Adj. R^2	0.617		0.605		0.581		0.590	

Results: Cross-Sectional Variations

	CDS Liquidity Proxied by:							
	V2V		NOC		T2Q		BAS	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
	Panel A: By Search Intensity							
NQ$\leq$30	4.25	6.95	0.25	3.62	-1.59	-1.58	35.78	2.28
NQ$>$30	4.55	7.65	0.18	3.35	19.42	1.11	-29.47	-0.52
	Panel B: By Information Asymmetry							
PIN$\leq$0.25	4.74	8.60	0.23	4.64	-7.90	-1.73	19.09	1.69
PIN$>$0.25	2.60	2.52	0.34	3.14	6.99	2.00	-53.95	-1.79
	Panel C: By Liquidity Demand							
OIB$<$0	3.97	2.36	0.20	3.89	-14.41	-2.34	39.27	2.23
OIB$>$0	5.41	4.59	0.24	4.14	6.62	2.13	-29.94	-1.35

Liquidity Risk and CDS Spreads

- **Investors may demand liquidity *risk* premium if liquidity commonality exists and varies over time**
  - **Stock market:** Pastor and Stambaugh (2003); Acharya and Pedersen (2005)
- **Systematic default risk beta and three liquidity betas:**

$$E(r_t - r_t^f) = E(c_t) + \lambda\beta^1 + \lambda\beta^2 - \lambda\beta^3 - \lambda\beta^4$$

$$\begin{aligned}
\text{Systematic default risk:} \quad & \beta^1 \propto cov(r^i, r^M) && (1)\\
\text{Liquidity commonality:} \quad & \beta^2 \propto cov(c^i, c^M) && (2)\\
\text{Default-market liquidity:} \quad & \beta^3 \propto cov(r^i, c^M) && (3)\\
\text{Liquidity-market default:} \quad & \beta^4 \propto cov(c^i, r^M) && (4)
\end{aligned}$$

(r: CDS price; c: bid-ask spread proxy for liquidity)

- **Betas are regression coefficients**

Results: Liquidity Risk and CDS Prices

	Models:							
	(1)		(2)		(3)		(4)	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
CDS Liquidity	22.92	1.81	16.42	1.90	24.41	1.62	26.33	1.64
β^1			1.52	0.66	1.29	0.45	2.43	0.89
β^2							0.31	2.74
β^3							-1.24	-1.79
β^4							6.84	1.08
β^{net}	1.27	1.89			1.22	1.77		
N	5365		5447		5365		5365	
Clusters	312		345		312		312	
Adj. R^2	0.598		0.590		0.598		0.599	

Volume Proxy for Liquidity Risk

- **Johnson (2008): volume is related to variance of liquidity, therefore proxy for liquidity risk**

	Models:							
	(1)		(2)		(3)		(4)	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
Volume	1.37	2.02	2.89	3.89	1.58	2.36	3.36	4.27
V2V			23.41	3.28			48.67	6.81
NOC			0.17	3.79			0.16	3.43
T2Q			-7.96	-1.45			-15.41	-2.69
BAS					21.11	1.78	-80.48	-2.30
N	7343		2058		5447		2005	
Clusters	371		258		345		256	
Adj. R^2	0.581		0.645		0.591		0.661	

Economic Significance

Average CDS spread: 138/115 bps for active/inactive contracts

- **Liquidity effects:** average across various proxies to be around 13.2 bps
  - Estimated overall market liquidity premium: $16.4 billion

- **Liquidity risk effects:** aggregate to be about 10.9 bps

Summary

- **Liquidity characteristics affect CDS spreads**
  - **Adverse selection, search costs, buying pressure, and inventory constraints contribute to liquidity effects**
  - **Effects vary across different subsamples**
- **Liquidity risk affects CDS spreads**
  - **In a beta pricing framework, controlling for liquidity characteristics**
  - **Volume as a proxy**