The Anatomy of the CDS Market

Martin Oehmke (Columbia University)

Adam Zawadowski (Boston University)

June 21, 2013

The CDS market

Credit Default Swap is a derivative contract:

- insurance on the default of the *reference entity*'s bonds (typically 5 yr)
- buyer pays fixed insurance premium called *CDS spread*
- upon default seller pays: *(face value) - (recovery value)*
- amount of insured bonds is the *notional amount* (typically $10m)

Size of market:

- BIS statistics (Nov 2011): 18 trillion USD gross single name
- also large CDS index market

Motivation

CDS markets have become major markets for credit risk transfer

- tremendous growth in market size over the last decade

CDS markets are at center of multiple policy debates (Stulz 2010)

- role of CDS markets in recent crisis
- impact on debtor-creditor relationship
- etc.

BUT: Little is known about positions in CDS markets

- What determines CDS market existence and size of position?
- What is the economic role of the CDS market?

This Paper

Investigate determinants of positions taken in CDS market

- using novel position data from DTCC
- actual positions at the reference entity level

Main message: CDS markets are "alternative trading venues"

- hedging (bonds and other types of debt)
- speculation (as proxied by disagreement)
- arbitrage (CDS-bond basis)

Why alternative trading venues?

CDS more likely to be used when reference entity's bonds are hard to trade:

- illiquid
- fragmented $\sim$ CDS is a unified trading venue

Related Literature

- **Role of CDS in risk transfer:** Duffee and Zhou (2001), Parlour and Plantin (2008), Thompson (2009), Parlour and Winton (2012)
- **Debtor-creditor relationship:** Hu and Black (2007), Stulz (2010), Bolton and Oehmke (2011), Subrahmanyam et al. (2012)
- **Disagreement:** Geanakoplos and Fostel (2011), Che and Sethi (2011)
- **Liquidity of Bonds and CDS:** Oehmke and Zawadowski (2013)
- **Microstructure of CDS market:** Shachar (2011), Chen et al. (2011), Qiu and Yu (2012)
- **Informational role of CDS:** Acharya and Johnson (2007)
- **Usage of CDS and effect on credit supply:** Minton et al. (2009), Ashcraft and Santos (2009), Hirtle (2009), Saretto and Tookes (2013)
- **CDS-bond basis:** Blanco et al. (2005), Nashikkar et al. (2010), Bai and Collin-Dufresne (2010), Fontana (2011)

Data: DTCC Trade Information Warehouse

- weekly snapshots: October 31, 2008 to December 2011
- net and gross notional amount on top 1000 reference entities
- includes all major CDS dealers and 1100+ hedge funds and managers; altogether 1700+ buy side firms

$\Rightarrow$ Most comprehensive CDS position data available (95% of market)

Gross notional outstanding

- sum of all contracts on a given reference entity

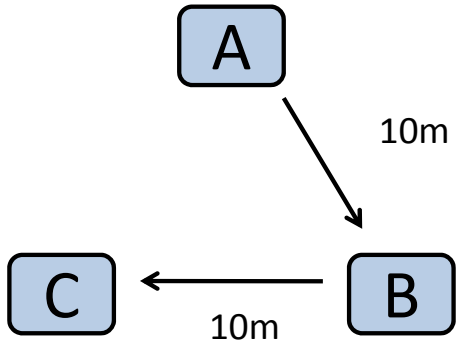
Net notional outstanding

- sum of net contracts bought (netting within counterparty)
- maximum amount that can change hands (with zero recovery)

Gross and Net Notional

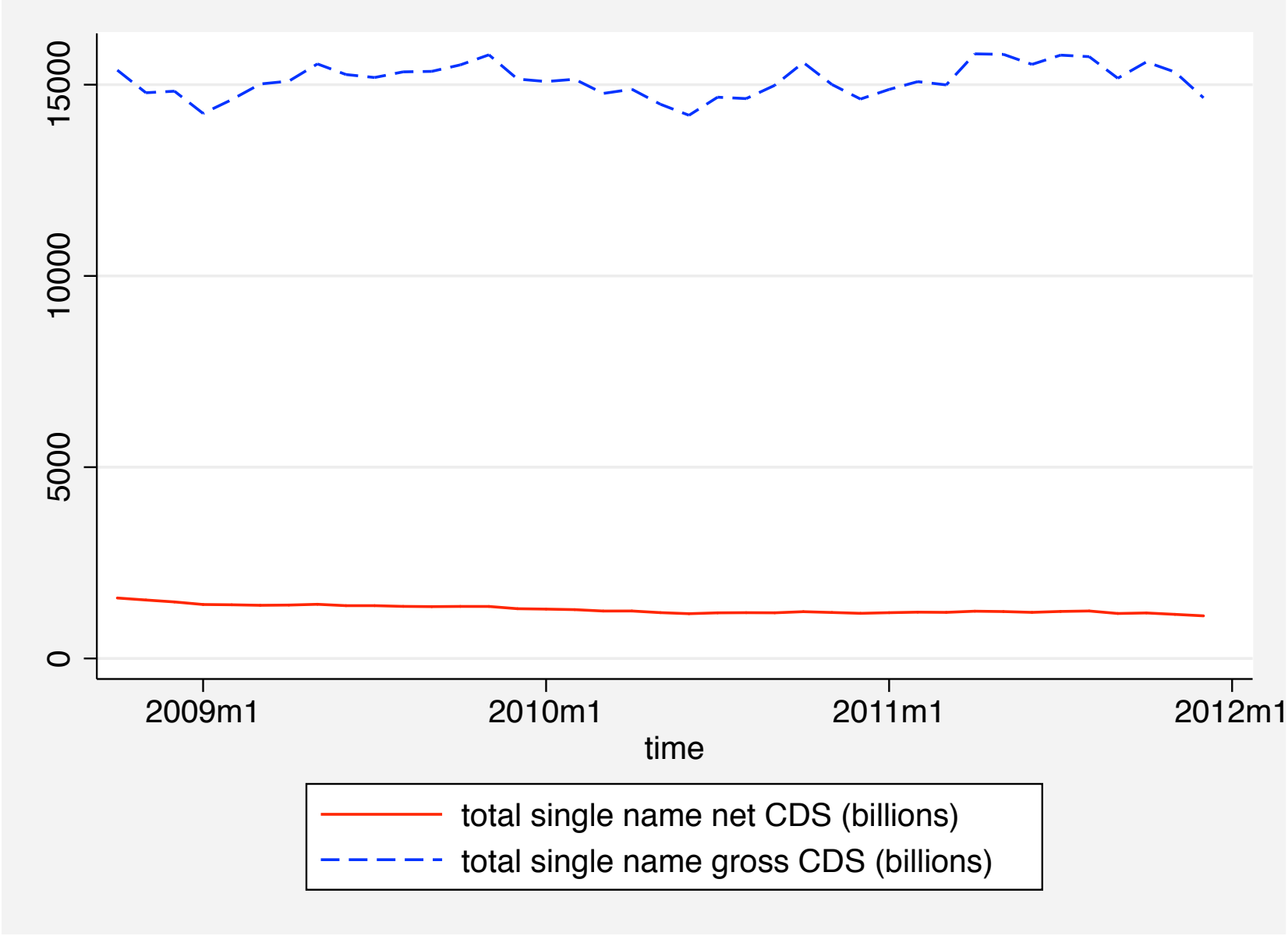
- Net notional nets out contracts within each counterparty

Example (b): Gross and net notional positions

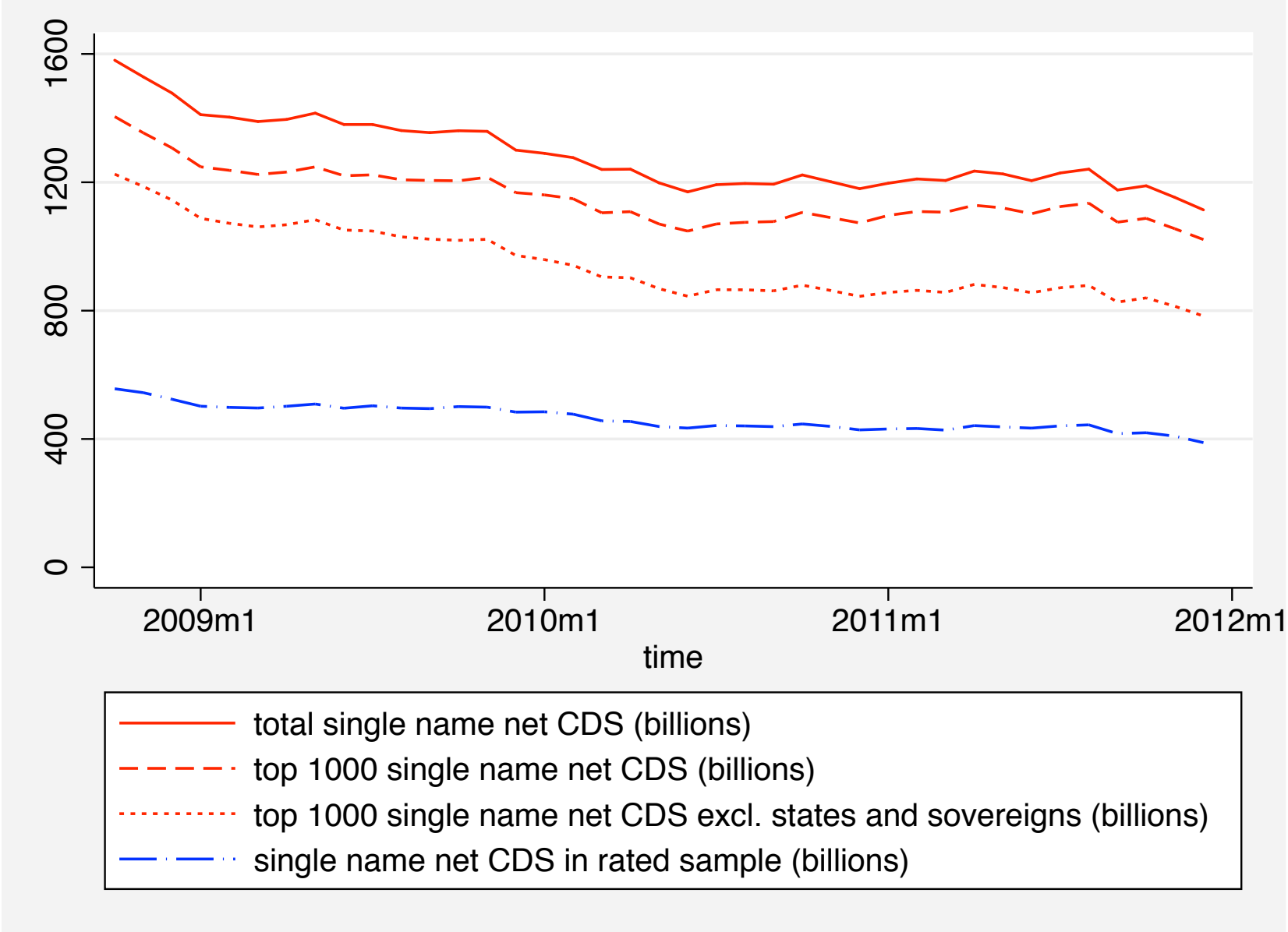


	Gross CDS bought	Gross CDS sold	Net CDS
A	0	10	(10)
B	10	10	0
C	10	0	10
Total	**Gross Notional Bought =20**	**Gross Notional Sold =20**	**Net Notional Bought/Sold=10**

Single-name CDS gross and net notional in DTCC data



Net single-name CDS positions in the data



Other Data Sources

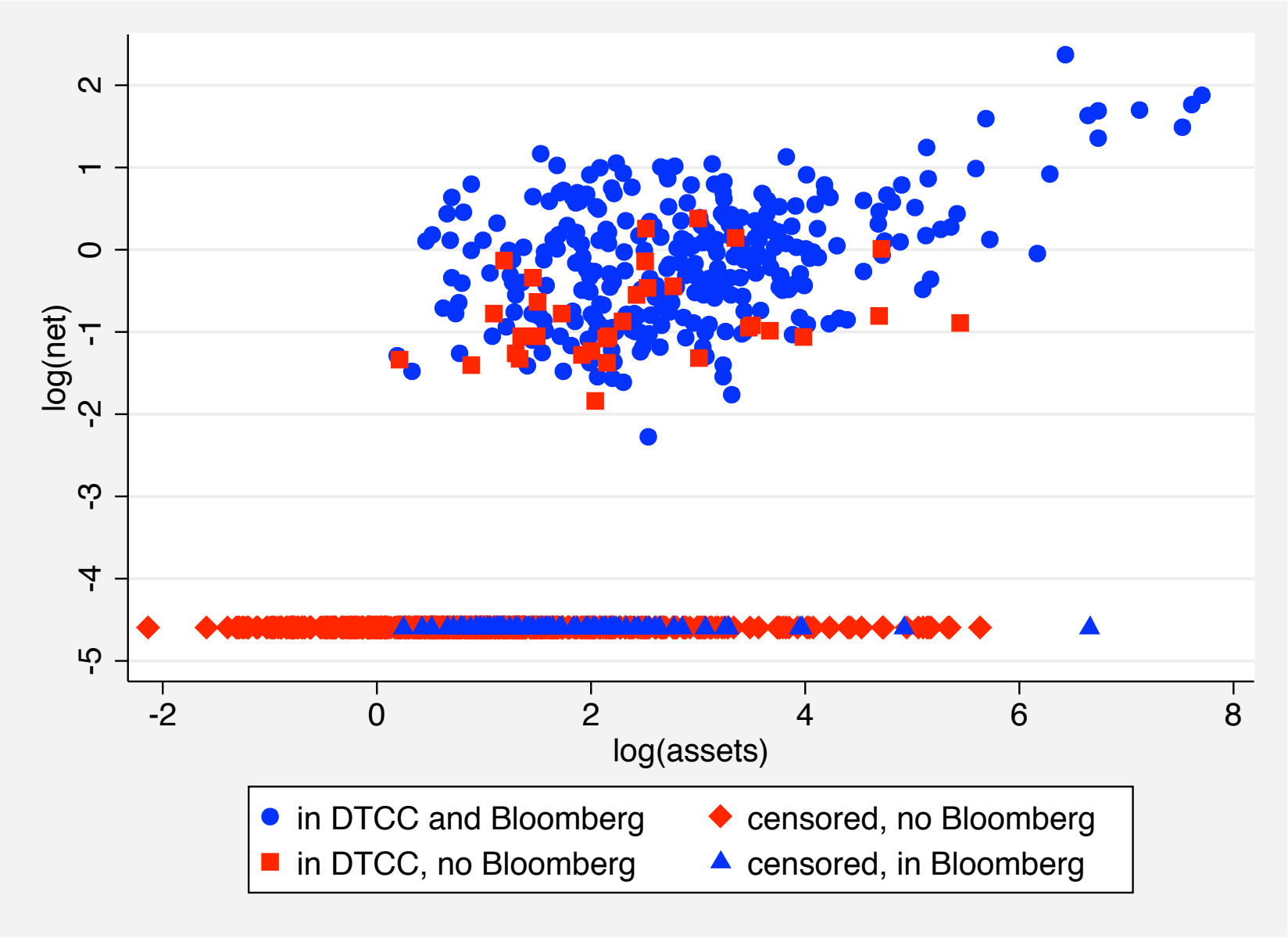
- Compustat (international + domestic): assets, debt, accounts payable
- Compustat ratings: S&P monthly ratings
- Trace: all transactions involving US issued bonds
- Mergent FISD: all US bond issues
- IBES: analyst earnings forecasts
- Capital IQ: detailed debt structure (annual only)
- Bloomberg: CDS spreads and CDS-bond basis

Our sample: use all rated Compustat firms

- DTCC data hand-matched with Compustat: 481 companies
- all data transformed into monthly: 39 months
- exclude all firms with multiple CDS markets

Summary Statistics: All Rated Firms

VARIABLES	(1) N	(2) mean	(3) std	(4) p10	(5) p90
assets (USD billions)	58,035	33.33	151.2	0.806	48.35
net CDS (USD billions)	16,523	1.096	0.897	0.320	2.080
gross CDS (USD billions)	16,525	14.36	13.56	2.847	29.47
number of CDS	16,525	2,178	1,518	573	4,184
net CDS / assets	16,523	0.0841	0.125	0.00701	0.208
net CDS / debt	16,394	0.300	0.461	0.0340	0.698



Censoring in net notional at approx. 170 million dollars (Dec 2009)

Estimation using Maximum Likelihood

$$y_{i,t} = \log\left(Net\_CDS_{i,t}\right) = \beta \cdot X_{i,t} + \epsilon_{i,t}$$

$$L_t = \prod_{i=1}^{n} \left[\frac{1}{\sigma} \cdot \phi\left(\frac{y_{i,t} - \beta \cdot X_{i,t}}{\sigma}\right)\right]^{d_{i,t}} \cdot \left[\Phi\left(\frac{\tilde{y}_{i,t} - \beta \cdot X_{i,t}}{\sqrt{\sigma^2 + \sigma^2_{n2g,t}}}\right)\right]^{1-d_{i,t}}$$

$$\tilde{y}_{i,t} = \log\left(\textit{NetCutoff}_t\right) = log(\textit{GrossCutoff}_t) + \mu_{n2g,t}$$

- μ_{n2g} is the average observed log(net/gross) in a given month
- σ_{n2g} is the std. of the observed log(net/gross) in a given month
- $d_{i,t}$ is an indicator for observing net notional CDS outstanding

Three regressions

1. **all**: all observations assuming censoring only
2. **if exist**: conditional on the existence of CDS
3. **probit**: whether or not the CDS market exists

Existence of CDS market:

- at least one CDS spread quoted on Bloomberg after Jan 2007
- in DTCC data at least once

Other:

- Fixed effects: time, industry (first digit SIC)
- Rating buckets: baseline is BB (includes BB-, BB, BB+)
- Standard errors clustered at the firm level

Hypotheses

H1: *Higher hedging demand increases the amount of CDSs outstanding.*

H2: *Higher speculative demand increases the amount of CDSs outstanding.*

H3: *Illiquidity of the bond market increases the amount of CDSs outstanding. Furthermore, H1 and H2 should be more pronounced if the bond market is illiquid.*

H4: *Higher demand from arbitrageurs increases the amount of CDSs outstanding.*

Hypothesis

H1: *Higher hedging demand increases the amount of CDSs outstanding.*

- more insurable interest (bonds, derivatives): buy more CDS
- losing investment grade (IG) status should lead to forced offloading of credit risk: bond sales or buying CDS

Table 2: Baseline Regression, log(net CDS)

	all	if exist	probit
log(assets)	0.443***	0.172***	0.339***
	(5.32)	(2.87)	(5.61)
log(debt)	0.513***	0.333***	0.217***
	(7.22)	(6.37)	(4.22)
credit enhancement (dummy)	3.276***	1.789***	perfect +
	(6.05)	(6.16)	(omitted)
industry: finance	-1.920***	-0.606***	-1.300***
	(-10.96)	(-5.08)	(-10.00)
systemic	0.578*	0.560***	perfect +
	(1.71)	(2.58)	(omitted)
Number of Firms	1784	609	1784
Number of Observations	57220	21095	57220

	all	if exist	probit
AA or higher rating	0.108	-0.280	0.289
	(0.40)	(-1.46)	(1.31)
A rating	0.907***	0.116	0.764***
	(4.66)	(0.80)	(5.53)
BBB rating	1.149***	0.358***	0.854***
	(6.92)	(2.65)	(7.76)
B rating	0.0324	-0.156	0.0743
	(0.20)	(-1.15)	(0.70)
CCC or lower rating	0.359	0.152	0.237
	(1.10)	(0.52)	(1.28)
lost inv. grade in last 5 years	1.926***	0.862***	1.268***
	(9.42)	(5.81)	(8.50)
Number of Firms	1784	609	1784
Number of Observations	57220	21095	57220

Hypothesis 1: Results

H1: *Higher hedging demand increases the amount of CDSs outstanding.*

Conditional on CDS market existing:

- 10% more debt, 3.33% more CDS
- sellers of credit enhancement have 498% more CDS
  (Zawadowski 2011)
- companies that lost investment grade status have 137% more CDS
- NEW RESULT: regressing *net CDS* on forms of *debt*:
  - 8.5 cents*** of CDS for every $ of bonds outstanding
  - 1.6 cents** of CDS for every $ of accounts payable
  - all other borrowing are insignificant
  - $2.2 billion*** more CDS if sell credit enhancement

Why trade in CDS?

Investors have a choice:

- trade in the derivative (CDS)
- trade in the bond directly

Conjecture: CDS are attractive when

- reference entity's bonds are illiquid
  - lower trading costs when using CDS
- reference entity's bond issues are fragmented
  - CDS provide a standardized trading place for credit risk

Liquidity measures

3 liquidity buckets formed using below measures (low, medium, high)

# of bond trades

- for each issuer: trades over previous 12 months from Trace
- related to measure: # of zero trading days
- scales with size of bond market

bond turnover

- for each issuer: turnover from previous 12 months using Trace
- also a measure of trading demand?

Herfindahl index

- for issuer: calculate Herfindahl of bond issuances (fragmentation)
- take logs and orthogonalize to log(bonds outstanding)

Hypotheses 2&3

H2: *Higher speculative demand increases the amount of CDSs outstanding.*

- speculative demand: use analyst earnings forecast dispersion (normalized by price)

H3: *Illiquidity of the bond market increases the amount of CDSs outstanding. Furthermore, H1 and H2 should be more pronounced if the bond market is illiquid.*

- more fragmented bond market: more CDS
- effect of losing IG larger for low liquidity firms
- effect of earnings diagreement larger for low liquidity firms

Table 2 (cont'd) for US firms in Mergent FISD

	all	if exist	probit
log(bonds outstanding)	0.559***	0.301***	0.501***
	(3.56)	(2.62)	(3.13)
log(debt)	-0.147	0.0718	-0.192
	(-1.23)	(0.74)	(-1.60)
bond turnover (last 12 months)	0.264	0.0303	0.328*
	(1.52)	(0.19)	(1.94)
adj. log(bond Herfindahl)	-0.645***	-0.313***	-0.559***
	(-4.50)	(-2.58)	(-3.59)
disagree: analyst std/price	4.046***	3.352***	1.224
	(3.67)	(3.94)	(1.07)
Number of Firms	685	335	685
Number of Observations	19966	11101	19966

Hypothesis 2&3: Results

H2: *Higher speculative demand increases the amount of CDSs outstanding.*

Conditional on CDS market existing:

- one std increase in analyst disagreement: 10.2% increase in CDS
- similar results for other disagreement measures

H3 (1): *Illiquidity of the bond market increases the amount of CDSs outstanding.*

Conditional on CDS market existing:

- one std decrease in adj. Herfindahl: 13.3% more CDS

H3 (2): *H1 and H2 more pronounced if the bond market is illiquid.*

Hypothesis 3: Results

Conditional on CDS market existing (using # of Bond Trades):

- a one std increase in disagreement increases CDS by:

  5.8% for high liquidity companies,

  19.2% for medium liquidity companies

  61.2% for low liquidity companies (t-stat of high-low diff.: 4.03)

- losing IG increases CDS by:

  122% for high liquidity companies,

  179% for medium liquidity companies

  580% for low liquidity companies (t-stat of high-low diff.: 2.77)

- turnover gives similar results, adj. Herfindahl weaker results

- NEW RESULT: regressing *net CDS* on *bonds outstanding*:
  - small bond markets: 5.4 cents*** of CDS for every $ of bonds
  - large bond markets: 30.3 cents*** of CDS for every $ of bonds

Hypothesis

H4: *Higher demand from arbitrageurs increases the amount of CDSs outstanding.*

- CDS-bond_basis = CDS_spread - (bond_yield - r_f)
- negative basis trade:

  buy bond

  buy CDS
- positive basis trade:

  short bond (harder)

  sell CDS

Hypothesis 4: Results

H4: *Higher demand from arbitrageurs increases the amount of CDSs outstanding.*

- for bonds with a negative basis, a one standard deviation decrease in the basis leads to 32.9% more CDS
- insignificant effect for positive basis
- channel through which CDS can lower firms' borrowing cost (Saretto and Tookes 2013, Oehmke and Zawadowski 2013)
- regressing *net CDS* on *basis*:
  - $308 million more CDS for every % point of negative basis

Conclusion

CDS emerge as "alternative trading venues"

CDS markets used for hedging and speculation:

- insuring bond and OTC derivatives exposure
- 'taking views' on default probability (disagreement)

Liquidity matters:

- CDS attractive when firm's bonds are fragmented (Herfindahl)
- effect of downgrades and disagreement larger if underlying bond illiquid

CDS markets also used for arbitrage:

- arbitrage mispricing: CDS-bond basis

References

Acharya, Viral V. and Timothy C. Johnson, "Insider Trading in Credit Derivatives," *Journal of Financial Economics*, 2007, *84* (1), 110–141.

Ashcraft, Adam B. and Joao A. C. Santos, "Has the CDS Market Lowered the Cost of Corporate Debt," *Journal of Monetary Economics*, 2009, *56* (4), 514–523.

Bai, Jennie and Pierre Collin-Dufresne, "The Determinants of the CDS-Bond Basis During the Financial Crisis of 2007-2009," 2010. Working Paper, Columbia University.

Blanco, Roberto, Simon Brennan, and Ian W. Marsh, "An Empirical Analysis of the Dynamic Relation between Investment-Grade Bonds and Credit Default Swaps," *The Journal of Finance*, 2005, *60* (5), pp. 2255–2281.

Bolton, Patrick and Martin Oehmke, "Credit Default Swaps and the

Empty Creditor Problem," *Review of Financial Studies*, 2011, *24* (8), 2617–2655.

Che, Yeon-Koo and Rajiv Sethi, "Credit Derivatives and the Cost of Capital," 2011. Working Paper, Columbia University.

Chen, Kathryn, Michael Fleming, John Jackson, Ada Li, and Asani Sarkar, "An Analysis of CDS Transactions: Implications for Public Reporting," *Federal Reserve Bank of New York Staff Reports*, 2011, *517.*

Duffee, Gregory R. and Chunsheng Zhou, "Credit derivatives in banking: Useful tools for managing risk?," *Journal of Monetary Economics*, 2001, *48* (1), 25 – 54.

Fontana, Alessandro, "The Negative CDS-bond Basis and Convergence Trading during the 2007/09 Financial Crisis," 2011. Working Paper, Geneva Finance Research Institute.

Geanakoplos, John and Ana Fostel, "Tranching, CDS and Asset Prices:

How Financial Innovation can Cause Bubbles and Crashes," 2011. Working Paper, Yale University.

Hirtle, Beverly, "Credit Derivatives and Bank Credit Supply," *Journal of Financial Intermediation*, 2009, *18* (2), 125–150.

Hu, Henry T. C. and Bernard Black, "Hedge Funds, Insiders, and the Decoupling of Economic and Voting Ownership: Empty Voting and Hidden (Morphable) Ownership," *Journal of Corporate Finance*, 2007, *13*, 343–367.

Minton, Bernadette, René M. Stulz, and Rohan Williamson, "How Much Do Banks Use Credit Derivatives to Hedge Loans," *Journal of Financial Services Research*, 2009, *35* (1), 1–31.

Nashikkar, Amrut, Marti G. Subrahmanyam, and Sriketan Mahanti, "Liquidity and Arbitrage in the Market for Credit Risk," *Journal of Financial and Quantitative Analysis*, 2010. (forthcoming).

Oehmke, Martin and Adam Zawadowski, "Synthetic or Real? The

equilibrium effect of CDSs on bonds," 2013. Working Paper, Columbia University.

Parlour, Christine A. and Andrew Winton, "Laying off Credit Risk: Loan Sales versus Credit Default Swaps," *Journal of Financial Economics*, 2012. (forthcoming).

___ **and Guillaume Plantin**, "Loan Sales and Relationship Banking," *Journal of Finance*, 2008, *63* (3), 1291–1314.

Qiu, Jiaping and Fan Yu, "Endogenous liquidity in credit derivatives," *Journal of Financial Economics*, 2012, *103* (3), 611 – 631.

Saretto, Alessio and Heather Tookes, "Corporate Leverage, Debt Maturity and Credit Default Swaps: The Role of Credit Supply," *Review of Financial Studies*, 2013. (forthcoming).

Shachar, Or, "Exposing the Exposed: Intermediation Capacity in the Credit Default Swap Market," 2011. Working Paper, NYU Stern.

Stulz, René M., "Credit Default Swaps and the Credit Crisis," *Journal of*

Economic Perspectives, 2010, *24* (1), 73–92.

Thompson, James R., "Credit Risk Transfer: To Sell or to Insure," 2009. Working Paper, University of Waterloo.

Zawadowski, Adam, "Entangled Financial Systems," 2011. Working Paper, Boston University.