

Dealer Networks and the Cost of Immediacy

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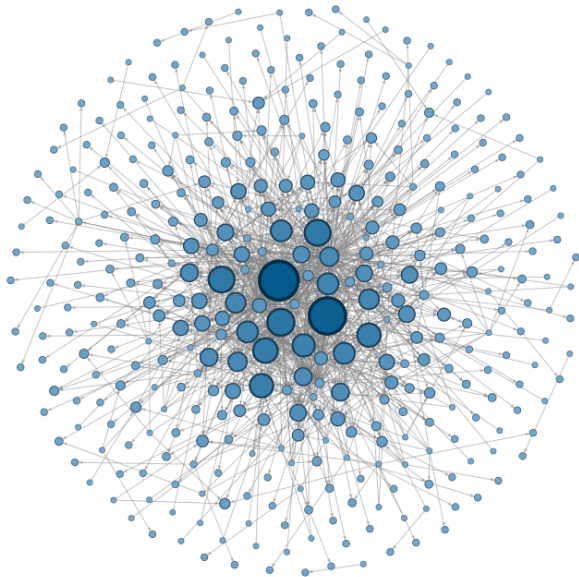
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Core-Periphery Network Structure



Centrality **premium**

- Foreign exchange – Hasbrouck and Levich (2020)
- Municipal bonds – Li and Schürhoff (2019)
- Corporate bonds – Di Maggio et al. (2017) and Hollifield et al. (2020)

Centrality **discount**

- Securitizations – Hollifield et al. (2017)
- Corporate bonds – Goldstein and Hotchkiss (2020)

→ Important for understanding price formation and liquidity in OTC markets

Research question

- How does the cost of immediacy depend on dealer network position?

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Corporate bond index exclusions

- Index trackers sell near the exclusion date to minimize tracking error
- Dealers use their inventory to provide immediacy

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Corporate bond index exclusions

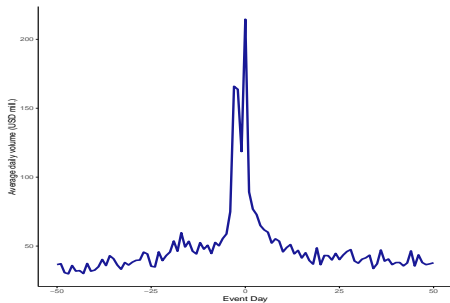
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Main findings

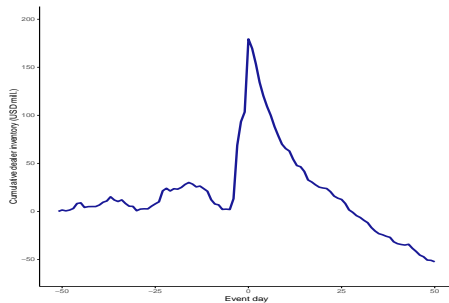
- Customer–dealer centrality **discount** and interdealer centrality **premium**
- Core dealers provide more immediacy and unwind inventory faster
 - Comparative advantage in inventory management predicts a **discount**
 - Market power from central network position predicts a **premium**

Demand and Supply of Immediacy

Trading Volume



Inventory



- *Rebalancing at the end of March 2020 was postponed until April to avoid forced sales during a period of acute market stress – risk.net*

Inventory management

- Dealers with wider trading networks are better able to manage inventory risk
 - Huang and Wei (2017), Üslü (2019), Colliard et al. (2020)

Adverse selection

- Core dealers observe more order flow (**discount**) – Babus and Kondor (2018)
→ **Index exclusions are information-free**

Customer clientele

- Trade-off between cost and speed (**premium**) – Li and Schürhoff (2019)
- Sophisticated fast-preference customers (**discount**) – Hollifield et al. (2017)
→ **Index trackers require fast execution and have weak outside options**

Index trackers

- Sample the index instead of holding all bonds in the index

Bloomberg Barclays US Corporate Bond Index

- Issuance size above a certain threshold
- Time-to-maturity greater than 1 year
- Investment grade rating

Exclusions

- Index rebalanced on the last trading day of each month at 3PM EST
- Mechanical index rules make exclusions [information-free events](#)

Index Exclusions

	Number of exclusions	Exclusions in TRACE	Dealer buys at exclusion	Dealer sells after exclusion
Maturity exclusions	3,102	3,069	2,840	2,978
Downgrade exclusions	1,070	1,054	935	969

- Exclusions from July 2002 to November 2013
- Bond transaction data from Academic TRACE
- Bond characteristics from Mergent FISD

Time-series

Sample

- All non-convertible corporate bonds that are not rule 144A issues

Eigenvector centrality score

- Monthly dealer-level measure based on interdealer trades
- Reflects the number of trading partners and their relative importance

	Dealers	Mean	SD	P5	P50	P95
Maturity exclusions	476	0.49	0.27	0.02	0.49	0.94
Downgrade exclusions	452	0.44	0.27	0.02	0.43	0.93
All corporate bonds	3,499	0.08	0.16	0.00	0.02	0.45

Dealer Inventory

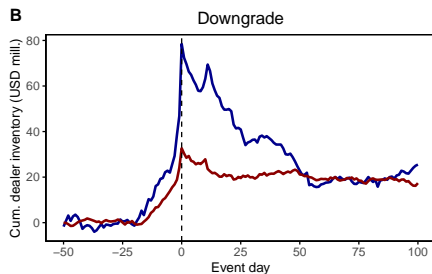
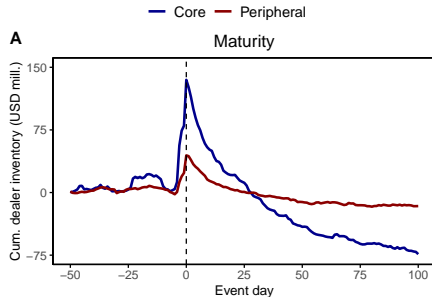


Table Trading volume

Core Dealers Unwind Inventory Faster

For each dealer in each month, we estimate the inventory adjustment speed β

$$I_t - I_{t-1} = \beta(I_{t-1} - I^*) + \epsilon_t$$

- I_t is cumulative inventory, $I^* = \alpha_0 + \alpha_1 \mathbb{1}_{[t > -3]}$ is desired inventory

$$\beta_{im} = \alpha + \theta \text{Centrality}_{im} + \delta_m + \epsilon_{im}$$

	Maturity exclusions		Downgrade exclusions	
Centrality	-0.12*** (-12.11)	-0.11*** (-10.94)	-0.05*** (-3.30)	-0.02 (-1.05)
Constant	-0.09*** (-16.23)		-0.11*** (-11.93)	
Month FE	No	Yes	No	Yes
Adj. R^2	0.04	0.06	0.01	0.04
Dealers	210	210	197	197
Months	137	137	101	96
Observations	3,134	3,134	1,151	1,146

Customer–dealer trades

- Dealer-bond specific volume-weighted price when dealers
 - buy from index trackers over event days $[-2, 0]$
 - sell to customers on event days $t \in \{1, \dots, 30\}$

Interdealer trades

- Bond specific volume-weighted price for dealer pairs
 - on each event day $t \in \{-2, \dots, 30\}$ for index exclusions

→ Compare transaction prices for the same bond on the same day

Centrality Discount for Customer–Dealer Trades

$$Price_{ijt} = \alpha + \beta_1 Centrality_{it} + \beta_2 \text{Log}(Volume_{ijt}) + \delta_{jt} + \epsilon_{ijt}$$

	Maturity exclusions		Downgrade exclusions		All corporate bonds	
	Buy from customer	Sell to customer	Buy from customer	Sell to customer	Buy from customer	Sell to customer
Centrality	4.704** (2.53)	-9.282*** (-7.37)	45.952 (0.97)	-20.354*** (-3.81)	11.149*** (15.72)	-20.130*** (-22.36)
Log(Volume)	3.943*** (13.97)	-3.442*** (-10.82)	17.828*** (5.05)	-23.337*** (-8.92)	7.173*** (17.90)	-12.242*** (-27.01)
Bond × day FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.991	0.991	0.983	0.992	0.997	0.996
Dealers	240	575	263	524	1,632	1,799
Bonds	2,173	2,184	715	675	21,281	25,565
Observations	7,962	26,391	4,036	15,631	2,542,764	3,370,986

Exclude crisis Immediacy

Centrality Premium for Interdealer Trades

$$Price_{jt} = \alpha + \beta_1 Buyer\ centrality_t + \beta_2 Seller\ centrality_t + \beta_3 \text{Log}(Volume_{jt}) + \delta_{jt} + \epsilon_{jt}$$

	Maturity exclusions	Downgrade exclusions	All corporate bonds
Buyer centrality	-8.218*** (-8.62)	-22.323*** (-3.98)	-9.900*** (-12.36)
Seller centrality	13.447*** (10.58)	19.495*** (4.17)	9.943*** (15.82)
Log(Volume)	-1.217** (-2.51)	2.442 (0.99)	-2.117*** (-8.54)
Bond×day FE	Yes	Yes	Yes
Adj. R^2	0.994	0.998	0.998
Buying dealers	851	788	2,303
Selling dealers	710	734	2,196
Bonds	2,323	777	35,346
Observations	37,992	37,757	6,301,315

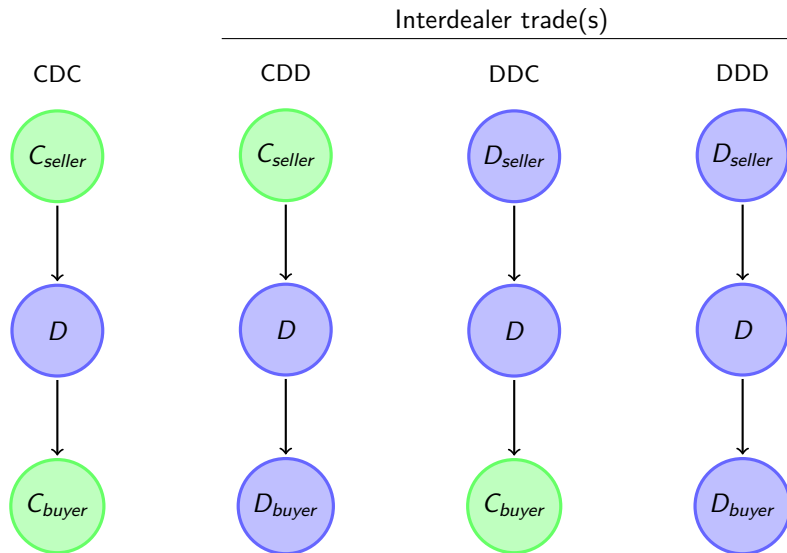
Prearranged Trades: No Inventory Risk

- Dealers **avoid inventory risk** by prearranging trades between buyers and sellers
- Definition: buy/sell the same bond with the same volume within 60 seconds

	Prearranged volume out of total volume (%)		
	Maturity exclusions	Downgrade exclusions	All corporate bonds
Peripheral	5.02	11.30	9.04
Core	1.81	4.91	4.60

Summary statistics

Types of Prearranged Trades



Centrality Spread for Prearranged Trades

$$\text{Markup}_{ijt} = \alpha + \beta \text{Centrality}_{it} + \gamma \text{Log}(\text{Trade size}_{ijt}) + \delta_{jt} + \epsilon_{ijt}$$

	CDC	Interdealer trade(s)		
		CDD	DDC	DDD
Seller centrality			12.989*** (8.49)	1.779*** (4.58)
Prearranging centrality	2.133 (1.10)	-28.409*** (-14.08)	-35.726*** (-21.84)	-5.402*** (-4.46)
Buyer centrality		-2.550* (-1.68)		3.240*** (6.80)
Log(Trade size)	-1.535*** (-3.31)	-5.814*** (-13.59)	-12.514*** (-26.14)	-0.039 (-0.25)
Bond × day FE	Yes	Yes	Yes	Yes
Adj. R^2	0.601	0.451	0.544	0.421
Dealers	448	998	1,355	686
Bonds	6,495	5,420	10,815	11,602
Observations	48,245	53,984	230,485	294,779

Adverse selection

- Core dealers observe more order flow (**discount**)
- Control for dealer-level fraction of total order flow

Customer clienteles

- Customers with strong outside options trade only with core dealers (**discount**)
- Control for dealer market share
- Control for dealer-level fraction of block trades
- Average trade size decreases with centrality

Proxies

Trade size

The cost of immediacy

- Customer–dealer centrality **discount** and interdealer centrality **premium**

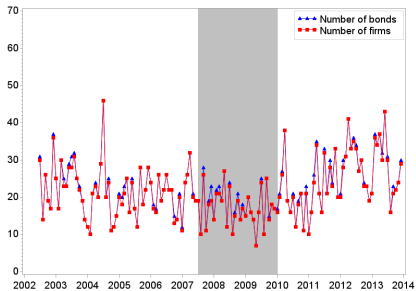
Inventory management

- Core dealers provide more immediacy and unwind inventory faster
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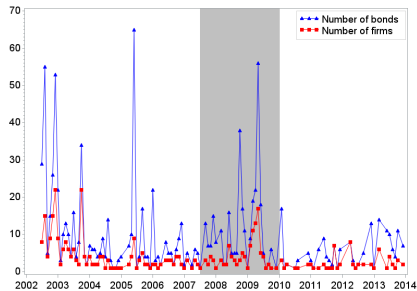
Appendix

Index Exclusions over Time

Maturity < 1 year

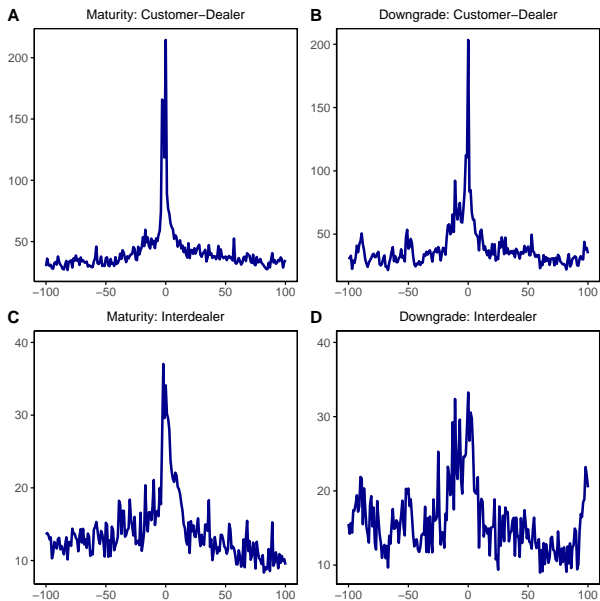


Rating less than investment grade



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Trading Volume



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Trading Volume

Event time	Customer-Dealer				Interdealer			
	Maturity		Downgrade		Maturity		Downgrade	
	Volume	Fraction	Volume	Fraction	Volume	Fraction	Volume	Fraction
-100	29.9	0.14	31.6	0.16	13.6	0.40	15.5	0.47
-50	36.6	0.17	38.4	0.19	15.2	0.45	20.3	0.61
-10	50.6	0.24	68.8	0.34	21.1	0.62	23.1	0.69
-5	58.8	0.27	59.1	0.29	20.0	0.59	19.6	0.59
-4	74.9	0.35	70.4	0.35	17.8	0.52	24.6	0.74
-3	165.9	0.77	83.7	0.41	27.0	0.79	24.6	0.74
-2	163.7	0.76	112.3	0.55	37.0	1.09	24.9	0.75
-1	118.6	0.55	110.6	0.54	29.6	0.87	28.7	0.86
0	214.5	1.00	203.5	1.00	34.1	1.00	33.3	1.00
1	89.2	0.42	83.7	0.41	30.2	0.89	26.8	0.80
2	76.8	0.36	84.8	0.42	29.5	0.87	30.6	0.92
3	72.8	0.34	67.0	0.33	28.0	0.82	29.8	0.90
4	64.9	0.30	61.4	0.30	23.8	0.70	25.8	0.78
5	61.8	0.29	61.5	0.30	22.2	0.65	20.0	0.60
10	45.8	0.21	52.1	0.26	20.1	0.59	17.6	0.53
20	36.5	0.17	42.2	0.21	11.0	0.32	15.1	0.45
30	37.6	0.18	34.2	0.17	13.6	0.40	13.2	0.40
40	38.0	0.18	38.4	0.19	11.2	0.33	16.4	0.49
50	37.9	0.18	40.2	0.20	11.7	0.34	14.8	0.45
100	35.0	0.16	34.8	0.17	9.4	0.28	20.5	0.62

Cumulative Dealer Inventory

Event time	Maturity Exclusions				Downgrade Exclusions			
	Core		Peripheral		Core		Peripheral	
	Inventory	Fraction	Inventory	Fraction	Inventory	Fraction	Inventory	Fraction
-50	0.2	0.00	1.2	0.03	-1.7	-0.02	-0.1	-0.00
-10	7.7	0.06	4.5	0.10	16.8	0.21	6.8	0.21
-5	4.1	0.03	-2.1	-0.05	22.0	0.28	13.8	0.42
-4	12.5	0.09	0.6	0.01	25.7	0.33	15.5	0.48
-3	56.4	0.42	12.4	0.28	29.3	0.37	16.8	0.51
-2	74.0	0.55	19.4	0.43	38.5	0.49	18.9	0.58
-1	80.0	0.59	23.4	0.53	46.8	0.60	24.1	0.74
0	135.0	1.00	44.5	1.00	78.5	1.00	32.7	1.00
1	126.1	0.93	43.5	0.98	72.4	0.92	30.4	0.93
2	114.5	0.85	39.0	0.88	69.7	0.89	28.5	0.87
3	100.5	0.74	33.9	0.76	66.3	0.85	29.3	0.90
4	89.6	0.66	30.8	0.69	64.9	0.83	27.1	0.83
5	80.7	0.60	28.5	0.64	62.5	0.80	26.8	0.82
10	51.4	0.38	14.0	0.31	63.2	0.81	27.8	0.85
20	20.9	0.15	3.5	0.08	49.9	0.64	20.9	0.64
30	-5.5	-0.04	-0.8	-0.02	36.4	0.46	20.0	0.61
40	-27.6	-0.20	-6.0	-0.14	34.3	0.44	22.1	0.68
50	-41.1	-0.30	-11.4	-0.26	22.8	0.29	21.1	0.65
100	-73.8	-0.55	-16.2	-0.36	25.5	0.33	17.4	0.53

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Excluding the Crisis Period

$$Price_{ijt} = \alpha + \beta_1 Centrality_{it} + \beta_2 \text{Log}(Volume_{ijt}) + \delta_{jt} + \epsilon_{ijt}$$

	Maturity exclusions		Downgrade exclusions		All corporate bonds	
	Buy from customer	Sell to customer	Buy from customer	Sell to customer	Buy from customer	Sell to customer
Centrality	5.418*** (2.96)	-8.514*** (-6.58)	27.208** (2.20)	-21.277*** (-3.77)	11.955*** (15.32)	-20.032*** (-20.63)
Log(Volume)	3.766*** (14.41)	-2.247*** (-8.68)	12.374*** (4.05)	-22.352*** (-10.10)	6.452*** (17.29)	-11.146*** (-19.38)
Bond × day FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.992	0.994	0.995	0.995	0.997	0.996
Dealers	218	499	214	496	1,568	1,722
Bonds	1,828	1,790	495	486	20,478	24,638
Observations	6,798	20,562	2,820	13,303	2,095,587	2,675,587

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Centrality Spread and Immediacy Provision

$$Price_{ijt} = \alpha + \beta_1 Centrality_{it} + \beta_2 \text{Log}(Volume_{ijt}) + \delta_{jt} + \epsilon_{ijt}$$

	Maturity exclusions		Downgrade exclusions	
	Buy from customer	Sell to customer	Buy from customer	Sell to customer
<i>High immediacy</i>				
Dealer buy volume	5.043** (2.30)	-8.260*** (-6.53)	41.378 (1.08)	-21.851*** (-3.87)
Inventory buildup	7.317*** (3.29)	-8.813*** (-6.19)	45.451 (0.98)	-20.084*** (-3.53)
Number of exclusions	4.004*** (3.22)	-9.002*** (-5.00)	43.304 (0.84)	-22.378*** (-4.17)
<i>Low immediacy</i>				
Dealer buy volume	3.731 (1.46)	-13.422*** (-4.23)	73.585 (0.69)	-12.079 (-0.90)
Inventory buildup	-0.679 (-0.20)	-10.304*** (-4.21)	47.105 (0.91)	-19.729** (-2.37)
Number of exclusions	5.903 (1.27)	-9.671*** (-5.10)	76.917 (1.62)	7.789 (0.51)

Prearranged Trades: Summary Statistics

	CDC			DDD		
	Maturity	Downgrade	All bonds	Maturity	Downgrade	All bonds
Markup	12.30	132.29	37.01	2.93	13.83	7.63
Trade size	3.56	4.13	2.43	1.32	0.81	0.99
Seller centrality				0.65	0.60	0.58
Prearranging centrality	0.49	0.44	0.44	0.61	0.51	0.52
Buyer centrality				0.38	0.54	0.47
Observations	183	343	298,719	443	536	731,623

	CDD			DDC		
	Maturity	Downgrade	All bonds	Maturity	Downgrade	All bonds
Markup	14.96	49.28	33.37	21.72	88.34	55.66
Trade size	1.52	0.57	0.54	1.03	0.76	0.58
Seller centrality				0.71	0.69	0.70
Prearranging centrality	0.38	0.38	0.35	0.40	0.43	0.39
Buyer centrality	0.70	0.68	0.70			
Observations	270	243	330,934	884	360	702,459

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Prearranged Trades: Centrality Spread

	CDC			DDD		
	Maturity	Downgrade	All bonds	Maturity	Downgrade	All bonds
Seller centrality				-0.970 (-0.77)	-7.582 (-1.09)	1.779*** (4.58)
Prearranging centrality	-5.082 (-0.94)	-44.059 (-1.15)	2.133 (1.10)	-7.692*** (-3.17)	-16.856** (-2.09)	-5.402*** (-4.46)
Buyer centrality				2.906** (2.24)	2.007 (0.60)	3.240*** (6.80)
Log(Trade size)	-2.037* (-1.87)	-23.624 (-1.24)	-1.535*** (-3.31)	-0.129 (-0.49)	-0.982 (-0.55)	-0.039 (-0.25)
Adj. R^2	0.200	0.230	0.601	0.354	0.359	0.421
Dealers	59	61	448	68	80	686
Bonds	139	176	6,495	285	179	11,602
Observations	150	321	48,245	414	524	294,779
	CDD			DDC		
	Maturity	Downgrade	All bonds	Maturity	Downgrade	All bonds
Seller centrality				3.575 (0.75)	45.591** (2.64)	12.989*** (8.49)
Prearranging centrality	-21.326*** (-3.95)	-78.307** (-2.79)	-28.409*** (-14.08)	-17.939*** (-3.93)	13.211 (0.52)	-35.726*** (-21.84)
Buyer centrality	-6.003 (-0.55)	-0.068 (-0.00)	-2.550* (-1.68)			
Log(Trade size)	-4.188*** (-2.87)	2.350 (0.25)	-5.814*** (-13.59)	-3.909*** (-5.14)	-12.998 (-1.50)	-12.514*** (-26.14)
Adj. R^2	0.143	0.140	0.451	0.154	0.227	0.544
Dealers	94	92	998	179	118	1,355
Bonds	185	111	5,420	490	144	10,815
Observations	231	225	53,984	870	343	230,485
Controls, month FE	Yes	Yes	No	Yes	Yes	No
Bond \times day FE	No	No	Yes	No	No	Yes

Alternative Explanations: Maturity Exclusions

$$Price_{ijt} = \alpha + \beta_1 Centrality_{it} + \beta_2 \text{Log}(Volume_{ijt}) + \beta_3 Proxy_{it} + \delta_{jt} + \epsilon_{ijt}$$

	Buy from customer			Sell to customer		
Centrality	4.743** (2.56)	4.787** (2.57)	4.839** (2.59)	-8.664*** (-7.02)	-8.600*** (-6.97)	-8.874*** (-7.15)
Log(Volume)	3.992*** (13.90)	4.032*** (13.65)	3.816*** (13.52)	-3.250*** (-10.36)	-3.243*** (-10.24)	-3.192*** (-10.22)
Order flow	-2.383 (-0.65)			-18.274*** (-5.61)		
Dealer market share		-3.507 (-0.85)			-17.584*** (-4.81)	
Block trades			1.803 (1.28)			-8.832*** (-8.24)
Bond×day FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.991	0.991	0.991	0.991	0.991	0.991
Observations	7,962	7,962	7,962	26,391	26,391	26,391

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Alternative Explanations: Downgrade Exclusions

$$Price_{ijt} = \alpha + \beta_1 Centrality_{it} + \beta_2 \text{Log}(\text{Volume}_{ijt}) + \beta_3 \text{Proxy}_{it} + \delta_{jt} + \epsilon_{ijt}$$

	Buy from customer			Sell to customer		
Centrality	46.690 (0.99)	46.635 (0.99)	46.083 (0.98)	-20.698*** (-3.67)	-20.341*** (-3.64)	-20.059*** (-3.81)
Log(Volume)	18.880*** (5.75)	18.859*** (5.92)	17.600*** (5.46)	-23.495*** (-8.01)	-23.330*** (-8.00)	-22.753*** (-6.86)
Order flow	-34.944 (-0.95)			8.314 (0.27)		
Dealer market share		-30.044 (-0.82)			-0.346 (-0.01)	
Block trades			3.090 (0.18)			-10.378 (-0.48)
Bond×day FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R ²	0.983	0.983	0.983	0.992	0.992	0.992
Observations	4,036	4,036	4,036	15,631	15,631	15,631

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Alternative Explanations: Trade Size

$$\text{Log}(\text{Trade size}_{ijt}) = \alpha + \beta_1 \text{Centrality}_{it} + \delta_{jt} + \epsilon_{ijt}$$

	Maturity exclusions		Downgrade exclusions		All corporate bonds	
	Buy from customer	Sell to customer	Buy from customer	Sell to customer	Buy from customer	Sell to customer
Centrality	-0.351*** (-3.79)	-0.221*** (-4.97)	0.043 (0.27)	0.249*** (3.00)	-0.053** (-2.04)	-0.067** (-2.53)
Bond \times day FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	-0.027	0.134	0.098	0.296	0.311	0.353
Issuers (clusters)	761	868	290	327	4,373	4,391
Days (clusters)	137	137	107	106	2,867	2,863
Dealers	249	659	271	577	1,654	1,819
Bonds	2,367	2,858	792	872	26,679	30,165
Observations	12,011	56,196	7,885	28,907	3,847,323	5,054,495

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Round-Trip Intermediation Chains: Spreads vs. Prices

Panel A: Spreads

	Last minus first chain leg	Second minus first chain leg
Centrality	4.60*** (2.84)	22.17*** (14.34)
Log(Volume)	-12.30*** (-12.58)	-6.44*** (-9.78)
Bond \times day FE	Yes	Yes
Adj. R^2	0.090	0.020
Dealers	1,130	1,411
Bonds	10,639	11,893
Observations	589,130	830,871

Panel B: Prices

	Dealer buys from customer		Dealer sells to		
	All trades	Completed chains	Customer/dealer in 2nd chain leg	Customer in final chain leg	Customer all trades
Centrality	4.81*** (6.77)	3.64*** (5.05)	28.07*** (15.02)	6.02*** (3.59)	-18.91*** (-20.04)
Log(Volume)	5.88*** (17.22)	4.30*** (11.51)	-2.40*** (-4.47)	-9.21*** (-14.59)	-11.22*** (-25.06)
Bond \times day FE	Yes	Yes	Yes	Yes	Yes
Adj. R^2	1.000	1.000	0.980	0.980	1.000
Dealers	1,514	1,130	1,411	1,130	1,701
Bonds	13,698	10,639	11,893	10,639	15,752
Observations	1,788,143	589,130	830,871	589,130	2,578,851

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