Whose Asset Sales Matter?

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Motivation

Recent stress episodes have reminded us of the **financial stability risks from asset sales**.

Need to quantify and monitor these risks for both banks and non-banks.

However, available price impact measures and studies tend to focus on a single sector.

This Paper

Question

❶ How do asset sales impact prices?

❷ How does this depend on who is selling?

Approach

❶ Unique data on all types of firms' trading in corporate and government bonds.

❷ New measure of selling pressure based on traders' sales of bonds other than the bond in question.
$\rightarrow$ Instrumental variable for sales.

❸ Study price impact of sales across time, bonds, and traders.

Findings

Findings

- Price impacts of sales material, greater in corporate bonds, and greater in 'dash for cash' in March 2020.
- Impacts vary hugely depending on who is selling.
- Dealers most impactful sellers, followed by hedge funds. Mutual funds less impactful.

Policy Implications

- More attention should be devoted to risks coming from these impactful sellers.
- Price impact measure useful to monitor risks from asset sales for banks & non-banks.

Literature & Contribution

Impact of fire sales on asset prices & other outcomes
Coval & Stafford (2007); Choi, Hoseinzade, Shin & Tehranian
(2020); Wardlaw (2020); Falato, Hortacsu, Li & Shin (2021);
Edmans, Goldstein & Jiang (2012); Ellul, Jotikasthira & Lundblad
(2011).

Innovation: Data across all traders (and asset types) and
consistent measure of selling pressure.

Contribution: Whose sales matter? Which assets?

Literature & Contribution

Developments in OTC market liquidity
Duffie (2018, 2020); He, Nagel & Song (2021); Choi, Huh & Shin (2023).

Our paper: propensity of traditional liquidity suppliers to become liquidity demanders as key determinant of liquidity.

Trading in recent stress episodes
Barth & Kahn (2021); Haddad, Moreira & Muir (2020); Kargar, Lester, Lindsay, Liu, Weill, Zúñiga (2020); Schrimpf, Shin & Sushko (2020); Czech, Gual-Ricart, Lillis & Worlidge (2021); Czech, Huang, Lou & Wang (2021).

Our paper: different focus – importance of **who** is selling – and both corporate & government bonds.

Data

Data

Transactions: Transactions of government and corporate bonds from MiFID II.

Funds: Mutual funds' TNAs, estimated net flows and quarterly portfolio holdings from Morningstar.

Time period: 1 January 2019 to 1 July 2020 (smaller subsample for fund analysis), weekly aggregation.

Summary stats: Instruments

	Share	Trade Share
Corporate	85	44
Government	15	56
GBP	7	11
EUR	26	44
USD	47	39
Other	20	6
0-5 years	45	21
6-10 years	37	44
11-20 years	7	12
21+ years	11	24

Summary stats: Traders

	Share	Trade Share
Fund	44	15
Bank	11	14
Dealer	3	51
Hedge Fund	6	2
Other	37	18

Summary stats: Weekly Trading

	Number
Instruments	23,588
Traders	2,922
Instruments per Trader	78
Traders per Instrument	10

On average:

- each trader trades a large number of bonds; and
- each bond is traded by a large number of traders.

Research Design

Price Impact: Fundamental Issue

Suppose we observe investor selling bond i issued by Dell. We cannot know if sale was due to:

- The **bond**: investor received signal about Dell.
- The **investor**: needed to sell for their own reasons.

Implication: can't study price impacts by looking at price changes when assets are sold.

Outside Selling Pressure: Intuition

Suppose:

- We can identify 'unrelated' bonds.
- There are no 'systemic' events in a period.

If investor selling bond i is selling many unrelated bonds,
$\rightarrow$ trades in i likely driven by investor's condition, rather than idiosyncratic properties of bond i.

If investor is selling bond i for idiosyncratic (to the bond) reasons,
$\rightarrow$ sales of unrelated bonds should ≈ 0.

Outside Selling Pressure: Details

For investors $j \in \mathcal{J}$ selling bond i at time t:

- Compute their % net selling of all bonds except those issued by the same entity as bond i.
- Call this variable **outside selling pressure** $z_{i,t}$.

Pressure high when investors selling asset i at time t are big net sellers of other bonds. `Formalism`

Empirical Approach

Two steps:

1. Use outside selling pressure $z_{i,t}$ as an instrumental variable.
2. Include issuer-week fixed effects (and control for bond characteristics).

Compare bonds **within issuers**: price falls in one Dell bond facing large outside selling pressure to another Dell bond that isn't.

Assumptions:

1. Exogeneity: selling pressure uncorrelated with news.
2. Relevance: selling pressure correlated with sales.

...conditional on fixed effects.

Empirical Specification

$$p_{i,t} = \sum_{\mathcal{J}} \beta_{\mathcal{J}} s_{i,t,\mathcal{J}}^V + X_{i,t}\gamma + \epsilon_{i,t}$$

$$s_{i,t,\mathcal{J}}^V = \sum_{\mathcal{J}} \eta_{\mathcal{J}} z_{i,t,\mathcal{J}} + X_{i,t}\omega + \nu_{i,t}$$

where:

- $p_{i,t}$ is price of bond i at time t.
- $s_{i,t,\mathcal{J}}^V$ are sales of bond i by firms of type $\mathcal{J}$.
- $z_{i,t,\mathcal{J}}$ is outside selling pressure for bond i and firms of type $\mathcal{J}$.
- $X_{i,t}$ is a vector of controls including issuer-week and bond fixed effects.

Role of Instrumental Variable

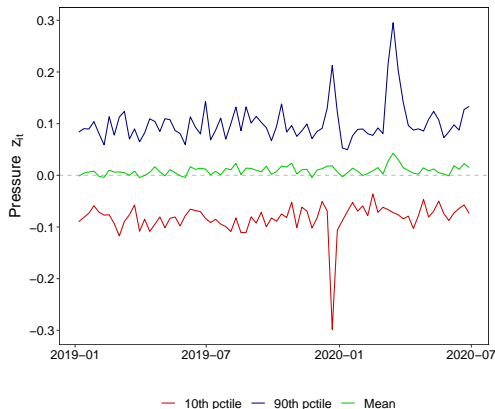$$p_{i,t} = \sum_{\mathcal{J}} \beta_{\mathcal{J}} s_{i,t,\mathcal{J}}^{V} + X_{i,t}\gamma + \epsilon_{i,t}$$

2 issues with OLS:

1. Prices & sales simultaneously determined: supply or demand?
2. Sales endogenous: responding to information?

2 roles for instrument:

1. Exogenous shift in traders' demand: trace out liquidity supply.
2. Sales unrelated to fundamentals.

Selling Pressure through Time

Selling pressure varies across bonds and spiked for some bonds during dash-for-cash. Summary Stats

Outside Selling Pressure (OSP) vs. Existing Measures

	Fund outside selling pressure $z_{i,t}^F$		
	(1)	(2)	(3)
Coval-Stafford	0.007***		
	(0.002)		
Wardlaw F2V		0.0002	
		(0.0007)	
Wardlaw F2S			0.003***
			(0.0008)
R^2	0.38	0.30	0.30
Observations	335,335	830,292	830,292
Issuer-Week FEs	Yes	Yes	Yes
Instrument FEs	Yes	Yes	Yes

OSP shares some common variation with existing measures of
selling pressure based on fund flows.

Results

Results Overview

Aggregate results.

- Impact of pressure on all traders on prices.
- Variation across bonds & time.
- Aggregate sales net to zero $\rightarrow$ cannot use 2SLS approach, so use reduced form:

$$p_{i,t} = \sum_{\mathcal{J}} \delta_{\mathcal{J}} z_{i,t,\mathcal{J}} + X_{i,t}\eta + \nu_{i,t}$$

Sector-level results.

- Variation across trader types, for the same bond.
- Use 2SLS approach: coefficient is price impact of selling.

Price Impacts of Pressure

	Price (%) (1)
Pressure $z_{i,t}$	-0.3727***
	(0.0506)
R^2	0.89582
Observations	1,514,387
Issuer-Week FEs	Yes
Instrument FEs	Yes

5th to 95th percentile of OSP $\rightarrow$ 25 basis point fall in price.

Summary Stats

Price Impacts: Bond type & Stress

| | Price (%) | | | |
	Corporate (1)	Government (2)	March 2020 (3)	Rest of sample (4)
Pressure $z_{i,t}$	-0.468***	-0.102	-0.593***	-0.402***
	(0.055)	(0.114)	(0.176)	(0.052)
R^2	0.89	0.90	0.97	0.90
Observations	1,193,684	320,703	80,541	1,433,846
Issuer-Week FEs	Yes	Yes	Yes	Yes
Instrument FEs	Yes	Yes	Yes	Yes

Impact of selling pressure greater in:

- Less liquid (corporate) bonds.
- Times of stress (March 2020).

Duration of Price Impacts
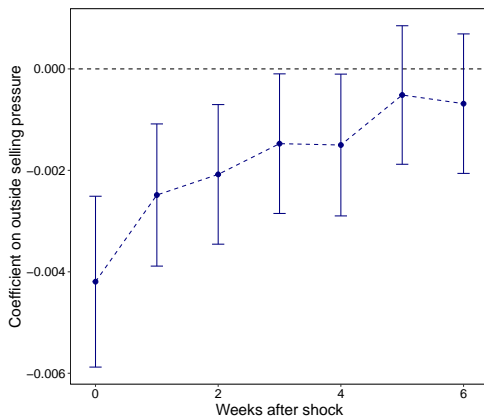
Truly non-fundamental sales should have only temporary impacts on price → no news about asset fundamentals.

$$p_{i,t+\tau} = \sum_{\mathcal{J}} \delta_{\mathcal{J}} z_{i,t,\mathcal{J}} + X_{i,t}\eta + \nu_{i,t}$$

for $\tau = 0, 1, 2, 3, ...$.

Price impacts should **die away**.

Price Impacts through Time

Price impacts persistent, but indistinguishable from 0 after a month.
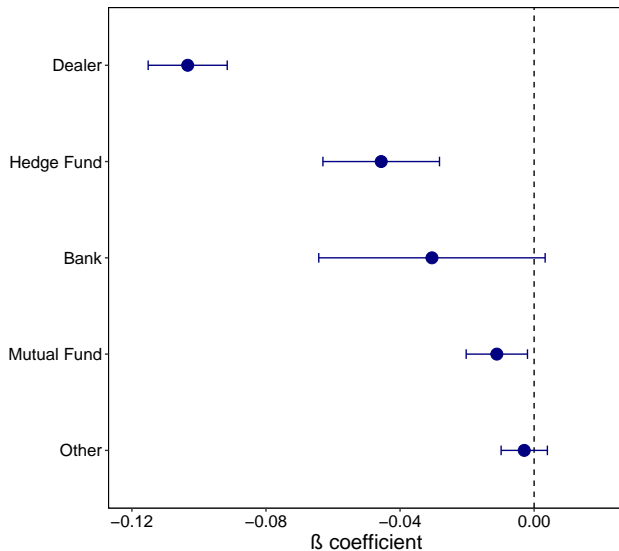
Sector-level Results

Key features of paper:

1. **Common measure** of selling pressure across all types of trader.
2. Data on identities of **all types of trader**.

Whose asset sales matter?

$$p_{i,t} = \sum_{\mathcal{J}} \beta_{\mathcal{J}} s^V_{i,t,\mathcal{J}} + X_{i,t}\gamma + \epsilon_{i,t}$$

Summary Stats

Price Impacts by Sector

Price Impacts by Sector

Clear **ordering across sectors**:

- Dealers' sales most impactful.
- Hedge funds second.
- Mutual funds are relatively low impact.

Large magnitudes:

- 1 standard deviation change in dealers' sales associated with 6.9pp drop in bond price.
- Impact of funds' sales 9 times smaller than dealers' sales.

What drives outside selling pressure?

Three types of sales:

1. **Fundamentals** trading: based on news about cashflows.
2. **Noise** trading: uncorrelated with anything.
3. **Correlated** trading: non-fundamental & correlated across assets.

Outside selling pressure removes fundamentals and noise trading.

What's left?

- Fire sales.
- Other correlated non-fundamental sales.

Non-fundamental sales by sector

Balance in OSP between fire sales and other non-fundamental sales likely varies across sectors.

Ample evidence of fire sale dynamics in **mutual funds** (Ma, Xiao & Zeng, 2022).
$\rightarrow$ OSP correlated with fund-based measures of selling pressure.

Evidence of fire sales by **hedge funds** (Ben-David, Franzoni & Moussawi, 2012; Barth & Kahn, 2021).
$\rightarrow$ OSP captures this plus other non-fundamental trading.

Dealers not thought of as major fire sellers in recent years.
$\rightarrow$ OSP likely to capture other non-fundamental trading, e.g. selling for inventory/liquidity management during dash-for-cash (O'Hara & Zhou, 2021).

Why does it matter who sells a bond?

Why do the price effects of the same size sales of the same asset differ according to who is selling?

Two potential explanations:

1. **Information**: how informed is the seller perceived to be?
2. **Roles in markets**: is the seller typically key in supplying liquidity?

Information

Our IV approach means we know sales are non-fundamental.
$\rightarrow$ But counterparties to these sales do not.

Counterparty faces inference problem to establish the extent to which sales are driven by private information.
$\rightarrow$ More private information leads to greater price discount.

Dealers and hedge funds likely to have advantages on two types of information.

- Information about **bond fundamentals**.
- Information about **future order flow**.

Natural Suppliers of Liquidity

Shleifer & Vishny (1992): sales trigger price falls if 'specialists' are unable to buy assets and 'non-specialists' are forced to do so instead.

Dealers traditionally make markets in OTC markets: 'lean against the wind' (Weill, 2007).

Hedge funds are arbitrageurs, who seek to profit from other firms' sales causing price dislocations (Jylhä, Rinne & Suominen, 2014; Pinter, 2023).

Large **price falls when these suppliers of liquidity change roles** and demand it.

Implications

Literature

- Heterogeneity across traders, bonds and times.
- Literature on fire sales understudies role of dealers.
- Recent findings of modest effects of mutual fund forced sales (Wardlaw, 2020; Choi et al, 2020) do not imply risks from asset sales are always modest.

Policy

- Risk from fire sales by a sector a function of:
    - Likelihood of fire sales.
    - Impact of fire sales.
- Our findings on the latter suggest more focus should be placed on impactful sellers.

Conclusion

New method to identify price impacts of asset sales, applicable in
principle to any trader in any asset.

$\rightarrow$ Can be used to:

1. monitor asset sale risks for both banks & non-banks; and
2. inform stress testing models.

Key result: price impacts of selling depend heavily on who is
selling.

Thank you!

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Outside Selling Pressure: Formalism

Let $s_{i,j,t}$ be net sales of bond i by trader j at time t, and iss_i be the issuer of bond i.

Define:

$$
\begin{aligned}
z_{i,j,t}^{NS} &= \sum_k \mathbf{1}(iss_i \neq iss_k) s_{k,j,t} \\
z_{i,j,t}^{T} &= \sum_k \mathbf{1}(iss_i \neq iss_k) |s_{k,j,t}|
\end{aligned}
$$

Outside selling pressure:

$$
z_{i,t,\mathcal{J}} = \frac{\sum\limits_{j \in \mathcal{J}} \mathbf{1}(s_{i,j,t} > 0) z_{i,j,t}^{NS}}{\sum\limits_{j \in \mathcal{J}} \mathbf{1}(s_{i,j,t} > 0) z_{i,j,t}^{T}}
$$

where $\mathcal{J}$ is a set of investors of a particular type. (Back)

Summary stats: Pressure, Prices & Sales

	Mean	Std. dev.	95th - 5th pctile
Prices $p_{i,t}$	99.82	4.86	5.65
Sales $s_{i,t}^{V}$	0.36	67.73	144.06
Pressure $z_{i,t}$	0.02	0.22	0.68

Back Regressions

Sector Summary Stats

Sector	Mean	Std dev	95th - 5th pctile
Sales $s_{i,t}^V$			
Bank	-0.6	46.0	66.5
Dealer	-0.5	68.7	149.8
Fund	0.5	48.3	78.4
Hedge fund	0.1	14.4	3.5
Other	0.3	42.6	52.4
Pressure $z_{i,t}$			
Bank	-0.01	0.14	0.40
Dealer	0.00	0.07	0.12
Fund	0.01	0.16	0.40
Hedge fund	0.00	0.07	0.00
Other	0.01	0.16	0.32

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Sector Impacts: Reduced Form

| | Price (%) |
	(1)
Dealer pressure	-2.147***
	(0.1050)
Bank pressure	-0.0579*
	(0.0349)
Fund pressure	-0.0861***
	(0.0326)
Hedge fund pressure	-0.3496***
	(0.0674)
Other pressure	-0.0625**
	(0.0314)
R^2	0.88798
Observations	1,864,873
Issuer-Week FEs	Yes
Instrument FEs	Yes

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Sector Impacts: Two-Stage Least Squares

	(1)	(2)	Price (%) (3)	(4)	(5)
Dealer sales	-0.1034*** (0.0071)				
Bank sales		-0.0305 (0.0194)			
Fund sales			-0.0111** (0.0053)		
Hedge fund sales				-0.0456*** (0.0105)	
Other sales					-0.0029 (0.0039)
R^2	0.68722	0.88544	0.89221	0.89152	0.89323
Observations	1,591,470	1,591,470	1,591,470	1,591,470	1,591,470
Issuer-Week FEs	Yes	Yes	Yes	Yes	Yes
Instrument FEs	Yes	Yes	Yes	Yes	Yes

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Sector Impacts: First stage

Sector	Coeff ($z_{i,t}$)	t-stat	R-squared	F-stat
Dealer	22.7	21.1	0.25	1,125.7
Hedge fund	6.6	40.8	0.27	35.0
Bank	1.9	6.8	0.28	4.4
Fund	6.2	23.3	0.29	7.5
Other	8.0	34.8	0.28	0.9

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