# An information-based theory of financial intermediation


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May 2018

# What do we do?

Develop a new theory of financial intermediation

- Builds on information frictions
- Private information on trade motives of investors

  **Different hedging motives**, wealth heterogeneity, etc

Main idea: Agents differ in their **screening expertise**

- Experts more likely to know their counterparty's trade motives
- It makes them natural intermediaries

Theoretical results:

- Generates a core-periphery structure with experts at the core

  (Green, Hollifield and Schurhoff (2007), Bech and Atalay (2010), Li and Schurhoff (2014), Hollifield, Neklyudov and Spatt (2017), etc.)
- Screening experts trade faster and extract more rents

related lit. on private information

# Empirical validation of the model

Large investors (over $100 million in assets) file Form 13F

Provide information about their asset positions

- We interpret this as revealing their trade needs/type

We use CDS trade data from DTCC to test the model predictions

- We have information about individual trades, identity of traders, date of trade, etc

We test unique predictions of our theory and we find that they **hold in the data**

These predictions do not hold in models of complete information

(Hugonnier, Lester and Weill (2014), Chang and Zhang (2015), Menzio, Jarosch, Farboodi (2016), Farboodi, Jarosch, Shimer (2017), etc.)

# Outline

# Model

# Environment

Build on Duffie, Garleanu, and Pedersen (2005)

Time is continuous

Measure one of agents called investors with discount rate $r > 0$

Investor have type $\theta = (\alpha, \nu) \in [0, 1] \times \mathbb{R} := \Theta$

- Call $\alpha$ the screening expertise
- Call $\nu$ the utility type

Types have distribution $F(\theta)$, density $f(\theta)$ and full support in $\Theta$

# Environment

There are assets

Investors can hold either $a = 0$ or $a = 1$ of the asset

- if $a = 0$ the investor is called an non-owner
- if $a = 1$ the investor is called an owner

Instantaneous utility from holding an asset is $\nu$

There is transferable utility

To generate trade in steady state:

- Assets mature at Poisson rate $\mu > 0$
- Investors can issue an asset at no cost at Poisson rate $\eta > 0$

# Environment

Investors randomly meet in pairs with arrival rate $\lambda$

Consider a type $\theta_o$ owner and a type $\theta_n$ non-owner:

- with probability $\alpha_o$, the owner knows (learns) $\theta_n$
- with probability $1 - \alpha_o$, he does not

The screening expertise determines the probability an investor knows his counterparty type $\boldsymbol{\theta}$

# Notation

Distributions: owners $\Phi_o(\theta_o)$ and non-owners $\Phi_n(\theta_n)$

Asset supply: $s \in [0, 1]$

Call $\Delta(\theta)$ the reservation value of a type $\theta$ investor

- $M_o$ denotes the owners distribution of res. values
- $M_n$ denotes the non-owners distribution of res. values

$$M_o(\Delta_o) = \frac{1}{s} \int \mathbb{1}_{\{\Delta(\theta) \leq \Delta_o\}} d\Phi_o(\theta)$$

$$M_n(\Delta_n) = \frac{1}{1-s} \int \mathbb{1}_{\{\Delta(\theta) \leq \Delta_n\}} d\Phi_n(\theta).$$

Let $m_o$ and $m_n$ denote the densities of $M_o$ and $M_n$

# Bilateral trade

In a meeting, one investor is selected to propose the terms of trade

- with probability $\xi_o$, it is the owner
- with probability $\xi_n = 1 - \xi_o$, it is the non-owner

When selected and knows the counter-party type

- the owner asks $\max\{\Delta(\theta_o), \Delta(\theta_n)\}$
- the non-owner bids $\min\{\Delta(\theta_o), \Delta(\theta_n)\}$

Otherwise, the investor designs an optimal trade mechanism

OBS: If $\alpha = 1$ for all investors, this is just Nash bargaining

# Optimal ask and bid under incomplete information

The owner's problem:

$$\max_{ask} obj^o(ask) := [ask - \Delta_o]\,[1 - M_n(ask)]$$

The non-owner's problem:

$$\max_{bid} obj^n(bid) := [\Delta_n - bid]\,M_o(bid)$$

- Problem is analogous top a monopoly/monopsony
- We show in paper that bid/ask are optimal trade mechanisms

# Optimal ask and bid under incomplete information

The owner's problem:

$$\left.\frac{\partial obj^o}{\partial ask}\right|_{ask=\Delta_o} = 1 - M_n(\Delta_o) > 0$$

$$\left.\frac{\partial obj^n}{\partial bid}\right|_{bid=\Delta_n} = -M_o(\Delta_n) < 0$$

- Owner asks more than $\Delta_o \implies$ trade is distorted
- Non-owner bids less than $\Delta_n \implies$ trade is distorted

# Gains from trade

The owner expected gain from trade is

$$\pi_o(\theta_o) = \xi_o \left\{ \alpha_o \int_{\Delta_o}^{\infty} (\Delta_n - \Delta_o)\, dM_n + (1 - \alpha_o)\,(ask_o - \Delta_o)\,[1 - M_n(ask_o)] \right\}$$

$$+ \xi_n \int (1 - \alpha_n)\,(bid_n - \Delta_o)\, \mathbb{1}_{\{bid_n \geq \Delta_o\}}\, d\,\frac{\Phi_n(\theta_n)}{1 - s}$$

The non-owner expected gain from trade is

$$\pi_n(\theta_n) = \xi_n \left\{ \alpha_n \int_{0}^{\Delta_n} (\Delta_n - \Delta_o)\, dM_o + (1 - \alpha_n)\,(\Delta_n - bid_n)\, M_o(bid_n) \right\}$$

$$+ \xi_o \int (1 - \alpha_o)(\Delta_n - ask_o)\mathbb{1}_{\{\Delta_n \geq ask_o\}}\, d\,\frac{\Phi_o(\theta_o)}{s}$$

# Value functions and reservation value

The value function of investors are

$$rV_o(\theta) = \max\{rV_n(\theta), \nu - \mu\big[V_o(\theta) - V_n(\theta)\big] + \lambda(1-s)\pi_o(\theta)\}$$

$$rV_n(\theta) = \eta\big[\max\{V_o(\theta), V_n(\theta)\} - V_n(\theta)\big] + \lambda s \pi_n(\theta)$$

And the reservation value is

$$r\Delta(\theta) = \max\{\nu - (\mu+\eta)\Delta(\theta) + \lambda(1-s)\pi_o(\theta) - \lambda s \pi_n(\theta), 0\}$$

# Distributions

The probability of trade of a type $\theta$ owner and non-owner are

$$\bar{q}_o(\theta) = \int q(\theta, \theta_n)\phi_n(\theta_n)d\theta_n, \quad \text{and} \quad \bar{q}_n(\theta) = \int q(\theta_o, \theta)\phi_o(\theta_o)d\theta_o$$

where

$$q(\theta_o, \theta_n) = \mathbb{1}_{\{\Delta_n \geq \Delta_o\}}$$

$$- \xi_o(1-\alpha_o)\mathbb{1}_{\{ask_o > \Delta_n \geq \Delta_o\}} - \xi_n(1-\alpha_n)\mathbb{1}_{\{\Delta_n \geq \Delta_o > bid_n\}}$$

The time change in the mass of owners with type $\theta$ is

$$\dot{\phi}_o(\theta) = \eta\phi_n(\theta)\mathbb{1}_{\{\Delta(\theta)>0\}} - \mu\phi_o(\theta) + \lambda[\phi_n(\theta)\bar{q}_n(\theta) - \phi_o(\theta)\bar{q}_o(\theta)]$$

# Equilibrium

**Definition**

A steady-state symmetric equilibrium is given by a family $\{\Delta, \Phi_o, \Phi_n, s, big, ask\}$ satisfying the above conditions

Result: There exists a steady-state symmetric equilibrium

Result: It is still an equilibrium if we allow for optimal contracts

# Trade probabilities, speed and centrality

# Probability to sell

The probability to sell is

$$\bar{q}_o(\theta) = \xi_o \Big\{ \alpha \big[ 1 - M_n(\Delta_o) \big] + (1-\alpha) \big[ 1 - M_n\big( ask(\Delta_o) \big) \big] \Big\}$$

$$+ \xi_n \mathbb{E} \Big\{ \alpha_n \mathbb{1}_{\{\Delta_n \geq \Delta_o\}} + (1-\alpha_n) \mathbb{1}_{\{bid(\Delta_n) \geq \Delta_o\}} \Big\}$$

Uninformed owners don't sell to non-owners $\Delta_n \in \big[ \Delta_o, ask(\Delta_o) \big)$

which implies that $\frac{\partial \bar{q}_o(\theta)}{\partial \alpha} \Big|_{\Delta_o} = \xi_o \Big\{ M_n\big( ask(\Delta_o) \big) - M_n(\Delta_o) \Big\} > 0$

- Experts sell to more people

# Probability to buy

The probability to buy is

$$\bar{q}_n(\theta) = \xi_n \Big\{ \alpha M_o(\Delta_n) + (1-\alpha) M_o\big(bid(\Delta_n)\big) \Big\}$$

$$+\xi_o \mathbb{E}\Big\{ \alpha_o \mathbb{1}_{\{\Delta_n \geq \Delta_o\}} + (1-\alpha_o) \mathbb{1}_{\{\Delta_n \geq ask(\Delta_o)\}} \Big\}$$

Uninformed non-owners don't buy from owners
$\Delta_o \in \big(bid(\Delta_n), \Delta_n\big)$

which implies that $\frac{\partial \bar{q}_n(\theta)}{\partial \alpha}\Big|_{\Delta_n} = \xi_n \Big\{ M_o(\Delta_n) - M_o\big(bid(\Delta_n)\big) \Big\} > 0$

- Experts buy from more people

# Trading speed

The effective trading speed

$$speed_o(\theta) = \lambda \bar{q}_o(\theta) \quad \text{and} \quad speed_n(\theta) = \lambda \bar{q}_n(\theta)$$

For given $\Delta_o$ and $\Delta_n$, trading speed is increasing in expertise

We get:

- **same** contact rate $\lambda$, **higher** trading probability

Farboodi, Jarosch, and Shimer (2017):

- **higher** contact rate $\lambda$, **same** trading probability

# What is centrality?

Centrality is the degree in which an investor engages in the business of buying and selling assets

$$c(\theta) = \frac{\lambda}{2Vol} \times \frac{\phi_o(\theta)\bar{q}_o(\theta) + \phi_n(\theta)\bar{q}_n(\theta)}{f(\theta)}$$

where

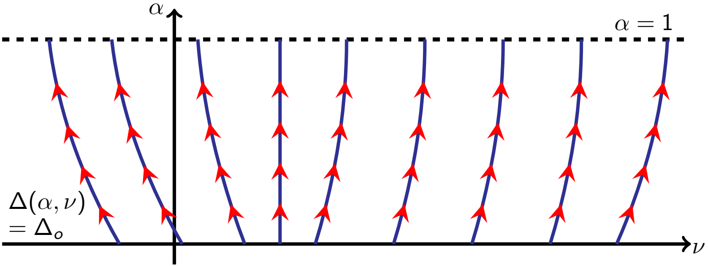
- $Vol = \lambda \int \int q(\theta_o, \theta_n) d\Phi_o(\theta_o) d\Phi_n(\theta_n)$ is the trade volume

Note that $\int c(\theta) f(\theta) d\theta = 1$

# Centrality

Centrality is increasing in both: $\bar{q}_o(\theta)$ and $\bar{q}_n(\theta)$

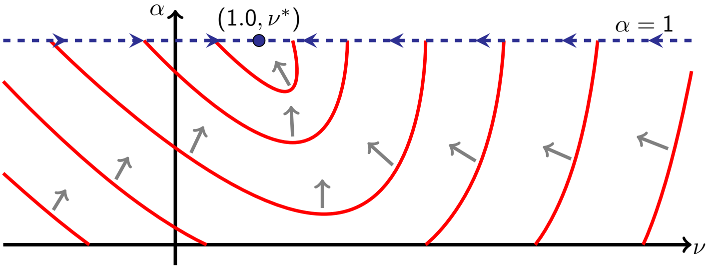
$$\left.\frac{\partial c(\theta)}{\partial \alpha}\right|_{\Delta(\theta)=\tilde{\Delta}} > 0$$



# Centrality

Who is more central?

- Low $\nu$: too costly to buy an asset and wait to sell
- High $\nu$: too costly to sell an asset and wait to buy




Most central investor is among the best experts!

# To wrap it up

Our theory says that

1. Information on counterparties determines trade probability
   - All else constant, experts—high $\alpha$ investors—trade faster
2. Therefore, more central investors will have high expertise

Now we take these predictions to the data

# Empirical validation

# How we test the theory?

A subgroup of investors managers have to file Form 13F

- investment advisers, banks, insurance companies, broker-dealers, pension funds, and corporations

They report holdings of all securities regulated by the SEC

- include equities that trade on an exchange, certain options, shares of closed-end investment companies, and certain debts
- the information is made available to the public... even any of us can download it from the web

We interpret the report as revealing individual trading needs/types

# How we test the theory?

Extend model (economy at steady state): a small group of investors get their type revealed at future time $T$

- Common knowledge by all market participants about this

Two main set of predictions (for both buyers and sellers). For those that reveal their type, around $T$,

1. Probability of trading increases after $T$

   When counterparty makes offer under full information: **no** distortion

2. But less so if counterparty is central in trade (i.e. high $\alpha$)

   When central counterparty makes offer: **small** distortion

details

# Data

We use CDS trade data from the Trade Information Warehouse (TIW) made available to regulators by the Depository Trust and Clearing House Corporation (DTCC)

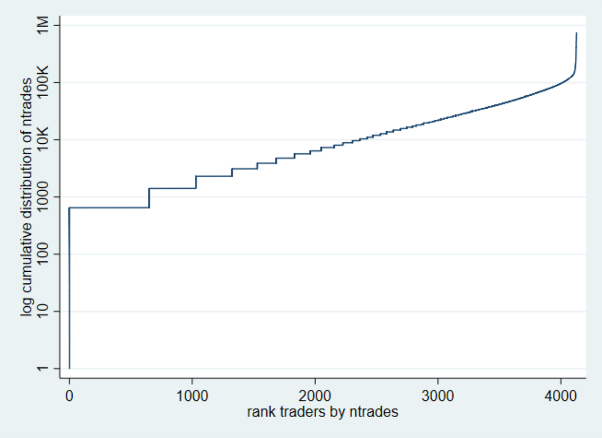
- Trade date
- Buyer/seller id
- Reference entity—we use centrally cleared CDS indexes
- Data range: 1st quarter 2013 - last quarter 2017

Note: Some trades occur through clearing houses. We excluded these trades, unless we were able to match them to a particular buyer and seller

# Summary statistics

| | North America | All |
|---|---|---|
| no. of trades | 369,540 | 921,211 |
| no. of traders | 4,128 | 5,514 |
| no. of traders who report at least once | 52 | 63 |
| no. of trades with reports in same quarter | 37,359 | 86,557 |
| fraction where only buyer reported in that quarter | 0.49 | 0.48 |
| fraction where only seller reported in that quarter | 0.48 | 0.49 |
| fraction where both reported in that quarter | 0.03 | 0.03 |

# Distribution of trades



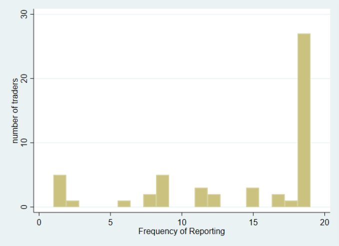
# Distribution of centrality and reporters

Number of traders in the top $x$ percent of centrality

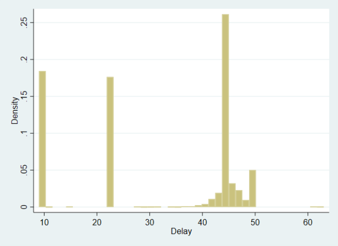
| x | All | Reporters |
|---|---|---|
| 5 | 207 | 3 |
| 10 | 416 | 6 |
| 25 | 1054 | 13 |
| 50 | 2078 | 27 |
| 100 | 4128 | 52 |

# Distribution of reports and delays

Conditional distribution of no. of reports




Conditional distribution of delays




(1) large variation in number of reports

(2) institutions report late and there is variation in delays

delay = report - official

# Implementation of test

Given delays, we cannot use the *official*, rather must use actual *report* day

Question: does a report affects the trade probability?

Approach:

- Assign randomly a *report* day to those traders in any trade with no reports

  use empirical distribution of delays

  some trades linked to a **real** *report* day; others linked to **fake** *report* day
- Question: is trade more likely when a real report happened in the previous $N$ weeks?

# Empirical specification

Let $trader \in \{buyer, seller\}$

$R^N_{trader_j,i,k,t}$: $= 1$ if trader $j$ in trade $i$, trading asset CDS on entity $k$ at time $t$, had an *ard* within $N$ weeks before the trade date

$real_{trader_j,i}$: $= 1$ if trader $j$ *ard* in trade $i$ is real

$top_{trader_j,i}$: $= 1$ if tradr $j$ in trade $i$ is among the top 5 in centrality

Specification:

$$R^N_{trader_j,i,k,t} = \gamma_1 real_{trader_j,i} + \gamma_2 real_{trader_j,i} \times top_{trader_{-j},i} + FE_j + FE_k + FE_t$$

Theory predicts: $\gamma_1$ positive and $\gamma_2$ negative (for both buyer and seller)

# Results - North American entities

| | (1) 1 week | (2) 1 week | (3) 2 weeks | (4) 2 weeks | (5) 3 weeks | (6) 3 weeks |
|---|---|---|---|---|---|---|
| $real_{buyer}$ | 0.0374*** | 0.0278*** | 0.111*** | 0.0910*** | 0.130*** | 0.107*** |
| | (0.00277) | (0.00308) | (0.00373) | (0.00413) | (0.00450) | (0.00498) |
| $real_{buyer} * top_{seller}$ | -0.0163*** | -0.0122*** | -0.0601*** | -0.0575*** | -0.0320*** | -0.0482*** |
| | (0.00319) | (0.00347) | (0.00429) | (0.00466) | (0.00518) | (0.00562) |
| Constant | 0.0377*** | | 0.0702*** | | 0.107*** | |
| | (0.000338) | | (0.000455) | | (0.000549) | |
| Observations | 348,903 | 348,012 | 348,903 | 348,012 | 348,903 | 348,012 |
| R-squared | 0.001 | 0.016 | 0.004 | 0.027 | 0.006 | 0.030 |
| Within R-squared | | .0003 | | .0014 | | .0015 |

| | (7) 1 week | (8) 1 week | (9) 2 weeks | (10) 2 weeks | (11) 3 weeks | (12) 3 weeks |
|---|---|---|---|---|---|---|
| $real_{seller}$ | 0.0304*** | 0.0299*** | 0.0954*** | 0.0832*** | 0.120*** | 0.103*** |
| | (0.00288) | (0.00323) | (0.00385) | (0.00431) | (0.00469) | (0.00524) |
| $real_{seller} * top_{buyer}$ | -0.00731** | -0.0107*** | -0.0412*** | -0.0427*** | -0.0295*** | -0.0403*** |
| | (0.00329) | (0.00361) | (0.00440) | (0.00482) | (0.00536) | (0.00586) |
| Constant | 0.0377*** | | 0.0689*** | | 0.107*** | |
| | (0.000337) | | (0.000450) | | (0.000548) | |
| Observations | 348,903 | 348,205 | 348,903 | 348,205 | 348,903 | 348,205 |
| R-squared | 0.001 | 0.015 | 0.003 | 0.021 | 0.005 | 0.025 |
| Within R-squared | | 0.0003 | | 0.0012 | | 0.0013 |
| FE | no | trader qrt ent | no | trader qrt ent | no | trader qrt ent |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

NA/reporters All All/reporters

# Concluding remarks

We construct a theory of financial intermediation

- Builds on information asymmetries
- Central investors are screening experts
- Generates the observed market structure

We derive and test **two** testable implications particular to our model

- An investor trade probability increases when information about his trade motives is publicly released
- Effect is muted when trading with central investors (i.e. experts, through the lens of our model)
- These predictions hold in the CDS data

These predictions **follow** from our theory of financial intermediation due to private information, but **do not follow** from any of the theories of financial intermediation relying on complete information

# Private information and related literature

Economics has a long tradition of studying the role of information asymmetries in determining financial markets outcomes

- Centralized markets

  Grossman and Stiglitz (1976), Radner (1979), Grossman and Stiglitz (1980), Milgrom and Stokey (1982), etc

- Decentralized markets

  Duffie, Malamud, and Manso (2009), Babus and Kondor (2013), Golosov, Lorenzoni, and Tsyvinski (2014), Guerrieri and Shimer (2014), Lester, Shourideh, Venkateswaran, and Zetlin-Jones (2015), etc

Study

- Prices
- Learning
- Efficiency
- What we do?

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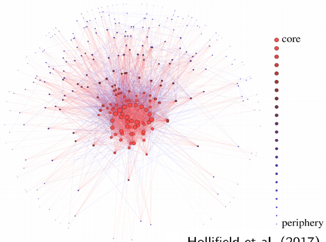
Study

- Prices
- Learning
- Efficiency
- What we do? Intermediation

Inter-dealer market for ABS, CDO, CMBS and CMO




Hollifield et al. (2017)

# Private information and related literature

Main focus has been **expertise** in the sense of

what people know about assets $\Longrightarrow$ common value

- profits of a firm, changes in interest rates, etc

We shift the focus to **expertise** in the sense of

what people know about other people $\Longrightarrow$ private value

Myerson (1981), Myerson and Satterthwaite (1983), etc

- hedge motives, liquidity needs, etc

Information asymmetry has **built-in** a theory of intermediation

back

# Results - North American assets; reporters only

| | (1) 1 week | (2) 1 week | (3) 2 weeks | (4) 2 weeks | (5) 3 weeks | (6) 3 weeks |
|---|---|---|---|---|---|---|
| $real_{buyer}$ | 0.0381*** | 0.0233*** | 0.121*** | 0.0847*** | 0.143*** | 0.115*** |
| | (0.00305) | (0.00441) | (0.00404) | (0.00583) | (0.00488) | (0.00702) |
| $real_{buyer} * top_{seller}$ | -0.0163*** | -0.0123*** | -0.0601*** | -0.0559*** | -0.0320*** | -0.0456*** |
| | (0.00337) | (0.00375) | (0.00447) | (0.00496) | (0.00540) | (0.00597) |
| Constant | 0.0370*** | | 0.0610*** | | 0.0935*** | |
| | (0.000917) | | (0.00121) | | (0.00147) | |
| Observations | 69,661 | 69,636 | 69,661 | 69,636 | 69,661 | 69,636 |
| R-squared | 0.004 | 0.012 | 0.018 | 0.029 | 0.026 | 0.043 |
| Within R-squared | | .0004 | | .0033 | | .0039 |

| | (7) 1 week | (8) 1 week | (9) 2 weeks | (10) 2 weeks | (11) 3 weeks | (12) 3 weeks |
|---|---|---|---|---|---|---|
| $real_{seller}$ | 0.0540*** | 0.0504*** | 0.116*** | 0.0823*** | 0.144*** | 0.00822 |
| | (0.00590) | (0.00757) | (0.00781) | (0.0100) | (0.00966) | (0.0124) |
| $real_{seller} * top_{buyer}$ | -0.0482*** | -0.0162 | -0.0762*** | -0.0411** | -0.0610*** | 0.00914 |
| | (0.00781) | (0.0158) | (0.0103) | (0.0209) | (0.0128) | (0.0258) |
| Constant | 0.0373*** | | 0.0669*** | | 0.108*** | |
| | (0.000739) | | (0.000979) | | (0.00121) | |
| Observations | 69,661 | 69,316 | 69,661 | 69,316 | 69,661 | 69,316 |
| R-squared | 0.001 | 0.032 | 0.004 | 0.035 | 0.004 | 0.041 |
| Within R-squared | | 0.0007 | | 0.0010 | | 0.00001 |
| FE | no | trader qrt ent | no | trader qrt ent | no | trader qrt ent |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

back

# Results - All assets

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | 1 week | 1 week | 2 weeks | 2 weeks | 3 weeks | 3 weeks |
| $real_{buyer}$ | 0.0481*** | 0.0484*** | 0.109*** | 0.0999*** | 0.130*** | 0.111*** |
| | (0.00168) | (0.00197) | (0.00225) | (0.00264) | (0.00270) | (0.00316) |
| $real_{buyer} * top_{seller}$ | -0.0253*** | -0.0204*** | -0.0480*** | -0.0414*** | -0.0256*** | -0.0240*** |
| | (0.00200) | (0.00211) | (0.00268) | (0.00281) | (0.00321) | (0.00337) |
| Constant | 0.0370*** | | 0.0680*** | | 0.102*** | |
| | (0.000212) | | (0.000284) | | (0.000341) | |
| Observations | 865,094 | 864,092 | 865,094 | 864,092 | 865,094 | 864,092 |
| R-squared | 0.001 | 0.009 | 0.004 | 0.015 | 0.006 | 0.019 |
| Within R-squared | | 0.0007 | | 0.0018 | | 0.0018 |

| | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|
| | 1 week | 1 week | 2 weeks | 2 weeks | 3 weeks | 3 weeks |
| $real_{seller}$ | 0.0365*** | 0.0436*** | 0.0981*** | 0.0985*** | 0.123*** | 0.128*** |
| | (0.00170) | (0.00204) | (0.00227) | (0.00272) | (0.00272) | (0.00326) |
| $real_{seller} * top_{buyer}$ | -0.0174*** | -0.0127*** | -0.0448*** | -0.0378*** | -0.0298*** | -0.0214*** |
| | (0.00203) | (0.00215) | (0.00270) | (0.00286) | (0.00324) | (0.00342) |
| Constant | 0.0392*** | | 0.0711*** | | 0.107*** | |
| | (0.000217) | | (0.000289) | | (0.000347) | |
| Observations | 865,094 | 864,265 | 865,094 | 864,265 | 865,094 | 864,265 |
| R-squared | 0.001 | 0.009 | 0.003 | 0.013 | 0.005 | 0.017 |
| Within R-squared | no | 0.0006 | | 0.0016 | | 0.0023 |
| FE | no | trader qrt ent | no | trader qrt ent | no | trader qrt ent |

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

back

# Results - All assets; reporters only

| | (1) 1 week | (2) 1 week | (3) 2 weeks | (4) 2 weeks | (5) 3 weeks | (6) 3 weeks |
|---|---|---|---|---|---|---|
| $real_{buyer}$ | 0.0488*** | 0.0499*** | 0.115*** | 0.0989*** | 0.139*** | 0.110*** |
| | (0.00186) | (0.00254) | (0.00247) | (0.00338) | (0.00294) | (0.00401) |
| $real_{buyer} * top_{seller}$ | -0.0253*** | -0.0199*** | -0.0480*** | -0.0385*** | -0.0256*** | -0.0214*** |
| | (0.00212) | (0.00226) | (0.00283) | (0.00301) | (0.00336) | (0.00358) |
| Constant | 0.0364*** | | 0.0625*** | | 0.0933*** | |
| | (0.000552) | | (0.000736) | | (0.000875) | |
| Observations | 180,725 | 180,696 | 180,725 | 180,696 | 180,725 | 180,696 |
| R-squared | 0.005 | 0.009 | 0.018 | 0.024 | 0.025 | 0.034 |
| Within R-squared | | 0.0021 | | 0.0047 | | 0.0045 |
| | (7) 1 week | (8) 1 week | (9) 2 weeks | (10) 2 weeks | (11) 3 weeks | (12) 3 weeks |
| $real_{seller}$ | 0.0384*** | 0.0589*** | 0.0989*** | 0.108*** | 0.119*** | 0.103*** |
| | (0.00311) | (0.00461) | (0.00408) | (0.00606) | (0.00486) | (0.00721) |
| $real_{seller} * top_{buyer}$ | -0.0316*** | -0.00482 | -0.0651*** | -0.0162** | -0.0556*** | 0.00217 |
| | (0.00458) | (0.00587) | (0.00602) | (0.00771) | (0.00716) | (0.00918) |
| Constant | 0.0415*** | | 0.0734*** | | 0.109*** | |
| | (0.000485) | | (0.000638) | | (0.000759) | |
| Observations | 180,725 | 180,251 | 180,725 | 180,251 | 180,725 | 180,251 |
| R-squared | 0.001 | 0.020 | 0.003 | 0.023 | 0.004 | 0.024 |
| Within R-squared | | 0.0009 | | 0.0018 | | 0.0012 |
| FE | no | trader qrt ent | no | trader qrt ent | no | trader qrt ent |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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# Extension

Same economy as before and in steady state

A measure zero of investors receive a shock

These investors have to reveal their types in period $T > 0$

Call these the $13F$ investors

All the equilibrium conditions extend in a trivial way

- before time $T$: trades use the appropriate mechanism
- after time $T$: there is complete information of $13F$ investors

# Results

Let $\bar{q}^{13F}_{ot}(\theta)$ be the probability that a $13F$ owner of type $\theta$ sell an asset in period $t$ on a meeting with a non-owner investor

For $t < T$

$$\bar{q}^{13F}_{ot}(\theta) = \xi_o \Big\{ \alpha\big[1 - M_n(\Delta^{13F}_{ot})\big] + (1-\alpha)\big[1 - M_n\big(ask(\Delta^{13F}_{ot})\big)\big] \Big\}$$

$$+\xi_n \mathbb{E}\Big\{ \alpha_n \mathbb{1}_{\{\Delta_n \geq \Delta^{13F}_{ot}\}} + (1-\alpha_n)\mathbb{1}_{\{bid^{13F}_t(\Delta_n) \geq \Delta^{13F}_{ot}\}} \Big\}$$

For $t \geq T$

$$\bar{q}^{13F}_{ot}(\theta) = \xi_o \Big\{ \alpha\big[1 - M_n(\Delta^{13F}_{ot})\big] + (1-\alpha)\big[1 - M_n\big(ask(\Delta^{13F}_{ot})\big)\big] \Big\}$$

$$+\xi_n \mathbb{E}\Big\{ \mathbb{1}_{\{\Delta_n \geq \Delta^{13F}_{ot}\}} \Big\}$$

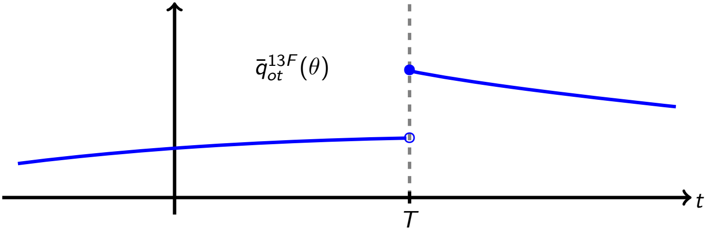
# Results

$\bar{q}_{ot}^{13F}(\theta)$ is discontinuous at $T$ and the jump is

$$\lim_{\epsilon \searrow 0} \bar{q}_{oT+\epsilon}^{13F}(\theta) - \bar{q}_{oT-\epsilon}^{13F}(\theta) = \xi_n \mathbb{E}\left\{(1-\alpha_n)\mathbb{1}_{\{\Delta_n \geq \Delta_{oT}^{13F} \geq bid_T^{13F}(\Delta_n)\}}\right\} > 0$$

The above equation implies that:

1. $13F$ owners are more likely to sell after the report
2. but not with high $\alpha_n$ non-owners



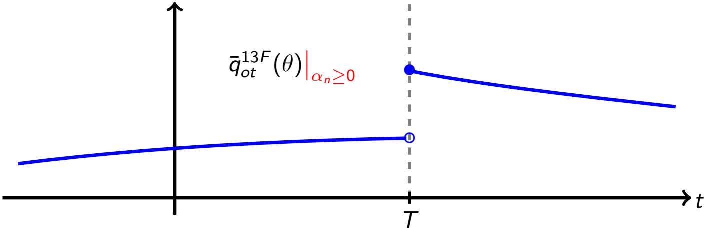
# Results

$\bar{q}^{13F}_{ot}(\theta)$ is discontinuous at $T$ and the jump is

$$\lim_{\epsilon \searrow 0} \bar{q}^{13F}_{oT+\epsilon}(\theta) - \bar{q}^{13F}_{oT-\epsilon}(\theta) = \xi_n \mathbb{E}\left\{(1-\alpha_n)\mathbb{1}_{\{\Delta_n \geq \Delta^{13F}_{oT} \geq bid^{13F}_T(\Delta_n)\}}\right\} > 0$$

The above equation implies that:

1. $13F$ owners are more likely to sell after the report
2. but not with high $\alpha_n$ non-owners



# Results

$\bar{q}_{ot}^{13F}(\theta)$ is discontinuous at $T$ and the jump is

$$\lim_{\epsilon \searrow 0} \bar{q}_{oT+\epsilon}^{13F}(\theta) - \bar{q}_{oT-\epsilon}^{13F}(\theta) = \xi_n \mathbb{E}\left\{(1-\alpha_n)\mathbb{1}_{\{\Delta_n \geq \Delta_{oT}^{13F} \geq bid_T^{13F}(\Delta_n)\}}\right\} > 0$$

The above equation implies that:

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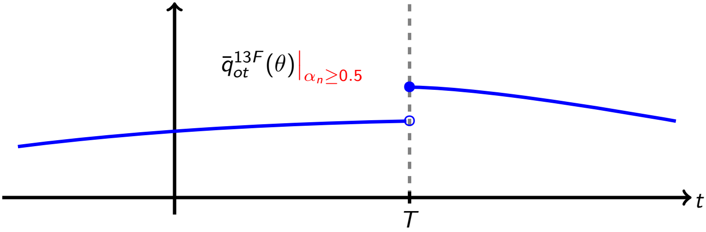


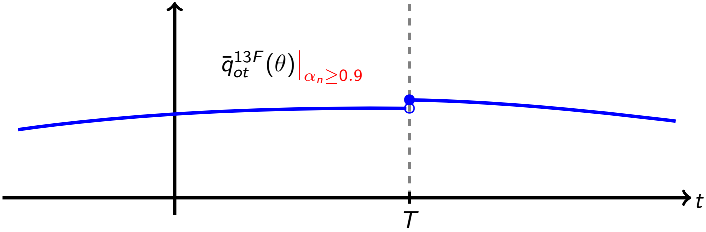
# Results

$\bar{q}^{13F}_{ot}(\theta)$ is discontinuous at $T$ and the jump is

$$\lim_{\epsilon \searrow 0} \bar{q}^{13F}_{oT+\epsilon}(\theta) - \bar{q}^{13F}_{oT-\epsilon}(\theta) = \xi_n \mathbb{E}\left\{(1-\alpha_n)\mathbb{1}_{\{\Delta_n \geq \Delta^{13F}_{oT} \geq bid^{13F}_T(\Delta_n)\}}\right\} > 0$$

The above equation implies that:

1. $13F$ owners are more likely to sell after the report
2. but not with high $\alpha_n$ non-owners



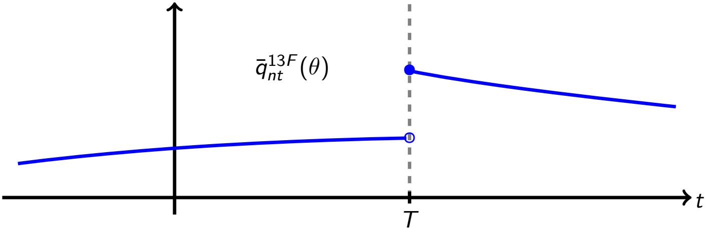
# Results

$\bar{q}_{nt}^{13F}(\theta)$ is discontinuous at $T$ and the jump is

$$\lim_{\epsilon \searrow 0} \bar{q}_{nT+\epsilon}^{13F}(\theta) - \bar{q}_{nT-\epsilon}^{13F}(\theta) = \xi_s \mathbb{E}\Big\{(1-\alpha_o)\mathbb{1}_{\{ask_T^{13F}(\Delta_o) \geq \Delta_{nT}^{13F} \geq \Delta_o\}}\Big\} > 0$$

The above equation implies that:

1. $13F$ non-owners are more likely to buy after the report
2. but not with high $\alpha_n$ non-owners

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