Ripple Effects of Noise on Corporate Investment

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Motivation - Question

- Stock prices sometimes deviate from fundamentals
  - Transient shocks to demand can generate price fluctuations above and beyond changes due to fundamentals
  - Various reasons: noise trading, liquidity needs, or slow-moving capital (e.g. Duffie (2010)).

- **Questions: Do non-fundamental variations in stock prices (noise) affect the real economy?**
  - Do non-fundamental variation in prices influence corporate investment?
  - Does this matter for the allocation of resources?
  - **If yes, through which channels?**

What we know and don't know

- Existing research: Non-fundamental changes in prices affect corporate investment through:
  - Financing channel (e.g., positive non-fundamental shock relaxes constraints)
  - Managerial incentive channel (e.g., negative shock increases takeover likelihood)
- **Our paper: Is there a direct (faulty) informational effect?**
  - Managers rely on stock prices as a source of information
  - Imperfect ability to distinguish noise from fundamentals (but rational)
  - Noisy prices + signal extraction problem $\Rightarrow$ real effects
  - Lead to (ex-post) inefficient decisions and possible corrections
  - Faulty Informant Hypothesis (Morck, Shleifer, and Vishny (1990))

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Empirical challenges

- Stock prices reflect information that managers may already know
- Non-fundamental variations affect **cost of capital** and **managers' incentives** (e.g. take-over risks, lay-offs)
- Our approach (guided by a model for more structure):
  - Decompose stock prices between **fundamental** and **non-fundamental** using exogenous shocks to prices
  - Focus on non-fundamental shocks to **peers' stock prices**
- Strong support for the faulty informant role of stock prices
  - 1 sd decrease in peers' noise $\Longrightarrow$ 1.8 p.p. decrease in investment (5% mean)
  - Truly a faulty informant channel (we try hard to reject this...)

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Implications

- Stock market is not a side-show, it matters for the real economy
- Managers rationally use stock prices, but cannot perfectly filter out the noise (no evidence so far...)
- Limited signal extraction ability can have real consequences
- Non-fundamental variations in stock prices does not only affect small (constrained) firms, and at risk of being acquired
- Amplification effects through peers' stock prices (i.e., "ripple effects")
- Bottom line: Ex-ante optimal for managers to follow noisy signals, but lead to ex-post inefficient outcomes

Literature

1. **Asset prices informativeness ⇒ Real Decisions**
   - Theory: Dow and Gorton (1997), Subrahmanyam and Titman (1999), Goldstein and Guembel (2008) or Albagli, Hellwig and Tsyvinski (2014).
   - Empirics: Chen, Goldstein, and Jiang (2006), Bakke and Whited (2010), or Foucault and Fresard (2014)
   - Macro: David, Hopenhayn and Venkateswaran (2016)

2. **Non-fundamental shocks ⇒ Firm Investment**
   - Capex: Baker, Stein, and Wurgler (2003), Hau and Lai (2013)
   - M&A: Edmans, Goldstein, and Jiang (2012)
     - Always a **cost of capital / managers' incentives story**

Model and Predictions

Model: Timing

- At date 1, Firm i has a growth opportunity whose payoff at date 2 is:

$$G(K_i, \widetilde{\theta}_i) = \widetilde{\theta}_i K_i - \frac{K_i^2}{2}$$

- K_i is the size of the investment in the growth opportunity
- $\widetilde{\theta}_i$:
  - Marginal productivity of investment (i.e., "fundamental") unknown at $t = 1$
  - Uncertain $\widetilde{\theta}_i \sim \mathcal{N}(0, \sigma^2_{\theta_i})$
- Date 1, manager chooses K_i to maximize expected payoff conditional on information (Ω_1)
- K_i^* solves: $Max_{K_i}\ \mathrm{E}(G(K_i, \widetilde{\theta}_i)\,|\Omega_1) = \mathrm{E}(\widetilde{\theta}_i\,|\Omega_1)\,K_i - \frac{K_i^2}{2}$
- **FOC**: $K_i^*(\Omega_1) = \mathrm{E}(\widetilde{\theta}_i\,|\Omega_1)$

Model: Information Structure

- Manager has access to several signals:
  1. *Private signal about the fundamental*: $s_m = \widetilde{\theta}_i + \chi_i$
  2. *Signal contained in firm i's stock price*: $P_i = \widetilde{\theta}_i + u_i$ where the noise (or non-fundamental) component is u_i
  3. *Signal contained in peer's stock price*: $P_{-i} = \widetilde{\theta}_i + u_{-i}$ where the noise component is u_{-i}
  4. *Information about the noise in firm i's stock price*: $s_{u_i} = u_i + \eta_i$
  5. *Information about the noise in peer's stock price*: $s_{u_{-i}} = u_{-i} + \eta_{-i}$
- Errors in the manager's signals (χ, u_i, u_{-i}, η_i, η_{-i}) are normally distributed (with zero means) and independent from each other and $\widetilde{\theta}_i$
- Nest perfect information on noise or no information at all

Optimal Investment

$$K_i^*(\Omega_1) = \mathrm{E}(\widetilde{\theta}_i \,|\Omega_1) = a_i \times s_{m_i} + b_i \times P_i + c_i \times s_{u_i} + b_{-i} \times P_{-i} + c_{-i} \times s_{u_{-i}}$$

- where a_i, b_i, c_i, b_{-i}, c_{-i} are functions of the variance of each signal

1. **Manager's private information perfect**: $b_i = c_i = b_{-i} = c_{-i} = 0$
   - Manager observes $\widetilde{\theta}$ and ignores stock prices ($a_i > 0$)
2. **Manager's private information <u>im</u>perfect**:
   - $b_i > 0$ and/or $b_{-i} > 0$ if prices are informative (manager use prices)
3. **Manager's cannot perfectly detect <u>noise</u> in prices**:
   - $c_i < 0$ and/or $c_{-i} < 0$ (uses his info to filter out noise in prices)

- K_i^* depends on signal about the noise (s_{u_i} and $s_{u_{-i}}$) even though this signal is **uninformative** about $\widetilde{\theta}$

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Prediction: Optimal Investment with Noisy Stock Prices

$$I_i = \overbrace{\alpha S_m}^{\text{Private Signal}} + \overbrace{\gamma_0 U_i + \gamma_1 (P_i - U_i)}^{\text{Firm Stock Price}} + \overbrace{\beta_0 U_{-i} + \beta_1 (P_{-i} - U_{-i})}^{\text{Peers' Stock Price}}$$

- Null Hyp: "No ripple effect of noisy stock price"
  - Inv. to noise sensitivity $\Rightarrow \beta_0 = 0$
    - i Managers perfectly informed
    - ii Managers perfectly filter out noise
- Reject of the null = "Faulty informant channel" $\Rightarrow$ **3 predictions**:
  1. $\beta_0 > 0$
  2. $\beta_1 > \beta_0$ (managers can filter out some noise)
  3. β_0 Δ with manager information ($\Downarrow$) and stock price informativeness ($\Uparrow$)

$\Rightarrow$ *Focus on **peers' stock price** to mitigate alternative stories*

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Tests and Results

Step 1: Empirical Proxy for Non-Fundamental Shock

- Use Mutual Funds Fire-Sales as non-fundamental shocks to prices (U_i and U_{-i})
  - Fire sales ➔ **stock prices to deviate from its fundamental values** then mean-revert

- Mutual Funds *Hypothetical* Sales (Edmans Goldstein, and Jiang, 2012)
  - Focus on extreme flows ($>$ 5% of funds' assets)
  - Assume mutual funds keep their portfolio constant (**We do not use real trades!**)
  - Magnitude of trades purely determined by **size of outflow**
  - $MFHS < 0$ and cov($MFHS$,P)>0

- Key assumption: Mutual funds hypothetical trading *not* based on funds private information about the firms' fundamentals

mff-construction

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mff-construction

Step 2: Decompose Stock Price (into U and $(P - U)$)

- Decompose normalized stock price (Tobin's Q)

$$Q_{i,t} = \phi \times \underbrace{MFHS_{i,t}}_{\substack{\text{Noise due to} \\ \text{Mutual Funds} \\ \text{fire sales}}} + \lambda_i + \delta_t + \underbrace{\upsilon_{i,t}}_{\substack{\text{“Fundamental”} \\ \text{Component of} \\ \text{Price } (Q^*)}}$$

- $\phi > 0$ and significant (strong)

- $MFHS_{-i,t}$ = “Firm Non-Fundamentals”

- Construct $Q^*_{-i,t} = \hat{\upsilon}_{-i,t}$ $\Rightarrow$ “Firm Fundamentals”

Step 3: Estimate Investment to Noise Sensitivity to Peers

- Identify **product market peers** (the $-i$)
  - Text-based Network Industry Classification (Hoberg and Philips, 2015) $\Rightarrow$ Firms share the same **growth opportunities**
  - $\overline{MFHS}_{-i,t}$ = average $MFHS_{i,t}$ over peers of firm i $\Rightarrow$ "Peers' Non-Fundamentals"
  - $\overline{Q}^*_{-i,t}$ = average $Q^*_{i,t}$ over peers of firm i $\Rightarrow$ "Peers' Fundamentals"
- Estimate **investment-to-noise sensitivity**
  - Compustat sample 1996–2011

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Empirical Specification

$$I_{i,t} = \overbrace{\overbrace{\beta_0 \overline{MFHS}_{-i,t-1}}^{\text{Noise due to Mutual Funds fire sales}} + \overbrace{\beta_1 \overline{Q}^*_{-i,t-1}}^{\text{``Fundamental'' Component}}}^{\text{Peers' stock prices (Average)}} + \overbrace{\overbrace{\gamma_2 MFHS_{i,t-1}}^{\text{Noise due to Mutual Funds fire sales}} + \overbrace{\gamma_3 Q^*_{i,t-1}}^{\text{``Fundamental'' Component}}}^{\text{Own stock price}}$$

$$+ \underbrace{\mathbf{\Gamma X_{i,-i,t-1}}}_{\text{Controls for size and cash-flows (own and peers)}} + \lambda_i + \delta_t + \varepsilon_{i,t}$$

- Faulty Informant: $\beta_0 > 0$ (and $\beta_1 > \beta_0$) if managers **cannot** filter out the noise

$\Rightarrow$ *Do we really have a <u>localized</u> **<u>non</u>-fundamental** shock?*

  - *MFHS* truly valid instrument?

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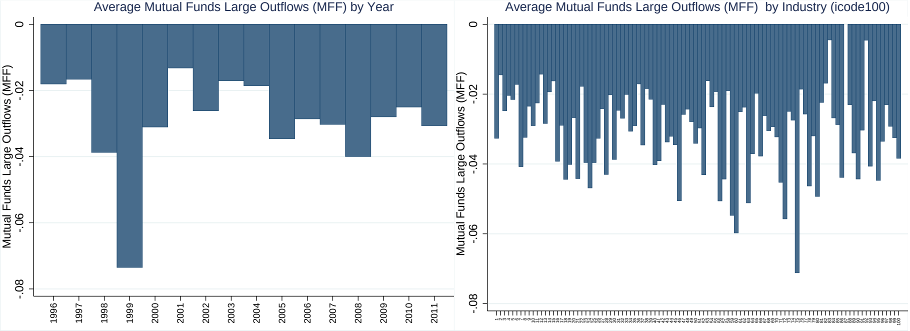
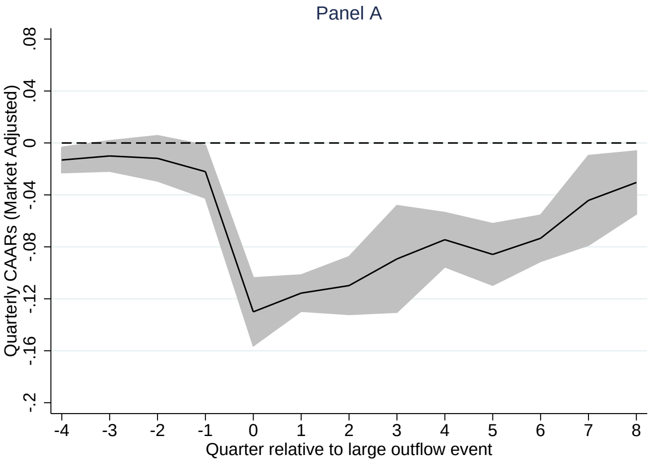
Instrument Validity I



- Panel A: No obvious clustering in time (non-systematic shocks)
- Panel B: No obvious clustering across industries

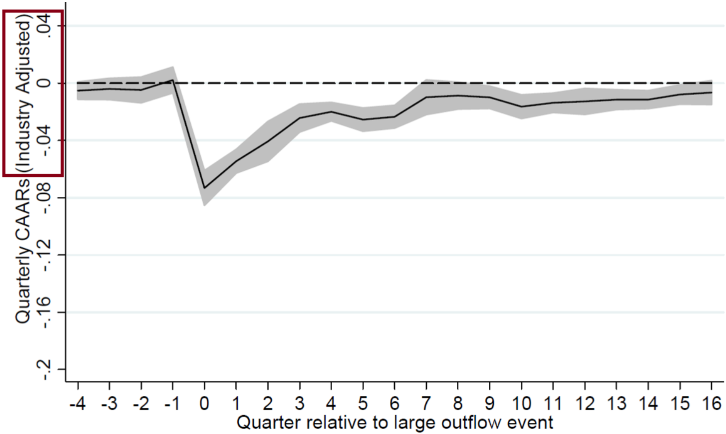
Non-fundamental shock? (*MFHS* in lowest decile)



- Drop and reversal in prices (non-fundamental shocks)

Instrument Validity II

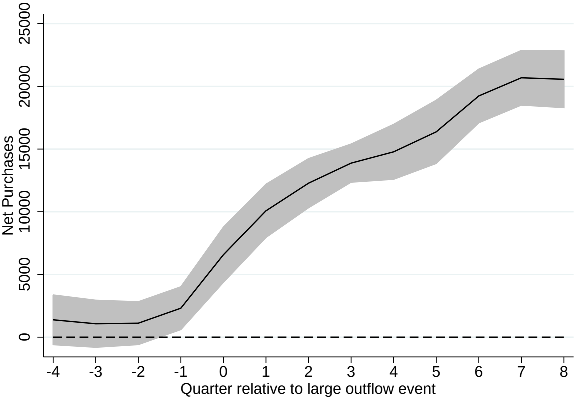
- Downward price pressure survives *industry adjustment*



- *MFHS* capture *localized* non-fundamental shocks and not industry-wide shocks

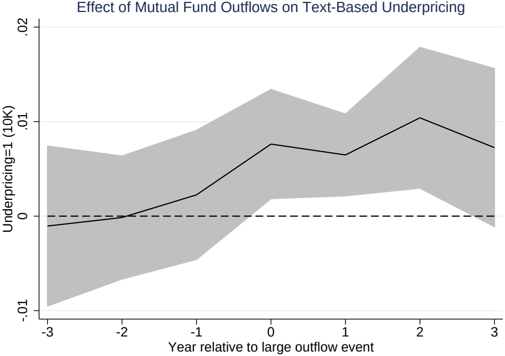
Instrument Validity III

- Insider trading around the fire-sale event



- Managers trade *against* their own price pressure (buy when price drops)
- Some of them detect the noise in their own price

Instrument Validity IV



- Firms mention non-fundamental shocks in their 10K reports
- Keywords: underpricing, underpriced, undervaluation, undervalued

Main Result

- 1 sd decrease in peers' noise $\Longrightarrow$ 1.8 p.p. decrease in investment (5% mean)

Dependent variable	Capex/PPE	
	Coeff	t-stat
$\overline{MFHS}_{-i}$	**0.018*** **	7.51
$\overline{Q}^*_{-i}$	0.029***	12.71
$MFHS_i$	0.011***	6.55
Q^*_i	0.081***	27.52
Obs.	45,388	
Controls	Yes	
Firm FE	Yes	
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Main Result

- Inv. also (*less*) sensitive to noise in **own** stock price (1.1pp)
- But inv. **8 times** more sensitive to "fundamentals" $\Rightarrow$ Managers **filter out noise better in their own stock price**

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Main Result

- $\beta_0 > 0 \Rightarrow$ Rejects null "No ripple effect via imperfect filtering"
- Localized **non-fundamental** shocks of peers' prices affect a firm investment after controlling for its own stock price (and other drivers)

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alternative-peers

Temporary vs Permanent Effect

- Imperfect filtering: ex-ante rational, but **ex-post mistake** $\Rightarrow$ Do managers ***correct***?

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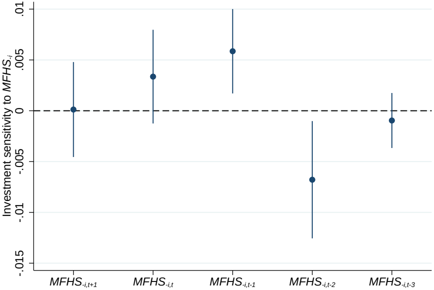

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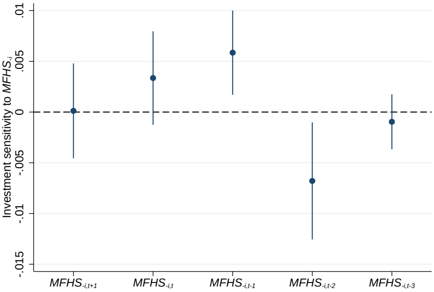

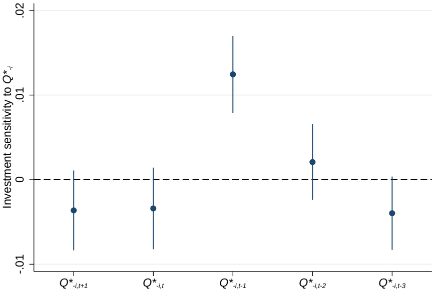

- Non-fundamental shocks: effect **transient** (mistake *corrected*)
- **Fundamental** shock: **Permanent** effect on capital stock (*not corrected*)

Other Results

- In the cross-section investment-to-noise sensitivity

1. ... **decreases** when managers are **better informed** result
    - Insider trades are more profitable
    - Firm affected itself by the same shock in the past
    - Analysts detect the mispricing of peers

2. ... **increases** when peers' stock prices are **more informative** result
    - Higher stock prices ability to forecast future earnings (Bai, Philipon, and Savov, 2014)
    - Lower firm-specific return variation (Roll, 1988; Durnev et al., 2004)
    - Lower analyst average earnings forecast error

$\Rightarrow$ ***Uniquely predicted by the faulty informant channel***

Other Results

- In the cross-section investment-to-noise sensitivity

1. ... **decreases** when managers are **better informed** result
   - Insider trades are more profitable
   - Firm affected itself by the same shock in the past
   - Analysts detect the mispricing of peers
2. ... **increases** when peers' stock prices are **more informative** result
   - Higher stock prices ability to forecast future earnings (Bai, Philipon, and Savov, 2014)
   - Lower firm-specific return variation (Roll, 1988; Durnev et al., 2004)
   - Lower analyst average earnings forecast error

$\Rightarrow$ ***Uniquely predicted by the faulty informant channel***

Alternative Stories

- **Financing channel** (e.g. Baker et al., 2003; Shleifer and Vishny, 1992)
  - Capital providers (e.g. bankers) rely on peers' stock prices to set lending costs
  - Fire sales of peer stocks trigger real assets fire sales $\Rightarrow$ lower firm collateral value
- **Pressure channel** (e.g. Stein, 1989)
  - Increase risk of being taken over / fired $\Rightarrow$ cut investment to boost **short-term cash-flow (and stock price)**
  - Effort provision due to compensation indexed on peers' performance (RPE)
- **Investment complementarity channel**
  - Investment respond to investment, not stock prices
- Reminder: **perform several tests to rule out these channels**

Alternative Stories

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Capital Allocation Within Firms

- Similar test, at the **Firm** $\times$ **Division** $\times$ **Year level**
  - Investment within firm (across divisions)
- Conglomerate: Compustat segment - FF48 industries (Krueger et al. 2014)
- 3,409 distinct conglomerate firms, operating a total of 8,342 divisions over the 1996-2011 period.
- Investment for division d of firm i at year t:

$$I_{i,d,t} = \lambda_{i,d} + \delta_{i,t} + \alpha_0 \overline{Q}^*_{-i,d,t-1} + \alpha_1 \overline{MFHS}_{-i,d,t-1} + \mathbf{\Gamma X_{-i,d,t}} + \varepsilon_{i,d,t}$$

- $\delta_{i,t}$: Firm $\times$ Year FE remove *time-varying* unobserved heterogeneity at the *firm* level

Within-Conglomerate: Reallocation Across Divisions?

- Similar test, at the **Firm** $\times$ **Division** $\times$ **Year level**
- Inv. in division sensitive to **noise** in stock prices of **that division's peers**. Noise influences capital allocation **WITHIN** firm

Dependent variable:	Capex/A	
	Coeff	t-stat
$\overline{MFHS}_{-i}$	0.0044**	(2.43)
$\overline{Q}^*_{-i}$	0.0055***	(3.40)
Obs.	63,330	
Firm-Division FE	Yes	
Firm $\times$ Year FE	Yes	

Within-Conglomerate: Reallocation Across Divisions?

- Similar test, at the **Firm** $\times$ **Division** $\times$ **Year level**
- Inv. in division sensitive to **noise** in stock prices of **that** **division's peers**. Noise influences capital allocation **WITHIN** firm
- Spe absorbs **all** **time-varying** firm-level variables (e.g. P_i, U_i, $MFHS_i$, etc.)

Dependent variable:	Capex/A	
	Coeff	t-stat
$\overline{MFHS}_{-i}$	0.0044**	(2.43)
$\overline{Q}^*_{-i}$	0.0055***	(3.40)
Obs.	63,330	
Firm-Division FE	Yes	
Firm $\times$ Year FE	**Yes**	

Within-Conglomerate: Reallocation Across Divisions?

- Rules out other stories because cost of financing / access to financing / CEO incentives / CEO compensation same across divisions
  - Can explain investment allocation across firms ... BUT NOT across divisions for the SAME firm in the SAME year

Dependent variable:	Capex/A	
	Coeff	t-stat
$\overline{MFHS}_{-i}$	0.0044**	(2.43)
$\overline{Q}^*_{-i}$	0.0055***	(3.40)
Obs.	63,330	
Firm-Division FE	Yes	
Firm × Year FE	**Yes**	

Alternative: Cost of Capital Channel

- Firm-level measures of financing costs and access to external capital
  - Average annual CDS spreads: Markit
  - Average spreads on new (private) debt issues: Dealscan
  - Text-based measures of financing constraints (Hoberg and Maksimovic (2015))
    - Textual analysis of the Management's Discussion and Analysis (MD&A) section of firms' 10Ks
    - Score of equity-market and debt-market constraints

Alternative: Cost of Capital Channel

Dep. Variable	CDS Spread	New Debt Spread	Text Eq.-Cons.	Text Debt-Cons.
	(1)	(2)	(3)	(4)
$\overline{MFHS}_{-i}$	0.075	0.032**	-0.000	0.001
	(1.08)	(2.24)	(-0.27)	(1.22)
$\overline{Q}^{*}_{-i}$	0.027	-0.025**	-0.001**	0.000
	(0.55)	(-2.07)	(-2.45)	(0.66)
$\overline{CF/A}_{-i}$	-0.409***	-0.062***	-0.001*	-0.001
	(-3.36)	(-2.77)	(-1.94)	(-1.32)
$\overline{Size}_{-i}$	-0.098	-0.007	0.000	0.001
	(-1.62)	(-0.36)	(0.52)	(1.31)
$MFHS_i$	-0.360**	0.009	-0.000	0.001
	(-2.19)	(0.74)	(-0.37)	(1.09)
Q^{*}_{i}	-0.116*	-0.132***	-0.001***	0.002***
	(-1.75)	(-9.14)	(-4.57)	(5.29)
CF/A_i	-1.140***	-0.358***	-0.001***	-0.006***
	(-4.65)	(-10.79)	(-3.24)	(-9.38)
$Size_i$	-0.893**	-0.595***	0.000	-0.001
	(-2.24)	(-12.51)	(0.02)	(-0.47)
Obs.	3,765	10,759	33,198	33,198
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj. R^2	0.708	0.759	0.580	0.667

Alternative: Pressure Channel

- Firm-level measures of CEOs risk
  - Probability of takeover offer: SDC
  - CEO turnover: Execucomp
- Use of relative performance evaluation (RPE)
  - users vs non-users (Aggrawal and Samwick (1999))
  - sensitivity of compensation to peers' stock returns (industry-level)

Alternative: Pressure Channel

Dep. Variable	Prob(Target)	CEO Turnover	Capex/PPE	Capex/PPE
Sub-sample:			$RPE = 1$	$RPE = 0$
	(1)	(2)	(3)	(4)
$\overline{MFHS}_{-i}$	0.004	0.002	0.019***	0.017***
	(1.43)	(0.38)	(6.08)	(4.83)
$\overline{Q}^{*}_{-i}$	-0.006***	0.005	0.032***	0.026***
	(-3.54)	(1.50)	(9.64)	(8.40)
$\overline{CF/A}_{-i}$	0.006*	0.000	0.019***	0.004
	(1.88)	(0.07)	(3.82)	(0.87)
$\overline{Size}_{-i}$	0.002	0.007	-0.005	0.009*
	(0.54)	(1.31)	(-1.13)	(1.91)
$MFHS_i$	-0.007***	-0.003	0.010***	0.010***
	(-3.43)	(-0.76)	(4.12)	(4.52)
Q^*_i	-0.010***	-0.010***	0.083***	0.077***
	(-5.95)	(-3.36)	(19.15)	(18.24)
CF/A_i	-0.015***	-0.036***	0.030***	0.043***
	(-5.58)	(-5.17)	(5.69)	(8.56)
$Size_i$	0.060***	0.006	-0.068***	-0.084***
	(7.92)	(0.53)	(-4.56)	(-5.36)
Obs.	45,388	18,121	23,518	21,870
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj. R^2	0.307	0.127	0.568	0.553

Alternative: Investment Complementarity Channel

Dependent variable:	Capex/PPE					
Peers Average:	EW (1)	VW (2)	Median (3)	5 Closest (4)	Agg. (5)	EW (6)
$\overline{MFHS}_{-i}$	0.009***	0.011***	0.004**	0.011***	0.014***	0.009***
	(3.85)	(5.20)	(2.19)	(3.85)	(4.53)	(3.34)
$\overline{Q}^{*}_{-i}$	0.018***	0.022***	0.019***	0.017***	0.019***	0.017***
	(7.94)	(9.20)	(7.80)	(7.39)	(8.17)	(6.60)
$\overline{CF/A}_{-i}$	0.009***	0.005	0.007**	0.003	0.004*	-0.002
	(2.55)	(1.47)	(2.06)	(1.05)	(1.66)	(-0.50)
$\overline{Size}_{-i}$	0.002	0.002	-0.000	0.001	-0.000	-0.001
	(0.76)	(0.75)	(-0.13)	(0.42)	(-0.13)	(-0.26)
$\overline{Capex/PPE}_{-i}$	0.051***	0.034***	0.049***	0.043***	-0.000	
	(11.42)	(9.17)	(10.87)	(11.85)	(-0.43)	
$MFHS_i$	0.010***	0.011***	0.011***	0.011***	0.013***	0.009***
	(6.01)	(6.36)	(6.56)	(6.43)	(7.61)	(5.31)
Q^{*}_{i}	0.079***	0.080***	0.080***	0.078***	0.086***	0.076***
	(26.84)	(27.08)	(27.07)	(27.23)	(28.99)	(24.92)
CF/A_i	0.034***	0.035***	0.034***	0.035***	0.037***	0.032***
	(10.10)	(10.25)	(10.08)	(10.33)	(10.77)	(9.13)
$Size_i$	-0.074***	-0.075***	-0.071***	-0.071***	-0.068***	-0.075***
	(-6.86)	(-6.87)	(-6.60)	(-6.60)	(-6.24)	(-6.50)
Obs.	45,355	45,390	45,355	45,355	45,357	45,388
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	No
Ind-Year FE	No	No	No	No	No	Yes
Adj. R^2	0.489	0.487	0.489	0.497	0.487	0.498

Conclusion

- When **filtering is imperfect**
  - Non-fundamental shocks to prices (noise) affect investment decisions of peers because investment loads on noise
  - Average manager not able to fully filter out the noise $\Rightarrow$ lead to **(ex post) inefficient decisions**
- Manager rational and conditions on informative but noisy signals (ex-ante efficient)
- Open question: effect on aggregate investment and misallocation?

Thank You

Construction of Mutual Fund Hypothetical Sales

- Step 1 - Mutual Fund Outflow (fund j in quarter q of year t)

$$Flow_{j,q,t} = \frac{TNA_{j,q,t} - TNA_{j,q-1,t} \times (1 + Return_{j,q,t})}{TNA_{j,q-1}}.$$

- Step 2 - Fund's j holdings of stock i (in dollar value)

$$SHARES_{i,k,q,t} \times Price_{i,q,t},$$

- Step 3- Hypothetical net selling at stock level when $Flow_{j,q,t} \leq -0.05$

$$MFHS^{dollars}_{i,q,t} = \sum_j (Flow_{j,q,t} \times SHARES_{j,i,q} \times Price_{i,q,t})$$

- Step 4- Sum over four quarter

$$MFHS_{i,t} = \frac{\sum_{q=1}^{q=4} \sum_j (Flow_{j,q,t} \times SHARES_{j,i,q,t} \times Price_{i,q,t})}{\text{Dollar Volume Trading}_{i,q,t}}$$

Back

Manager Private Information

Dep. Variable:	Capex/PPE			
Int. Variable ϕ:	Ins.CARs (1)	Prev. Sales (2)	Common MF (3)	Analyst Discount (4)
$\overline{MFHS}_{-i}$	0.018***	0.019***	0.026***	0.024***
	(7.54)	(6.95)	(6.53)	(8.20)
$\overline{MFHS}_{-i} \times \phi$	-0.052	-0.008	-0.054***	-0.006**
	(-1.56)	(-1.54)	(-3.97)	(-2.17)
Obs.	45,388	45,388	45,388	33,398
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Adj. R^2	0.394	0.393	0.397	0.406

x-section

Peers' Stock Price Informativeness

Dep. Variable	Capex/PPE			
Int. Variable ϕ:	BPS (1)	1-R2 (2)	Prev. Sales (3)	Analyst Disp (4)
$\overline{MFHS}_{-i}$	0.016*** (6.16)	0.009* (1.70)	0.024*** (7.17)	0.031*** (7.44)
$\overline{MFHS}_{-i} \times \phi$	0.017* (1.83)	0.005* (1.82)	-0.453*** (-3.06)	-0.023*** (-2.48)
Obs.	45,388	45,089	44,360	45,178
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Adj. R^2	0.394	0.394	0.397	0.395

x-section

Results

Dependent variable	Capex/PPE				
Peers Average:	E-W (1)	S-W (2)	Median (3)	5 closest (4)	Agg. (5)
$\overline{MFHS}_{-i}$	0.018***	0.015***	0.010***	0.015***	0.014***
	(7.51)	(7.12)	(4.95)	(7.56)	(4.51)
$\overline{Q}^*_{-i}$	0.029***	0.028***	0.029***	0.024***	0.019***
	(12.71)	(12.17)	(12.09)	(10.54)	(8.19)
$MFHS_i$	0.011***	0.011***	0.012***	0.012***	0.013***
	(6.55)	(6.70)	(7.23)	(7.13)	(7.60)
Q^*_i	0.081***	0.081***	0.082***	0.082***	0.086***
	(27.52)	(27.42)	(27.89)	(28.16)	(29.02)
Obs.	45,388	45,388	45,388	45,388	45,388
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.485	0.484	0.485	0.483	0.482

back

Estimating Investment-Noise Sensitivity (β_{-i})

- Econometrician does not perfectly observe manager's signals (s_m) and noise in prices (s_{u_i} and $s_{u_{-i}}$), only stock prices (P_i and P_{-i})
- We can recover $\beta_{-i} > 0$ if we can observe part of the noise
  - Let $u_{-i} = u^o_{-i} + u^{no}_{-i}$ with u^o_{-i} an **observed** component in peer's price
  - Assume u^o_{-i} and u^{no}_{-i} independent and normally distributed

$$K^*_i = \underbrace{\delta_i P^*_i + \gamma_i u^o_i}_{P_i} + \underbrace{\delta_{-i} P^*_{-i} + \beta_{-i} u^o_{-i}}_{P_{-i}} + \epsilon_i$$

  - $P^*_{-i} = \widetilde{\theta}_i + u^{no}_{-i} = P_{-i} - \mathrm{E}(P_{-i} \,|u^o_{-i})$ (and $P^*_i = \widetilde{\theta}_i + u^{no}_i = P_i - \mathrm{E}(P_i \,|u^o_i)$)
  - P^*_{-i} (P^*_i) is the residual of a regression of P_{-i} (P_i) on u^o_{-i} (u^o_i).
- **This is estimable if we have proxies for u^o_{-i} and u^o_i**

back