Cross-Asset Information Synergy in Mutual Fund Families

Jun Kyung Auh[1]   Jennie Bai[2]

[1]Yonsei University

[2]Georgetown University

Mar 22, 2019

Motivation

- ▶ Theoretically, equities and corporate bonds issued by the same firm are different contingent claims on the same cash flows (Merton 1974), thus their values should be related.

- ▶ Empirically, the two asset markets are segmented due to institutional and informational frictions.
  - Stock returns and bond returns have a low correlation
    (Collin-Dufresne et. al 2001, Kapadia and Pu 2012)
  - Risk factors are different
    (Chordia et. al 2017, Choi et. al 2018)
  - Investors characteristics are different
    (Fed Fund of Flow Report, 2017)
  - Information focuses are different
    (Bai et. al, 2017)

Research Question

In the presence of the known segmentation frictions..

"Would well-integrated investors in different asset markets share price-relevant information?"

We examine investment decisions of equity and bond fund managers under *the same fund family* and holding equity and bond of *the same issuer*.

Research Question

In the presence of the known segmentation frictions..

"Would well-integrated investors in different asset markets share price-relevant information?"

We examine investment decisions of equity and bond fund managers under *the same fund family* and holding equity and bond of *the same issuer*.

It it an important question because

▶ it would indicate whether sharing information in equity and bond market is beneficial.

▶ it provides an implication on information redundancy in cross-asset markets.

Related Literature

- ▶ Cross-fund subsidization within fund families
  - Gaspar, Massa, and Matos (2006JF), Bhattacharya, Lee and Pool (2013JF)
- ▶ Performance competition within fund families
  - Brown, Harlow, and Starks (1996JF), Chevalier and Ellison (1997JPE), Kempf and Ruenzi (2007RFS)
- ▶ Cross-fund learning
  - Brown and Wu (2016JF), Choi, Kahraman, and Mukherjee (2016JF)

⇒ All the above studies consider equity mutual funds only

Related Literature

- ▶ Cross-fund subsidization within fund families
  - Gaspar, Massa, and Matos (2006JF), Bhattacharya, Lee and Pool (2013JF)
- ▶ Performance competition within fund families
  - Brown, Harlow, and Starks (1996JF), Chevalier and Ellison (1997JPE), Kempf and Ruenzi (2007RFS)
- ▶ Cross-fund learning
  - Brown and Wu (2016JF), Choi, Kahraman, and Mukherjee (2016JF)

⇒ All the above studies consider equity mutual funds only

- ▶ Dual-holding and shareholder-creditor conflicts
  - Jiang, Li, and Pei (2010RFS), Bodnaruk and Rossi (2016JFE)
- ▶ Price discovery in two markets, hedging across equities and bonds
  - Collin-Dufresne, Goldstein, and Martin (2001JF), Kapadia and Pu (2012JFE), Kwan (1996JFE), etc.

⇒ Cross-holding of equity and bond by the same entity has incentive/information implications

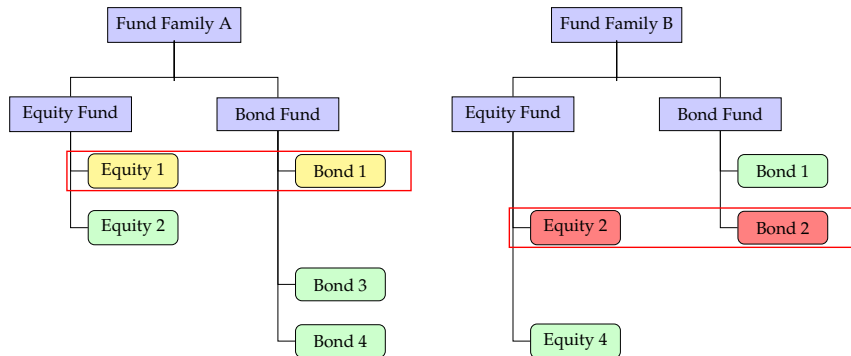## Data Structure and Variable Definition

At a given quarter t,

- **Change of Holdings**: ΔH_{ift} is change in quantity (number of units) of firm i's equity (bond) held by fund family f during quarter t.

Data Structure and Variable Definition

At a given quarter t,

- ▶ **Sister fund cross-holding** and **Stand-alone holding** are defined at the level of fund family $f \times$ firm i.

Data: CRSP Survivorship Bias-Free MF Database

- We only include (i) fund families with actively-managed equity and bond funds and (ii) firms with publicly tradable equity and bonds.
- Fund families with equity and bond fund take about 30%..
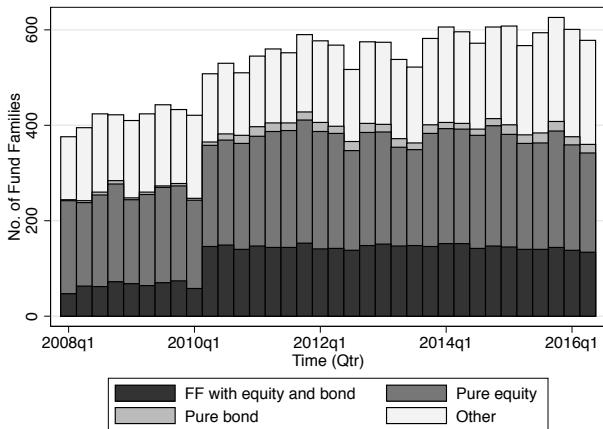
Data: CRSP Survivorship Bias-Free MF Database

- We only include (i) fund families with actively-managed equity and bond funds and (ii) firms with publicly tradable equity and bonds.
- But they cover almost 90% in market value.
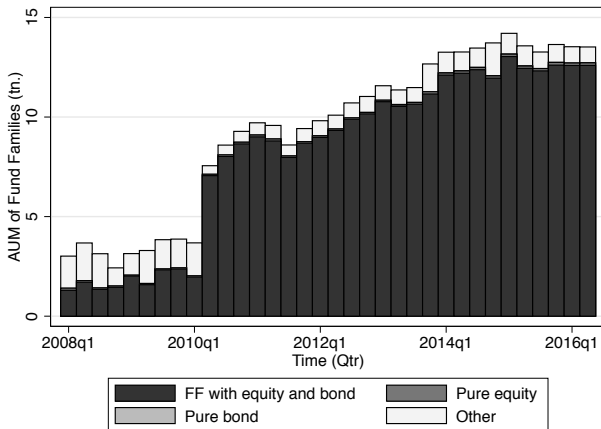
# Holding Decision Co-movement?

$$\Delta H_{i,f,t}^{Equity} = \alpha + \theta \cdot \Delta H_{i,f,t}^{Bond} + \gamma \cdot Z_{i,t} + FE + \varepsilon_{i,f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
ΔH^{Bond}	0.626***	0.622***	0.622***	0.594***	0.595***	0.597***
	(28.59)	(30.05)	(30.06)	(28.39)	(28.37)	(28.12)
Log(Asset)	0.008	0.010*	0.009	0.011*	0.010	0.027
	(1.59)	(1.86)	(1.42)	(1.96)	(1.48)	(1.35)
Leverage	-0.188***	-0.205***	-0.192***	-0.198***	-0.181***	-0.195***
	(-5.94)	(-6.12)	(-5.81)	(-5.78)	(-5.38)	(-4.75)
Book/Mkt	0.001***	0.001***	0.001***	0.002***	0.002***	0.001***
	(3.62)	(3.37)	(3.05)	(7.74)	(6.54)	(9.08)
Fund Family FE	Y	Y	Y	N	N	N
Time FE	N	Y	Y	N	N	N
Fund Family x Time FE	N	N	N	Y	Y	Y
Industry FE	N	N	Y	N	Y	N
Firm FE	N	N	N	N	N	Y
N.Obs	104,399	104,399	104,399	104,399	104,399	104,399
R-squared	0.145	0.150	0.150	0.201	0.201	0.203

▶ Significant investment decision co-movement is necessary evidence of information sharing.
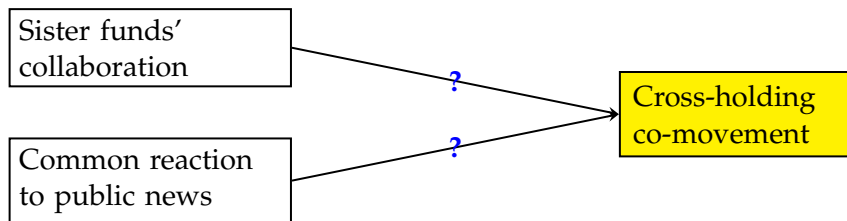
Collaboration or Common Reaction?

Holding co-movement appears to be clear. However, holding co-movement does not imply internal collaboration.
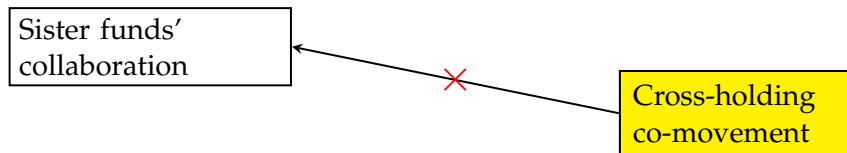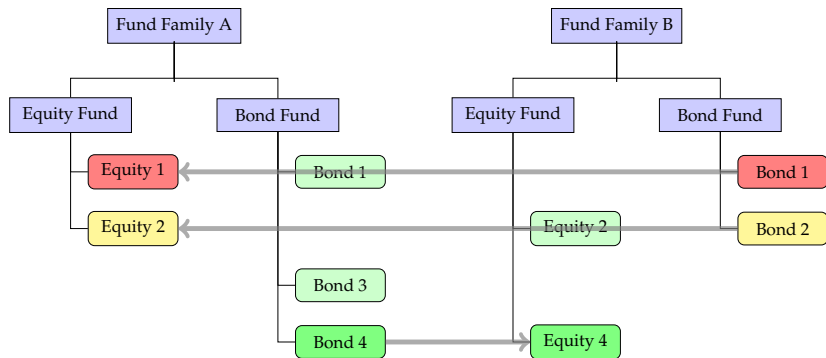
Collaboration or Common Reaction?

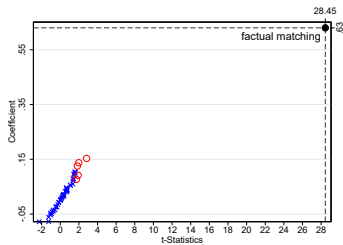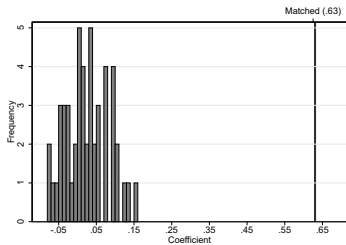Because another reason can contribute.

Placebo Test

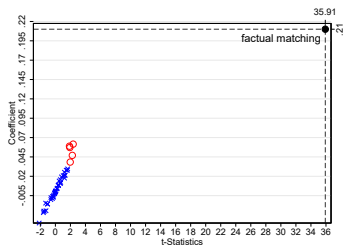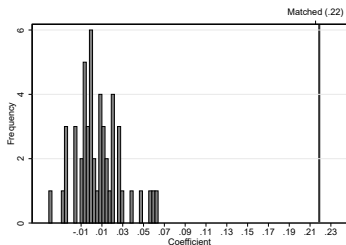We construct counter-factual sister fund cross holding relationship.

This experiment removes the "treatment effect".

Results of Random Matching (unique 50 $f' \neq f$)

Bond → Equity

Equity → Bond

Relative Comparison of the Magnitude

$$\Delta H_{i,f,t}^{Equity} = \alpha + \theta \cdot \Delta H_{i,f,t}^{Bond} + \theta' \cdot \Delta H_{i,f',t}^{Bond} + \gamma \cdot Z_{i,t} + FE + \varepsilon_{i,f,t}$$

	(1)	(2)	(3)	(4)	(5)	(6)
ΔH_f^{Bond}	0.356***	0.362***	0.343***	0.336***	0.377***	0.356***
	(19.42)	(21.23)	(18.21)	(18.96)	(19.81)	(19.47)
$\Delta H_{f'}^{Bond}$	0.026***	0.027***	0.026***	0.027***	0.025***	0.026***
	(3.15)	(3.37)	(3.13)	(3.48)	(3.06)	(3.32)
Log(Asset)	0.034***	0.032***	0.032***	0.030***	-0.258***	-0.211***
	(9.83)	(9.01)	(4.61)	(4.25)	(-5.22)	(-4.15)
Leverage	-0.089***	-0.058**	0.431***	0.519***	0.423***	0.743***
	(-3.22)	(-2.21)	(8.31)	(10.27)	(4.59)	(8.40)
Book/Mkt	0.011	0.003	-0.069***	-0.076***	-0.120***	-0.109***
	(1.57)	(0.39)	(-7.55)	(-7.74)	(-7.48)	(-5.49)
Time FE	N	Y	N	N	N	N
Industry FE	N	N	Y	N	N	N
Industry x Time FE	N	N	N	Y	N	N
Firm FE	N	N	N	N	Y	N
Firm x Time FE	N	N	N	N	N	Y
N.Obs	19,111	19,111	19,111	19,111	19,111	19,111
R-squared	0.057	0.140	0.089	0.174	0.137	0.223

▶ With all the possible $f' \neq f$ matches in the same specification, we can still see that θ and θ' are vastly different.
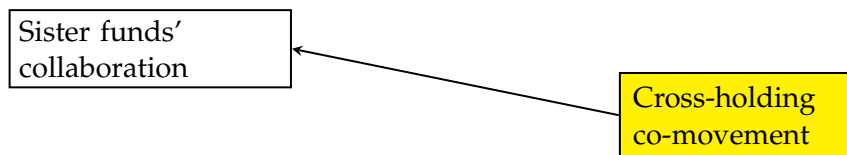
Collaboration or Common Reaction?
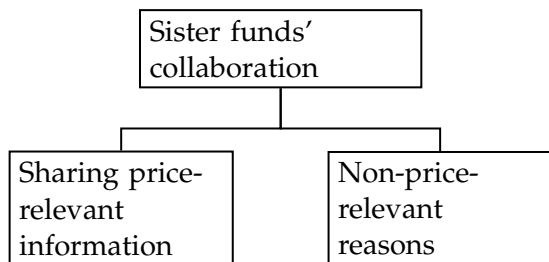
Common reaction does not seem to be the main driver.
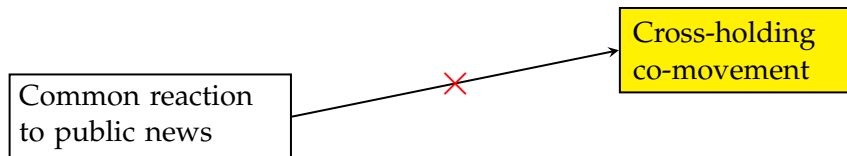
Collaboration or Common Reaction?

We can now know what the holding co-movement implies - Internal collaboration.

Sister funds' collaboration

Cross-holding co-movement

Economic Implication of Collaboration

What is the nature of collaboration? There are two mechanisms of internal collaboration:

```
                    ┌─────────────────┐
                    │ Sister funds'   │
                    │ collaboration   │
                    └─────────────────┘
                             │
              ┌──────────────┴──────────────┐
   ┌─────────────────┐          ┌─────────────────┐
   │ Sharing price-  │          │ Non-price-      │
   │ relevant        │          │ relevant        │
   │ information     │          │ reasons         │
   └─────────────────┘          └─────────────────┘
```

E.g., logistical reasons
(sharing infrastructure),
random attentions,
free-riding

Economic Implication of Collaboration

Sharing price-relevant information? If so, cross-holdings would correspond to better profitability.
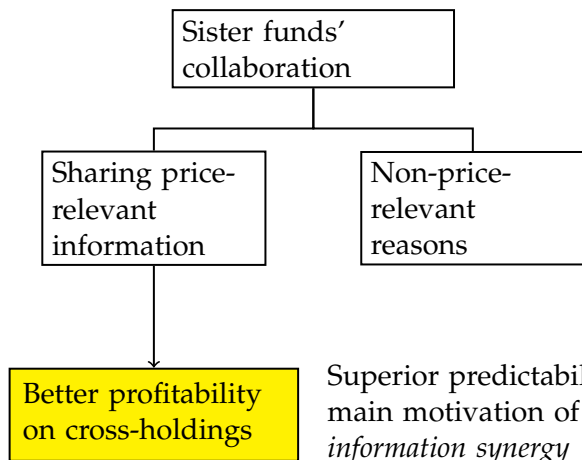
Superior predictability suggests the main motivation of collaboration: *information synergy*

Profit Enhancing Position Adjustment

Construct *PROFIT* to determine profit-enhancing position adjustment. For equity fund of fund family f's action on firm i's equity at quarter t:

$$PROFIT_{ift} = \begin{cases} 1 & \text{if } s(\Delta H_{ift-1}) \times s(r_{it}) > 0 \\ 0 & \text{if } s(\Delta H_{ift-1}) \times s(r_{it}) \leq 0 \end{cases}$$

Note: $s(\mathbb{R}^+) = 1, s(\mathbb{R}^-) = -1$
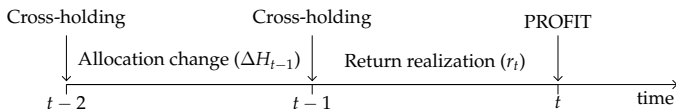
If equity fund of f increases (decrease) position on i at $t - 1$ and equity return of i is positive (negative) at t then *PROFIT* = 1.

Does Cross-holding Provide Better Chance?

Contrast *PROFIT* of fund family with cross-holding against fund family without it, *within* the same equity.

$$PROFIT_{i,f,t} = \alpha + \beta \cdot Cohold_{i,f,t-1} + FE + \varepsilon_{i,f,t}$$

	(1)	(2)	(3)	(4)	(5)
$Cohold_{t-1}$=1	0.111***	0.094***	0.108***	0.090***	0.116***
	(14.85)	(13.80)	(13.57)	(12.69)	(56.96)
Firm FE	Y	Y	N	N	N
Time FE	Y	Y	N	N	N
Fund Family FE	N	Y	N	Y	N
Firm x Time FE	N	N	Y	Y	Y
Model	OLS	OLS	OLS	OLS	Logit
N.Obs	645,657	645,657	645,657	645,657	572,330
R-squared	0.081	0.108	0.090	0.117	

▶ When a firm's bond is cross-held, its sister fund has $\sim 11\%$ better chance of making profit generating position adjustment on the same firm's equity.

Direct Test of Return Predictability

For a given equity of Firm i, construct average holding change of equity funds with and without cross-holding:

$$\Delta \bar{H}_{i,f\in XH,t}^{Bond} = \frac{1}{n_{XH}} \cdot \sum_{f\in XH} \Delta H_{i,f,t}^{Bond}$$

$$\Delta \bar{H}_{i,f\in SA,t}^{Bond} = \frac{1}{n_{SA}} \cdot \sum_{f\in SA} \Delta H_{i,f,t}^{Bond},$$

Note: *XH* (*SA*) is a set of fund families with (without) cross-holding.

- If, on average, information synergy occurs, actions of cross-holding funds (*XH*) must show better predictability than that of stand-alone funds (*SA*).
- Also, the signal would become stronger as more funds with cross-holding ($n_{XH} \uparrow$) make actions.

Experiment Design for Return Predictability

Compare predictability for Firm 1's equity using bond holding change of Fund Family A (with sister fund) with that of Fund Family B (without sister fund).
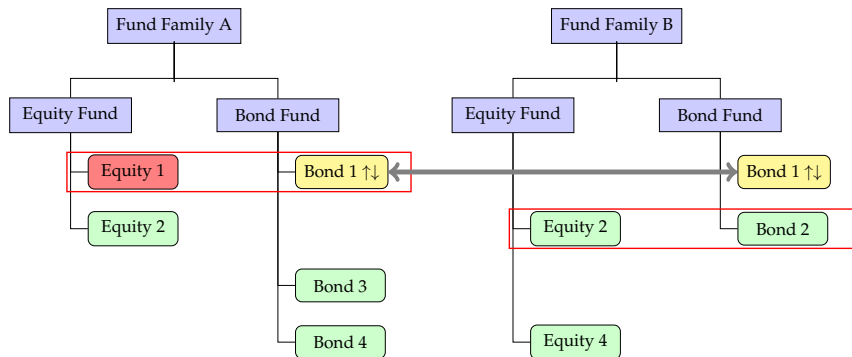
Does Cross-holding Better Predict Return?

$$Return_{i,t+1} = \alpha_i + \alpha_t + \theta_{XH} \cdot \Delta \bar{H}^{Bond}_{i,f \in XH,t} + \theta_{SA} \cdot \Delta \bar{H}^{Bond}_{i,f \in SA,t} + \gamma \cdot Z_{i,t} + \varepsilon_{i,t}$$

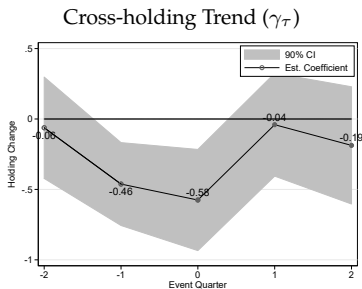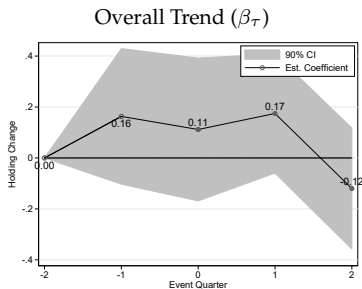|	(1) $n_{XH} > 0$	(2) $n_{XH} > 1$	(3) $n_{XH} > 10$
$\Delta \bar{H}^{Bond}_{f \in XH}$	0.013**	0.016**	0.037**
	(2.43)	(2.45)	(2.32)
$\Delta \bar{H}^{Bond}_{f \in SA}$	0.003	0.005	0.017
	(0.64)	(0.97)	(1.44)
Log(Asset)	-0.001	-0.014	0.000
	(-0.12)	(-0.99)	(0.02)
Leverage	-0.319***	-0.305***	-0.377***
	(-7.22)	(-6.26)	(-4.25)
Book/Mkt	-0.022***	-0.022***	-0.031*
	(-2.90)	(-2.87)	(-1.67)
Firm FE	Y	Y	Y
Time FE	Y	Y	Y
N.Obs	10,204	8,718	1,935
R-squared	0.322	0.311	0.351

- ▶ *Only* cross-holding funds' actions predict return
  (1 σ corresponds to $\sim$ 1.2% / qtr.)
- ▶ Average action from more *XH* funds gives a stronger signal
- ▶ Implication on a trading strategy

Case Study I: Around Downgrade Events

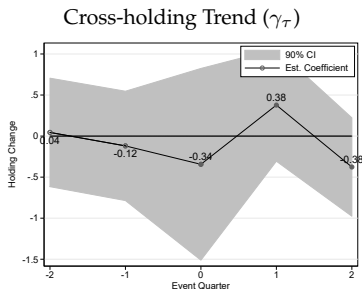Do equity funds learn from its sister bond funds around downgrading ($\mathbb{D}$) events?

$$\Delta H_{i,f,t+\tau}^{Equity} = \alpha_{f,t} + \beta_\tau \cdot \mathbb{D}_{i,t} + \gamma_\tau \cdot \mathbb{D}_{i,t} \cdot Cohold_{i,f,t-2} + \lambda \cdot Z_{i,t+\tau} + \varepsilon_{i,f,t+\tau}, \ \ \tau \in [-2, 2]$$

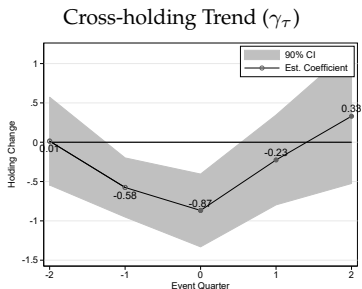Overall Trend (β_τ) — Cross-holding Trend (γ_τ)

▶ The equity fund with cross-holding reduces the holding at least 1 quarter prior to the downgrade.

Case Study I: Around Downgrade Events (IG→HY)

$$\Delta H_{i,f,t+\tau}^{Equity} = \alpha_{f,t} + \beta_\tau \cdot \mathbb{D}_{i,t} + \gamma_\tau \cdot \mathbb{D}_{i,t} \cdot Cohold_{i,f,t-2} + \lambda \cdot Z_{i,t+\tau} + \varepsilon_{i,f,t+\tau}, \ \ \tau \in [-2,2]$$

Cross-holding Trend (γ_τ)

Downgrade within IG

Cross-holding Trend (γ_τ)

Downgrade from IG to HY

▶ Most of the action is concentrated in events of "fallen angel".

Case Study II: Around Earning Surprise Events

Do bond funds learn from its sister equity funds around earning surprise ($\mathbb{N}$) events?

- ▶ Negative earning surprise events: a firm announces negative EPS while a positive EPS is expected by the most recent analysts' forecasts.

Overall Trend (β_τ)

Cross-holding Trend (γ_τ)
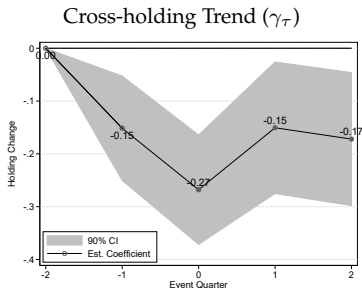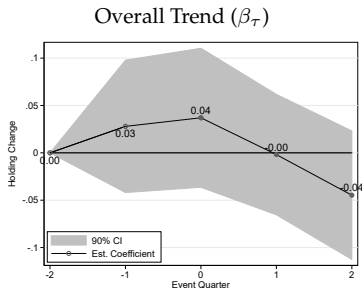
- ▶ The bond fund with cross-holding reduces the holding at least 1 quarter prior to the negative earning surprise.

Conclusion

The paper study how information flows across equity funds and bond funds in the same fund family.

- ▶ We show that sister funds' holdings comove more significantly than stand-alone equity and bond funds.

- ▶ We find that sister funds make more profit-generating position adjustment and better predict return by information synergy.

- ▶ Our results imply that information content in each asset market is *not* redundant, and integration of information can lead better performance than one side of information.