Connected Stocks: Evidence from Tehran Stock Exchange

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Motivation

Research Question

- **Can the common ownership cause stock return comovement ?**
  - We connect stocks through the common ownership by blockholders (ownership $> 1\%$)
  - We focus on excess return comovement for a pair of the stocks
  - We use common ownership to forecast cross-sectional variation in the realized correlation of four-factor + industry residuals

Why does it matter?

- Covariance
  - Covariance is a key component of risk in many financial applications.
    (Portfolio selection, Risk management, Hedging and Asset pricing)
  - Covariance is a significant input in risk measurement models
    (Such as Value-at-Risk)
- Return predictability
  - If it's valid, we can build a profitable buy-sell strategy

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Main Effect

- **Common-ownership and comovement efect**
  [Antón and Polk (2014)]
  Stocks sharing many common investors tend to comove more strongly with each other in the future than otherwise similar stocks.

- **Common-ownership and liquidity demand**

  [Koch et al (2016), Pastor and Stambaugh (2003), Acharya and Pedersen (2005)]
  Commonality in stock liquidity is likely driven by correlated trading among a given stock's investors. Commonality in liquidity is important because it can influence expected returns

- **Trading needs and comovement**

  [Greenwood and Thesmar (2011)]
  If the investors of mutual funds have correlated trading needs, the stocks that are held by mutual funds can comove even without any portfolio overlap of the funds themselves

- **Stock price synchronicity and poor corporate governance**

  [Boubaker et al. (2014), Khanna and Thomas (2009), Morck et al. (2000)]
  Stock price synchronicity has been attributed to poor corporate governance and a lack of firm-level transparency. On the other hand, better law protection encourages informed trading, which facilitates the incorporation of firm-specific information into stock prices, leading to lower synchronicity

Papers' Detail

Commonownership measurements

Model-based measures

- $HJL_I^A(A,B) = \sum_{i \in I^{A,B}} \frac{\alpha_{i,B}}{\alpha_{i,A}+\alpha_{i,B}}$ [Harford et al.-JFE-2011]
  - Bi-directional
  - Pair-level measure of common ownership
  - Its potential impact on managerial incentives
  - Measure not necessarily increases when the relative ownership increases
  - Accounts only for an investor's relative holdings
- $MHHI = \sum_j \sum_k s_j s_k \frac{\sum_i \mu_{ij}\nu_{ik}}{\sum_i \mu_{ij}\nu_{ij}}$ [Azar et al.-JF-2018]
  - Capture a specific type of externality
  - Measured at the industry level
  - Assumes that investors are fully informed about the externalities
- $GGL^A(A,B) = \sum_{i=1}^{I} \alpha_{i,A} g(\beta_{i,A}) \alpha_{i,B}$ [Erik et al.-JFE-2019]
  - Bi-directional
  - Less information
  - Not sensitive to the scope
  - Measure increases when the relative ownership of firm A increases

Commonownership measurements

Ad hoc common ownership measures

- $Overlap_{Count}(A,B) = \sum_{i \in I^{A,B}} 1$
  [He and Huang -RFS(2017)] [He et al-JFE(2019)]
- $Overlap_{Min}(A,B) = \sum_{i \in I^{A,B}} min\{\alpha_{i,A}, \alpha_{i,B}\}$
  [Newham et al.(2018)]
- $Overlap_{AP}(A,B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \frac{\bar{\nu}_A}{\bar{\nu}_A + \bar{\nu}_B} + \alpha_{i,B} \frac{\bar{\nu}_B}{\bar{\nu}_A + \bar{\nu}_B}$
  [Antón and Polk -JF(2014)]
- $Overlap_{HL}(A,B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \times \sum_{i \in I^{A,B}} \alpha_{i,B}$
  [Hansen and Lott -JGQA(1996)] [Freeman-(2019)]
- Unappealing properties
  - Unclear is whether any of these measures represents an economically meaningful measure of common ownership's impact on managerial incentives.
  - Both Overlap_{Count} and Overlap_{AP} are invariant to the decomposition of ownership between the two firms, which leads to some unappealing properties.

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Measuring Common Ownership

Antón and Polk -JF(2014)

$$FCAP_{ij,t} = \frac{\sum_{f=1}^{F}(S_{i,t}^{f} P_{i,t} + S_{j,t}^{f} P_{j,t})}{S_{i,t} Pi, t + S_{j,t} Pj, t}$$

SQRT

$$[\frac{\sum_{f=1}^{F}(\sqrt{S_{i,t}^{f} P_{i,t}} + \sqrt{S_{j,t}^{f} P_{j,t}})}{\sqrt{S_{i,t} Pi, t} + \sqrt{S_{j,t} Pj, t}}]^2$$

Quadratic

$$[\frac{\sum_{f=1}^{F}[(S_{i,t}^{f} P_{i,t})^2 + (S_{j,t}^{f} P_{j,t})^2]}{(S_{i,t} Pi, t)^2 + (S_{j,t} Pj, t)^2}]^{-1}$$

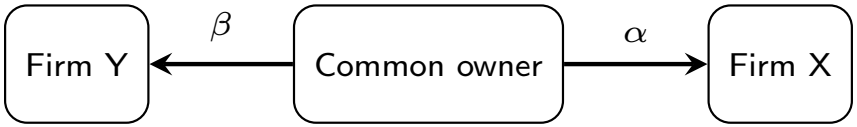
Intuition

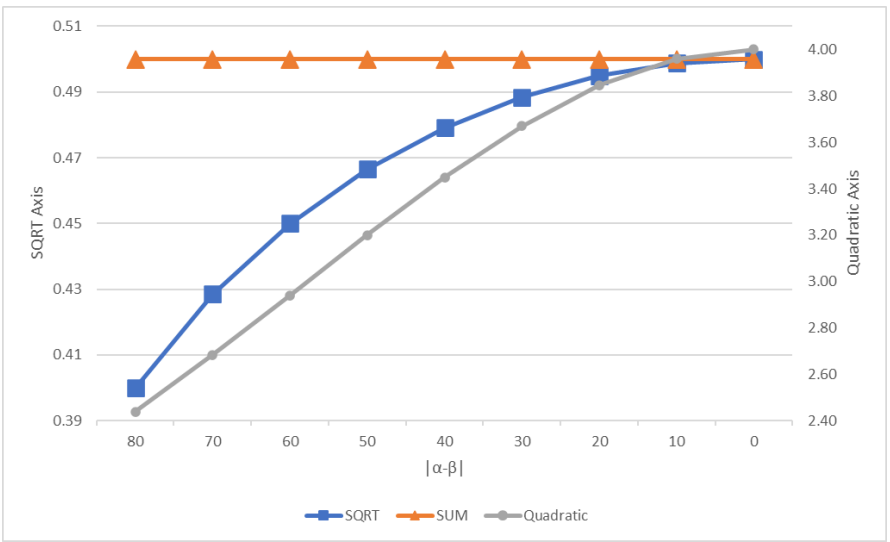
If for a pair of stocks with n mutual owners, all owners have even shares of each firm's market cap, then the proposed indexes will be equal to n. Proof

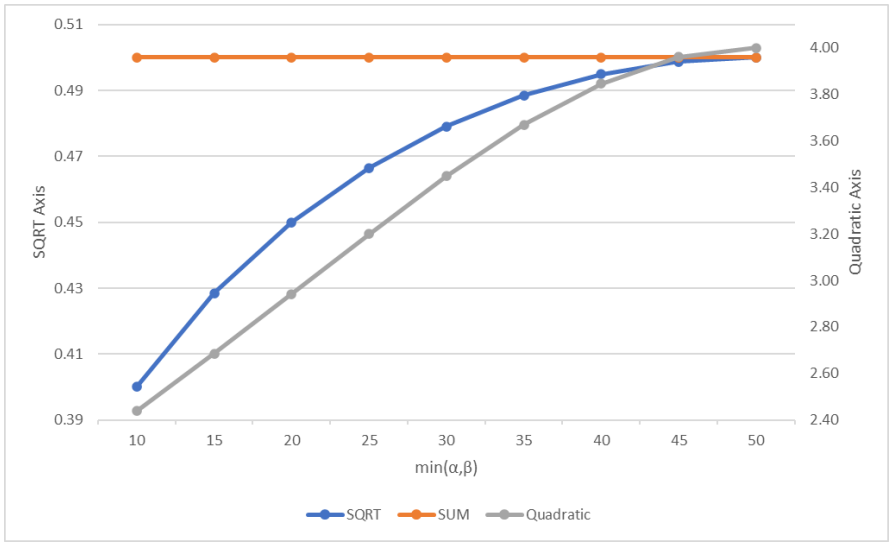
Measuring Common Ownership

Example

α and β are the percent of common owner's ownership from firms' market cap. For better observation, assume that $\alpha + \beta = 100$ and both firm have equal market cap.



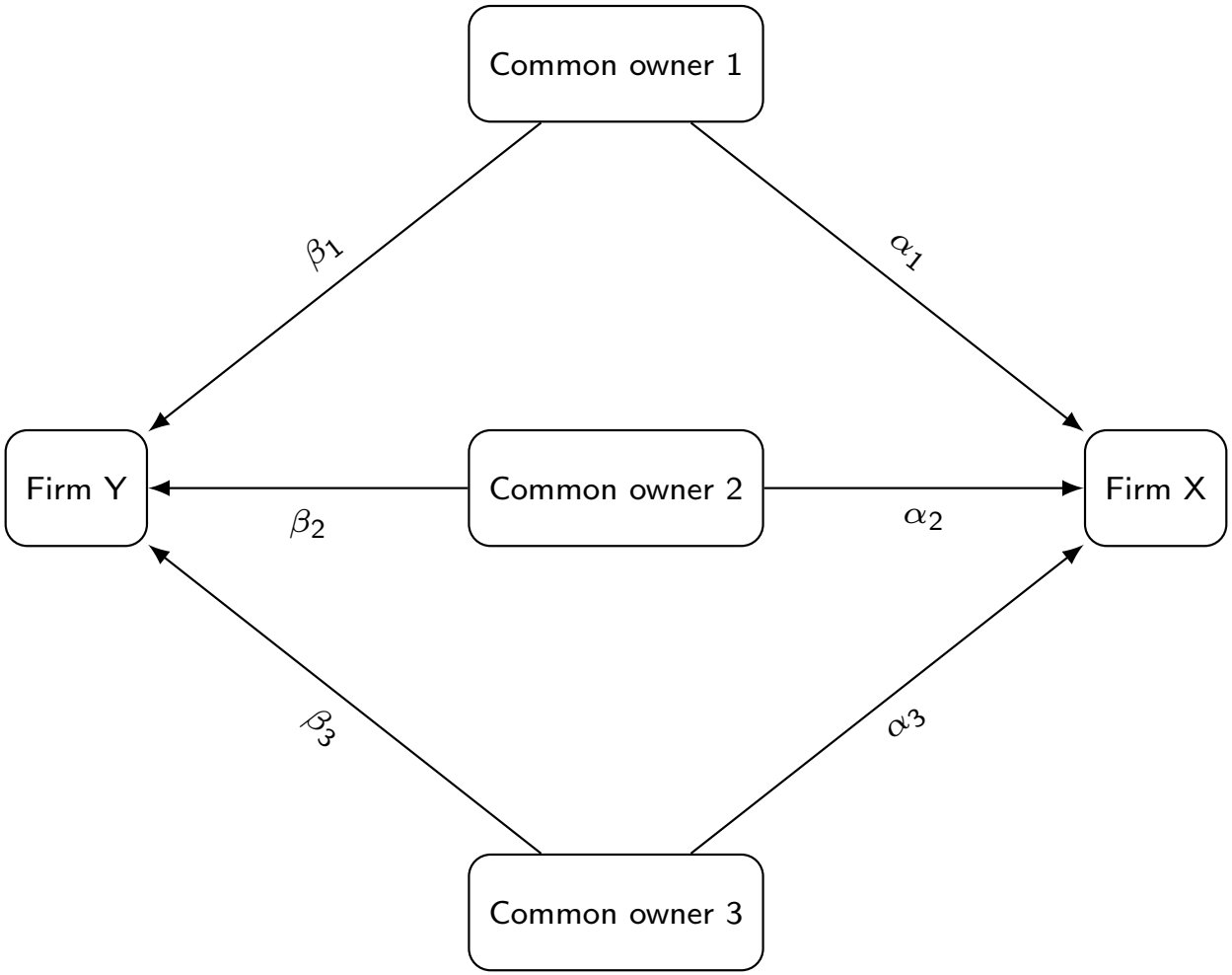




Comparison of three methods for calculating common ownership

Measuring Common Ownership

Example of three common owner



Measuring Common Ownership

Example of three common owner

Ownership	Type I	Type II	Type III	Type IV	Type V	Type VI	Type VII
α_1	1/3	20	10	20	10	5	1
β_1	1/3	10	10	20	10	5	1
α_2	1/3	10	80	20	10	5	1
β_2	1/3	200	80	20	10	5	1
α_3	1/3	70	10	20	10	5	1
β_3	1/3	70	10	20	10	5	1
SQRT	3	2.56	2.33	1.8	0.9	0.45	0.09
SUM	1	1	1	0.6	0.3	0.15	0.03
Quadratic	3	1.85	1.52	8.33	33.33	133.33	3333.33

Measuring Common Ownership

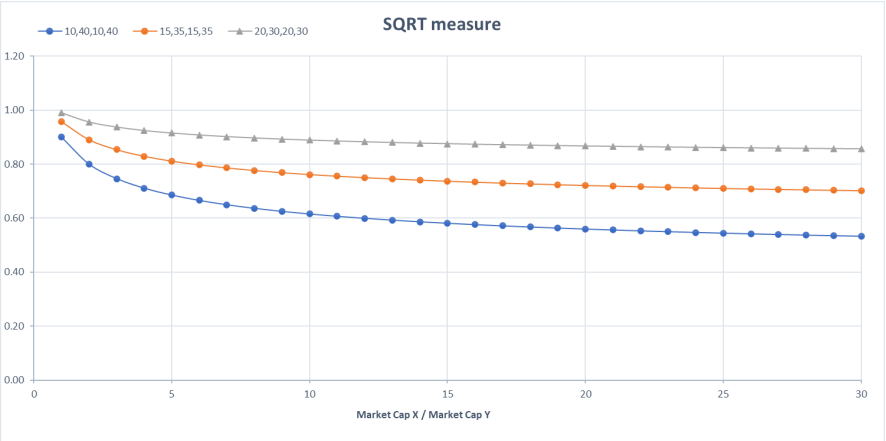
Comparison

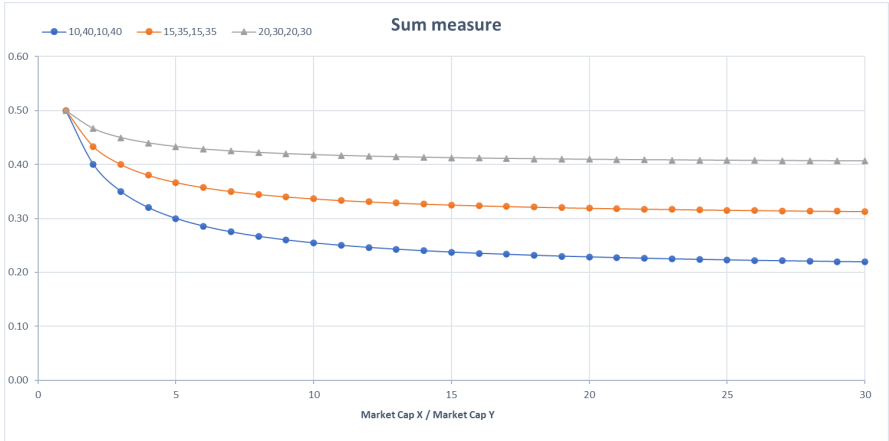
- For better comparison we relax previous assumptions:
  - Two Firms with different market caps.

	$(\alpha_1,\beta_1),(\alpha_2,\beta_2)$					
	(10,40),(10,40)		(15,35),(15,35)		(20,30),(20,30)	
$\frac{\text{MarketCap}_x}{\text{MarketCap}_y}$	SQRT	SUM	SQRT	SUM	SQRT	SUM
1	0.90	0.50	0.96	0.50	0.99	0.50
2	0.80	0.40	0.89	0.43	0.96	0.47
3	0.75	0.35	0.85	0.40	0.94	0.45
4	0.71	0.32	0.83	0.38	0.92	0.44
5	0.69	0.30	0.81	0.37	0.91	0.43
6	0.67	0.29	0.80	0.36	0.91	0.43
7	0.65	0.28	0.79	0.35	0.90	0.43
8	0.64	0.27	0.78	0.34	0.90	0.42
9	0.63	0.26	0.77	0.34	0.89	0.42
10	0.62	0.25	0.76	0.34	0.89	0.42

Measuring Common Ownership

Comparison





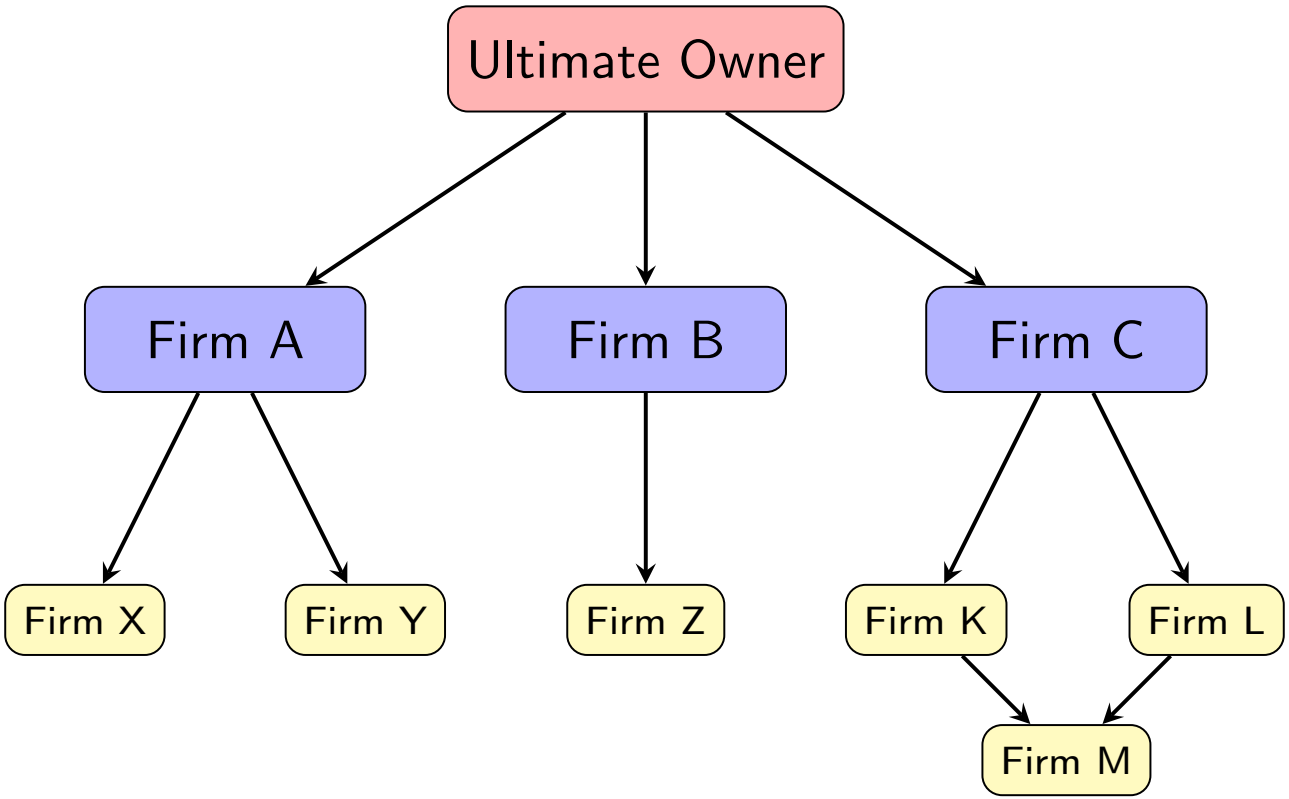
Comparison of two methods for calculating common ownership

Conclusion

We use the SQRT formula because it has an acceptable variation and has fair values at lower level of common ownership.

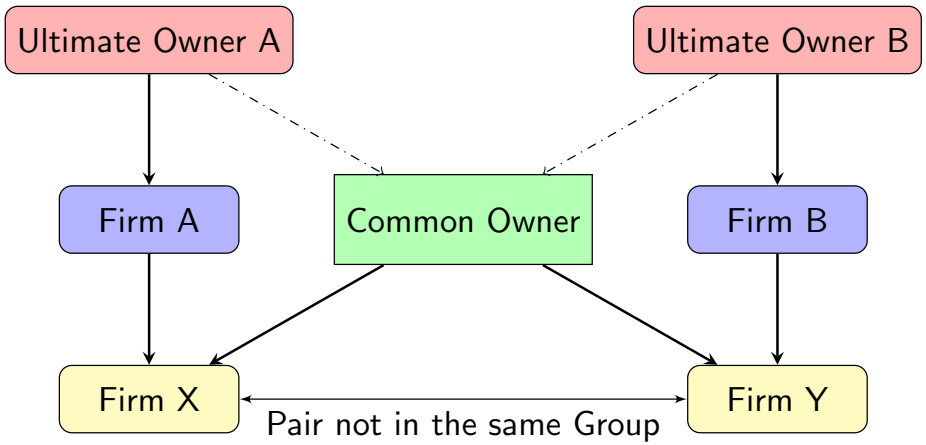
Pair Composition and Business Group

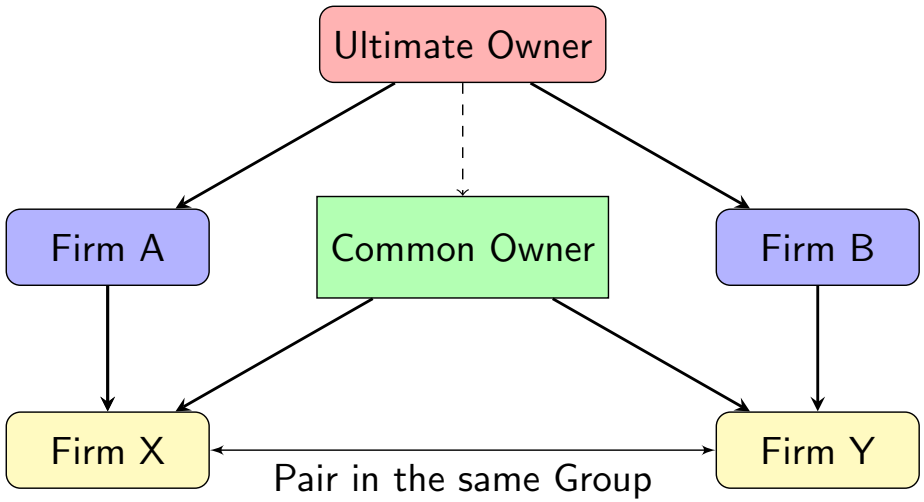
Business Group



Pair Composition and Business Group

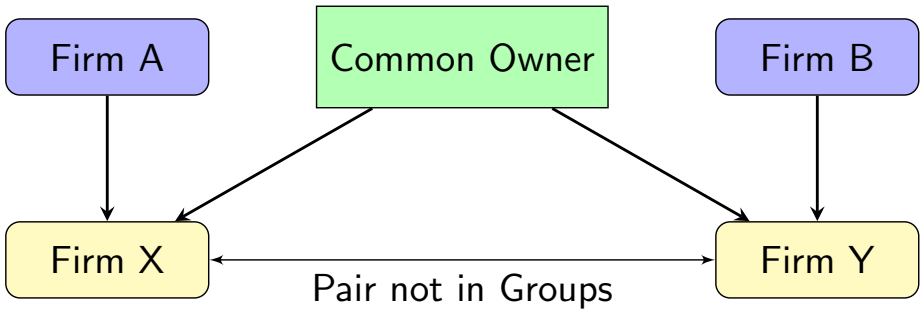
Pair in the Business Group

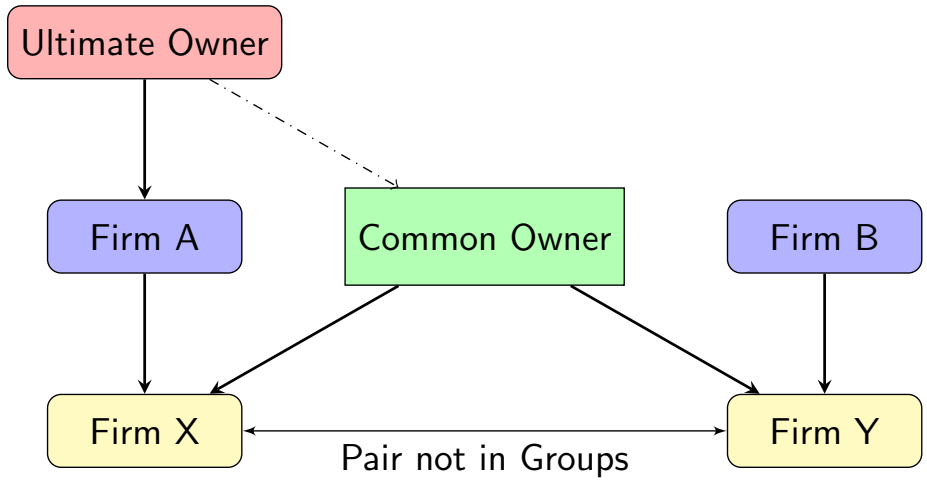




Pair Composition and Business Group

Pair not in any of Business Groups





Pair Composition

- Pairs consist of two firms with at least one common owner
  - 9336 unique pairs which is 16% of possible pairs ($\frac{342*341}{2} = 58311$)

	mean	min	median	max
Number of unique paris	4201	2889	4099	5115

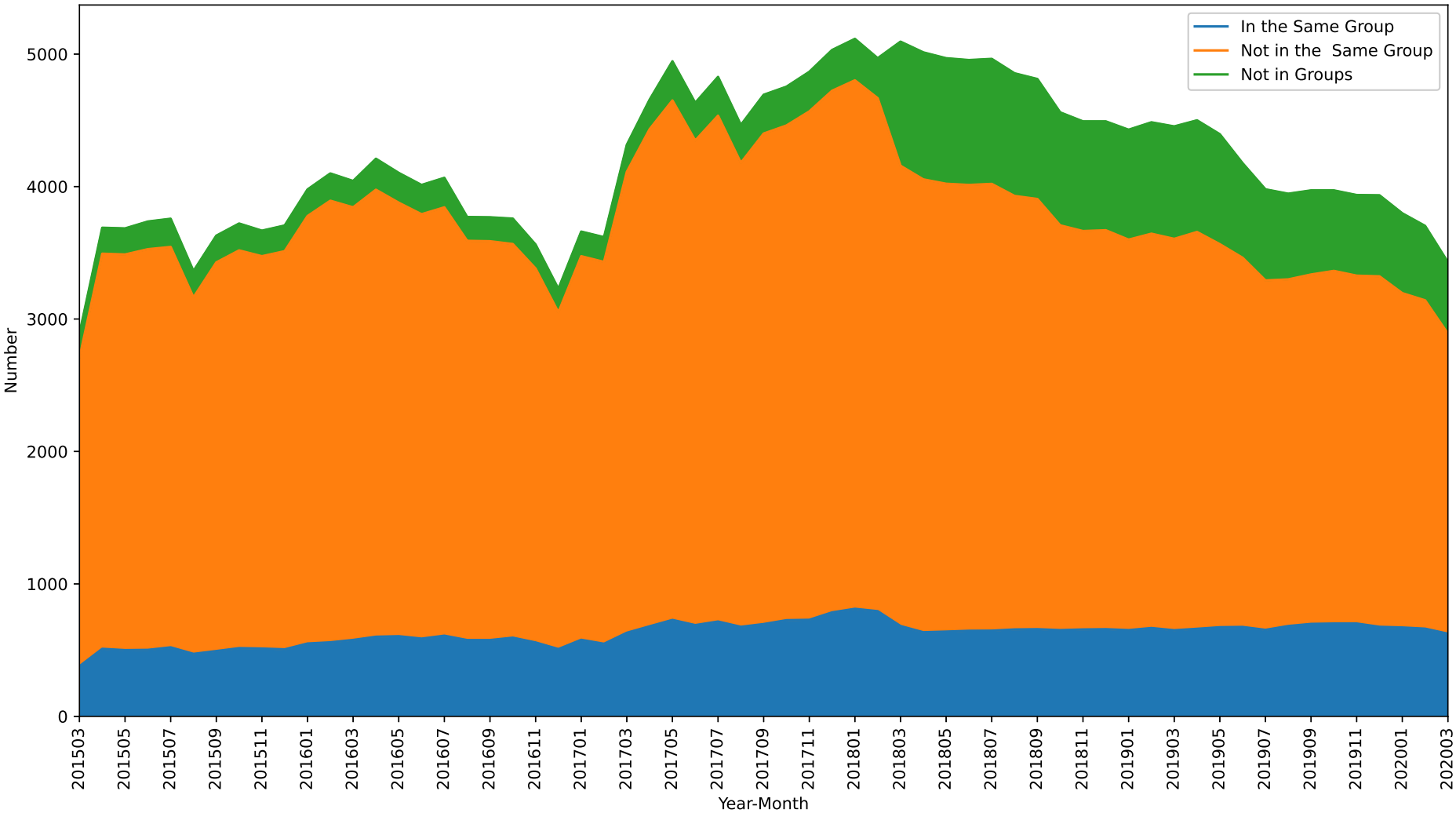
Year	2015	2016	2017	2018	2019	2020	Mean
No. of Pairs	4412	5591	6363	7439	6438	4078	5720
No. of Groups	40	41	43	43	39	39	41
No. of Pairs not in Groups	228	272	329	1116	1068	625	606
No. of Pairs in the same Group	628	749	959	1042	961	715	842
No. of Pairs not in the same Group	3541	4527	5032	5201	4313	2729	4224
Avg. Number of Common owner	1.24	1.22	1.21	1.19	1.20	1.18	1.21
Med. Number of Common owner	1	1	1	1	1	1	1
Avg. Number of Pairs in one Group	24	24	26	27	26	20	25
Med. Number of Pairs in one Group	10	11	9	10	11	8	10
Av. Percent of each Blockholder	18.74	19.25	19.41	19.38	19.28	18.82	19.15
Medi. Percent of each Blockholder	10	10.08	10.31	10.17	10.48	10.79	10.31
Av. Number of Owners	6.06	5.93	5.8	5.91	5.94	6.06	5.95
Med. Number of Owners	6.08	5.96	5.82	5.92	5.92	6.02	5.95
Av. Block. Ownership	81.37	82.21	82.64	83.29	83.48	82.94	82.66
Med. Block. Ownership	80.03	80.6	80.74	81.48	81.63	81.28	80.96

Data Summary

- We use blockholders' data from 2015/03/25 (1394/01/06) to 2020/03/18 (1398/12/28)
  - Includes of 1203 Days and 60 Months
  - Consists of 600 firm inculding 342 firm with common owners

Year	2015	2016	2017	2018	2019	2020	mean
No. of Firms	353	381	514	545	573	597	494
No. of Blockholders	721	886	1258	1367	1397	1369	1166
No. of Groups	41	42	46	45	40	46	43
No. of Firms not in Groups	112	124	191	204	228	253	185
No. of Firms in Groups	241	264	333	349	345	353	314
Avg. Number of Members	6	6	7	8	9	8	7
Med. of Number of Members	4	4	6	6	6	6	5
Av. Of each Blockholder's ownership	21	21.6	20.4	22.9	25.5	25.1	22.75
Med. of each Blockholder's ownership	7.66	6.87	6.8	7.25	9.33	9.63	7.92
Av. Number of Blockholders	5	5	5	5	5	4	5
Med. Number of Owners	4	4	4	4	4	3	4
Av. Block. Ownership	71.9	71.8	68.5	77.9	78.7	69.3	73.02
Med. Block. Ownership	80.6	80.4	77.5	83.4	82	75.1	79.83

Number of Pairs



FCA vs. FCAP Summary

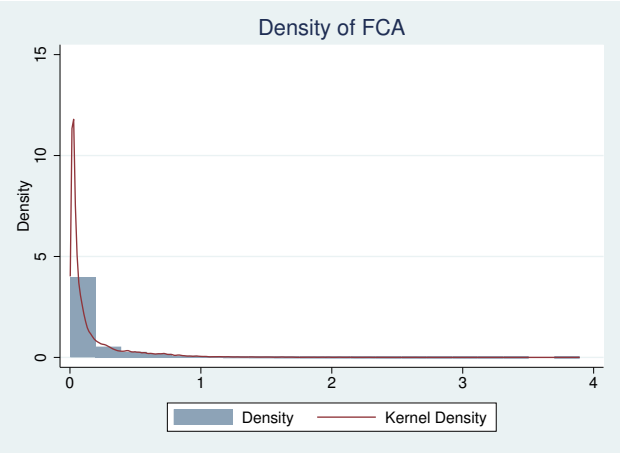
	variable	count	mean	std	min	25%	median	75%	max
Total	FCA	256296	0.164	0.266	0.002	0.024	0.057	0.174	3.893
	FCAP	256296	0.138	0.188	0.002	0.023	0.052	0.157	0.999
Same Group	FCA	41199	0.481	0.419	0.003	0.147	0.424	0.690	3.893
	FCAP	41199	0.388	0.264	0.004	0.124	0.394	0.605	0.999
Not Same Group	FCA	215097	0.104	0.166	0.002	0.022	0.045	0.112	2.813
	FCAP	215097	0.090	0.120	0.002	0.021	0.042	0.106	0.999
Same Industry	FCA	40009	0.375	0.416	0.007	0.059	0.233	0.567	3.893
	FCAP	40009	0.288	0.260	0.006	0.054	0.198	0.491	0.999
Not Same Industry	FCA	216287	0.125	0.205	0.002	0.023	0.048	0.128	2.869
	FCAP	216287	0.110	0.156	0.002	0.022	0.045	0.121	0.999

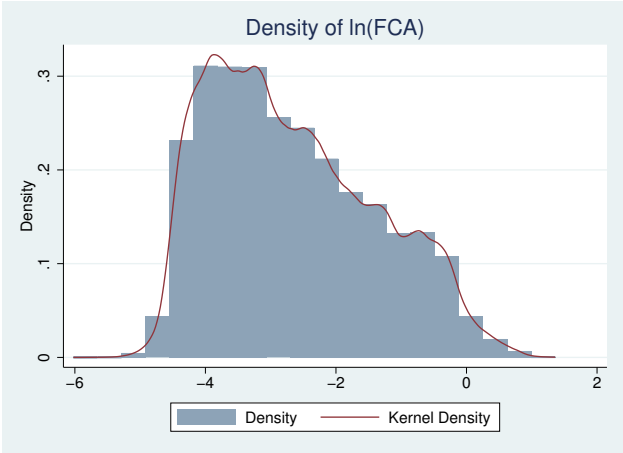
Results

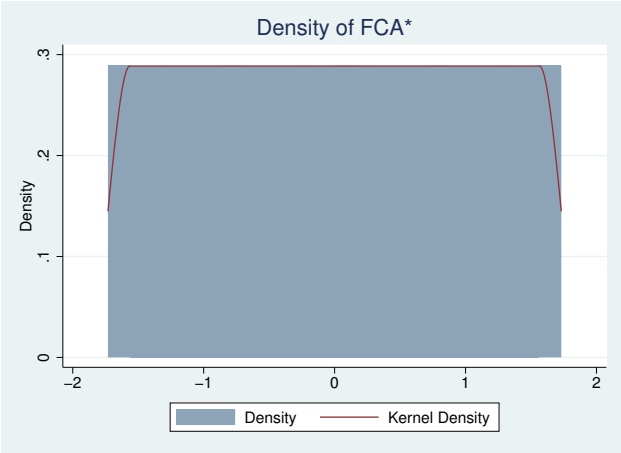
- By the proposed measurement, common ownership increases
- Common ownership is greater in pairs that are in the same business group and insutry

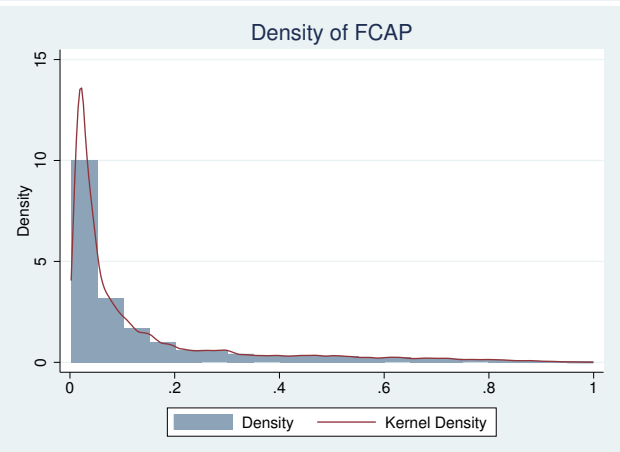
FCA vs. FCAP Distributions

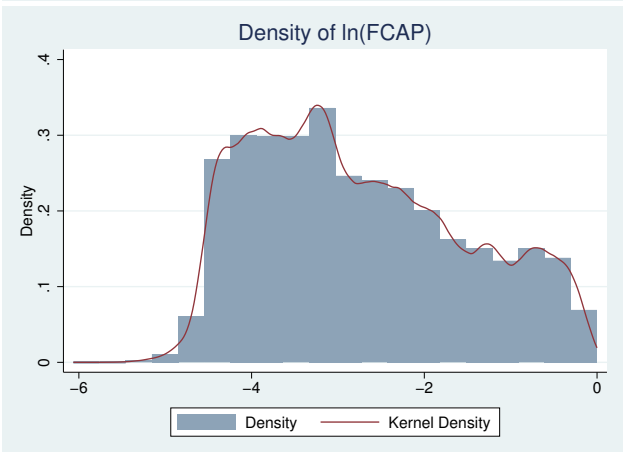
Monthly

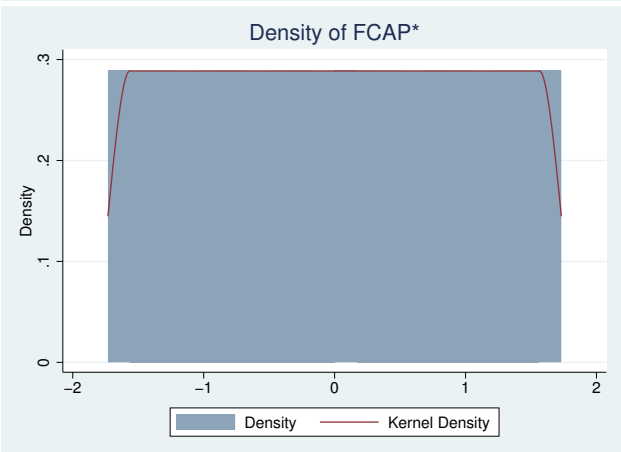












Fortnightly

Correlation Calculation

4 Factor + Industry

1. Frist Step:
   Estimate each of these models on periods of three month:
   - CAPM + Industry (2 Factor):

$$R_{i,t} = \alpha_i + \beta_{mkt,i} R_{M,t} + \beta_{Ind,i} R_{Ind,t} + \boxed{\varepsilon_{i,t}}$$

   - 4 Factor :

$$R_{i,t} = \alpha_i + \beta_{mkt,i} R_{M,t} + \\ + \beta_{HML,i} HML_t + \beta_{SMB,i} SMB_t + \beta_{UMD,i} UMD_t + \boxed{\varepsilon_{i,t}}$$

   - 4 Factor + Industry (5 Factor) :

$$R_{i,t} = \alpha_i + \beta_{mkt,i} R_{M,t} + \beta_{Ind,i} R_{Ind,t} + \\ + \beta_{HML,i} HML_t + \beta_{SMB,i} SMB_t + \beta_{UMD,i} UMD_t + \boxed{\varepsilon_{i,t}}$$

2. Second Step:
   Calculate monthly correlation of each stock pair's daily abnormal returns (residuals)

Correlation Calculation Results

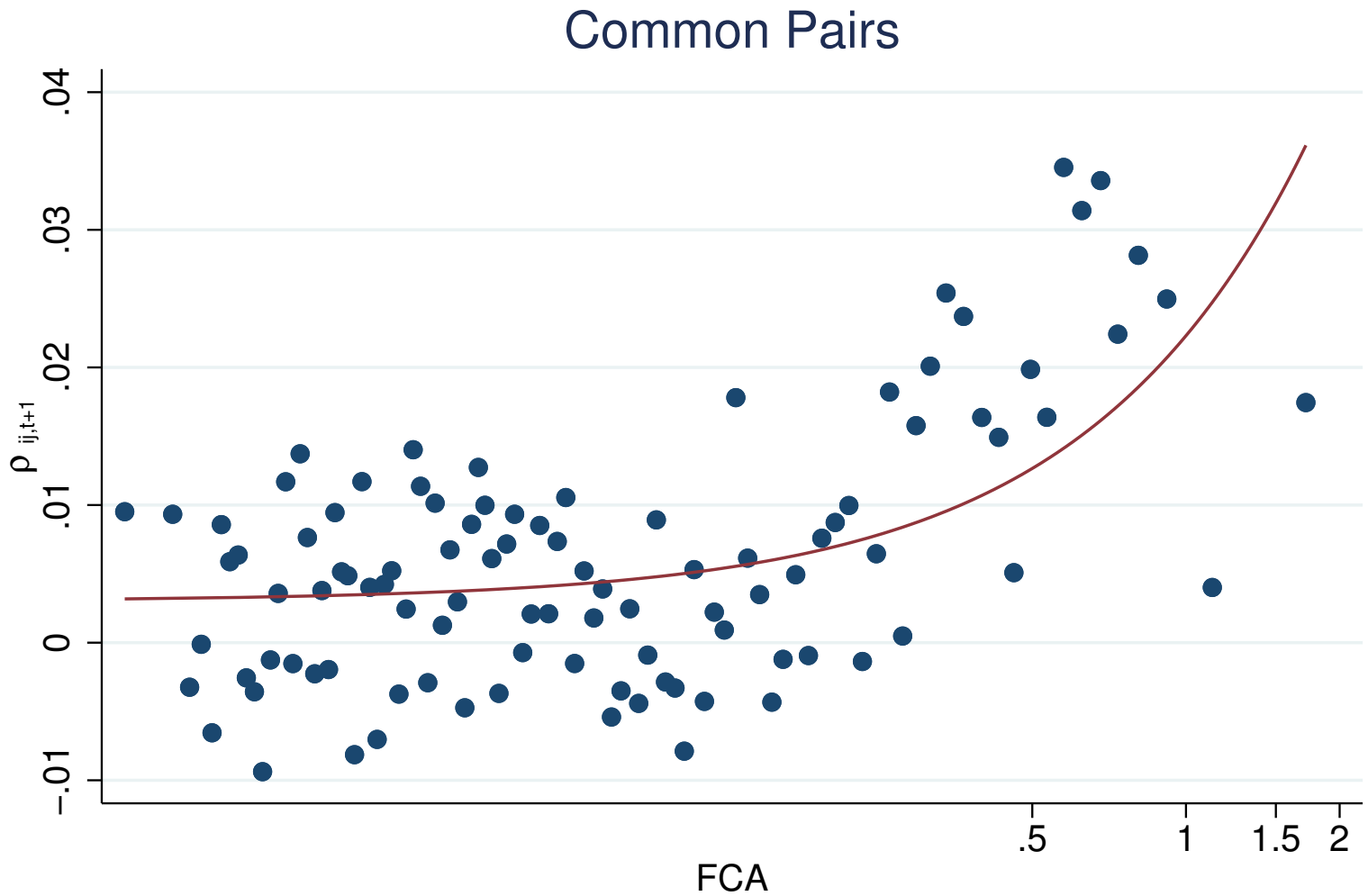
Factors	mean	std	min	max
SMB	0.19	1.47	-5.64	19.52
HML	-0.12	1.39	-4.90	23.20
Winner − Loser	0.69	1.06	-2.61	8.58
Market	0.24	1.23	-4.71	4.89

$\rho_{ij,t}$	count	mean	std	min	25%	50%	75%	max
CAPM + Industry	255222	0.008	0.324	-1	-0.192	0.007	0.206	1
4 Factor	255250	0.040	0.335	-1	-0.170	0.035	0.248	1
4 Factor + Industry	255239	0.006	0.322	-1	-0.192	0.005	0.204	1

Conclusion

We use the 4 Factor + Industry model to control for exposure to systematic risk because it almost captures all correlations between two firms in each pair.

Future Correlation via *FCA*



This figure graphs the correlation of daily 4Factor+Industry residuals in monthh t+1 against our measure of institutional connectedness.

Controls

- ρ_t : Current period correlation
- **SameGroup** : Dummy variable for whether the two stocks belong to the same business group.
- **SameIndustry** : Dummy variable for whether the two stocks belong to the same Industry.
- **SameSize** : The negative of absolute difference in percentile ranking of size across a pair
- **SameBookToMarket** :The negative of absolute difference in percentile ranking of the book to market ratio across a pair

Summary of Controls

Monthly

Type of Pairs	Yes	No
SameIndustry	1092	8244
	(12%)	(88%)
SameGroup	1065	8271
	(11%)	(89%)

	count	mean	std	min	25%	50%	75%	max
SameIndustry	256296	0.16	0.36	0	0	0	0	1.00
SameGroup	228640	0.17	0.37	0	0	0	0	1.00
Size1	256296	0.75	0.21	0.01	0.62	0.81	0.93	1.00
Size2	256296	0.48	0.25	0.00	0.29	0.46	0.67	1.00
SameSize	256296	-0.27	0.21	-0.99	-0.41	-0.23	-0.10	0.00
BookToMarket1	256296	0.52	0.26	0.00	0.32	0.53	0.74	1.00
BookToMarket2	256296	0.50	0.24	0.00	0.31	0.49	0.69	1.00
SameBookToMarket	256296	-0.29	0.21	-1.00	-0.42	-0.25	-0.12	0.00

Fortnightly

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Fama-MacBeth Estimation

- Fama-MacBeth regression analysis is implemented using a two-step procedure.
  - The first step is to run periodic cross-sectional regressions of the dependent variable of interest using data from each time period t.
  - The second step is to analyze the time series of each of the regression coefficients to determine whether the average coefficient differs from zero.

Fama-MacBeth (1973)

- Two Step Regression
  - First Step

$$Y_{i1} = \delta_{0,1} + \delta^1_{1,1} X^1_{i,1} + \cdots + \delta^k_{k,1} X^k_{i,1} + \varepsilon_{i,1}$$
$$\vdots$$
$$Y_{iT} = \delta_{0,1} + \delta^1_{1,T} X^1_{i,T} + \cdots + \delta^k_{k,T} X^k_{i,T} + \varepsilon_{i,T}$$

  - Second Step

$$\begin{bmatrix} \bar{Y}_1 \\ \vdots \\ \bar{Y}_T \end{bmatrix}_{T\times 1} = \begin{bmatrix} 1 & \delta^0_1 & \delta^1_1 & \dots & \delta^k_1 \\ \vdots & \vdots & \vdots & \dots & \vdots \\ 1 & \delta^0_T & \delta^1_T & \dots & \delta^k_T \end{bmatrix}_{T\times(k+2)} \times \begin{bmatrix} \lambda \\ \lambda_0 \\ \lambda_1 \\ \vdots \\ \lambda_k \end{bmatrix}_{(k+2)\times 1}$$

- Fama-MacBeth technique was developed to account for correlation between observations on different firms in the same period

calculate the standard errors

- In most cases, the standard errors are adjusted following Newey and West (1987).
  - Newey and West (1987) adjustment to the results of the regression produces a new standard error for the estimated mean that is adjusted for autocorrelation and heteroscedasticity.
  - Only input is the number of lags to use when performing the adjustment

    $$Lag = 4(T/100)^{\frac{2}{9}}$$

    where T is the number of periods in the time series

Fixed effect or Fama-MacBeth

- Both methods rely on zero correlation between the error terms of non-contemporaneous periods. A difference is weighting:
  - The Fama-Macbeth procedure weights each time period equally.
  - A panel regression will effectively give greater weight to periods with more observations or greater variation in right hand side variables
- The econometric analysis of panel data depends in a crucial way on the cross-sectional and timeseries correlation of the regression residuals

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Estimation model

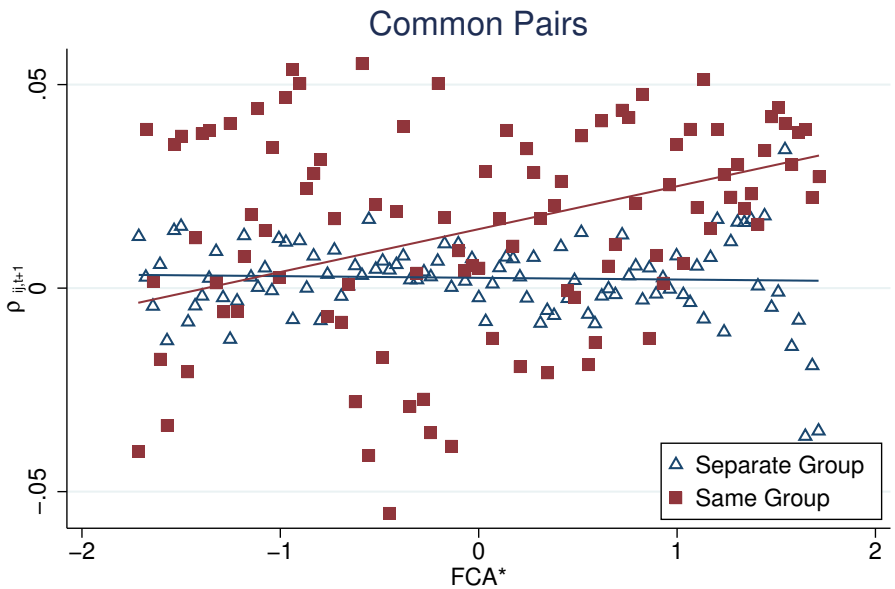
- Use Fama macbeth to estimate this model

$$\begin{aligned}\rho_{ij,t+1} = \beta_0 &+ \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij} \\ &+ \beta_3 * \text{FCA}^*_{ij,t} \times \text{SameGroup}_{ij} \\ &+ \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}\end{aligned} \tag{1}$$

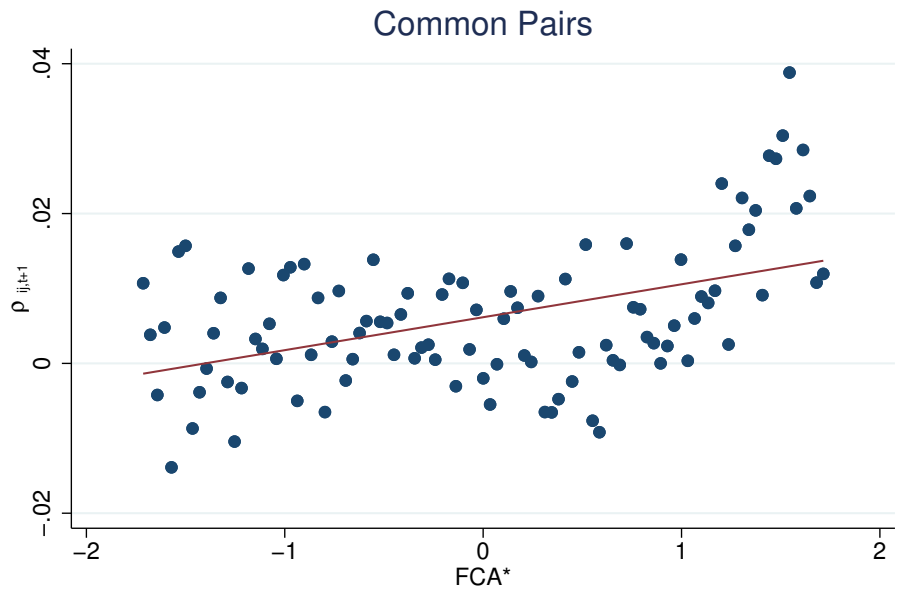
- Estimate that model on a monthly frequency
- Adjust standard errors by Newey and West adjustment with 4 lags $(4(60/100)^{\frac{2}{9}} = 3.57 \sim 4)$

Future Correlation via *FCA*

Normalized Rank-Transformed



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against normalized rank transformed of our measure of institutional connectedness.



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness.

Fortnightly

Model Estimation

Normalized Rank-Transformed

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
FCA*	0.00469***	0.00386***	0.00108	-0.000208	-0.0000636	-0.000294
	(4.64)	(4.90)	(1.21)	(-0.23)	(-0.07)	(-0.34)
ρ_t		0.129***	0.129***	0.129***	0.129***	0.129***
		(5.11)	(5.08)	(5.08)	(5.08)	(5.07)
SameGroup			0.0179***	0.0101***	0.0114***	0.0121***
			(8.00)	(3.96)	(4.28)	(4.56)
(FCA*) × SameGroup				0.00952***	0.00969***	0.00950***
				(4.36)	(4.40)	(4.31)
SameIndustry					-0.00403*	-0.00515**
					(-2.19)	(-2.72)
SameSize						0.0115***
						(4.19)
SameBookToMarket						0.00784*
						(2.06)
Constant	0.00623***	0.00531***	0.00249***	0.00227**	0.00264***	0.00804***
	(7.92)	(7.65)	(3.61)	(3.23)	(3.96)	(6.47)
Observations	247465	246715	246715	246715	246715	246715
R^2	0.001	0.035	0.036	0.036	0.036	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model Estimation

Normalized Rank-Transformed (Bearish Market)

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals				
	(1)	(2)	(3)	(4)	(5)
FCA*	-0.000294	-0.000294	-0.000294	-0.000294	-0.000294
	(-0.34)	(-0.34)	(-0.34)	(-0.34)	(-0.34)
(FCA*) × SameGroup	0.00950***	0.00950***	0.00950***		
	(4.31)	(4.31)	(4.31)		
SameGroup	0.0121***	0.00689**		0.00689**	
	(4.56)	(2.83)		(2.83)	
Bearish Market × SameGroup		0.00526***	0.00526***	0.00526***	0.00526***
		(3.71)	(3.71)	(3.71)	(3.71)
Bullish Market × SameGroup			0.00689**		0.00689**
			(2.83)		(2.83)
(FCA*) × Bullish Market × SameGroup				0.00464**	0.00464**
				(2.98)	(2.98)
(FCA*) × Bearish Market × SameGroup				0.00486**	0.00486**
				(2.86)	(2.86)
Observations	246715	246715	246715	246715	246715
R^2	0.037	0.037	0.037	0.037	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

Business Group Dummy

- We use group dummies and its interaction with FCA^*
  - Model with base:

$$\rho_{ij,t+1} = \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij} + \beta_3 * FCA^*_{ij,t} * \text{SameGroup}_{ij} + \sum_{1}^{G} \lambda_{1,g} * \delta_{ij,g} + \sum_{1}^{G} \lambda_{2,g} * \delta_{ij,g} * \text{FCA}^*_{ij,t} + \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}$$

  - Model without base:

$$\rho_{ij,t+1} = \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij} + \sum_{1}^{G} \lambda_{1,g} * \delta_{ij,g} + \sum_{1}^{G} \lambda_{2,g} * \delta_{ij,g} * \text{FCA}^*_{ij,t} + \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}$$

  - $\delta_{ij,g} = \text{SameGroup}_{ij} * \gamma_g$ which γ_g is a business group dummy

Effective Business Group

λ_2

Model without base		
Coef.	t-stat	Uo
0.07	2.29	vMaden
0.07	2	Sanat Madan Bank
0.06	4.64	Retirment
0.04	2.68	Maskan Bank
0.04	4.78	vKosar
0.03	2.07	Basij
0.02	2	Tapico
0.02	3.24	Melli Bank
0.01	2.01	vSakht
-0.04	-2.13	vTejarat
-0.09	-3.36	Fars
-0.1	-3.77	Edalat

Model with base		
Coef.	t-stat	Uo
0.037	4.78	β_3
-0.02	-2.32	Melli Bank
-0.02	-2.33	vSakht
-0.03	-3.15	Tipico
-0.03	-3.24	Sita
-0.03	-3.02	Setad ejraee Imam
-0.03	-3.42	Bonyad
-0.04	-2	Alipour Family
-0.05	-3.94	Imidro
-0.05	-2.21	Turkis partners
-0.06	-3.71	Sepah bank
-0.07	-3.89	vTejarat
-0.12	-4.6	Fars
-0.14	-4.95	Edalat

Effective Business Group

Check banking and Investment

- We define three types of groups
  - **Bank's Group:** Groups that their ultimate owner is bank
  - **Bank In Group:** Groups that ,at least, consist of one bank
  - **Inv. In Group:** Groups that ,at least, consist of one investment firm
- Estimated model:

$$\begin{aligned}\rho_{ij,t+1} = {} & \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij} \\ & + \beta_3 * \text{FCA}^*_{ij,t} * \ \text{SameGroup}_{ij} \\ & + \beta_4 * \text{Bank's Group}_{ij,g} + \beta_5 * \text{Bank's Group}_{ij,g} * \text{FCA}^*_{ij,t} \\ & + \beta_6 * \text{Bank In Group}_{ij,g} + \beta_7 * \text{Bank In Group}_{ij,g} * \text{FCA}^*_{ij,t} \\ & + \beta_8 * \text{Inv. In Group}_{ij,g} + \beta_9 * \text{Inv. In Group}_{ij,g} * \text{FCA}^*_{ij,t} \\ & + \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}\end{aligned}$$

  - All dummies of each type define by interaction with SameGroup_{ij}

Effective Business Group

Check banking and Investment

	De. Variable:Future Monthly Correlation of 4F+Industry Residuals				
	(1)	(2)	(3)	(4)	(5)
FCA*	-0.000481	-0.000500	-0.000418	-0.000484	-0.000393
	(-0.50)	(-0.51)	(-0.44)	(-0.50)	(-0.41)
SameGroup	0.0122***	0.0110***	0.0135***	0.0129**	0.0133**
	(4.57)	(3.72)	(4.22)	(2.71)	(2.77)
(FCA*) × SameGroup	0.00956***	0.00864***	0.00934***	0.00968**	0.00907*
	(4.28)	(3.63)	(3.89)	(2.68)	(2.53)
(FCA*) × Bank's group × SameGroup		0.00701			0.00896*
		(1.98)			(2.27)
(FCA*) × Bank in group × SameGroup			0.00436		0.00198
			(0.65)		(0.30)
(FCA*) × Inv. in group × SameGroup				-0.000916	-0.00243
				(-0.21)	(-0.46)
Observations	246715	246715	246715	246715	246715
R^2	0.037	0.038	0.038	0.038	0.039

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Estimation model

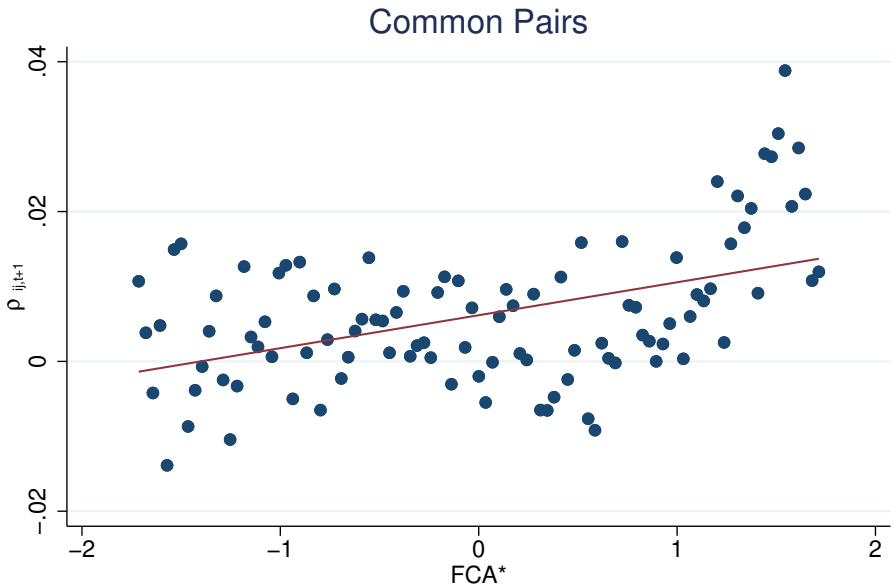
- Use Fama macbeth to estimate this model

$$\rho_{ij,t+1} = \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * (\text{FCA}^*_{ij,t} > Q3[\text{FCA}^*_{ij,t}]) \times \text{FCA}^*_{ij,t} + \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1} \tag{2}$$

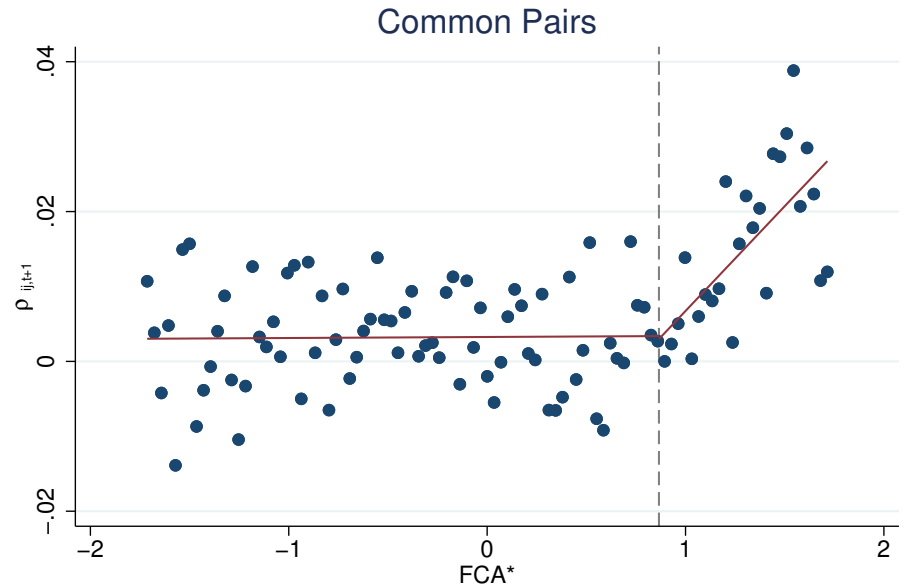
- Estimate that model on a monthly frequency

Future Correlation via *FCA*

Discontinuity



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness.



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness. Allow for discontinuity in fourth quarter

Fortnightly

Fama MacBeth Estimation

Discontinuity

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals				
	(1)	(2)	(3)	(4)	(5)
FCA*	0.00469***	0.000122	-0.000201	-0.000548	-0.000578
	(4.64)	(0.10)	(-0.18)	(-0.50)	(-0.53)
$(\text{FCA}^* > Q3[\text{FCA}^*]) \times \text{FCA}^*$		0.0104***	0.00922***	0.00424*	0.00411*
		(5.13)	(4.70)	(2.10)	(2.03)
ρ_t			0.129***	0.129***	0.129***
			(5.10)	(5.08)	(5.08)
SameGroup				0.0163***	0.0184***
				(7.21)	(7.49)
SameIndustry					-0.00531**
					(-2.85)
SameSize					0.0113***
					(4.15)
SameBookToMarket					0.00778*
					(2.04)
Constant	0.00623***	0.00286**	0.00232**	0.00137	0.00712***
	(7.92)	(3.00)	(2.71)	(1.60)	(4.89)
Observations	247465	247465	246715	246715	246715
R^2	0.001	0.001	0.035	0.036	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Estimation model

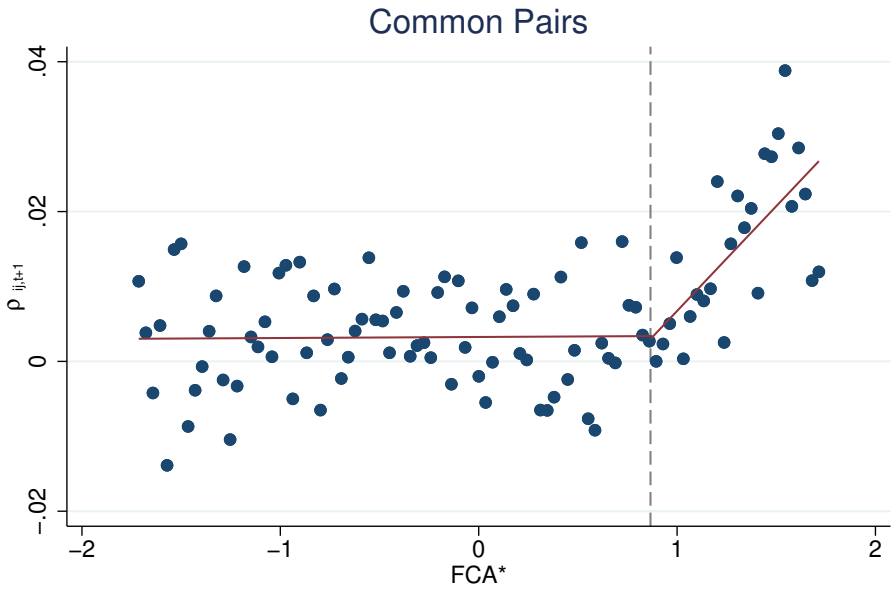
- Use Fama macbeth to estimate this model

$$\begin{aligned}\rho_{ij,t+1} = \beta_0 &+ \beta_1 * \text{FCA}^*_{ij,t} \\ &+ \beta_2 * (\text{FCA}^*_{ij,t} > Q3[\text{FCA}^*_{ij,t}]) \times \text{FCA}^*_{ij,t} \\ &+ \beta_3 * \text{FCA}^*_{ij,t} \times \text{SameGroup} \\ &+ \beta_4 * (\text{FCA}^*_{ij,t} > Q3[\text{FCA}^*_{ij,t}]) \times \text{FCA}^*_{ij,t} \times \text{SameGroup} \\ &+ \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}\end{aligned} \tag{3}$$

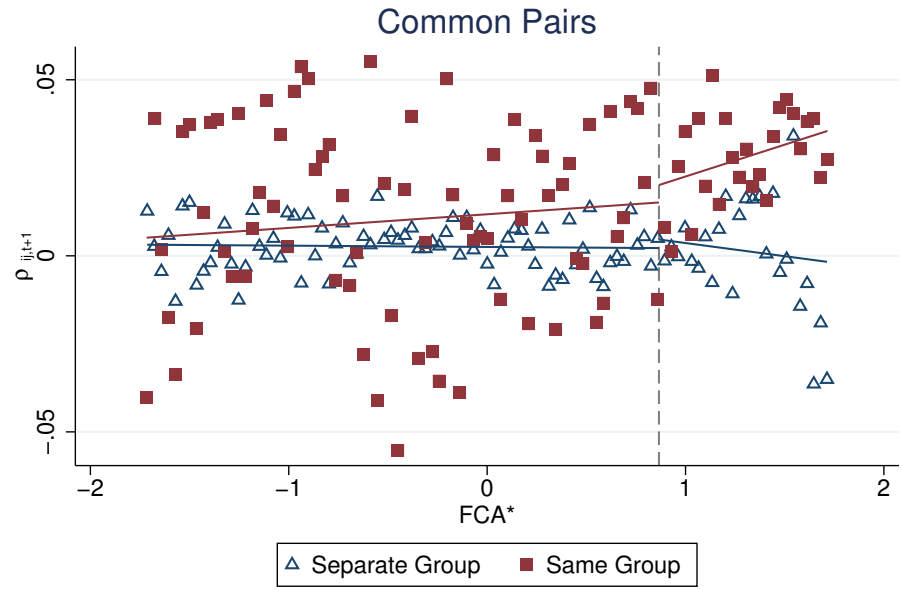
- Estimate that model on a monthly frequency

4 Factor + Industry Future Correlation via *FCA**

Discontinuity & Business Groups



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness. Allow for discontinuity in fourth quarter



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness. Allow for discontinuity in fourth quarter

Fortnightly

Fama MacBeth Estimation

Correlation of controls

variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)ρ_f	1.000										
(2)FCA*	0.014	1.000									
(3)(FCA* $>$ $Q3$[FCA*])	0.017	0.751	1.000								
(4)(FCA* $>$ $Q3$[FCA*]) $\times$ FCA*	0.019	0.760	0.976	1.000							
(5)(FCA*) $\times$ SameGroup	0.027	0.541	0.589	0.665	1.000						
(6)(FCA* $>$ $Q3$[FCA*]) $\times$ (FCA*) $\times$ SameGroup	0.028	0.519	0.618	0.698	0.946	1.000					
(7)SameGroup	0.026	0.429	0.476	0.530	0.739	0.817	1.000				
(8)SameIndustry	0.007	0.282	0.303	0.335	0.338	0.369	0.395	1.000			
(9)SameSize	0.009	0.130	0.135	0.135	0.062	0.065	0.020	0.116	1.000		
(10)SameBookToMarket	0.008	0.013	0.027	0.037	0.048	0.055	0.056	0.112	0.067	1.000	
(11)ρ	0.1107	0.0142	0.016	0.0184	0.0278	0.0291	0.0276	0.0075	0.0076	0.0096	1

Fama MacBeth Estimation

Discontinuity & Business Groups

	Future Monthly Correlation of 4F+Industry Residuals						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FCA*	-0.000578	-0.000294	-0.000162	-0.000816	-0.000284	-0.000254	-0.000465
	(-0.53)	(-0.34)	(-0.19)	(-0.76)	(-0.33)	(-0.23)	(-0.45)
$(FCA^* > Q3[FCA^*]) \times FCA^*$	0.00411*			0.00153		0.000235	0.000510
	(2.03)			(0.67)		(0.10)	(0.21)
$(FCA^*) \times$ SameGroup		0.00950***		0.00899***	0.00271		0.00290
		(4.31)		(3.60)	(0.61)		(0.68)
$(FCA^* > Q3[FCA^*]) \times (FCA^*) \times$ SameGroup			0.0126***		0.00992	0.0125***	0.00940
			(4.66)		(1.88)	(3.89)	(1.78)
Observations	246715	246715	246715	246715	246715	246715	246715
R^2	0.037	0.037	0.037	0.037	0.037	0.037	0.038

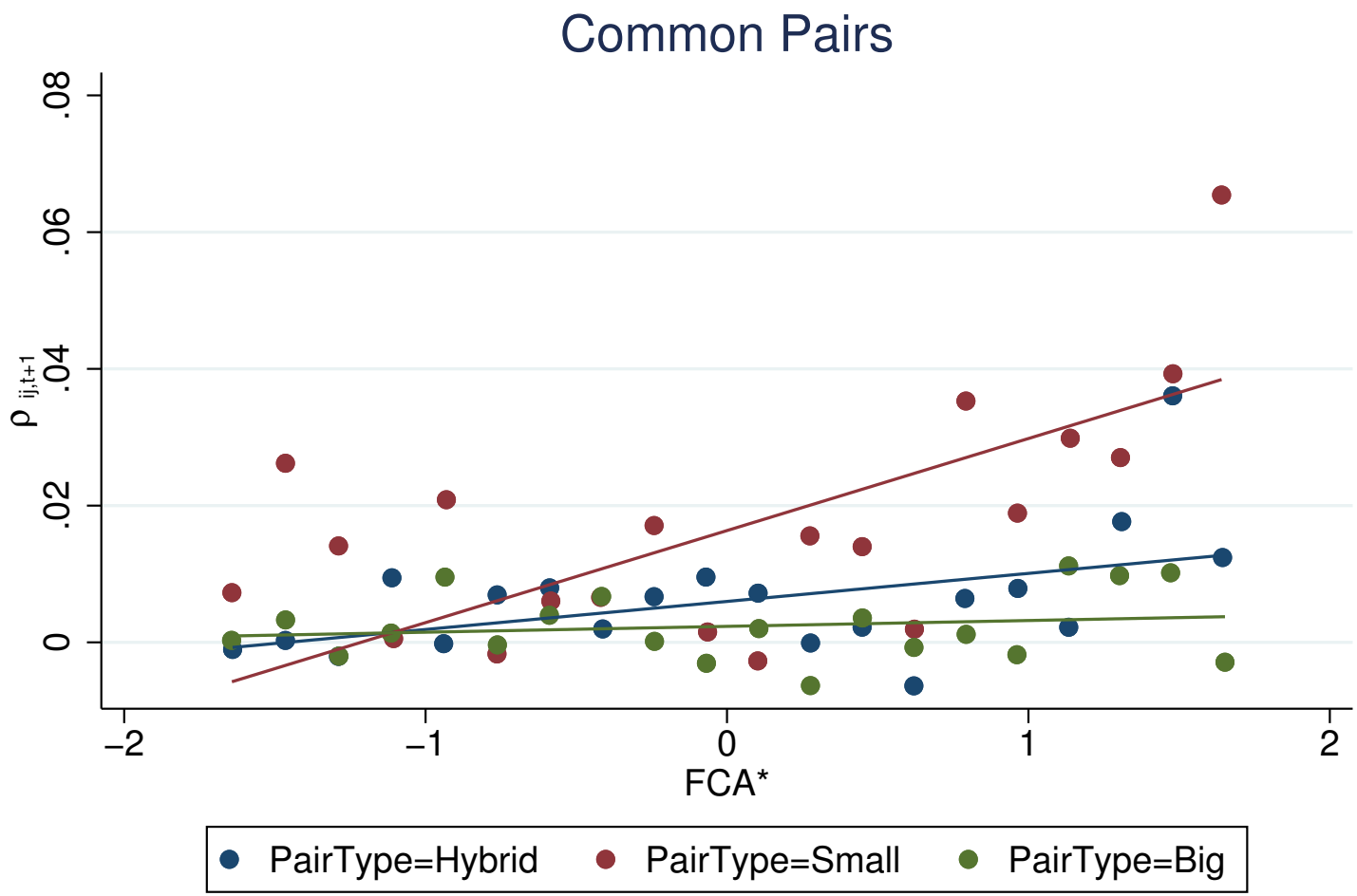
t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

Future Correlation via *FCA**

Grouped by size



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness.

Model Estimation

Grouped by size

	All Firms			Big Firms			Big & Small Firms			Small Firms		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FCA*	-0.000294	-0.000578	-0.000254	0.000842	-0.000249	-0.0000466	-0.00101	-0.000939	-0.000665	-0.00250	-0.00141	-0.000810
	(-0.34)	(-0.53)	(-0.23)	(0.90)	(-0.22)	(-0.04)	(-0.84)	(-0.60)	(-0.41)	(-1.14)	(-0.38)	(-0.22)
$(FCA^* > Q3[FCA^*]) \times FCA^*$		0.00411*	0.000235		0.00381	0.00243		0.00168	-0.00199		0.00723	-0.00231
		(2.03)	(0.10)		(1.37)	(0.89)		(0.58)	(-0.44)		(1.21)	(-0.39)
SameGroup	0.0121***	0.0184***	0.00839**	0.00690*	0.00878**	0.00508	0.0155**	0.0176***	0.0116*	0.00546	0.0243***	0.00387
	(4.56)	(7.49)	(2.78)	(2.38)	(3.32)	(1.52)	(3.21)	(3.84)	(2.15)	(0.73)	(3.60)	(0.40)
$(FCA^*) \times SameGroup$	0.00950***			0.00379			0.00401			0.0226***		
	(4.31)			(1.76)			(1.06)			(4.17)		
$(FCA^* > Q3[FCA^*]) \times (FCA^*) \times SameGroup$			0.0125***			0.00460			0.00906			0.0238**
			(3.89)			(1.88)			(1.46)			(2.85)
SameIndustry	-0.00515**	-0.00531**	-0.00539**	-0.0227***	-0.0231***	-0.0231***	0.00369	0.00356	0.00364	0.0115*	0.0109*	0.0112*
	(-2.72)	(-2.85)	(-2.84)	(-8.07)	(-8.29)	(-8.26)	(1.23)	(1.23)	(1.24)	(2.58)	(2.58)	(2.51)
Observations	246715	246715	246715	113173	113173	113173	99325	99325	99325	34217	34217	34217
R^2	0.037	0.037	0.037	0.032	0.032	0.033	0.044	0.044	0.045	0.081	0.081	0.083

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

Estimation model

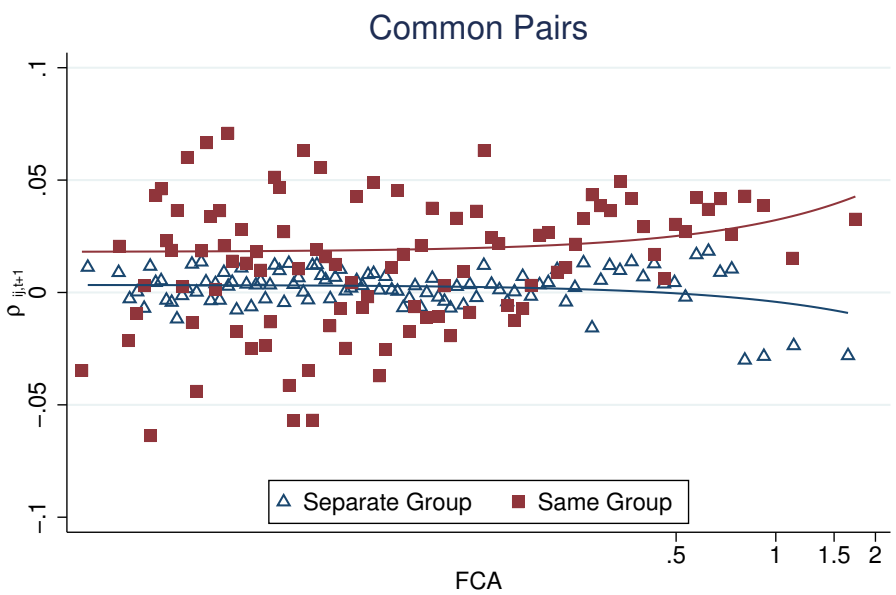
- Use Fama macbeth to estimate this model

$$\begin{aligned}\rho_{ij,t+1} = \beta_0 &+ \beta_1 * \ln(\text{FCA}_{ij,t}) + \beta_2 * \text{SameGroup}_{ij} \\ &+ \beta_3 * \ln(\text{FCA}_{ij,t}) \times \text{SameGroup}_{ij} \\ &+ \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}\end{aligned} \tag{4}$$

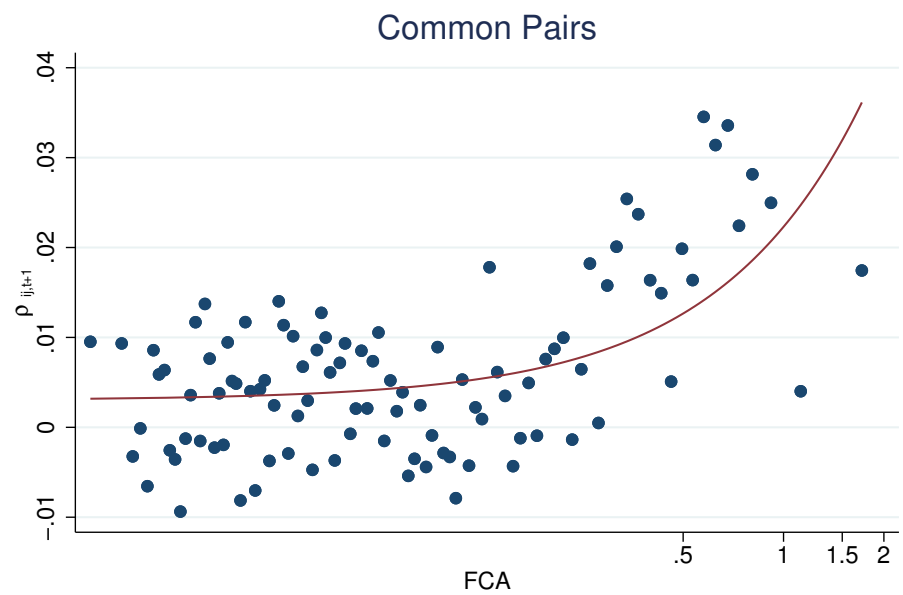
- Estimate that model on a monthly frequency

Future Correlation via *FCA*

Logaritmic Transformation



This figure graphs the correlation of daily 4Factor+Industry residuals in monthh t+1 against our measure of institutional connectedness.



This figure graphs the correlation of daily 4Factor+Industry residuals in monthh t+1 against our measure of institutional connectedness.

Fortnightly

Fama MacBeth Estimation

Logaritmic Transformation

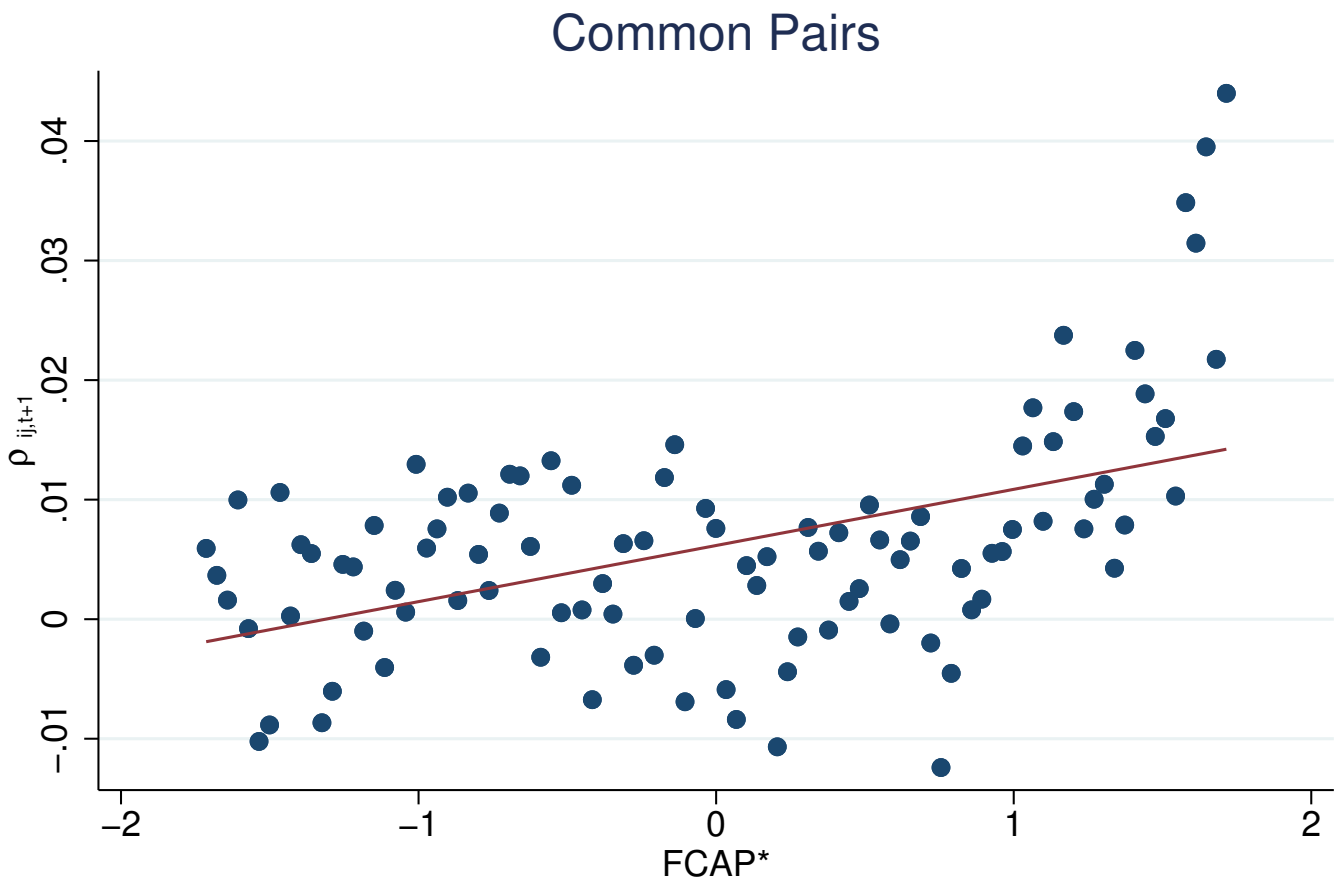
	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
ln(FCA)	0.00415***	0.00347***	0.00103	-0.000325	-0.000176	-0.000381
	(5.18)	(5.45)	(1.34)	(-0.41)	(-0.23)	(-0.51)
ρ_t		0.129***	0.129***	0.129***	0.129***	0.129***
		(5.10)	(5.08)	(5.08)	(5.08)	(5.07)
SameGroup			0.0175***	0.0285***	0.0301***	0.0305***
			(7.55)	(7.62)	(7.40)	(7.60)
(ln(FCA)) $\times$ SameGroup				0.00680***	0.00691***	0.00678***
				(4.46)	(4.48)	(4.41)
SameIndustry					-0.00414*	-0.00522**
					(-2.25)	(-2.76)
SameSize						0.0114***
						(4.15)
SameBookToMarket						0.00776*
						(2.05)
Constant	0.0171***	0.0145***	0.00519*	0.00121	0.00203	0.00683**
	(7.05)	(7.54)	(2.21)	(0.49)	(0.88)	(2.97)
Observations	247465	246715	246715	246715	246715	246715
R^2	0.001	0.035	0.036	0.036	0.036	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Future Correlation via *FCAP∗*

Normalized Rank Transformed



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against normalized rank transformed of our measure of institutional connectedness.

Fama MacBeth Estimation

Normalized Rank Transformed

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
FCAP*	0.00505***	0.00415***	0.00141	-0.0000485	0.0000890	-0.000240
	(5.14)	(5.51)	(1.67)	(-0.06)	(0.11)	(-0.29)
ρ_t		0.129***	0.129***	0.129***	0.129***	0.129***
		(5.10)	(5.08)	(5.07)	(5.07)	(5.07)
SameGroup			0.0175***	0.00896***	0.0104***	0.0111***
			(8.02)	(3.56)	(4.06)	(4.33)
(FCAP*) × SameGroup				0.0105***	0.0107***	0.0106***
				(4.37)	(4.38)	(4.33)
SameIndustry					-0.00415*	-0.00524**
					(-2.23)	(-2.73)
SameSize						0.0113***
						(4.09)
SameBookToMarket						0.00798*
						(2.09)
Constant	0.00622***	0.00532***	0.00255***	0.00230**	0.00268***	0.00806***
	(7.93)	(7.65)	(3.70)	(3.26)	(4.01)	(6.49)
Observations	247465	246715	246715	246715	246715	246715
R^2	0.001	0.035	0.036	0.036	0.036	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

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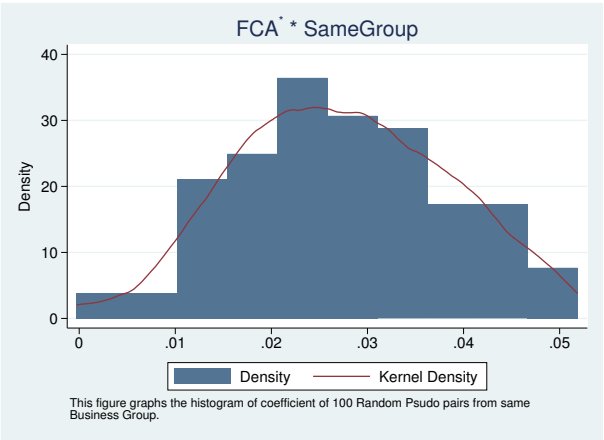
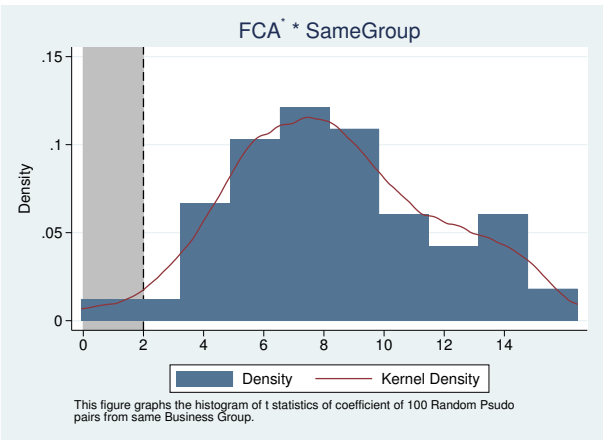
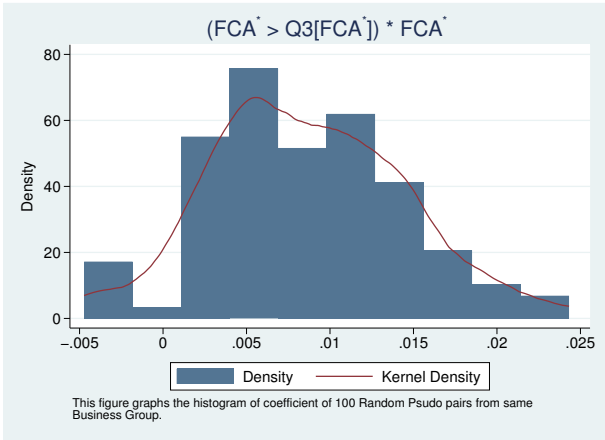
Random Pairs from Same Business Group

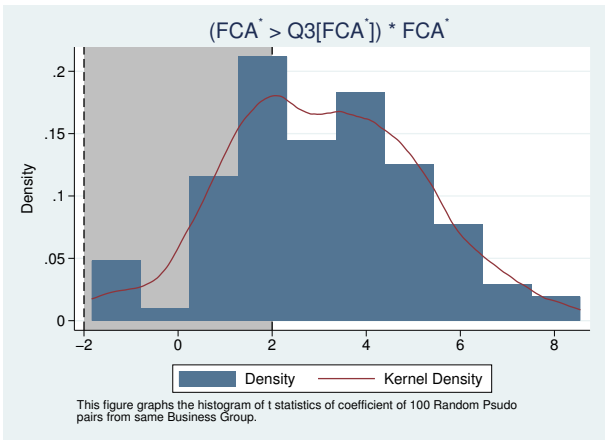
β_3 in model 1



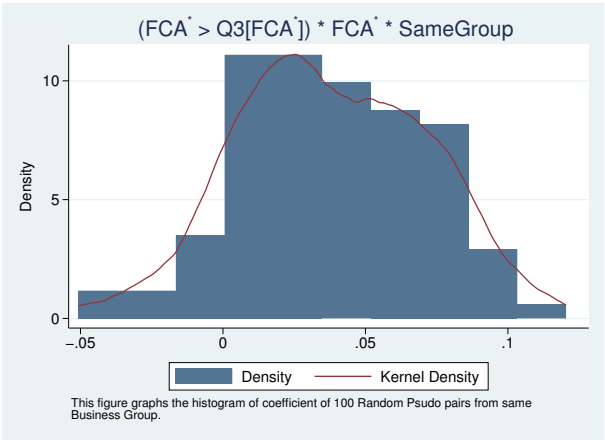


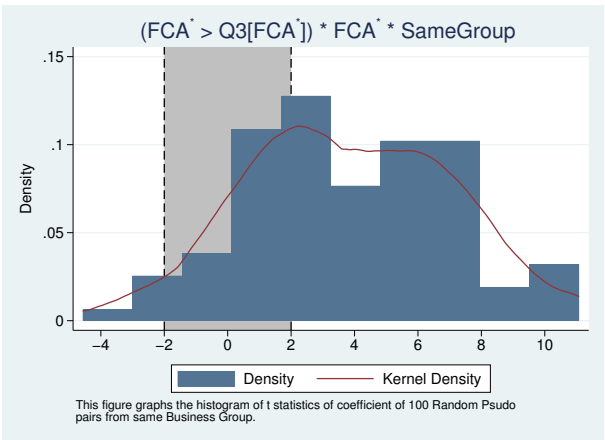
β_2 in model 2





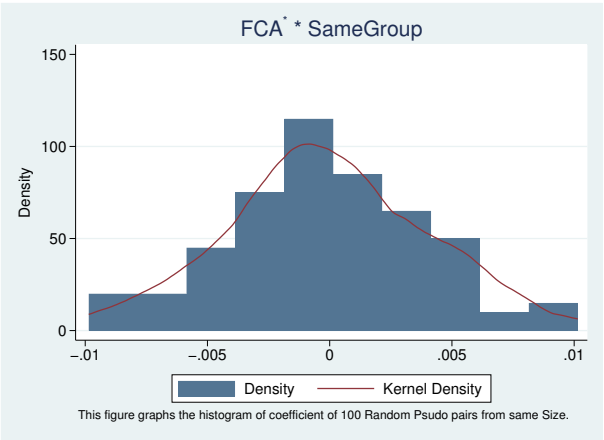
β_4 in model 3

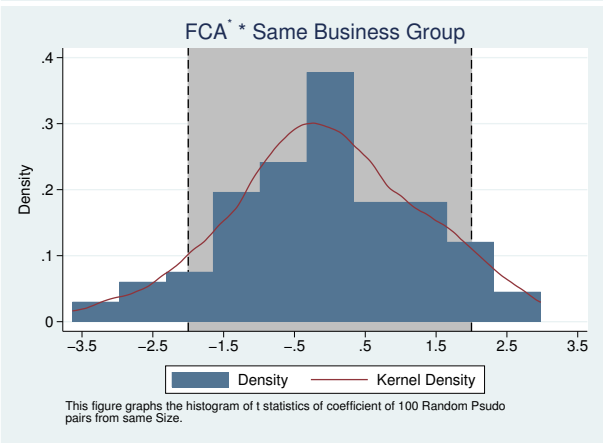




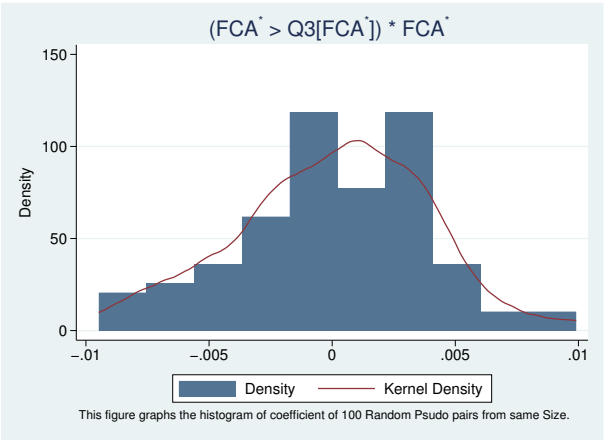
Random Pairs from Same Size

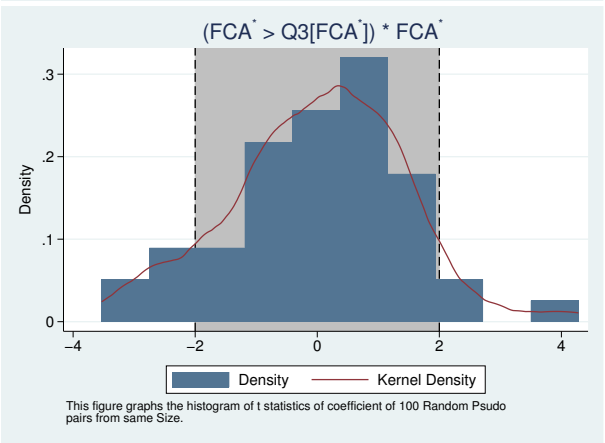
β_3 in model 1



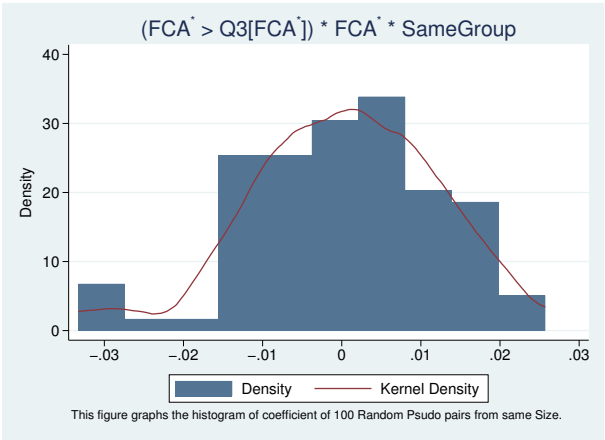


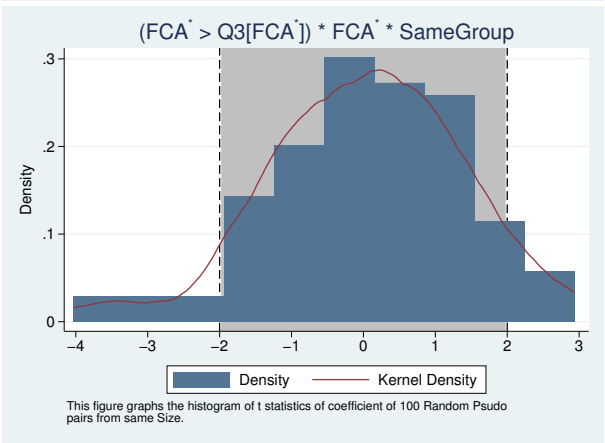
β_2 in model 2





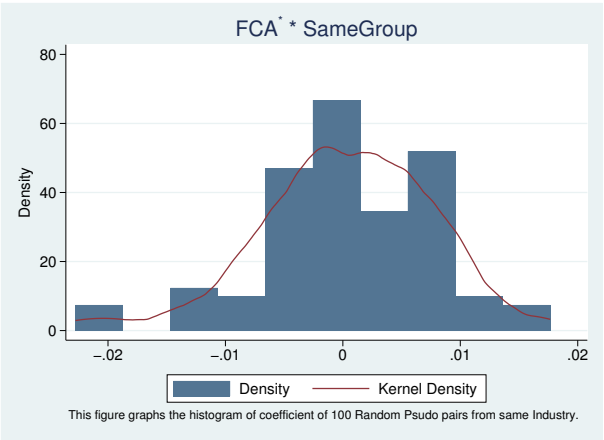
β_4 in model 3

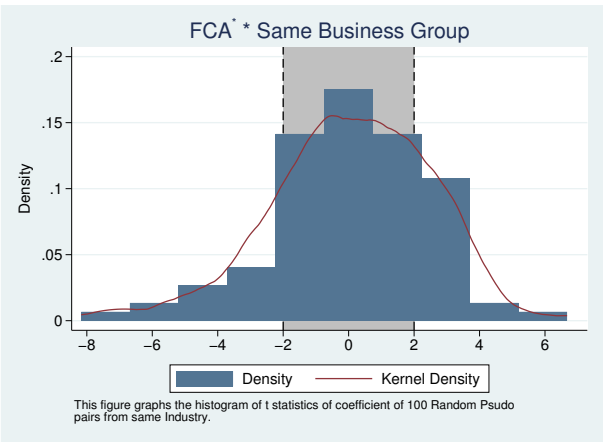




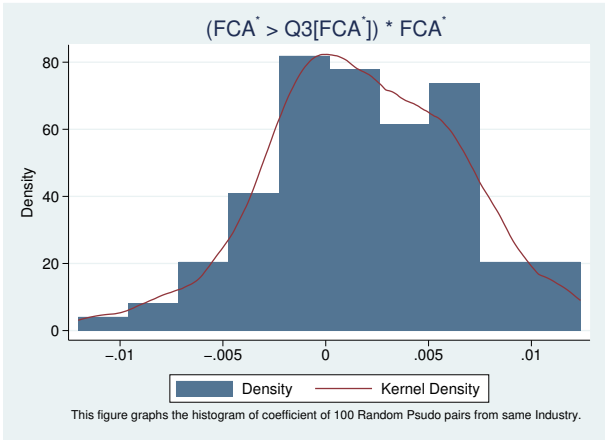
Random Pairs from Same Industry

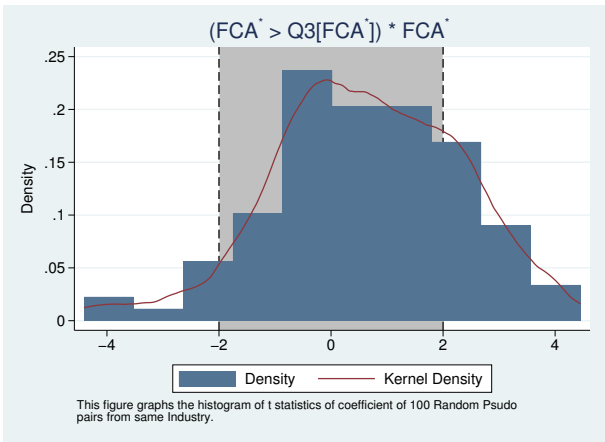
β_3 in model 1



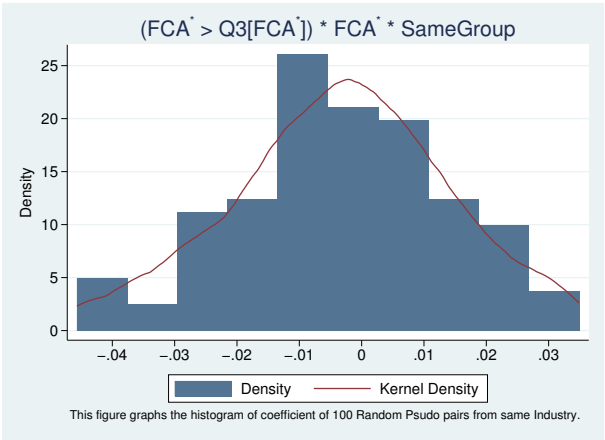


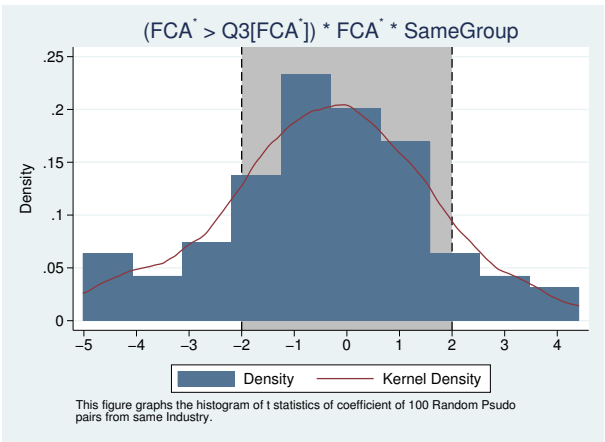
β_2 in model 2





β_4 in model 3





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Conclusion

- We derive a measure that captures the extent of common ownership distribution.
- The common ownership comovement effect with a extra explanation:
  - Common ownership that crosses a threshold affect on comovement
  - Be in the same business group has a major effect on comovement
  - Business groups of banks affect more than normal business groups

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- He,Jie (Jack) Huang,Jiekun ,Zhao,Shanc,*Internalizing governance externalities The role of institutional cross-ownership* , Journal of Financial 2019

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Measuring Common Ownership

Proof

- If two stocks in pair have n mutual owner, which total market cap divides them equally, the mentioned indexes equal n.
  - Each holder owns $1/n$ of each firm.
  - Firm's market cap is α_1 and α_2:
  - So for each holder of firms we have $S^f_{i,t} P_{i,t} = \alpha_i$
  - SQRT

$$\left[\frac{\sum_{f=1}^{n} \sqrt{\alpha_1/n} + \sum_{f=1}^{n} \sqrt{\alpha_2/n}}{\sqrt{\alpha_1} + \sqrt{\alpha_2}}\right]^2 = \left[\frac{\sqrt{n}(\sqrt{\alpha_1} + \sqrt{\alpha_2})}{\sqrt{\alpha_1} + \sqrt{\alpha_2}}\right]^2 = n$$

  - Quadratic

$$\left[\frac{\sum_{f=1}^{n} (\alpha_1/n)^2 + \sum_{f=1}^{n} (\alpha_2/n)^2}{\alpha_1^2 + {\alpha_2}^2}\right]^{-1} = \left[\frac{\alpha_1^2 + \alpha_2^2}{n(\alpha_1^2 + \alpha_2^2)}\right]^{-1} = n$$

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Synchronicity and firm interlocks

JFE-2009-Khanna

- Three types of network
  1. Equity network
  2. Director network
  3. Owner network
- Dependent variables

  Using deterended weekly return for calculation
  1. Pairwise returns synchronicity $= \frac{\sum_t (n^{up}_{i,j,t} n^{down}_{i,j,t})}{T_{i,j}}$
  2. Correlation $= \frac{Cov(i,j)}{\sqrt{Var(i).Var(j)}}$
- Tobit estimation of

$$f^d_{i,j} = \alpha I_{i,j} + \beta(1 * N_{i,j}) + \gamma Ind_{i,j} + \varepsilon_{i,j}$$

being in the same director network has a significant effect

Large controlling shareholder and stock price synchronicity

JBF-2014-Boubaker

- Stock price synchronicity:

$$SYNCH = \log(\frac{R^2_{i,t}}{1 - R^2_{i,t}})$$

where $R^2_{i,t}$ is the R-squared value from

$$RET_{i,w} = \alpha + \beta_1 MKRET_{w-1} + \beta_2 MKRET_w + \beta_3 INDRET_{i,w-1} + \beta_4 INDRET_{i,w} + \varepsilon_{i,w}$$

- OLS estimation of

$$SYNCH_{i,t} = \beta_0 + \beta_1 Excess_{i,t} + \beta_2 UCF_{i,t} + \sum_k \beta_k Control^k_{i,t} + IndustryDummies + YearDummies + \varepsilon_{i,t}$$

- Stock price synchronicity increases with excess control
- Firms with substantial excess control are more likely to experience stock price crashes

Connected Stocks

JF-2014-Anton Polk

- Common active mutual fund owners
- Measuring Common Ownership
  - $FCAP_{ij,t} = \frac{\sum_{f=1}^{F}(S_{i,t}^{f} P_{i,t} + S_{j,t}^{f} P_{j,t})}{S_{i,t} Pi,t + S_{j,t} Pj,t}$
  - Using normalized rank-transformed as $FCAP_{ij,t}^{*}$
- $\rho_{ij,t}$: within-month realized correlation of each stock pair's daily four-factor returns
-

$$\rho_{ij,t+1} = a + b_f \times FCAPF_{ij,t}^{*} + \sum_{k=1}^{n} CONTROL_{ij,t,k} + \varepsilon_{ij,t+1}$$

Estimate these regressions monthly and report the time-series average as in Fama and MacBeth

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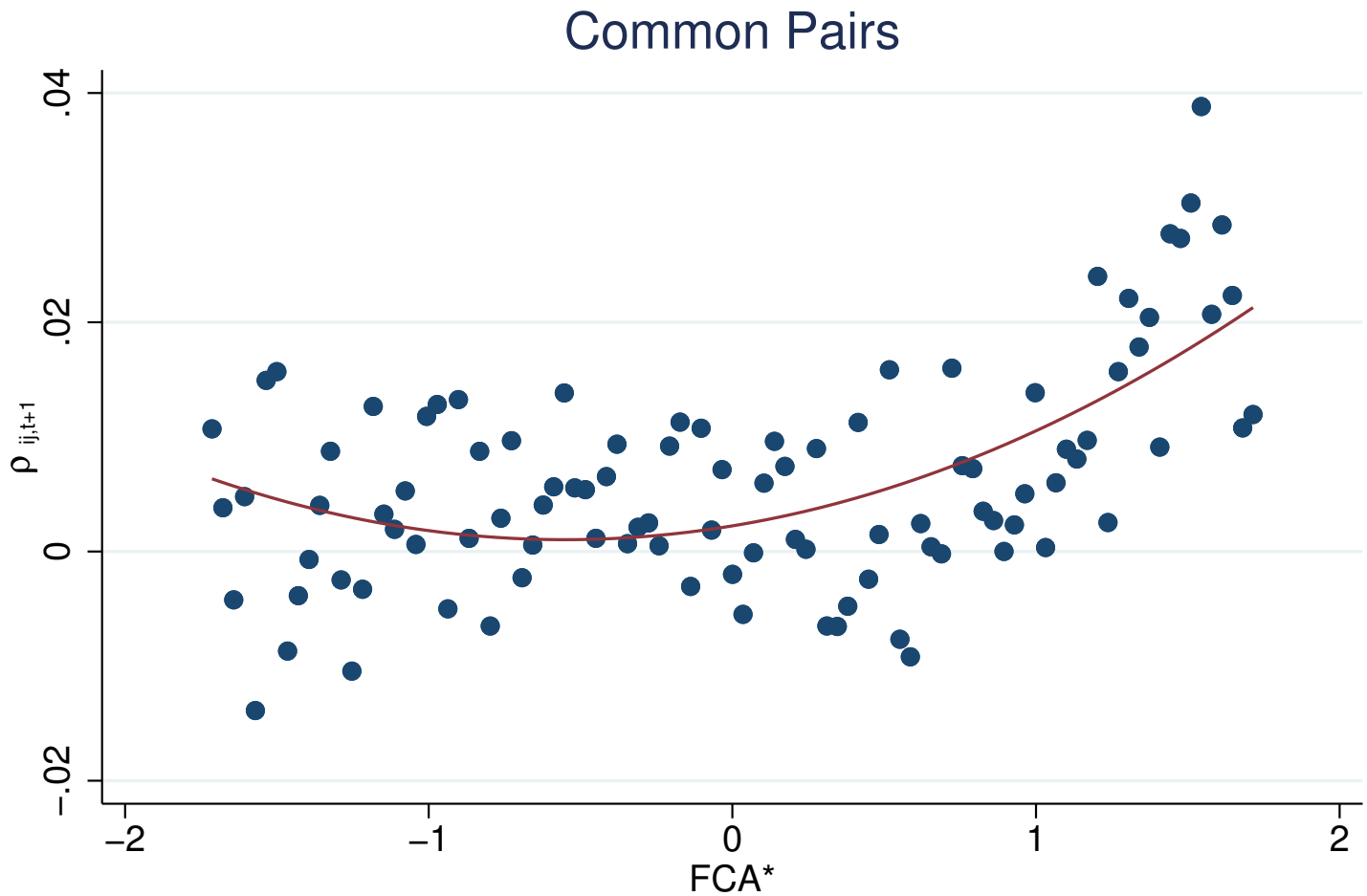
4 Factor + Industry Future Correlation via *FCA**

Normalized Rank Transformed for each cross section (Monthly)



This figure graphs the correlation of daily 4Factor+Industry residuals in month t+1 against our measure of institutional connectedness.

Fama MacBeth Estimation

Monthly variables

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
FCA*	0.00469***	0.00386***	0.00108	-0.000208	-0.0000636	-0.000294
	(4.64)	(4.90)	(1.21)	(-0.23)	(-0.07)	(-0.34)
ρ_t		0.129***	0.129***	0.129***	0.129***	0.129***
		(5.11)	(5.08)	(5.08)	(5.08)	(5.07)
SameGroup			0.0179***	0.0101***	0.0114***	0.0121***
			(8.00)	(3.96)	(4.28)	(4.56)
(FCA*) × SameGroup				0.00952***	0.00969***	0.00950***
				(4.36)	(4.40)	(4.31)
SameIndustry					-0.00403*	-0.00515**
					(-2.19)	(-2.72)
SameSize						0.0115***
						(4.19)
SameBookToMarket						0.00784*
						(2.06)
Constant	0.00623***	0.00531***	0.00249***	0.00227**	0.00264***	0.00804***
	(7.92)	(7.65)	(3.61)	(3.23)	(3.96)	(6.47)
Observations	247465	246715	246715	246715	246715	246715
R^2	0.001	0.035	0.036	0.036	0.036	0.037

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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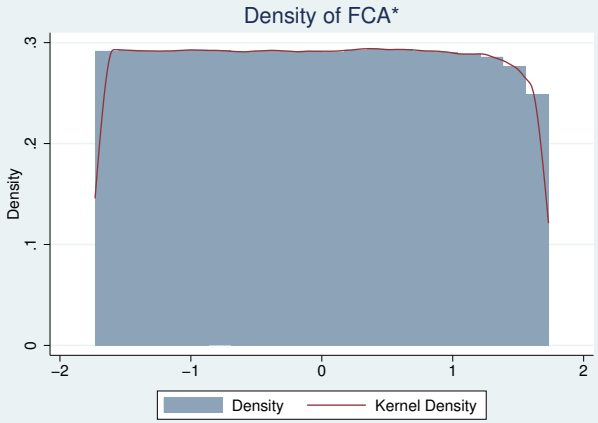
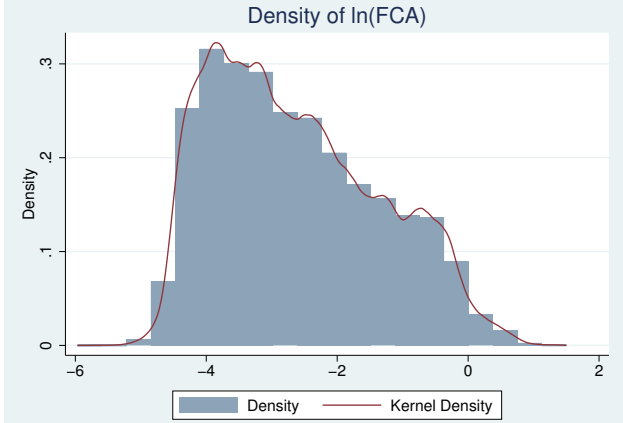
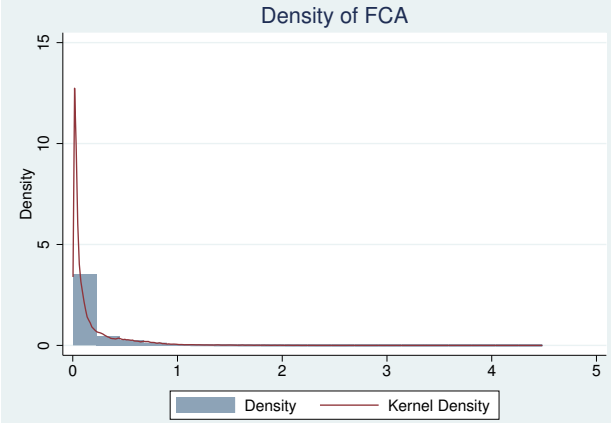
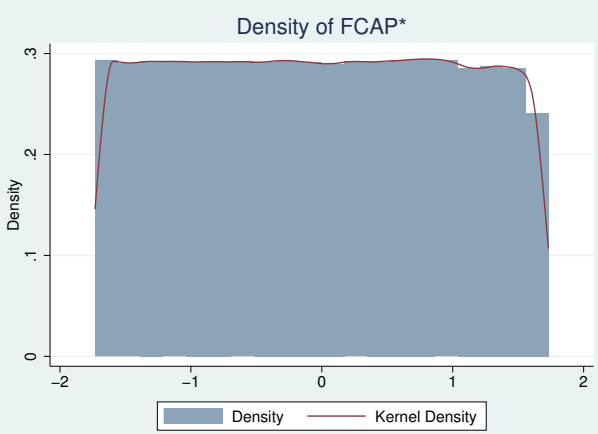
FCA vs. FCAP Distributions

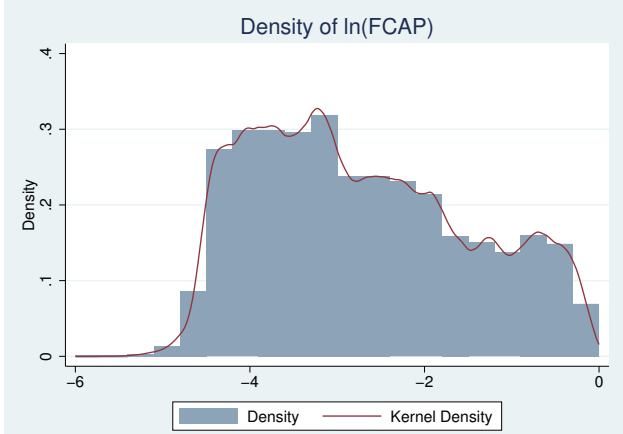
Fortnightly

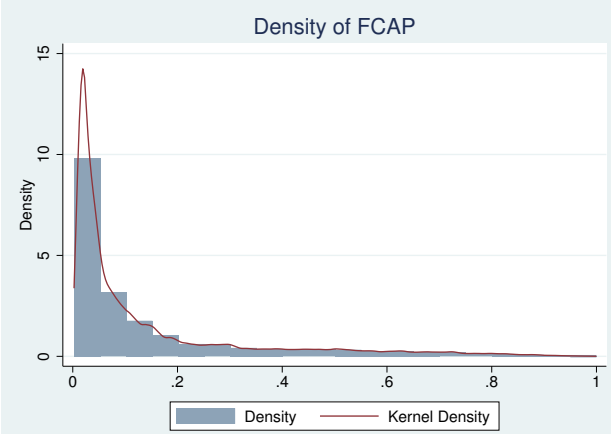












Monthly

Summary of Controls

Fortnightly

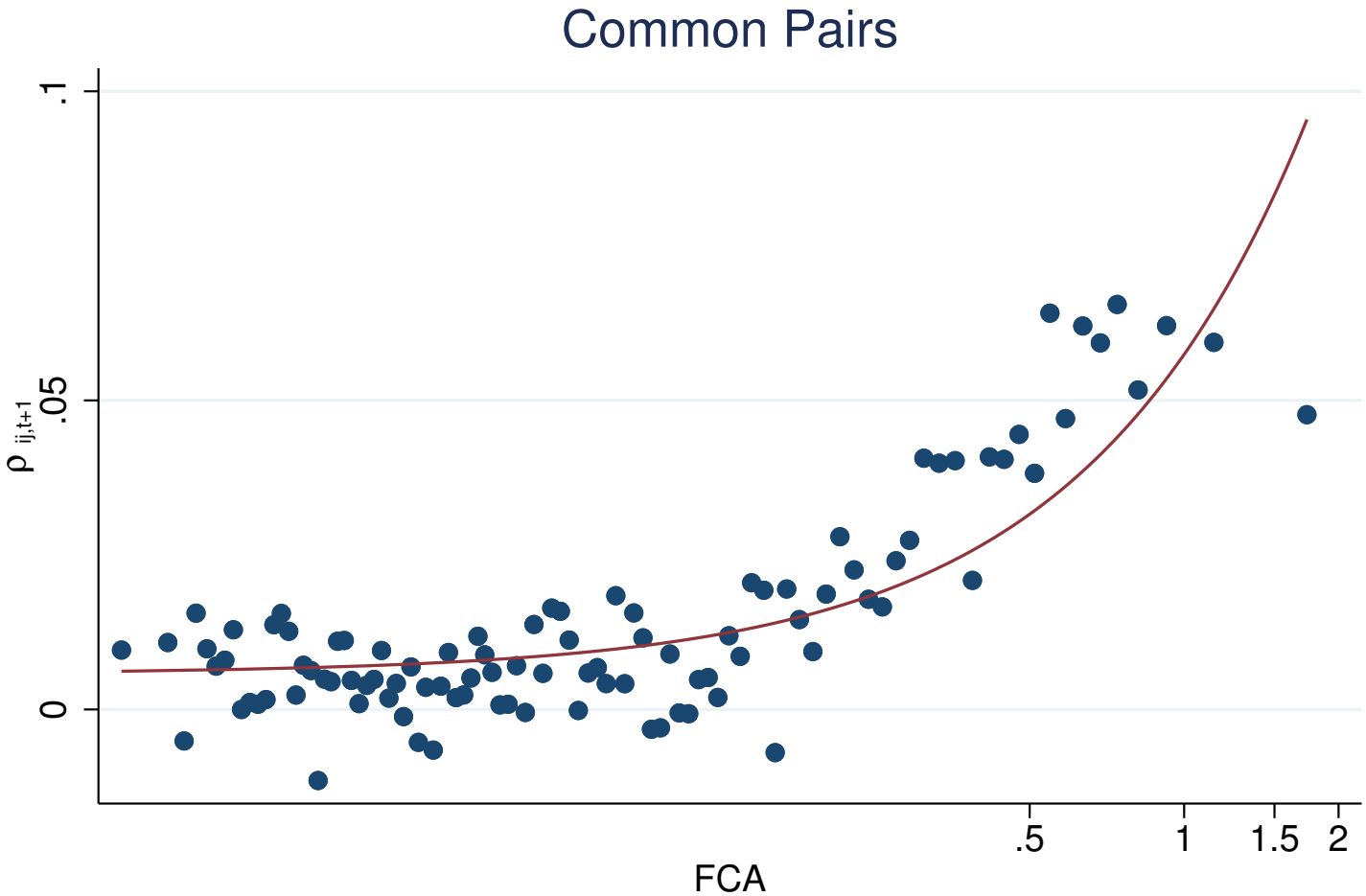
Type of Pairs	Yes	No
SameIndustry	1142	9125
	(11.1%)	(88.9%)
SameGroup	1173	9094
	(11.4%)	(88.6%)
ActiveHolder	2819	7448
	(27.5%)	(72.5%)

Variable	count	mean	std	min	25%	50%	75%	max
Size1	636641	0.75	0.21	0.01	0.61	0.81	0.93	1
Size2	636641	0.47	0.26	0.00	0.26	0.45	0.67	1.00
SameSize	636641	-0.28	0.22	-0.99	-0.42	-0.24	-0.10	0.00
BookToMarket1	636641	0.52	0.27	0.00	0.31	0.54	0.74	1.00
BookToMarket2	636641	0.50	0.25	0.00	0.29	0.49	0.70	1.00
SameBookToMarket	636641	-0.29	0.21	-1.00	-0.43	-0.25	-0.12	0.00

Monthly

Future Correlation via *FCA*

4 Factor + Industry (Fortnightly)



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness.

Fama MacBeth Estimation

Fortnightly variables

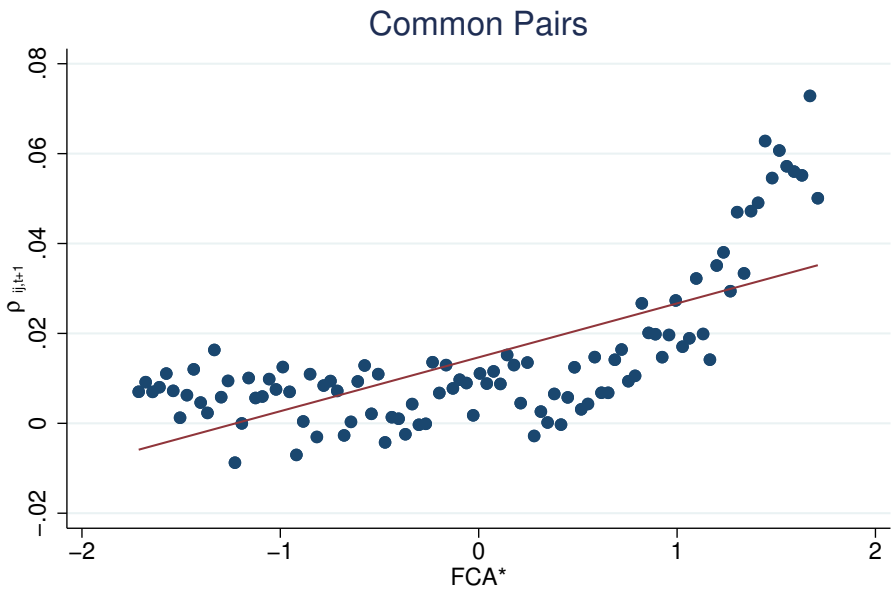
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ln(FCA)	0.0108***	0.00989***	0.00964***	0.00511***	0.00499***	0.00271***	0.00276***	0.00281***	0.00297***
	(8.48)	(9.12)	(8.81)	(5.15)	(4.95)	(4.12)	(4.07)	(4.16)	(3.78)
ρ_t		0.0740***	0.0739***	0.0734***	0.0733***	0.0710***	0.0708***	0.0711***	0.0723***
		(5.50)	(5.49)	(5.44)	(5.44)	(5.36)	(5.34)	(5.36)	(5.39)
ActiveHolder			0.00970***		0.00810***	0.00425*	0.00416*	0.00356	0.00410*
			(6.05)		(5.06)	(2.35)	(2.40)	(1.94)	(2.41)
SameGroup				0.0329***	0.0322***	0.0216***	0.0214***	0.0218***	0.0247***
				(10.98)	(10.80)	(7.32)	(7.29)	(7.47)	(9.32)
SameIndustry						0.0275***	0.0267***	0.0264***	0.0288***
						(7.00)	(6.73)	(6.55)	(6.45)
Samesize								0.0403***	0.0235***
								(3.53)	(4.35)
SameBookToMarket								0.0127**	0.0146***
								(3.22)	(4.34)
Constant	0.0432***	0.0395***	0.0363***	0.0214***	0.0191***	0.0396**	0.0504**	0.0372***	0.0225***
	(8.14)	(8.73)	(8.10)	(5.32)	(4.71)	(3.13)	(3.20)	(4.04)	(5.91)
Value	No	No	No	No	No	Yes	Yes	No	No
Interaction	No	No	No	No	No	No	Yes	Yes	No
N	613875	613875	613875	613875	613875	613875	613875	613875	613875
r2	0.00152	0.0127	0.0131	0.0137	0.0141	0.0184	0.0193	0.0183	0.0164

t statistics in parentheses

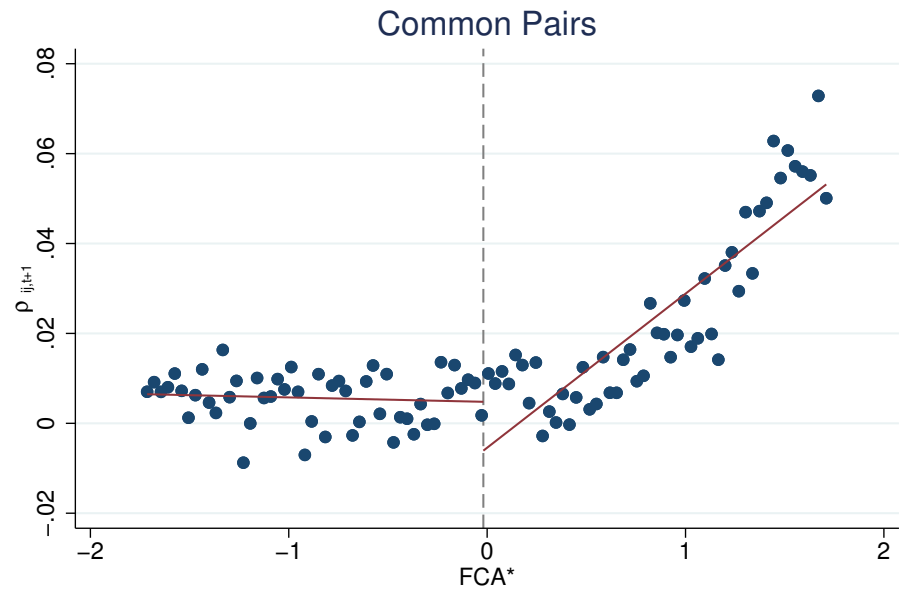
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Factor + Industry Future Correlation via *FCA**

Normalized Rank Transformed for each cross section (Fortnightly)



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness.



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness. Allow for discontinuity in median

Monthly

Fama MacBeth Estimation

Fortnightly variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FCA*	0.0124***	-0.00545***	-0.00518***	-0.00450***	-0.00440***	-0.00408**	-0.00537***	-0.00420**	-0.00526***	-0.00448***
	(7.43)	(-3.99)	(-3.90)	(-3.44)	(-3.40)	(-3.19)	(-4.06)	(-3.22)	(-3.98)	(-3.49)
(FCA* > *Median*[FCA*]) × FCA*		0.0360***	0.0332***	0.0314***	0.0240***	0.0232***	0.0228***	0.0156***	0.0231***	0.0231***
		(9.80)	(10.20)	(9.78)	(8.68)	(8.29)	(9.37)	(5.83)	(9.14)	(8.17)
ρ_t			0.0738***	0.0737***	0.0727***	0.0727***	0.0711***	0.0708***	0.0712***	0.0724***
			(5.50)	(5.49)	(5.42)	(5.41)	(5.38)	(5.34)	(5.38)	(5.41)
ActiveHolder				0.00792***		0.00494**	0.00362	0.00322	0.00284	0.00354*
				(4.85)		(2.98)	(1.94)	(1.81)	(1.49)	(2.02)
SameIndustry					0.0363***	0.0357***	0.0315***	0.0261***	0.0303***	0.0339***
					(8.06)	(7.91)	(7.93)	(6.60)	(7.47)	(7.54)
SameGroup								0.0191***		
								(6.14)		
Samesize									0.0416***	0.0213***
									(3.67)	(3.91)
SameBookToMarket									0.0128**	0.0147***
									(3.24)	(4.36)
Constant	0.0150***	-0.000422	-0.000591	-0.00187	-0.00234	-0.00312*	0.0300*	0.0375*	0.0258**	0.00782***
	(6.31)	(-0.25)	(-0.38)	(-1.19)	(-1.70)	(-2.19)	(2.59)	(2.50)	(3.22)	(3.56)
Value	No	No	No	No	No	No	Yes	Yes	No	No
Interaction	No	No	No	No	No	No	No	Yes	Yes	No
N	613875	613875	613875	613875	613875	613875	613875	613875	613875	613875
r2	0.00132	0.00208	0.0132	0.0136	0.0149	0.0151	0.0182	0.0196	0.0181	0.0162

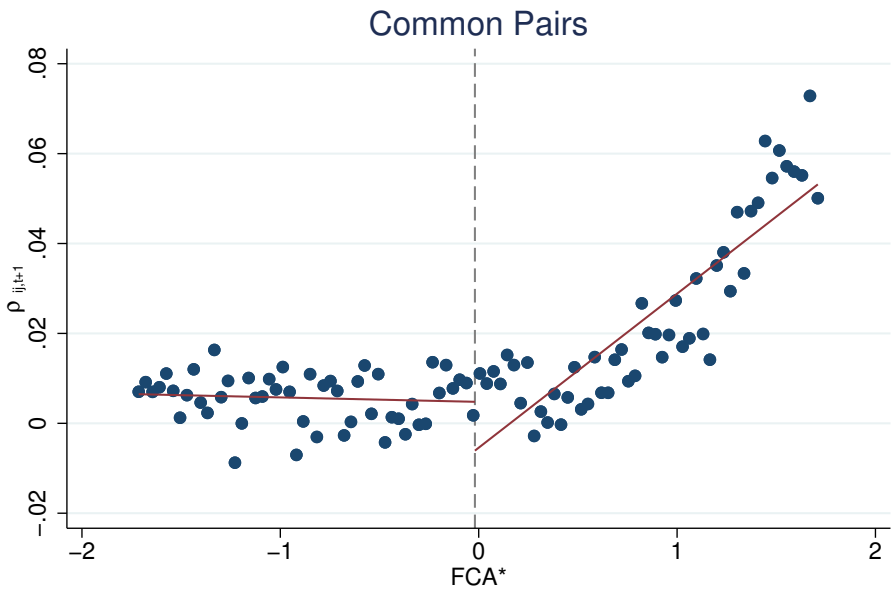
t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

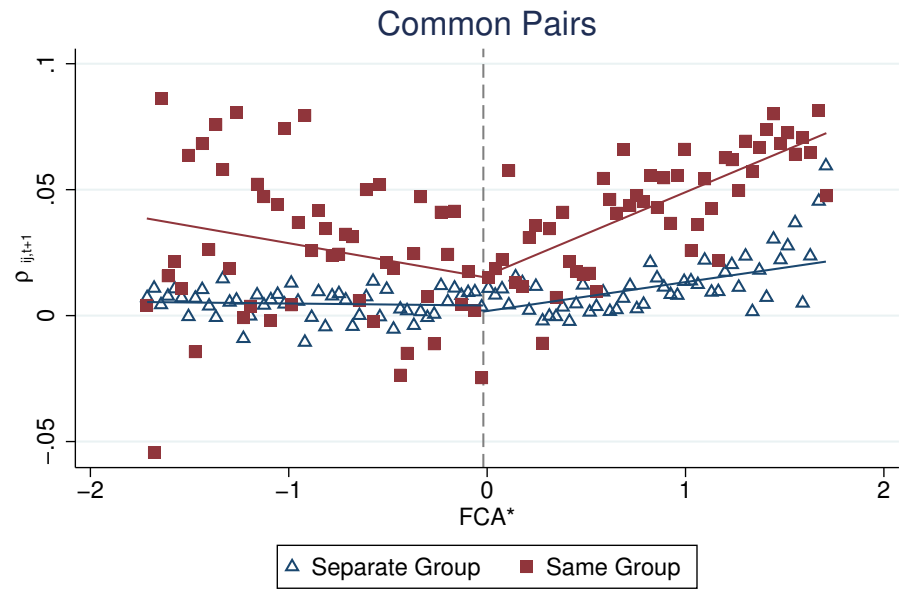
Monthly

4 Factor + Industry Future Correlation via *FCA**

Normalized Rank Transformed for each cross section (Fortnightly)



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness. Allow for discontinuity in median



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness. Allow for discontinuity in median

Monthly

Fama MacBeth Estimation

Monthly variables

	(1)	(2)
FCA*	-0.00370**	-0.00472***
	(-2.79)	(-3.39)
(FCA* > *Median*[FCA*]) × FCA*	0.0128***	0.0141***
	(4.34)	(5.15)
ρ_t	0.0722***	0.0708***
	(5.39)	(5.35)
ActiveHolder	0.00140	0.000470
	(0.73)	(0.22)
(FCA* > *Median*[FCA*]) × ActiveHolder	0.00338	0.00522
	(1.17)	(1.75)
SameGroup	0.0117**	0.0106**
	(3.29)	(2.87)
(FCA* > *Median*[FCA*]) × SameGroup	0.0139***	0.0109**
	(4.05)	(3.14)
Constant	0.00973***	0.0380*
	(4.57)	(2.51)
Value	No	Yes
Interaction	No	Yes
N	613875	613875
r2	0.0173	0.0202

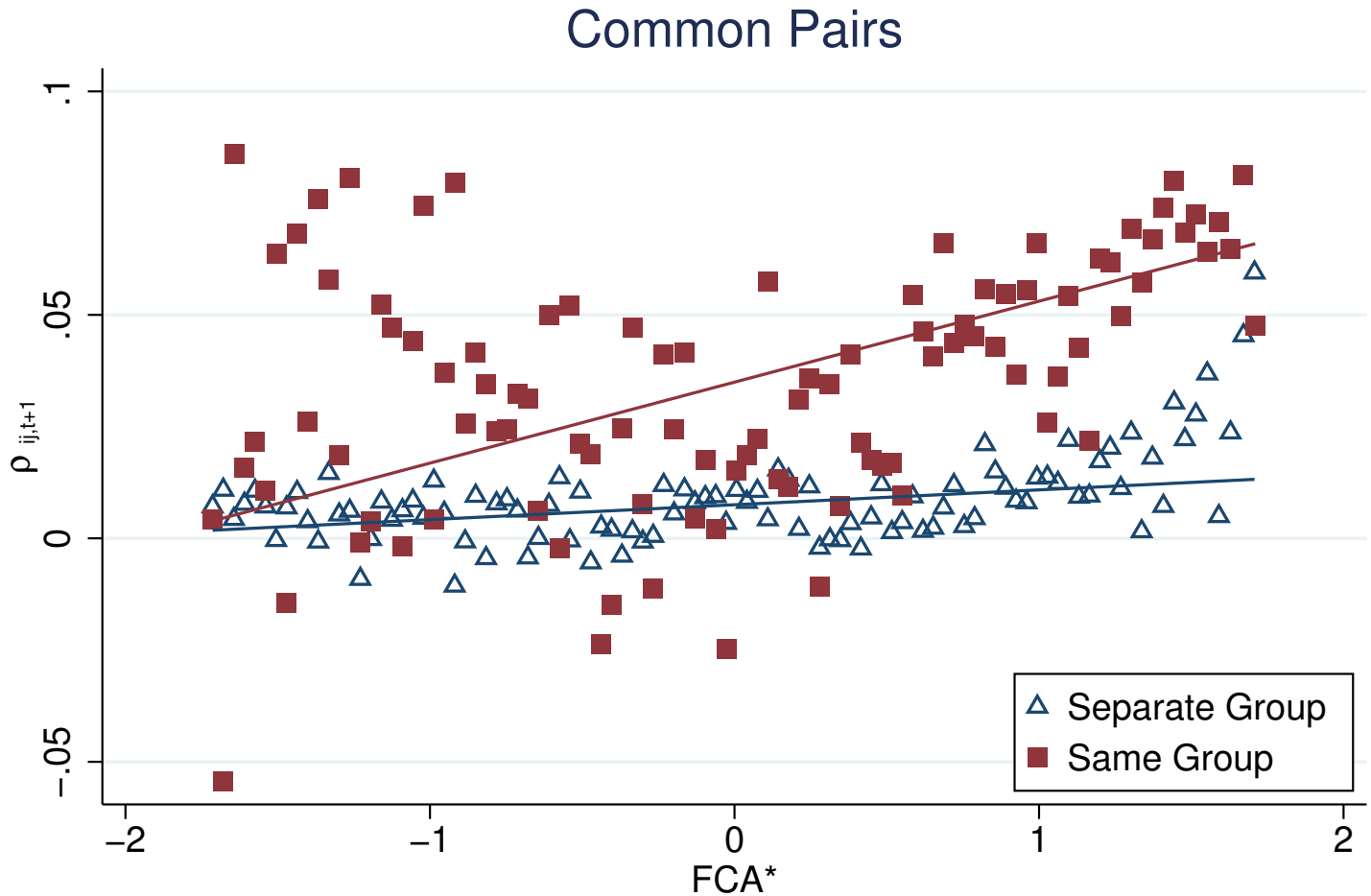
t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Monthly

Future Correlation via *FCA**

4 Factor + Industry (by Business Group)



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against normalized rank transformed of our measure of institutional connectedness.

Fama MacBeth Estimation

Fortnightly variables for subset of Same Business Group

	(1)	(2)	(3)	(4)	(5)	(6)
FCA*	0.0183***	-0.0127*	0.0100***	-0.00219	0.00842***	-0.00535
	(7.04)	(-2.13)	(5.21)	(-0.39)	(5.37)	(-0.98)
(FCA* > *Median*[FCA*]) × FCA*		0.0460***		0.0186*		0.0210*
		(4.63)		(2.08)		(2.53)
ActiveHolder			0.0162***	0.0149**	0.0188***	0.0174***
			(3.41)	(3.07)	(4.00)	(3.61)
SameIndustry			0.0336***	0.0333***	0.0330***	0.0327***
			(7.85)	(7.78)	(7.95)	(7.83)
Samesize			0.0340**	0.0318**		
			(3.17)	(3.03)		
SameBookToMarket			0.0609***	0.0605***		
			(5.97)	(5.90)		
Constant	0.0344***	0.0149**	0.0399***	0.0314***	0.104***	0.0941***
	(9.76)	(3.01)	(8.38)	(5.53)	(5.71)	(5.16)
Value	No	No	No	No	Yes	Yes
Interaction	No	No	No	No	Yes	Yes
N	103914	103914	103914	103914	103914	103914
r2	0.00281	0.00488	0.0390	0.0407	0.0494	0.0511

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Monthly

Fama MacBeth Estimation

Fortnightly variables for subset of Different Business Group

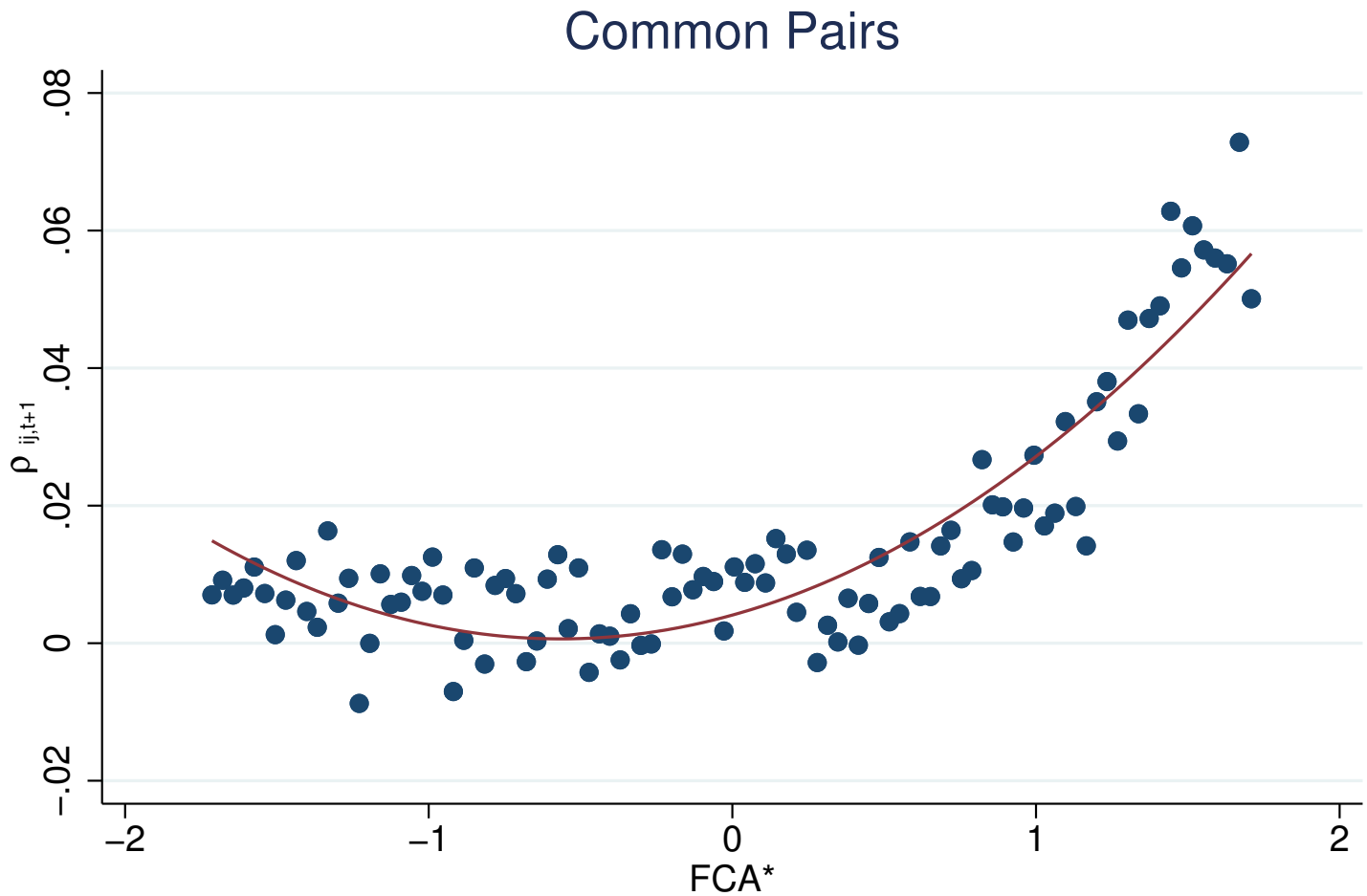
	(1)	(2)	(3)	(4)	(5)	(6)
FCA*	0.00422**	-0.00178	0.00194*	-0.00210	0.00172	-0.00290*
	(3.11)	(-1.37)	(1.98)	(-1.75)	(1.93)	(-2.26)
(FCA* > *Median*[FCA*]) × FCA*		0.0146***		0.00996***		0.0115***
		(4.22)		(3.48)		(3.82)
ActiveHolder			0.000676	0.000186	-0.000437	-0.00102
			(0.48)	(0.13)	(-0.30)	(-0.70)
SameIndustry			0.0238***	0.0231***	0.0211***	0.0202***
			(4.34)	(4.23)	(4.23)	(4.05)
Samesize			0.0217***	0.0217***		
			(3.94)	(3.94)		
SameBookToMarket			0.00482	0.00477		
			(1.49)	(1.48)		
Constant	0.00831***	0.00285	0.0124***	0.00886***	0.0240	0.0202
	(4.07)	(1.67)	(5.03)	(4.03)	(1.53)	(1.32)
Value	No	No	No	No	Yes	Yes
Interaction	No	No	No	No	Yes	Yes
N	509961	509961	509961	509961	509961	509961
r2	0.000490	0.000899	0.0120	0.0124	0.0148	0.0152

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4 Factor + Industry Future Correlation via *FCA**

Normalized Rank Transformed for each cross section (Fortnightly)



This figure graphs the correlation of daily 4Factor+Industry residuals in fortnight t+1 against our measure of institutional connectedness.

Fama MacBeth Estimation

Fortnightly variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
FCA*	0.0124***	0.0126***	0.0114***	0.0112***	0.00613***	0.00618***	0.00634***	0.00717***
	(7.43)	(7.54)	(8.09)	(7.90)	(8.02)	(7.89)	(8.12)	(7.01)
FCA*^{2}		0.0109***	0.0101***	0.00959***	0.00697***	0.00700***	0.00701***	0.00710***
		(10.30)	(10.52)	(10.08)	(9.59)	(9.97)	(9.37)	(8.49)
ρ_t			0.0737***	0.0736***	0.0711***	0.0709***	0.0712***	0.0724***
			(5.49)	(5.48)	(5.37)	(5.36)	(5.38)	(5.41)
ActiveHolder				0.00761***	0.00345	0.00331	0.00267	0.00336
				(4.62)	(1.84)	(1.84)	(1.40)	(1.90)
SameIndustry					0.0310***	0.0301***	0.0299***	0.0334***
					(7.85)	(7.57)	(7.40)	(7.46)
Samesize							0.0416***	0.0214***
							(3.66)	(3.91)
SameBookToMarket							0.0126**	0.0146***
							(3.19)	(4.29)
Constant	0.0150***	0.00429*	0.00372*	0.00224	0.0330**	0.0428**	0.0288***	0.0108***
	(6.31)	(2.35)	(2.24)	(1.35)	(2.82)	(2.85)	(3.52)	(4.76)
Value	No	No	No	No	Yes	Yes	No	No
Interaction	No	No	No	No	No	Yes	Yes	No
N	613875	613875	613875	613875	613875	613875	613875	613875
r2	0.00132	0.00215	0.0133	0.0136	0.0183	0.0191	0.0182	0.0162

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Monthly