Connected Stocks: Evidence from Tehran Stock Exchange

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- **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 effect
  [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

- $\text{HJL}_I^A(A, B) = \sum_{i \in I^{A,B}} \frac{\alpha_{i,B}}{\alpha_{i,A} + \alpha_{i,B}}$ [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
- $\text{MHHI} = \sum_j \sum_k s_j s_k \frac{\sum_i \mu_{ij} \nu_{ik}}{\sum_i \mu_{ij} \nu_{ij}}$ [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
- $\text{GGL}^A(A, B) = \sum_{i=1}^I \alpha_{i,A} g(\beta_{i,A}) \alpha_{i,B}$ [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.
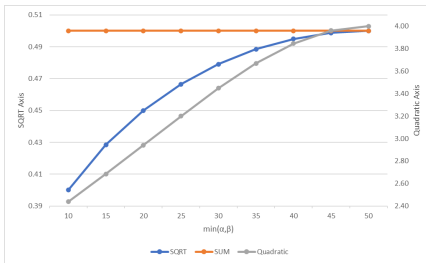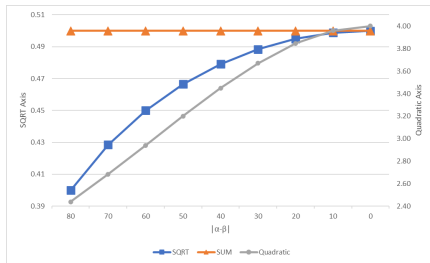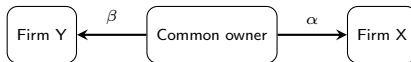
Comparison of three methods for calculating common ownership

Measuring Common Ownership

Example of three common owner

Measuring Common Ownership

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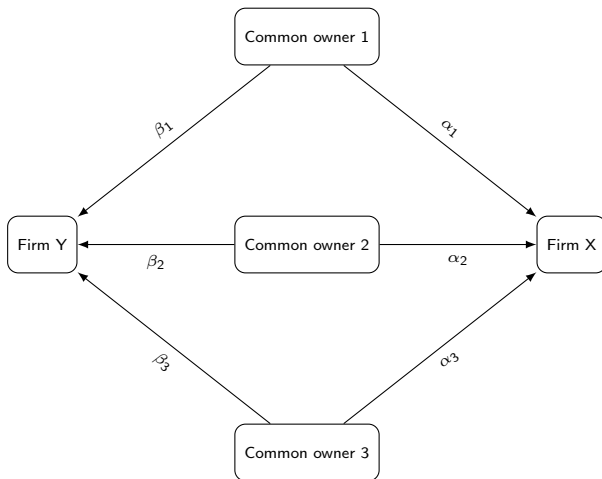
| Ownership	Type I	Type II	Type III	Type IV	Type V	Type VI	Type VII
α_1	1/3	20	10	20	10	5	1
β_1	1/3	10	10	20	10	5	1
α_2	1/3	10	80	20	10	5	1
β_2	1/3	20	80	20	10	5	1
α_3	1/3	70	10	20	10	5	1
β_3	1/3	70	10	20	10	5	1
SQRT	3	2.56	2.33	1.8	0.9	0.45	0.09
SUM	1	1	1	0.6	0.3	0.15	0.03
Quadratic	3	1.85	1.52	8.33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

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

$\frac{MarketCap_x}{MarketCap_y}$	$(\alpha_1,\beta_1),(\alpha_2,\beta_2)$					
	(10,40),(10,40)		(15,35),(15,35)		(20,30),(20,30)	
	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
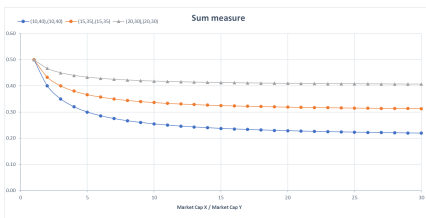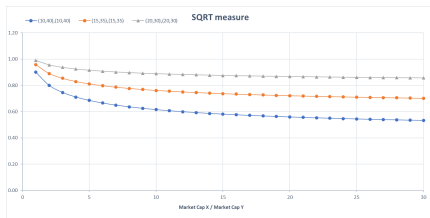
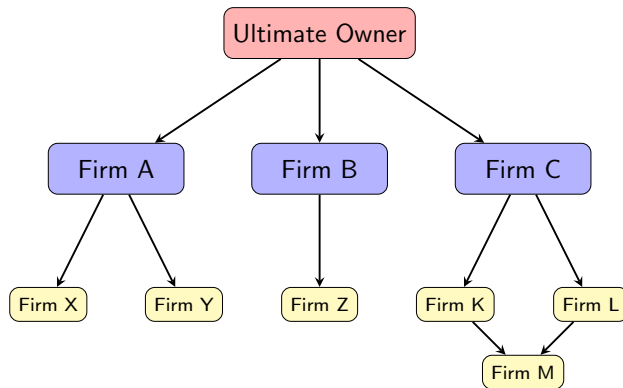Comparison of two methods for calculating common ownership

Conclusion

We use the SQRT measure because it has an acceptable variation and has fair values at a lower level of aggregate common ownership.
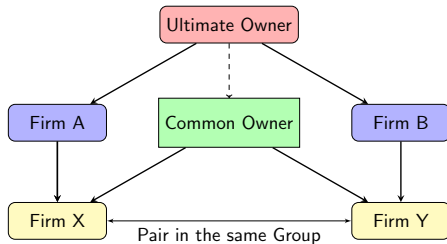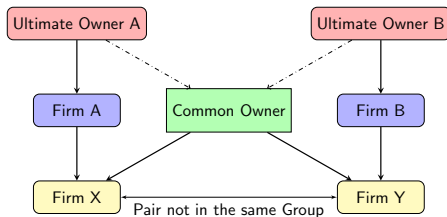
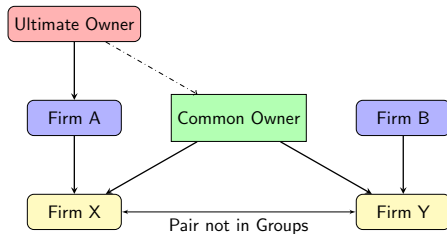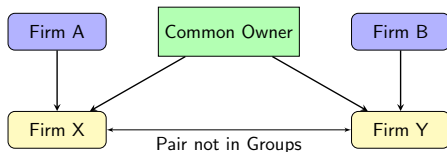# Pair Composition and Business Group
Business Group

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	4325	3222	4157	5101

Year	2015	2016	2017	2018	2019	2020	Mean
No. of Pairs	4689	5868	6554	7430	6371	4094	5834
No. of Groups	40	41	43	43	38	38	41
No. of Pairs not in Groups	231	275	318	969	924	544.00	544
No. of Pairs in the same Group	662	793	1012	1118	1055	803	907
No. of Pairs not in the same Group	3778	4746	5183	5273	4308	2741	4338
Mea. Number of Common owner	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mea. 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
Mea. Number of Pairs in one Group	25	26	27	29	28	21	26
Med. Number of Pairs in one Group	10	11	9	6	7	6	8
Med. Number of Owners	5.96	5.83	5.7	5.77	5.78	6	5.82
Medi. Percent of each Blockholder	10.18	10.27	10.46	10.3	10.69	11	10.49
Med. Block. Ownership	78.45	79.01	79.03	79.65	79.49	79.31	79.16

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	355	383	520	551	579	602	498
No. of Blockholders	724	887	1274	1383	1409	1390	1178
No. of Groups	41	42	46	45	40	40	42
No. of Firms not in Groups	113	128	207	224	247	602	254
No. of Firms in Groups	242	265	332	339	332	332	307
Mea Number of Members	6	6	7	8	8	8	7
Med. of Number of Members	4	4	6	5	6	6	5
Mea Of each Blockholder's ownership	21.30	22.00	20.80	20.50	21.90	23.00	21.58
Med. of Owners' Percent	7.94	7.55	6.95	6.34	8.31	9	8
Mea Number of Blockholders	5	5	5	5	5	4	5
Med. Number of Owners	4	4	4	4	4	3	4
Mea Block. Ownership	71.6	71.2	68	67.7	65.4	62.00	67.65
Med. Block. Ownership	79.9	80.1	77	77.1	72.9	69.70	76.12

Number of Pairs
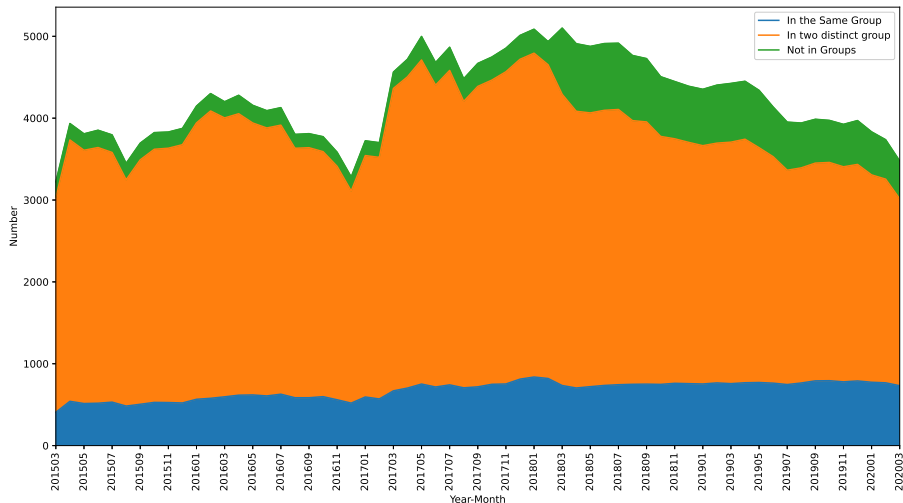
FCA vs. FCAP Summary

	variable	count$_{(month \times id)}$	mean	std	min	25%	median	75%	max
Total	FCA	258352	0.167	0.268	0.003	0.024	0.056	0.181	3.967
	FCAP	258352	0.141	0.192	0.003	0.023	0.052	0.164	0.985
Same Group	FCA	41191	0.499	0.425	0.005	0.172	0.441	0.703	3.967
	FCAP	41191	0.399	0.262	0.004	0.146	0.410	0.615	0.985
Not Same Group	FCA	192551	0.100	0.154	0.003	0.021	0.043	0.109	2.166
	FCAP	192551	0.089	0.121	0.003	0.020	0.041	0.103	0.970
Same Industry	FCA	40364	0.377	0.416	0.007	0.060	0.242	0.571	3.967
	FCAP	40364	0.291	0.259	0.006	0.055	0.209	0.498	0.970
Not Same Industry	FCA	217988	0.128	0.208	0.003	0.022	0.047	0.132	2.555
	FCAP	217988	0.114	0.162	0.003	0.021	0.044	0.125	0.985

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
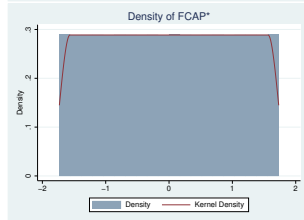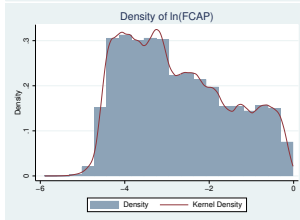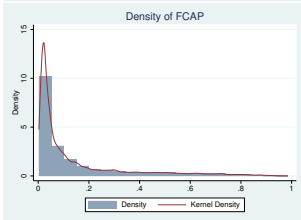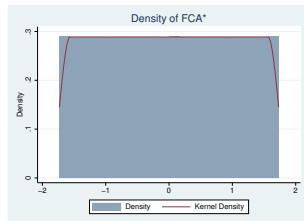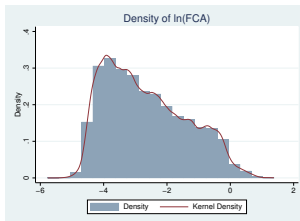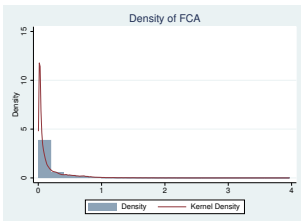
Monthly

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

$\rho_{ij,t}$	mean	std	min	25%	50%	75%	max
CAPM + Industry	0.007	0.328	-1	-0.194	0.006	0.208	1
4 Factor	0.038	0.338	-1	-0.172	0.035	0.248	1
4 Factor + Industry	0.006	0.326	-1	-0.194	0.005	0.206	1
4 Factor + Industry (With Lag)	0.006	0.325	-1	-0.194	0.006	0.206	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
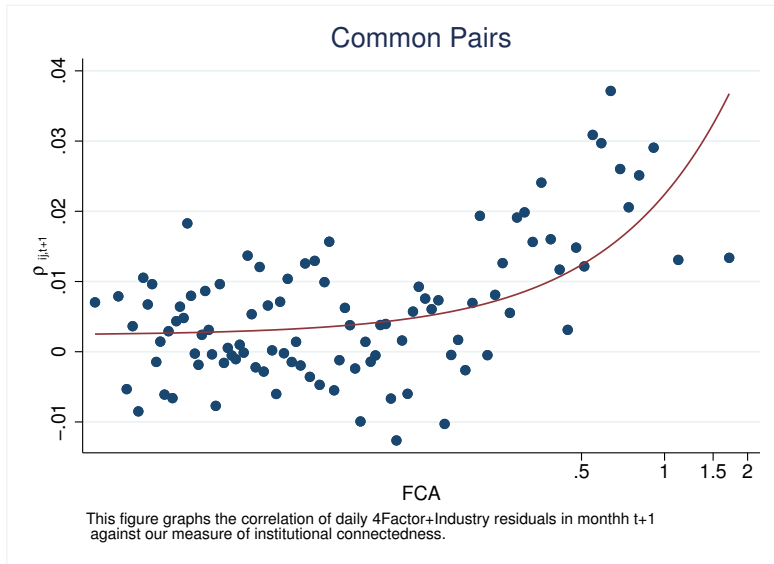
- ρ_t : Current period correlation
- **SameGroup** : Dummy variable for whether the two stocks belong to the same business group.
- **SameIndustry** : Dummy variable for whether the two stocks belong to the same Industry.
- **SameSize** : The negative of absolute difference in percentile ranking of size across a pair
- **SameBookToMarket** :The negative of absolute difference in percentile ranking of the book to market ratio across a pair
- **CrossOwnership**: The maximum percent of cross-ownership between two firms

Summary of Controls

Monthly

Type of Pairs	Yes	No
SameIndustry	1110 (11%)	8631 (88%)
SameGroup	1142 (12%)	8599 (89%)
SameGroup & SameIndustry	494 (5%)	9247 (95%)

	mean	std	min	25%	50%	75%	max
SameIndustry	0.16	0.36	0.00	0.00	0.00	0.00	1.00
SameGroup	0.18	0.38	0.00	0.00	0.00	0.00	1.00
Size1	0.75	0.21	0.01	0.61	0.81	0.93	1.00
Size2	0.47	0.25	0.00	0.27	0.44	0.66	1.00
SameSize	-0.28	0.21	-0.99	-0.42	-0.23	-0.10	0.00
BookToMarket1	0.53	0.26	0.00	0.33	0.54	0.75	1.00
BookToMarket2	0.51	0.24	0.00	0.31	0.50	0.70	1.00
SameBookToMarket	-0.29	0.21	-1.00	-0.42	-0.25	-0.12	0.00
MonthlyCrossOwnership	0.01	0.07	0.00	0.00	0.00	0.00	0.96

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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

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

  - Second Step

$$\begin{bmatrix} \bar{Y}_1 \\ \vdots \\ \bar{Y}_T \end{bmatrix}_{T \times 1} = \begin{bmatrix} 1 & \delta_1^0 & \delta_1^1 & \ldots & \delta_1^k \\ \vdots & \vdots & \vdots & \ldots & \vdots \\ 1 & \delta_T^0 & \delta_T^1 & \ldots & \delta_T^k \end{bmatrix}_{T \times (k+2)} \times \begin{bmatrix} \lambda \\ \lambda_0 \\ \lambda_1 \\ \vdots \\ \lambda_k \end{bmatrix}_{(k+2) \times 1}$$

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

- 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

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

- 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

Model Estimation
Normalized Rank-Transformed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent Variable: Future Monthly Correlation of 4F+Industry Residuals						
FCA*	0.00476***	0.00394***	0.00373***	0.00105	-0.0000511	-0.000238	0.000299
	(4.88)	(5.16)	(5.04)	(1.23)	(-0.06)	(-0.28)	(0.37)
ρ_t		0.124***	0.125***	0.124***	0.124***	0.124***	0.123***
		(4.92)	(4.93)	(4.90)	(4.90)	(4.90)	(4.88)
SameIndustry			0.00187	-0.00386*	-0.00402*	-0.00505*	-0.00476*
			(1.15)	(-2.01)	(-2.06)	(-2.58)	(-2.37)
SameGroup				0.0194***	0.0123***	0.0129***	0.00910*
				(7.86)	(4.30)	(4.54)	(2.26)
(FCA*) × SameGroup					0.00839**	0.00816**	0.00801**
					(3.29)	(3.20)	(3.02)
SameSize						0.0118***	0.0122***
						(4.61)	(4.67)
SameBookToMarket						0.00432	0.00624
						(1.28)	(1.63)
Observations	249030	248118	248118	248118	248118	248118	248118
Group FE	No	No	No	No	No	No	Yes
R^2	0.001	0.034	0.034	0.035	0.035	0.036	0.046

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

Bearish/Bullish Market

- Use Fama macbeth to estimate this model

$$
\begin{aligned}
\rho_{ij,t+1} = \ &\beta_0 + \beta_1 * \mathsf{FCA}^*_{ij,t} \\
&+ \beta_2 * \mathsf{Bearish\ Market} \times \mathsf{SameGroup} \\
&+ \beta_3 * \mathsf{Bullish\ Market} \times \mathsf{SameGroup} \\
&+ \beta_4 * \mathsf{FCA}^*_{ij,t} \times \mathsf{Bearish\ Market} \times \mathsf{SameGroup} \\
&+ \beta_5 * \mathsf{FCA}^*_{ij,t} \times \mathsf{Bullish\ Market} \times \mathsf{SameGroup} \\
&+ \sum_{k=1}^{n} \alpha_k * \mathsf{Control}_{ij,t} + \varepsilon_{ij,t+1}
\end{aligned}
\tag{2}
$$

- 37% of observations are bearish

Model Estimation
Normalized Rank-Transformed (Bearish Market)

	Fu. Monthly Cor. of 4F+Ind. Residuals		
	(1)	(2)	(3)
FCA*	-0.000238	-0.000238	-0.000238
	(-0.28)	(-0.28)	(-0.28)
(FCA*) × SameGroup	0.00816**	0.00816**	
	(3.20)	(3.20)	
SameGroup	0.0129***	0.00880***	0.00880***
	(4.54)	(4.60)	(4.60)
Bearish Market × SameGroup		0.00415	0.00415
		(1.92)	(1.92)
(FCA*) × Bullish Market × SameGroup			0.00424*
			(2.64)
(FCA*) × Bearish Market × SameGroup			0.00393*
			(2.62)
Observations	248118	248118	248118
R^2	0.036	0.036	0.036

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

	Fu. Monthly Cor. of 4F+Ind. Residuals		
	(1)	(2)	(3)
FCA*	-0.000238	-0.000238	-0.000238
	(-0.28)	(-0.28)	(-0.28)
(FCA*) × SameGroup	0.00816**	0.00816**	
	(3.20)	(3.20)	
SameGroup	0.0129***		
	(4.54)		
Bearish Market × SameGroup		0.00415	0.00415
		(1.92)	(1.92)
Bullish Market × SameGroup		0.00880***	0.00880***
		(4.60)	(4.60)
(FCA*) × Bullish Market × SameGroup			0.00424*
			(2.64)
(FCA*) × Bearish Market × SameGroup			0.00393*
			(2.62)
Observations	248118	248118	248118
R^2	0.036	0.036	0.036

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^*

$$\rho_{ij,t+1} = \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij} + \sum_1^G \lambda_{1,g} * \gamma_g$$

$$+ \sum_1^G \lambda_{2,g} * \text{SameGroup}_{ij} * \gamma_g + \sum_1^G \lambda_{3,g} * \gamma_g * \text{FCA}^*_{ij,t}$$

$$+ \sum_1^G \lambda_{4,g} \text{SameGroup}_{ij} * \gamma_g * \text{FCA}^*_{ij,t} + \sum_{k=1}^n \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}$$

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

Effective Business Group
Significant coefficients

	γ_g	
Coef.	t	uo
0.05	3.85	Farhangian
-0.01	-3.36	Bonyad
-0.01	-2.67	Sepah bank
-0.01	-2.11	Basij
-0.01	-2.55	Government
-0.01	-2.18	Tejarat bank

SameGroup$_{ij}$ * γ_g		
Coef.	t	uo
1.77	2.22	Sanat Bank
-0.10	-2.48	Government
FCA$^*_{ij,t}$ * γ_g		
Coef.	t	uo
0.02	2.23	Saman bank
0.01	2.12	Mirabi
0.01	2.34	Alipour&Keshavarz
0.01	2.15	Tipico
0.01	2.51	Imidro

SameGroup$_{ij}$ * γ_g * FCA$^*_{ij,t}$		
Coef.	t	uo
0.07	3.60	C.S Pension fund
0.06	2.61	Maskan bank
0.05	2.51	Taira
0.02	3.64	vKosar
0.02	3.16	vSakht
0.02	2.68	Tapico
0.02	2.86	Melli bank
-0.04	-2.19	Imidro
-1.02	-2.17	Sanat Bank

Effective Business Group
Check banking and Investment

- We define three types of groups
  - **Bank is Uo** Groups that their ultimate owner is bank
  - **Bank In Group:** Groups that ,at least, consist of one bank
- Estimated model:

$$\rho_{ij,t+1} = \beta_0 + \beta_1 * \text{FCA}^*_{ij,t} + \beta_2 * \text{SameGroup}_{ij}$$
$$+ \beta_3 * \text{FCA}^*_{ij,t} * \text{SameGroup}_{ij} + \beta_{10} * \text{Bank is Uo} + \beta_{11} * \text{Bank in group}$$
$$+ \beta_4 * \text{Bank is Uo} * \text{SameGroup}_{ij} + \beta_5 * \text{Bank is Uo} * \text{SameGroup}_{ij} * \text{FCA}^*_{ij,t}$$
$$+ \beta_6 * \text{Bank In Group} * \text{SameGroup}_{ij} + \beta_7 * \text{Bank In Group} * \text{SameGroup}_{ij} * \text{FCA}^*_{ij,t}$$
$$+ \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}$$

Effective Business Group
Check banking and Investment

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	De. Variable:Future Monthly Correlation of 4F+Industry Residuals
FCA*	-0.000307	-0.000294	-0.000303	-0.000299	-0.000189	-0.000199	-0.000204	-0.000161	-0.000183	-0.000180
	(-0.36)	(-0.35)	(-0.36)	(-0.35)	(-0.22)	(-0.24)	(-0.24)	(-0.19)	(-0.22)	(-0.21)
(FCA*) × SameGroup	0.00820**	0.00830**	0.00888***	0.00750*	0.00810**	0.00818**	0.00825**	0.00825**	0.00884***	0.00698*
	(3.22)	(3.28)	(3.53)	(2.64)	(3.19)	(3.20)	(3.01)	(3.27)	(3.52)	(2.49)
SameGroup	0.0130***	0.0131***	0.0106**	0.0121**	0.0125***	0.0130***	0.0132***	0.0127***	0.0110**	0.0131**
	(4.55)	(4.53)	(3.08)	(3.30)	(4.38)	(3.96)	(4.00)	(4.41)	(2.85)	(3.20)
Bank is Uo		0.00140	0.000550	0.000550				0.00214*	0.00132	0.00133
		(1.49)	(0.55)	(0.55)				(2.13)	(1.27)	(1.27)
Bank is Uo × SameGroup			0.00804	0.00381					0.00711	0.00181
			(1.51)	(0.70)					(1.37)	(0.34)
(FCA*) × Bank is Uo × SameGroup				0.00458						0.00570
				(1.33)						(1.68)
Bank in group					-0.00392**	-0.00378**	-0.00378**	-0.00431**	-0.00403**	-0.00404**
					(-2.97)	(-3.30)	(-3.30)	(-3.12)	(-3.35)	(-3.35)
Bank in group × SameGroup						-0.00244	-0.00760		-0.00269	-0.00734
						(-0.42)	(-0.80)		(-0.46)	(-0.76)
(FCA*) × Bank in group × SameGroup							0.00435			0.00313
							(0.64)			(0.48)
Observations	248118	248118	248118	248118	248118	248118	248118	248118	248118	248118
R^2	0.035	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.037	0.037

t statistics in parentheses

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

Estimation model

- Use Fama macbeth to estimate this model

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

$$(3)$$

- Estimate that model on a monthly frequency

Future Correlation via *FCA*

Discontinuity

Common Pairs

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

Common Pairs

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
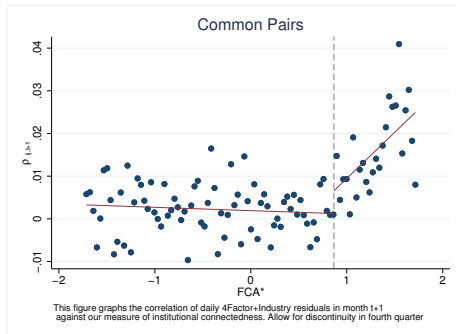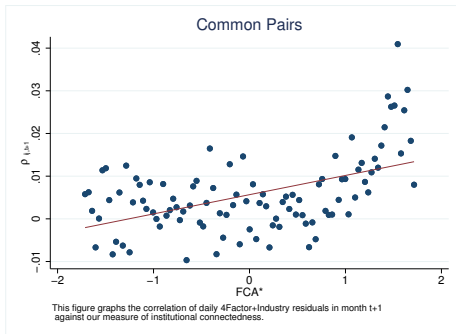
Fortnightly

Fama MacBeth Estimation

Discontinuity

	Dep. Variable: Future Monthly Corr. of 4F+Ind. Residuals				
	(1)	(2)	(3)	(4)	(5)
FCA*	0.00476***	-0.000946	-0.000876	-0.00129	-0.00133
	(4.88)	(-0.93)	(-0.83)	(-1.25)	(-1.32)
$(\text{FCA}^* > Q3[\text{FCA}^*]) \times \text{FCA}^*$		0.0129***	0.0109***	0.00581**	0.00584**
		(6.77)	(6.12)	(3.11)	(3.14)
ρ_t			0.124***	0.124***	0.124***
			(4.92)	(4.90)	(4.90)
SameGroup				0.0157***	0.0176***
				(7.09)	(7.21)
SameIndustry					-0.00540**
					(-2.80)
SameSize					0.0115***
					(4.50)
SameBookToMarket					0.00416
					(1.22)
Constant	0.00568***	0.00148	0.00128	0.000297	0.00511***
	(6.30)	(1.39)	(1.34)	(0.33)	(4.19)
Observations	249030	249030	248118	248118	248118
R^2	0.001	0.001	0.034	0.035	0.036

t statistics in parentheses

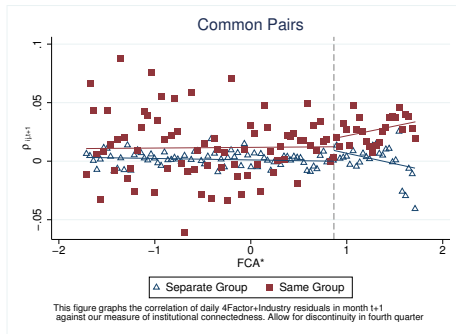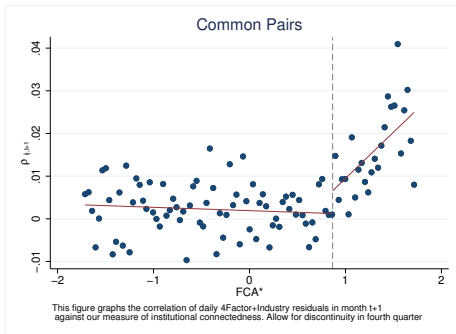$^*\ p < 0.05$, $^{**}\ p < 0.01$, $^{***}\ p < 0.001$

Fortnightly

Estimation model

- Use Fama macbeth to estimate this model

$$
\begin{aligned}
\rho_{ij,t+1} = {} & \beta_0 + \beta_1 * \mathsf{FCA}^*_{ij,t} \\
& + \beta_2 * (\mathsf{FCA}^*_{ij,t} > Q3[\mathsf{FCA}^*_{ij,t}]) \times \mathsf{FCA}^*_{ij,t} \\
& + \beta_3 * \mathsf{FCA}^*_{ij,t} \times \mathsf{SameGroup} \\
& + \beta_4 * (\mathsf{FCA}^*_{ij,t} > Q3[\mathsf{FCA}^*_{ij,t}]) \times \mathsf{FCA}^*_{ij,t} \times \mathsf{SameGroup} \\
& + \sum_{k=1}^{n} \alpha_k * \mathsf{Control}_{ij,t} + \varepsilon_{ij,t+1}
\end{aligned}
\tag{4}
$$

- Estimate that model on a monthly frequency

4 Factor + Industry Future Correlation via FCA^*

Discontinuity & Business Groups

Common Pairs

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

Common Pairs

△ Separate Group   ■ Same Group

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

Correlation	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) ρ_f	1.00										
(2) ρ	0.11	1.00									
(3) FCA*	0.02	0.01	1.00								
(4) (FCA* > $Q3$[FCA*])	0.02	0.02	0.75	1.00							
(5) (FCA* > $Q3$[FCA*]) × FCA*	0.02	0.02	0.76	0.98	1.00						
(6) (FCA*) × SameGroup	0.03	0.03	0.55	0.60	0.68	1.00					
(7) (FCA* > $Q3$[FCA*]) × (FCA*) × SameGroup	0.03	0.03	0.53	0.63	0.71	0.95	1.00				
(8) SameGroup	0.03	0.03	0.44	0.49	0.54	0.75	0.82	1.00			
(9) SameIndustry	0.01	0.01	0.28	0.30	0.32	0.33	0.36	0.38	1.00		
(10) SameSize	0.01	0.01	0.12	0.12	0.12	0.06	0.07	0.03	0.12	1.00	
(11) SameBookToMarket	0.01	0.01	0.02	0.03	0.04	0.05	0.06	0.06	0.11	0.07	1.00

Fama MacBeth Estimation
Discontinuity & Business Groups

	Dep. Variable: Future Monthly Correlation of 4F+Industry Residuals						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FCA*	-0.00133	-0.000238	-0.000251	-0.00150	-0.000223	-0.00109	-0.00110
	(-1.32)	(-0.28)	(-0.29)	(-1.49)	(-0.27)	(-1.09)	(-1.22)
(FCA* > Q3[FCA*]) × FCA*	0.00584**			0.00402		0.00282	0.00283
	(3.14)			(1.88)		(1.23)	(1.27)
(FCA*) × SameGroup		0.00816**		0.00659*	-0.00103		-0.000149
		(3.20)		(2.31)	(-0.20)		(-0.03)
(FCA* > Q3[FCA*]) × (FCA*) × SameGroup			0.0120***		0.0132*	0.0102**	0.0103
			(3.85)		(2.14)	(2.75)	(1.66)
Observations	248118	248118	248118	248118	248118	248118	248118
R^2	0.036	0.036	0.036	0.036	0.036	0.036	0.036

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Fortnightly

Common Pairs

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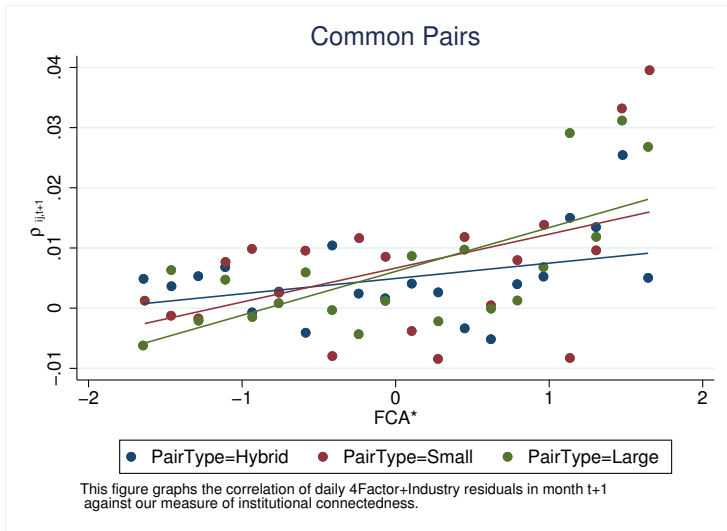
Model Estimation
Grouped by size

	All Firms			Big Firms			Big & Small Firms			Small Firms		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FCA*	-0.000238	-0.00133	-0.00109	0.00319**	0.000544	0.000480	-0.000936	-0.00212	-0.00209	-0.00199	-0.00138	-0.000247
	(-0.28)	(-1.32)	(-1.09)	(3.15)	(0.34)	(0.30)	(-0.76)	(-1.41)	(-1.41)	(-1.34)	(-0.88)	(-0.16)
$(FCA^* > Q3[FCA^*]) \times FCA^*$		0.00584**	0.00282		0.00861*	0.00771		0.00372	0.00324		0.00674*	-0.00415
		(3.14)	(1.23)		(2.48)	(1.92)		(1.52)	(1.15)		(2.17)	(-1.00)
SameGroup	0.0129***	0.0176***	0.00916**	0.0118*	0.0125**	0.00959	0.0248***	0.0252***	0.0233***	-0.00585	0.0106**	-0.0118
	(4.54)	(7.21)	(2.85)	(2.03)	(2.80)	(1.37)	(5.11)	(6.48)	(4.01)	(-1.42)	(2.89)	(-1.96)
$(FCA^*) \times SameGroup$	0.00816**			0.00490			0.00204			0.0224***		
	(3.20)			(1.17)			(0.68)			(6.03)		
$(FCA^* > Q3[FCA^*]) \times (FCA^*) \times SameGroup$			0.0102**			0.00452			0.00207			0.0290***
			(2.75)			(0.64)			(0.49)			(4.82)
SameIndustry	-0.00505*	-0.00540**	-0.00548**	0.00203	0.00172	0.00126	-0.0131***	-0.0134***	-0.0134***	0.00242	0.00315	0.00189
	(-2.58)	(-2.80)	(-2.81)	(0.39)	(0.33)	(0.24)	(-5.49)	(-5.57)	(-5.62)	(0.84)	(1.12)	(0.67)
Observations	248118	248118	248118	61741	61741	61741	123757	123757	123757	62620	62620	62620
R^2	0.036	0.036	0.036	0.043	0.043	0.046	0.038	0.038	0.039	0.040	0.040	0.041

t statistics in parentheses

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

Fortnightly

FCA* summary

| PairType	mean	std	min	25%	50%	75%	max
Small	0.25	0.99	-1.73	-0.57	0.27	1.18	1.73
Hybrid	-0.08	0.98	-1.73	-0.93	-0.10	0.72	1.73
Large	-0.02	1.01	-1.73	-0.91	-0.01	0.88	1.73
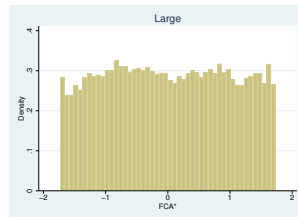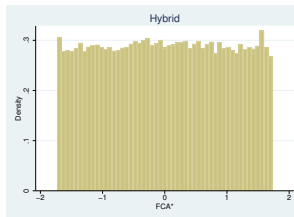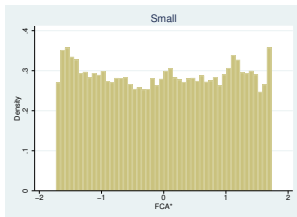
Estimation model

- Use Fama macbeth to estimate this model

$$
\begin{aligned}
\rho_{ij,t+1} = \beta_0 + \beta_1 * \ln(\text{FCA}_{ij,t}) &+ \beta_2 * \text{SameGroup}_{ij} \\
&+ \beta_3 * \ln(\text{FCA}_{ij,t}) \times \text{SameGroup}_{ij} \\
&+ \sum_{k=1}^{n} \alpha_k * \text{Control}_{ij,t} + \varepsilon_{ij,t+1}
\end{aligned} \tag{5}
$$

- Estimate that model on a monthly frequency

Future Correlation via *FCA*
Logaritmic Transformation
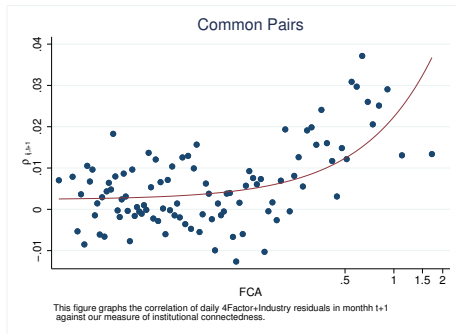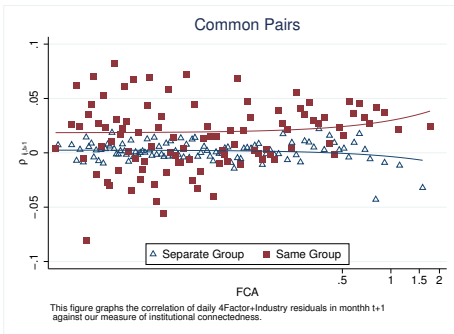
Fama MacBeth Estimation

Logaritmic Transformation

	Dependent Variable: Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(FCA)$	0.00420***	0.00351***	0.000907	-0.000249	-0.0000972	-0.000260
	(5.55)	(5.88)	(1.24)	(-0.32)	(-0.13)	(-0.36)
ρ_t		0.124***	0.124***	0.124***	0.124***	0.124***
		(4.92)	(4.90)	(4.90)	(4.90)	(4.90)
SameGroup			0.0176***	0.0269***	0.0284***	0.0286***
			(7.84)	(7.11)	(6.76)	(6.92)
$(\ln(FCA)) \times$ SameGroup				0.00582**	0.00589**	0.00574**
				(3.43)	(3.41)	(3.34)
SameIndustry					-0.00417*	-0.00518*
					(-2.13)	(-2.64)
SameSize						0.0116***
						(4.58)
SameBookToMarket						0.00428
						(1.27)
Constant	0.0167***	0.0141***	0.00420	0.000755	0.00159	0.00563*
	(7.38)	(7.77)	(1.92)	(0.32)	(0.74)	(2.61)
Observations	249030	248118	248118	248118	248118	248118
R^2	0.001	0.034	0.034	0.035	0.035	0.036

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*	0.00513***	0.00424***	0.00127	0.0000453	0.000188	-0.000110
	(5.33)	(5.73)	(1.46)	(0.05)	(0.22)	(-0.13)
ρ_t		0.124***	0.124***	0.124***	0.124***	0.124***
		(4.92)	(4.90)	(4.89)	(4.89)	(4.90)
SameGroup			0.0176***	0.0100**	0.0114***	0.0120***
			(8.16)	(3.43)	(3.94)	(4.16)
(FCAP*) × SameGroup				0.00904**	0.00912**	0.00900**
				(3.13)	(3.12)	(3.08)
SameIndustry					-0.00414*	-0.00513*
					(-2.12)	(-2.62)
SameSize						0.0116***
						(4.59)
SameBookToMarket						0.00443
						(1.31)
Constant	0.00568***	0.00482***	0.00187*	0.00166*	0.00206**	0.00654***
	(6.30)	(6.07)	(2.56)	(2.20)	(2.85)	(6.33)
Observations	249030	248118	248118	248118	248118	248118
R^2	0.001	0.034	0.034	0.035	0.035	0.036

t statistics in parentheses

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

Table of Contents

Random Pairs from Same Business Group
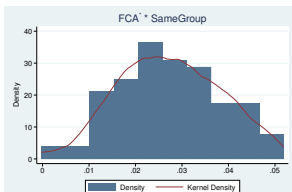
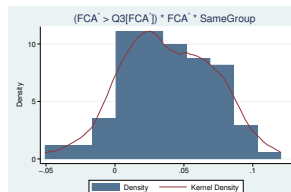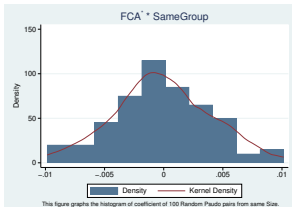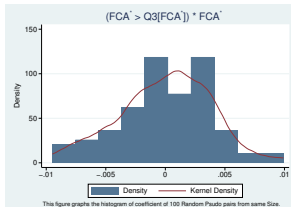β_3 in model 1 $\qquad$ β_2 in model 3 $\qquad$ β_4 in model 4
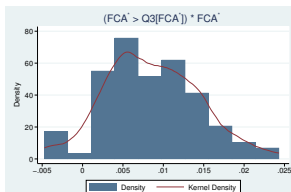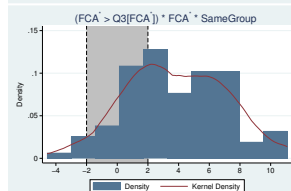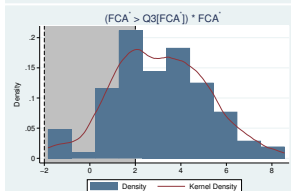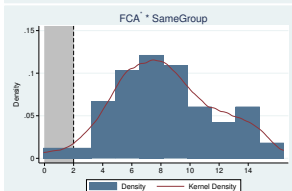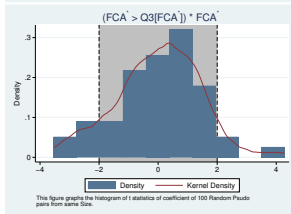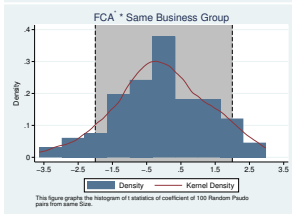
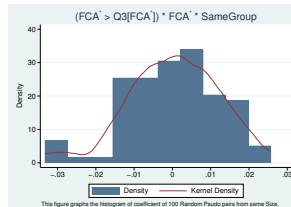# Random Pairs from Same Size

β_3 in model 1 $\qquad\qquad$ β_2 in model 3 $\qquad\qquad$ β_4 in model 4
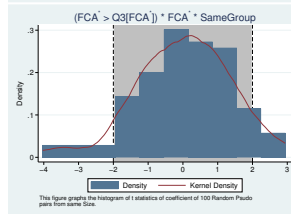
Random Pairs from Same Industry

β_3 in model 1 $\qquad\qquad$ β_2 in model 3 $\qquad\qquad$ β_4 in model 4

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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

Anton, Polk, *Connected Stocks* ,Jornal of Finance 2014

Andrew Koch, Stefan Ruenzi, Laura Starks , *Commonality in Liquidity A Demand-Side Explanation* ,The Review of Financial Studies 2016

Pastor, L., and R. Stambaugh , *Liquidity risk and expected stock returns* ,Journal of Political Economy 2003

Acharya,V., and L. Pedersen , *Asset pricing with liquidity risk* ,Journal of Financial Economics 2005

Khanna, T.,Thomas, C., *Synchronicity and firm interlocks in an emerging market* , Journal of Financial Economics 2009

Boubaker, S., Mansali, H., Rjiba, H.-*Large controlling shareholders and stock price synchronicity* , Journal of Banking and finance 2014

Morck, R., Yeung, B., Yu, W., *The information content of stock markets: Why do emerging markets have synchronous stock price*, Journal of Financial Economics 2000

Harford, J., Jenter, D., Li, K.,*Institutional cross-holdings and their effect on acquisition decisions* , Journal of Financial Economics 2011

AZAR, J., SCHMALZ, M. C., TECU, I,,*Anticompetitive Effects of Common Ownership* , Journal of Financial 2018

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 $S_{i,t}^f P_{i,t} = \alpha_i$
  - SQRT

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

  - Quadratic

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

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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 $= \frac{\sum_t (n_{i,j,t}^{up} n_{i,j,t}^{down})}{T_{i,j}}$
  2. Correlation $= \frac{Cov(i,j)}{\sqrt{Var(i).Var(j)}}$
- Tobit estimation of

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

being in the same director network has a significant effect

Large controlling shareholder and stock price synchronicity

JBF-2014-Boubaker

- Stock price synchronicity:

$$SYNCH = \log\left(\frac{R_{i,t}^2}{1 - R_{i,t}^2}\right)$$

where $R_{i,t}^2$ 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

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

- 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)

Common Pairs

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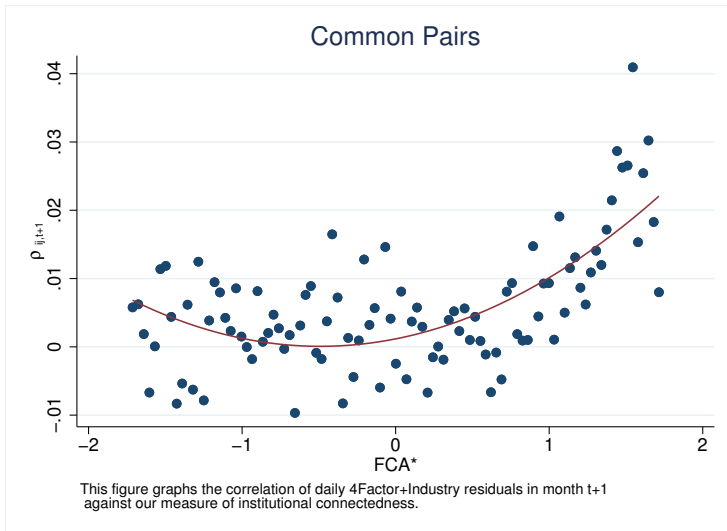
Fama MacBeth Estimation

Monthly variables

	Dependent Variable: Future Monthly Correlation of 4F+Industry Residuals						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FCA*	0.00476***	0.00394***	0.00373***	0.00105	-0.0000511	-0.000238	0.000299
	(4.88)	(5.16)	(5.04)	(1.23)	(-0.28)	(-0.28)	(0.37)
ρ_t		0.124***	0.125***	0.124***	0.124***	0.124***	0.123***
		(4.92)	(4.93)	(4.90)	(4.90)	(4.90)	(4.88)
SameIndustry			0.00187	-0.00386*	-0.00402*	-0.00505*	-0.00476*
			(1.15)	(-2.01)	(-2.06)	(-2.58)	(-2.37)
SameGroup				0.0194***	0.0123***	0.0129***	0.00910*
				(7.86)	(4.30)	(4.54)	(2.26)
(FCA*) × SameGroup					0.00839**	0.00816**	0.00801**
					(3.29)	(3.20)	(3.02)
SameSize						0.0118***	0.0122***
						(4.61)	(4.67)
SameBookToMarket						0.00432	0.00624
						(1.28)	(1.63)
Observations	249030	248118	248118	248118	248118	248118	248118
Group FE	No	No	No	No	No	No	Yes
R^2	0.001	0.034	0.034	0.035	0.035	0.036	0.046

t statistics in parentheses

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

Fortnightly

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FCA vs. FCAP Distributions
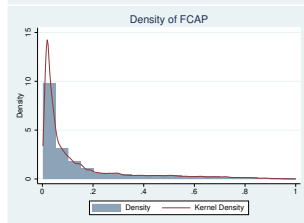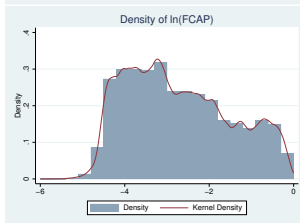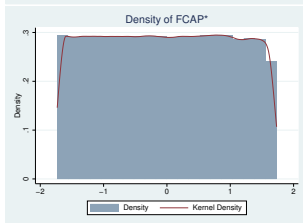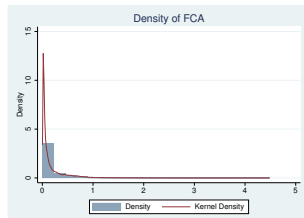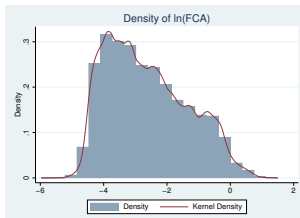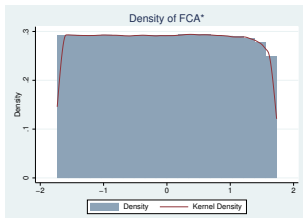
Fortnightly

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

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

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

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
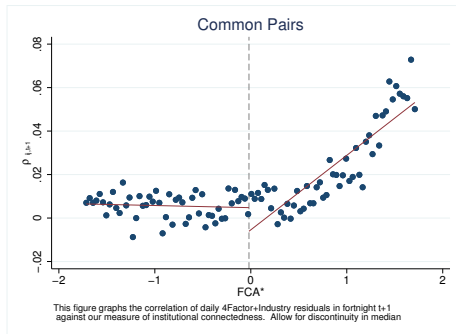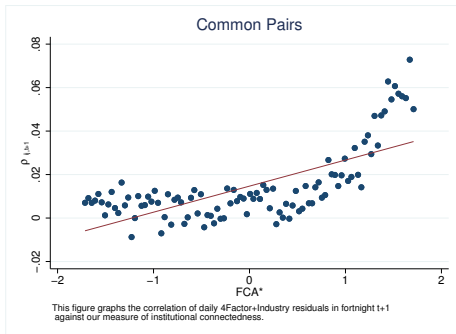
Monthly

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

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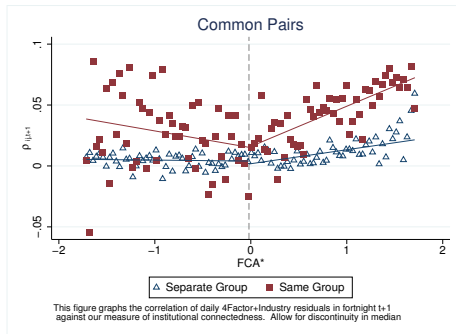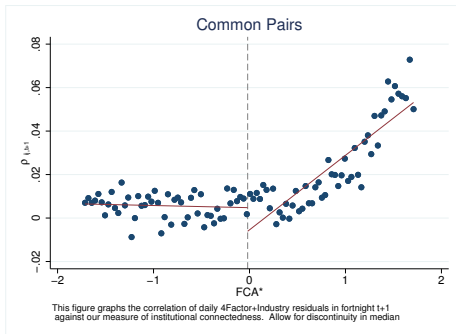
Monthly

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.
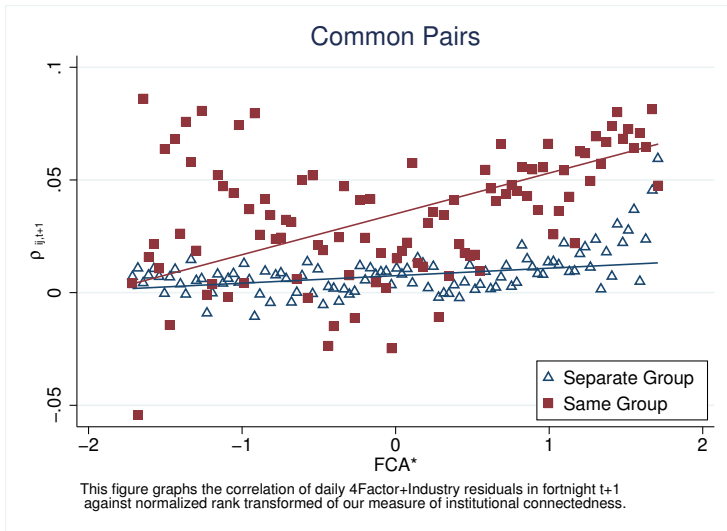
Fama MacBeth Estimation

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)
$(FCA^* > Median[FCA^*]) \times FCA^*$		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

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

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.
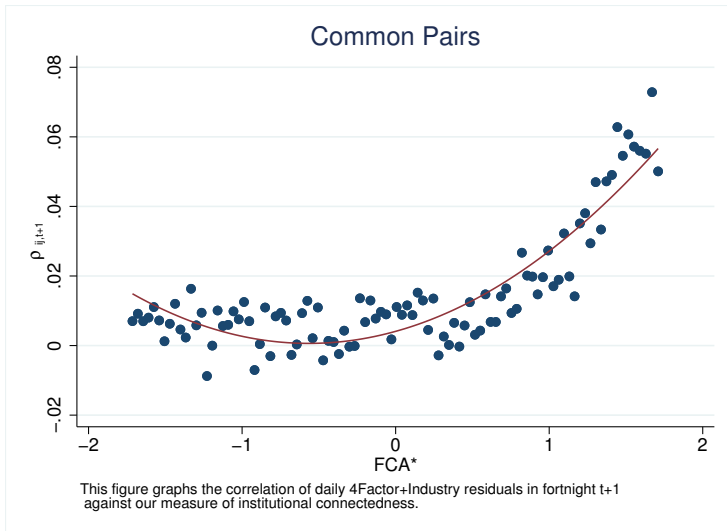
Fama MacBeth Estimation

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

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Model Estimation
Normalized Rank-Transformed

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals					
	(1)	(2)	(3)	(4)	(5)	(6)
FCA*	0.00486***	0.00413***	0.00132	0.000275	0.000407	0.000219
	(5.38)	(5.52)	(1.43)	(0.27)	(0.41)	(0.22)
ρ_t		0.127***	0.126***	0.126***	0.126***	0.126***
		(5.01)	(4.98)	(4.98)	(4.98)	(4.97)
SameGroup			0.0174***	0.0111***	0.0123***	0.0129***
			(6.97)	(4.51)	(4.93)	(5.19)
$(FCA^*) \times$ SameGroup				0.00764**	0.00776**	0.00756**
				(3.21)	(3.21)	(3.11)
SameIndustry					-0.00384	-0.00484*
					(-1.85)	(-2.28)
SameSize						0.0116***
						(5.96)
SameBookToMarket						0.00488
						(1.55)
Constant	0.00583***	0.00515***	0.00233**	0.00214**	0.00249**	0.00715***
	(6.90)	(6.71)	(2.99)	(2.73)	(3.29)	(5.92)
Observations	254640	253828	253828	253828	253828	253828
R^2	0.000	0.034	0.035	0.035	0.036	0.036

t statistics in parentheses

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

Fama MacBeth Estimation

Discontinuity

	Dependent Variable:Future Monthly Correlation of 4F+Industry Residuals				
	(1)	(2)	(3)	(4)	(5)
FCA*	0.00486***	0.0000346	-0.0000865	-0.000440	-0.000462
	(5.38)	(0.03)	(-0.08)	(-0.42)	(-0.44)
(FCA* > Q3[FCA*]) × FCA*		0.0109***	0.00956***	0.00464*	0.00456*
		(5.40)	(5.00)	(2.26)	(2.24)
ρ_t			0.126***	0.126***	0.126***
			(5.00)	(4.98)	(4.98)
SameGroup				0.0156***	0.0175***
				(5.92)	(6.04)
SameIndustry					-0.00509*
					(-2.51)
SameSize					0.0115***
					(5.83)
SameBookToMarket					0.00475
					(1.51)
Constant	0.00583***	0.00228*	0.00205*	0.00112	0.00610***
	(6.90)	(2.35)	(2.34)	(1.28)	(4.19)
Observations	254640	254640	253828	253828	253828
R^2	0.000	0.001	0.035	0.035	0.036

t statistics in parentheses

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

Fama MacBeth Estimation

Discontinuity & Business Groups

	Future Monthly Correlation of 4F+Industry Residuals						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FCA*	-0.000462	0.000219	0.000262	-0.000639	0.000229	-0.000227	-0.000309
	(-0.44)	(0.22)	(0.27)	(-0.62)	(0.23)	(-0.22)	(-0.32)
$(FCA^* > Q3[FCA^*]) \times FCA^*$	0.00456*			0.00267		0.00158	0.00169
	(2.24)			(1.06)		(0.58)	(0.64)
$(FCA^*) \times SameGroup$		0.00756**		0.00652*	0.000306		0.000852
		(3.11)		(2.22)	(0.07)		(0.19)
$(FCA^* > Q3[FCA^*]) \times (FCA^*) \times SameGrouop$			0.0107***		0.0106	0.00964*	0.00894
			(3.68)		(1.93)	(2.53)	(1.65)
Observations	253828	253828	253828	253828	253828	253828	253828
R^2	0.036	0.036	0.036	0.036	0.036	0.036	0.037

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$