

Connected Stocks: Evidence from Tehran Stock Exchange

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- 1 Motivation
- 2 Literature
 - Common-ownership measurements
 - Main Effect
- 3 Empirical Studies
 - Measuring Common-ownership
 - Correlation Calculation
 - Controls
- 4 Methodology
- 5 Results
 - Normalized Rank-Transformed
 - Discontinuity
- 6 Correlated trading
- 7 Conclusion

- **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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Common-ownership measurements

Model based measures

- $HJL^A(A, B) = \sum_{i \in I^{A,B}} \frac{\alpha_{i,B}}{\alpha_{i,A} + \alpha_{i,B}}$

Harford et al. (2011)

- $MHHI = \sum_j \sum_k s_j s_k \frac{\sum_i \mu_{ij} \nu_{ik}}{\sum_i \mu_{ij} \nu_{ij}}$

Azar et al. (2018)

- $Top5_j = \frac{1}{n-1} \sum_i^5 \sum_{j \neq k} \nu_{ik}$

Antón et al. (2020)

- $\kappa_{ij} = \cos(\nu_i, \nu_j) \cdot \sqrt{\frac{IHHI_j}{IHHI_i}}$

Backus et al. (2020)

- $GGL^A(A, B) = \sum_{i=1}^I \alpha_{i,A} g(\beta_{i,A}) \alpha_{i,B}$

Gilje et al. (2020) , Lewellen and Lewellen (2021)

- $MHHI_{\text{Delta}} = \sum_{j=1}^J \sum_{k \neq j}^K \frac{\sum_{i=1}^N w_j * w_k * \mu_{i,j} * \mu_{i,k}}{\sum_{i=1}^N \mu_{i,j} * \mu_{i,k}}$

Lewellen and Lowry (2021)

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- $MHHI_{Delta} = \sum_{j=1}^J \sum_{k \neq j}^K \frac{\sum_{i=1}^N w_j * w_k * \mu_{i,j} * \mu_{i,k}}{\sum_{i=1}^N \mu_{i,j} * \mu_{i,k}}$
Lewellen and Lowry (2021)

Ad-hoc measures

- $Overlap_{AP}(A, B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \frac{\bar{\nu}_A}{\bar{\nu}_A + \bar{\nu}_B} + \alpha_{i,B} \frac{\bar{\nu}_B}{\bar{\nu}_A + \bar{\nu}_B}$
Anton and Polk (2014)
- $Overlap_{Count}(A, B) = \sum_{i \in I^{A,B}} 1$
He and Huang (2017), He et al. (2019)
- $Overlap_{Min}(A, B) = \sum_{i \in I^{A,B}} \min\{\alpha_{i,A}, \alpha_{i,B}\}$
Newham et al. (2018)
- $Overlap_{HL}(A, B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \times \sum_{i \in I^{A,B}} \alpha_{i,B}$
Hansen and Lott Jr (1996) , Freeman (2019)

Common-ownership measurements

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Gilje et al. (2020) , Lewellen and Lewellen (2021)
- $MHHI_{Delta} = \sum_{j=1}^J \sum_{k \neq j}^K \frac{\sum_{i=1}^N w_j * w_k * \mu_{i,j} * \mu_{i,k}}{\sum_{i=1}^N \mu_{i,j} * \mu_{i,k}}$
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Hansen and Lott Jr (1996) , Freeman (2019)

Selected measure

We need a pair-level measure, which is bi-directional, so we use the AP measure.

Measures' detail

Main effect

Comovement effect

Papers

Main effect

Common-ownership

Comovement effect

Papers

Main effect



Papers

Main effect



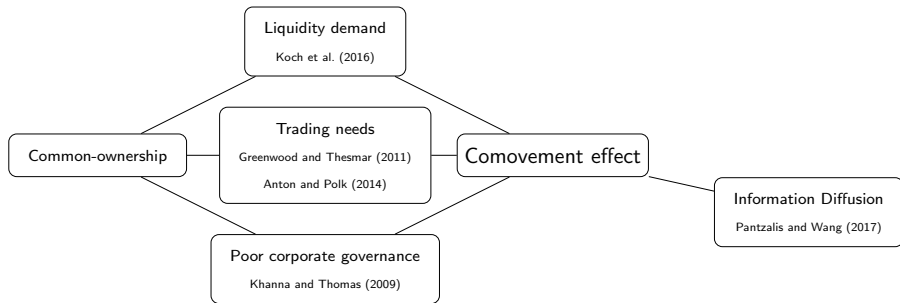
Papers

Main effect



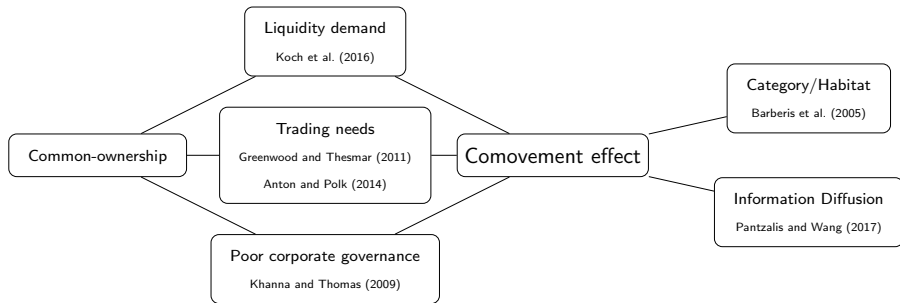
Papers

Main effect



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Papers

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Measuring Common-ownership

Anton and Polk (2014)

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

Measuring Common-ownership

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

SQRT

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

Quadratic

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

Measuring Common-ownership

Anton and Polk (2014)

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SQRT

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

Quadratic

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

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

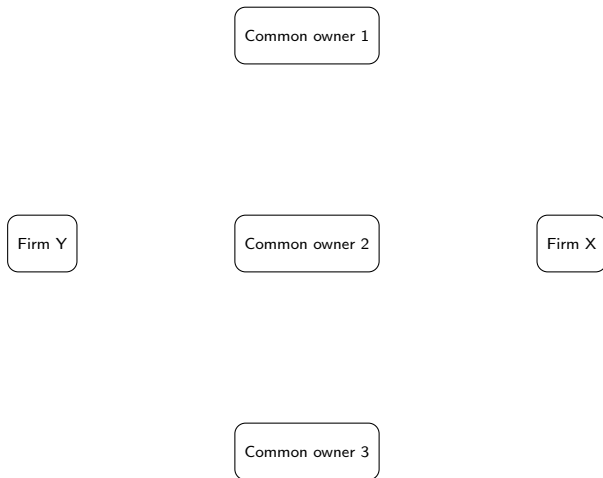
Example of three common owner

Firm Y

Firm X

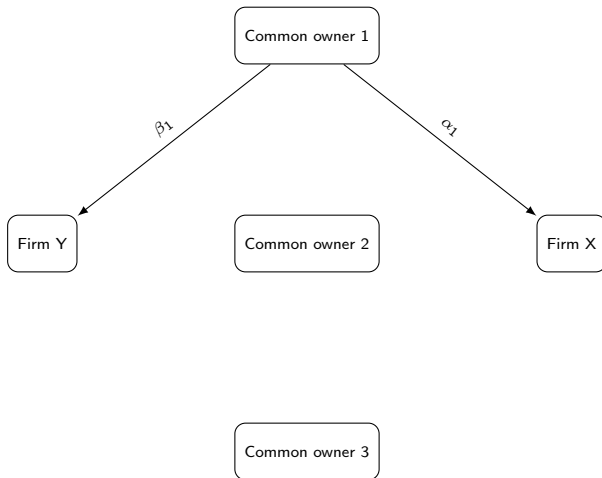
Measuring Common Ownership

Example of three common owner



Measuring Common Ownership

Example of three common owner



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 |

Measuring Common Ownership

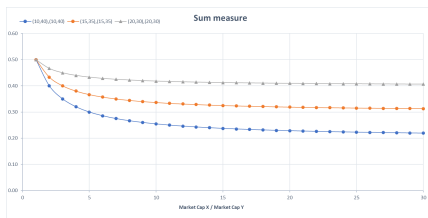
Comparison

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

| $\frac{\text{MarketCap}_x}{\text{MarketCap}_y}$ | $(\alpha_1, \beta_1), (\alpha_2, \beta_2)$ | | | | | |
|---|--|------|--------------------|------|--------------------|------|
| | $(10,40), (10,40)$ | | $(15,35), (15,35)$ | | $(20,30), (20,30)$ | |
| | 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

Ultimate Owner

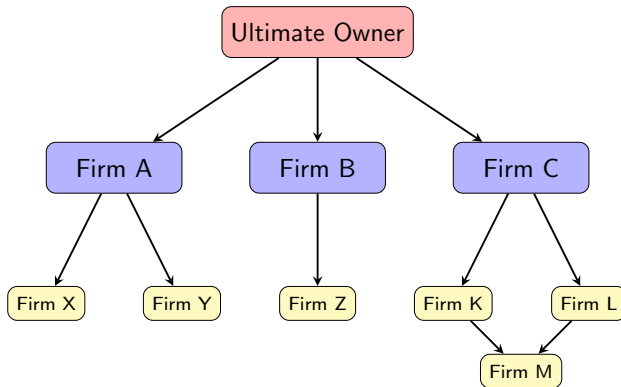
Pair Composition and Business Group

Business Group



Pair Composition and Business Group

Business Group



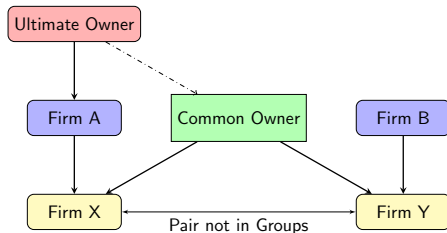
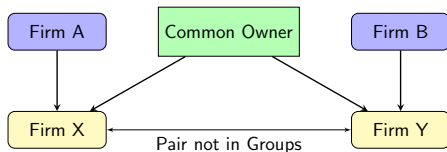
Pair Composition and Business Group

Pair in the Business Group



Pair Composition and Business Group

Pair not in any of Business Groups



Data Summary

- We use blockholders' data from 2014/03/25 (1393/01/06) to 2020/03/18 (1398/12/28)
 - Includes of 1203 Days and 60 Months
 - Consists of 618 firm including 562 firm with common owners

| Year | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 |
|--------------------------------------|------|------|------|------|------|------|
| No. of Firms | 365 | 376 | 447 | 552 | 587 | 618 |
| No. of Blockholders | 777 | 803 | 984 | 1297 | 1454 | 1458 |
| No. of Groups | 38 | 41 | 43 | 44 | 40 | 43 |
| No. of Firms not in Groups | 116 | 108 | 147 | 216 | 241 | 243 |
| No. of Firms in Groups | 249 | 268 | 300 | 336 | 346 | 375 |
| Mean Number of Members | 7 | 7 | 7 | 8 | 9 | 9 |
| Med. of Number of Members | 5 | 5 | 5 | 6 | 6 | 5 |
| Mean Of each Blockholder's ownership | 21 | 22 | 22 | 21 | 22 | 23 |
| Med. of Owners' Percent | 7 | 8 | 8 | 8 | 8 | 9 |
| Mean Number of Owners | 5 | 5 | 5 | 5 | 5 | 5 |
| Med. Number of Owners | 4 | 4 | 4 | 4 | 5 | 4 |
| Mean Block. Ownership | 76 | 77 | 75 | 75 | 75 | 71 |
| Med. Block. Ownership | 82 | 82 | 81 | 80 | 80 | 77 |

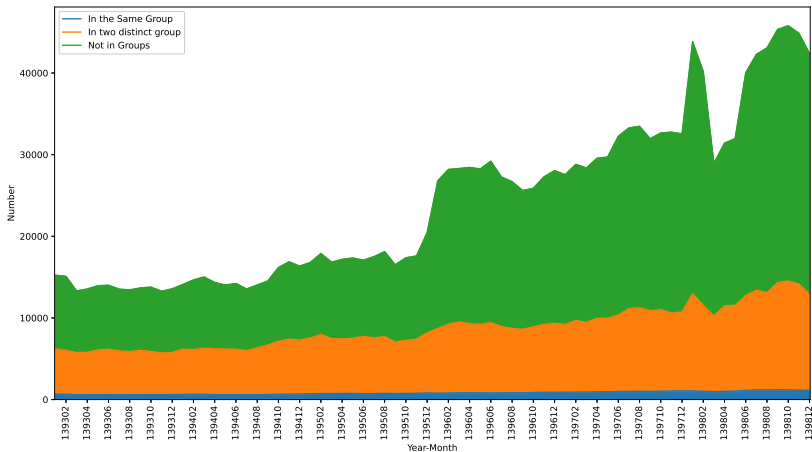
Pair Composition

- Pairs consist of two firms with at least one common owner
 - 93442 unique pairs which is 60% of possible pairs ($\frac{562 \times 561}{2} = 149878$)

| | mean | min | Median | max |
|------------------------|-------|-------|--------|-------|
| Number of unique paris | 24139 | 13272 | 23024 | 45795 |

| year | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 |
|---------------------------------------|-------|-------|-------|-------|-------|-------|
| No. of Pairs | 20876 | 21187 | 27784 | 41449 | 47234 | 67232 |
| No. of Groups | 37 | 40 | 42 | 43 | 39 | 43 |
| No. of Pairs not in Groups | 11452 | 11192 | 15351 | 26530 | 29182 | 43433 |
| Number of Pairs not in the same Group | 7962 | 8731 | 10971 | 12916 | 15366 | 20745 |
| Number of Pairs in the same Group | 923 | 955 | 1099 | 1260 | 1536 | 1774 |
| Mean Number of Common owner | 1 | 1 | 1 | 1 | 1 | 1 |
| Med. Number of Common owner | 1 | 1 | 1 | 1 | 1 | 1 |
| Mean Percent of each blockholder | 19 | 19 | 19 | 19 | 19 | 20 |
| Med. Percent of each blockholder | 13 | 12 | 12 | 12 | 12 | 14 |
| Mean Number of Pairs in one Group | 31 | 30 | 30 | 34 | 39 | 44 |
| Med. Number of Pairs in one Group | 8 | 10 | 8 | 10 | 9 | 10 |
| Mean Number of Owners | 5 | 5 | 5 | 5 | 4 | 5 |
| Med. Number of Owners | 5 | 5 | 5 | 5 | 4 | 5 |
| Mean Block. Ownership | 73 | 73 | 72 | 70 | 70 | 70 |
| Med. Block. Ownership | 73 | 73 | 73 | 71 | 71 | 71 |

Number of Pairs



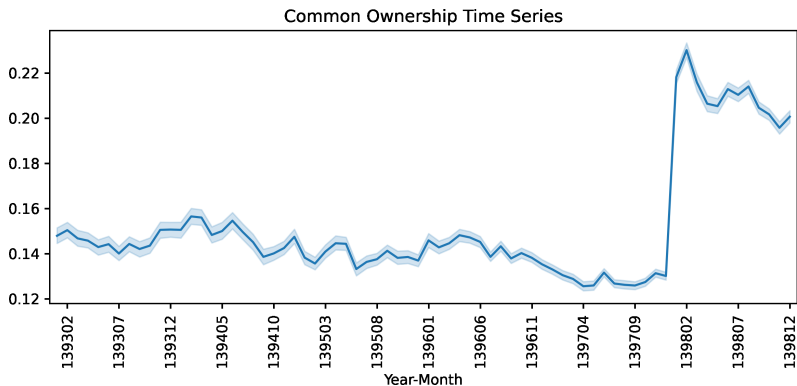
FCA vs. FCAP Summary

| | | mean | std | min | 25% | 50% | 75% | max |
|-------------------|------|-------|-------|-------|-------|-------|-------|--------|
| variable | | | | | | | | |
| All | FCA | 0.158 | 0.234 | 0.002 | 0.031 | 0.079 | 0.191 | 12.650 |
| | FCAP | 0.144 | 0.166 | 0.002 | 0.030 | 0.077 | 0.193 | 1.000 |
| Same Group | FCA | 0.474 | 0.478 | 0.005 | 0.096 | 0.367 | 0.691 | 6.174 |
| | FCAP | 0.346 | 0.265 | 0.004 | 0.081 | 0.321 | 0.561 | 1.000 |
| Not Same Group | FCA | 0.087 | 0.154 | 0.003 | 0.020 | 0.038 | 0.087 | 6.184 |
| | FCAP | 0.072 | 0.102 | 0.003 | 0.020 | 0.037 | 0.078 | 0.998 |
| Same Industry | FCA | 0.274 | 0.383 | 0.003 | 0.044 | 0.126 | 0.351 | 6.262 |
| | FCAP | 0.207 | 0.215 | 0.003 | 0.041 | 0.120 | 0.314 | 0.999 |
| Not Same Industry | FCA | 0.150 | 0.217 | 0.002 | 0.030 | 0.077 | 0.183 | 12.650 |
| | FCAP | 0.140 | 0.161 | 0.002 | 0.029 | 0.074 | 0.187 | 1.000 |

Results

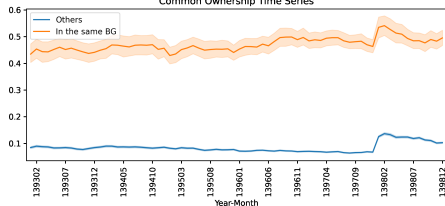
- By the proposed measurement, common ownership increases
- Common ownership is greater in pairs that are in the same business group and industry

FCA's time series

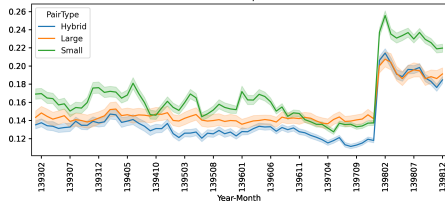


FCA's time series

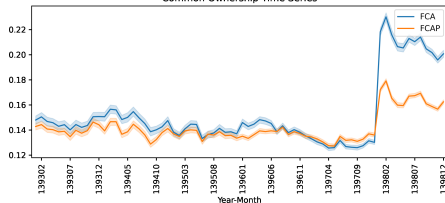
Common Ownership Time Series



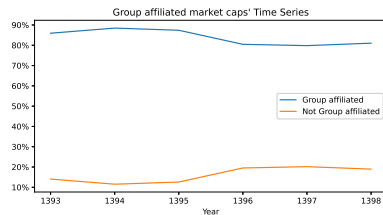
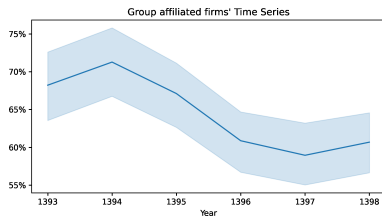
Common Ownership Time Series



Common Ownership Time Series



Group affiliated firm's time series



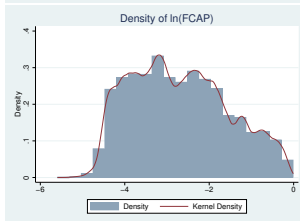
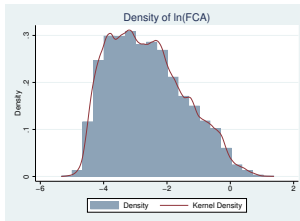
FCA vs. FCAP Distributions

Monthly



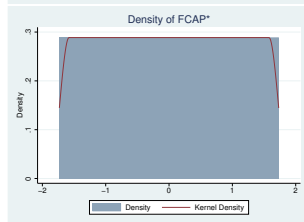
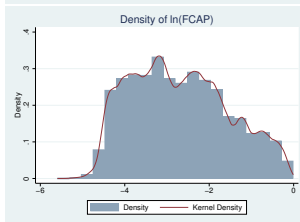
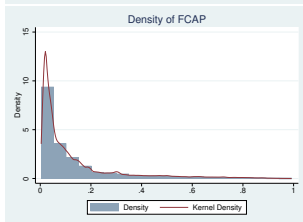
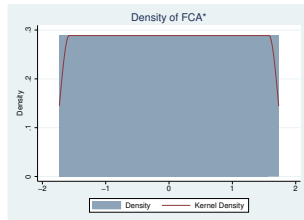
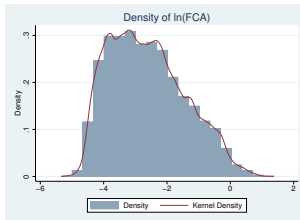
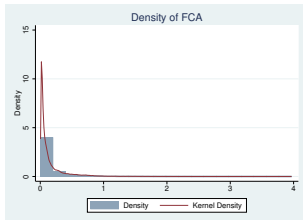
FCA vs. FCAP Distributions

Monthly



FCA vs. FCAP Distributions

Monthly



Correlation Calculation

4 Factor + Industry

1 First 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)

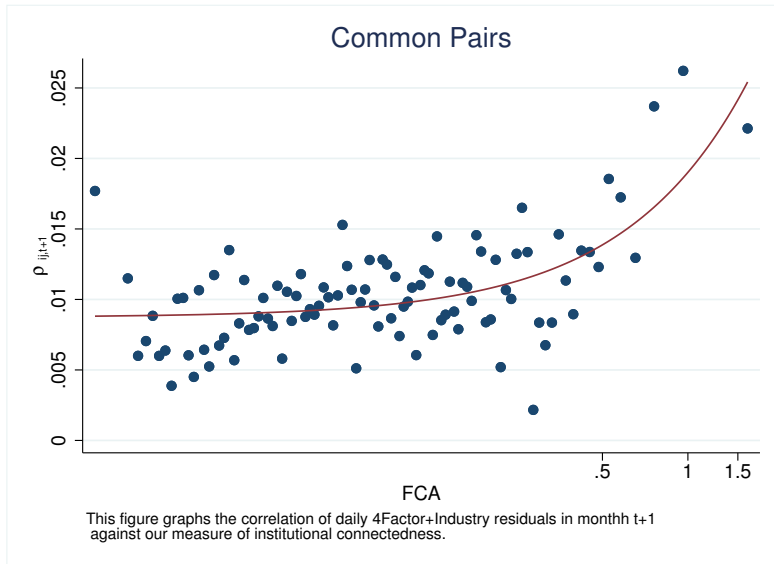
Correlation Calculation Results

| | mean | std | min | 25% | 50% | 75% | max |
|--------------------------------|-------|-------|------|--------|-------|-------|-----|
| CAPM + Industry | 0.021 | 0.200 | -1.0 | -0.047 | 0.016 | 0.084 | 1.0 |
| 4 Factor | 0.032 | 0.202 | -1.0 | -0.040 | 0.025 | 0.096 | 1.0 |
| 4 Factor + Industry | 0.016 | 0.199 | -1.0 | -0.051 | 0.010 | 0.076 | 1.0 |
| 4 Factor + Industry (With Lag) | 0.015 | 0.198 | -1.0 | -0.051 | 0.010 | 0.076 | 1.0 |

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.

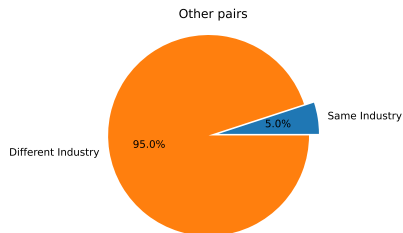
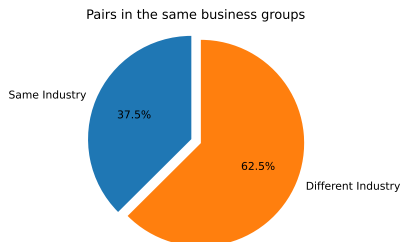
Future Correlation via *FCA*



- 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

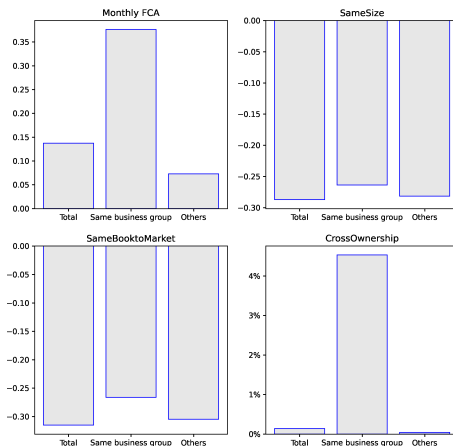
Industry & Business group

| | Yes | No |
|--------------------------|------------------|---------------------|
| SameIndustry | 753806 (5.7%) | 12422942 (94.3%) |
| SameGroup | 304444 (6.3%) | 4508062 (93.7%) |
| SameGroup & SameIndustry | 115536 (0.9%) | 13176748 (99.1%) |



Business group

Pairs' characteristic



Summary of Controls

Variables' distribution

| | mean | std | min | 25% | 50% | 75% | max |
|-----------------------|-------|------|-------|-------|-------|-------|-------|
| sgroup | 0.06 | 0.23 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| sBgroup | 0.06 | 0.24 | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 |
| Monthlysize1 | 0.58 | 0.23 | 0.01 | 0.40 | 0.58 | 0.77 | 1.00 |
| Monthlysize2 | 0.30 | 0.20 | 0.00 | 0.13 | 0.25 | 0.41 | 0.99 |
| MonthlySameSize | -0.29 | 0.20 | -0.97 | -0.41 | -0.24 | -0.13 | -0.00 |
| MonthlyB/M1 | 0.54 | 0.25 | 0.00 | 0.36 | 0.57 | 0.75 | 1.00 |
| MonthlyB/M2 | 0.55 | 0.24 | 0.00 | 0.36 | 0.56 | 0.75 | 1.00 |
| MonthlySameB/M | -0.32 | 0.20 | -0.99 | -0.44 | -0.27 | -0.16 | -0.00 |
| MonthlyCrossOwnership | 0.14 | 2.59 | 0.00 | 0.00 | 0.00 | 0.00 | 95.77 |

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

Fama-MacBeth (1973)

- Two Step Regression

- First Step

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

- Second Step

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

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

Calculating 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

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

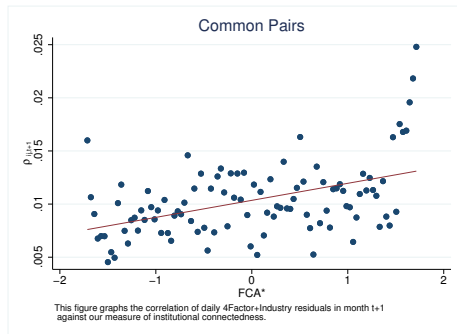
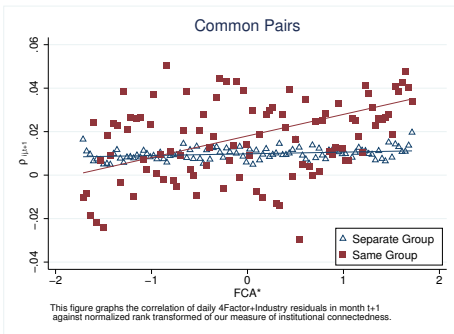
where T is the number of periods in the time series

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Future Correlation via *FCA*

Normalized Rank-Transformed



- Use Fama-MacBeth to estimate this model

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

- Estimate the model on a monthly frequency
- Adjust standard errors by Newey and West adjustment with 4 lags
($4(70/100)^{\frac{2}{9}} = 3.69 \sim 4$)

Model Estimation

Normalized Rank-Transformed

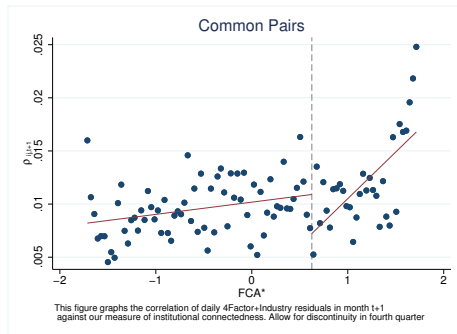
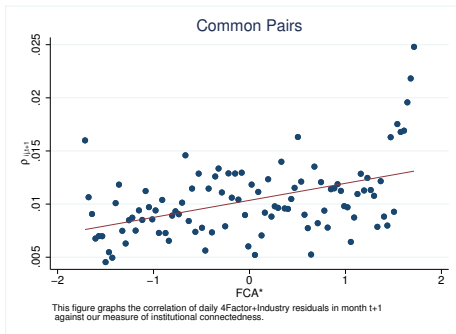
| Dependent Variable: Future Monthly Correlation of 4F+Industry Residuals | | | | | | | | | |
|---|---------------------|---------------------|----------------------|---------------------|---------------------|----------------------|--------------------|----------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| Same Group | 0.0166*** (8.54) | 0.0153*** (7.90) | | | 0.0147*** (6.97) | | | 0.00624*** (2.81) | 0.00549** (2.27) |
| FCA* | | | 0.00150*** (2.90) | 0.00112** (2.11) | 0.000736 (1.33) | 0.00944*** (7.24) | 0.000397 (0.68) | 0.000377 (0.65) | -0.0000113 (-0.02) |
| (FCA*) × SameGroup | | | | | | | | 0.00992*** (6.49) | 0.0107*** (6.97) |
| Observations | 1665996 | 1665996 | 1665996 | 1665996 | 1665996 | 58337 | 1607659 | 1665996 | 1665996 |
| Sub-sample | All | All | All | All | All | SameGroup | Others | All | All |
| Group Effect | No | No | No | No | No | No | No | No | Yes |
| Controls | No | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |
| R ² | 0.000180 | 0.000637 | 0.000170 | 0.000652 | 0.000804 | 0.0112 | 0.000577 | 0.000898 | 0.00575 |

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

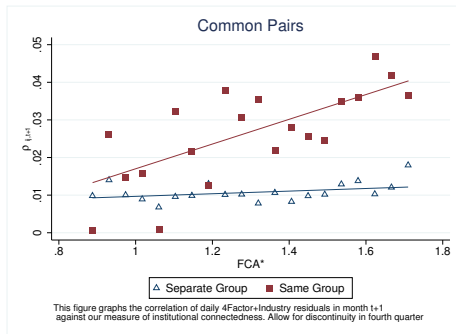
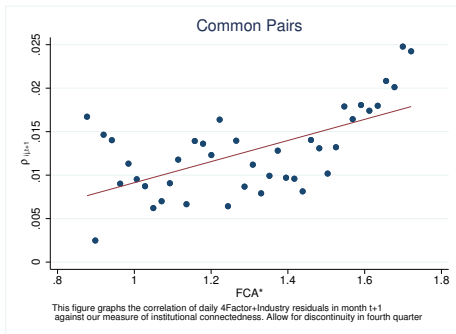
Future Correlation via *FCA*

Discontinuity

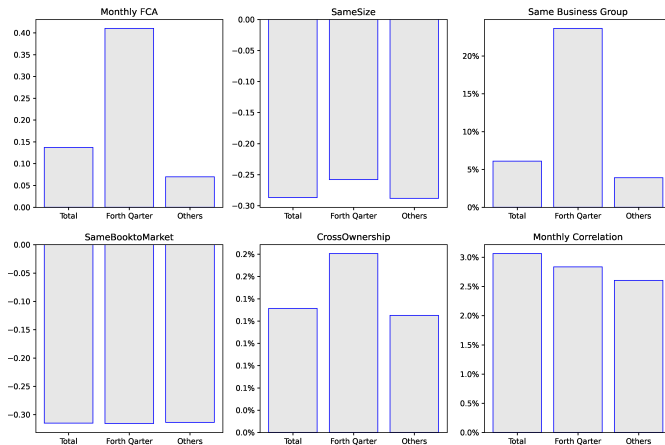


4 Factor + Industry Future Correlation via FCA^*

Discontinuity & Business Groups



Forth quarter summary



Fama-MacBeth Estimation

Discontinuity (sub-sample)

| Dependent Variable: Future Monthly Correlation of 4F+Ind. Res. | | | | | | | |
|--|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Same Group | 0.0229*** (9.86) | | 0.0220*** (8.34) | 0.0206*** (7.28) | 0.0195*** (7.24) | -0.0230* (-2.21) | -0.0201 (-1.94) |
| FCA* | | 0.0122** (3.11) | 0.00516 (1.23) | 0.00494 (1.18) | 0.00485 (1.17) | 0.00270 (0.60) | 0.00194 (0.46) |
| (FCA*) × SameGroup | | | | | | 0.0287*** (3.55) | 0.0269** (3.42) |
| SameIndustry | | | | 0.00367 (1.67) | 0.00277 (1.20) | 0.00232 (0.97) | 0.00404 (1.62) |
| SameSize | | | | | 0.00282 (0.78) | 0.00233 (0.66) | 0.00385 (1.03) |
| SameBookToMarket | | | | | 0.0104*** (3.55) | 0.0103*** (3.54) | 0.0113*** (4.04) |
| CrossOwnership | | | | | 0.0360 (1.46) | 0.0402 (1.62) | 0.0487 (1.99) |
| Observations | 416514 | 416514 | 416514 | 416514 | 416514 | 416514 | 416514 |
| Group FE | No | No | No | No | No | No | Yes |
| R ² | 0.000923 | 0.000353 | 0.00124 | 0.00151 | 0.00232 | 0.00253 | 0.0150 |

t statistics in parentheses

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

All non-common owner pairs

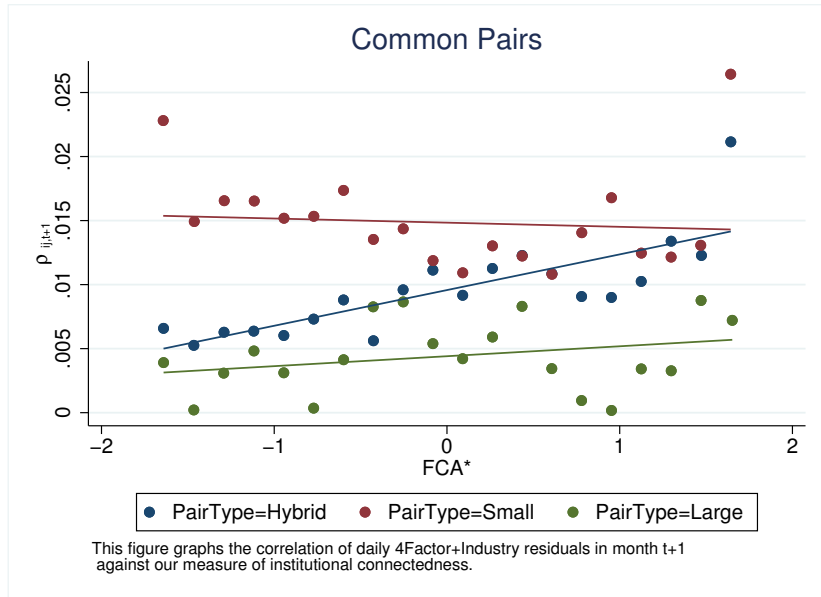
regression

| Dependent Variable: Future Monthly Correlation of 4F+Industry Residuals | | | | | | | | | | | | | | |
|---|---------------------|-----------------------|---------------------|-------------------|---------------------|---------------------|---------------------|--------------------|---------------------|--------------------|---------------------|-----------------------|-----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) |
| SameGroup | 0.0153*** (9.38) | | 0.0150*** (9.26) | | | 0.0134*** (7.81) | 0.0124*** (7.10) | | 0.0151*** (9.03) | | | | 0.0104*** (6.09) | 0.00926*** (5.34) |
| FCA* | | 0.000676*** (3.50) | 0.000496* (2.56) | 0.00212 (1.79) | 0.000427* (2.20) | 0.000408* (2.11) | 0.000116 (0.67) | | | | | | | |
| (FCA*) × SameGroup | | | | | | 0.00247* (2.15) | 0.00321** (2.90) | | | | | | | |
| (FCA > Q3[FCA]) | | | | | | | | 0.00226* (2.63) | 0.000744 (0.97) | 0.00226* (2.63) | 0.0122*** (4.40) | -0.0000291 (-0.03) | -0.0000725 (-0.07) | -0.00110 (-1.32) |
| (FCA > Q3[FCA]) × SameGroup | | | | | | | | | | | | | 0.0141*** (4.65) | 0.0161*** (5.54) |
| Observations | 6018646 | 6018646 | 6018646 | 114526 | 5904120 | 6018646 | 6018646 | 6018646 | 5851137 | 6018646 | 114526 | 5904120 | 6018646 | 6018646 |
| Sub Sample | Total | Total | Total | SameGroups | Others | Total | Total | Total | Total | Total | SameGroups | Others | Total | Total |
| Group Effect | No | No | No | No | No | No | Yes | No | No | No | No | No | No | Yes |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R ² | 0.000445 | 0.000392 | 0.000491 | 0.00699 | 0.000338 | 0.000515 | 0.00330 | 0.000372 | 0.00127 | 0.000372 | 0.00721 | 0.000323 | 0.000508 | 0.00330 |

t statistics in parentheses

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

Grouped by size



Model Estimation

Grouped by size

| Dependent Variable: Future Monthly Correlation of 4F+Ind. Res. | | | | | | | | |
|--|----------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------------------|-----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Same Group | 0.00624** (2.81) | 0.0102*** (3.95) | -0.00153 (-0.53) | 0.0117*** (3.76) | 0.00661* (2.15) | 0.0366*** (10.31) | 0.0268*** (6.57) | 0.00750*** (3.53) |
| FCA* | 0.000377 (0.65) | 0.000698 (1.25) | -0.000175 (-0.31) | 0.00199*** (3.56) | 0.00177** (3.00) | -0.00151 (-1.58) | -0.00177 (-1.84) | -0.0000771 (-0.14) |
| (FCA*) × SameGroup | 0.00992*** (6.49) | | 0.0134*** (4.80) | | 0.00599* (2.34) | | 0.0123*** (4.17) | 0.0105*** (6.72) |
| Observations | 1665996 | 346170 | 346170 | 693728 | 693728 | 626098 | 626098 | 1665996 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sub-sample | All Firms | Large Firms | Large Firms | Hybrid Firms | Hybrid Firms | Small Firms | Small Firms | All Firms |
| Pair Size FE | No | No | No | No | No | No | No | Yes |
| R ² | 0.000898 | 0.00193 | 0.00232 | 0.00135 | 0.00149 | 0.00180 | 0.00198 | 0.00130 |

t statistics in parentheses

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

Model Estimation

Grouped by size

| Dependent Variable: Future Monthly Correlation of 4F+Ind. Res. | | | | | | | | |
|--|---------------------|-----------------------|----------------------|---------------------|---------------------|------------------------|------------------------|------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| SameGroup | 0.0134*** (7.81) | 0.00954*** (4.63) | 0.00853*** (3.71) | 0.0136*** (7.35) | 0.0118*** (6.46) | 0.0314*** (10.19) | 0.0267*** (7.93) | 0.0138*** (8.27) |
| FCA* | 0.000408* (2.11) | -0.0000120 (-0.05) | -0.000115 (-0.47) | 0.000514* (2.09) | 0.000401 (1.67) | -0.00143*** (-3.86) | -0.00154*** (-3.97) | -0.000390** (-2.70) |
| (FCA*) × SameGroup | 0.00247* (2.15) | | 0.00178 (1.30) | | 0.00272 (1.59) | | 0.00545** (3.38) | 0.00313** (2.80) |
| Observations | 6018646 | 1753614 | 1753614 | 2992221 | 2992221 | 1272811 | 1272811 | 6018646 |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sub-sample | All Firms | Large Firms | Large Firms | Hybrid Firms | Hybrid Firms | Small Firms | Small Firms | All Firms |
| Pair Size FE | No | No | No | No | No | No | No | Yes |
| R ² | 0.000515 | 0.000796 | 0.000860 | 0.000688 | 0.000735 | 0.00191 | 0.00199 | 0.000829 |

t statistics in parentheses

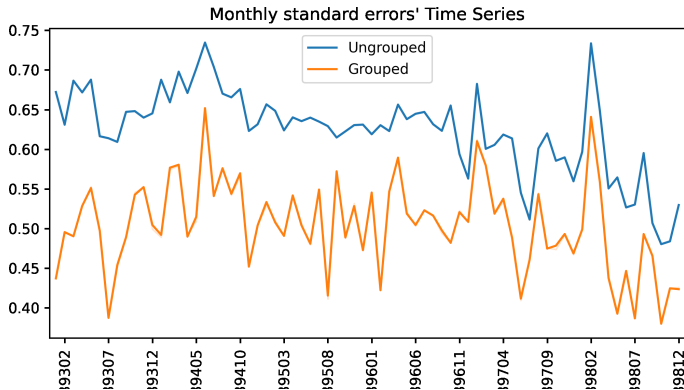
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

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Ins Imbalance

$$\text{InsImbalance}_i = \left(\frac{\text{InsBuy} - \text{InsSell}}{\text{InsBuy} + \text{InsSell}} \right)_{\text{value}}$$



Ins Imbalance

| | Future Monthly Corr. of 4F+Ind. Residuals | | | | | | | |
|--|---|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| FCA* | 0.000308 (0.60) | 0.000384 (0.81) | 0.000320 (0.68) | | 0.00945*** (6.07) | 0.0000347 (0.07) | 0.000123 (0.17) | 0.0000843 (0.11) |
| Same Group | 0.0164*** (8.68) | 0.0164*** (8.68) | 0.00765*** (3.64) | 0.00786*** (3.90) | | 0.00974*** (5.36) | 0.00241 (0.79) | 0.00154 (0.48) |
| Low Imbalance std | | 0.00119 (1.29) | 0.000325 (0.35) | 0.000192 (0.19) | 0.0241*** (6.15) | 0.000469 (0.52) | 0.0000788 (0.08) | 0.000481 (0.31) |
| Low Imbalance std × SameGroup | | | 0.0238*** (6.85) | 0.0240*** (6.90) | | | 0.0142** (2.95) | 0.0142** (3.14) |
| (FCA*) × SameGroup | | | | | | | 0.00580** (2.77) | 0.00645** (2.94) |
| Low Imbalance std × (FCA*) | | | | | | | -0.000584 (-0.77) | -0.000483 (-0.57) |
| Low Imbalance std × SameGroup × (FCA*) | | | | | | 0.0209*** (9.69) | 0.0126*** (4.44) | 0.0120*** (3.91) |
| Observations | 1665996 | 1665996 | 1665996 | 1665996 | 58337 | 1665996 | 1665996 | 1665996 |
| Group Effect | No | No | No | No | No | No | No | Yes |
| Pair Size FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Sub-sample | Total | Total | Total | Total | Same Groups | Total | Total | Total |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R ² | 0.00120 | 0.00132 | 0.00144 | 0.00129 | 0.0210 | 0.00149 | 0.00166 | 0.00643 |

t statistics in parentheses

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

$$\Delta \text{TurnOver} = \ln\left(\frac{\text{TurnOver}_{i,t}}{\text{TurnOver}_{i,t-1}}\right) = \ln\left(\frac{\text{volume}_{i,t}}{\text{MarketCap}_{i,t}}\right) - \ln\left(\frac{\text{volume}_{i,t-1}}{\text{MarketCap}_{i,t-1}}\right)$$

| Dependent Variable: $\Delta \text{TurnOver}_i$ | | | | | | |
|--|---------------------|---------------------|--------------------|---------------------|--------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\Delta \text{TurnOver}_{\text{Market}}$ | 0.431*** (14.56) | 0.453*** (14.49) | 0.287*** (8.23) | 0.321*** (14.03) | 0.288*** (6.92) | 0.321*** (14.14) |
| $\Delta \text{TurnOver}_{\text{Group}}$ | | | 0.245*** (6.31) | 0.234*** (7.15) | 0.284*** (6.02) | 0.273*** (7.19) |
| $\Delta \text{TurnOver}_{\text{Industry}}$ | 0.155*** (6.53) | 0.169*** (6.99) | 0.174* (2.08) | 0.118*** (3.68) | 0.152 (1.47) | 0.0430 (1.19) |
| Observations | 626813 | 623759 | 305563 | 301329 | 305563 | 301329 |
| Weight | - | - | MC \times CR | MC \times CR | MC | MC |
| Control | No | Yes | No | Yes | No | Yes |
| R^2 | 0.141 | 0.180 | 0.242 | 0.282 | 0.236 | 0.277 |

t statistics in parentheses

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

Cross-sectional analyze of Group turnover

| Dependent Variable: β_{Group} | | | | | | | | |
|-------------------------------------|--------------------|--------------------|-------------------|-------------------|--------------------|--------------------|--------------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| Excess | 0.355*** (4.99) | 0.505*** (6.94) | | | | | | |
| ExcessDummy | | | 0.00604 (0.16) | 0.101** (2.77) | | | | |
| ExcessDiff | | | | | 0.716*** (5.99) | 0.961*** (7.77) | | |
| ExcessHigh | | | | | | | 0.344*** (6.61) | 0.412*** (8.48) |
| Observations | 1349 | 1349 | 1367 | 1367 | 1349 | 1349 | 1367 | 1367 |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Controls | No | Yes | No | Yes | No | Yes | No | Yes |
| R^2 | 0.0251 | 0.0970 | 0.000973 | 0.0600 | 0.0436 | 0.123 | 0.0436 | 0.109 |

t statistics in parentheses

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

Pairwise correlations in turnover

| | Dependent Variable: Future Monthly Correlation of Delta turnover | | | | | | |
|--------------------|--|---------------------|--------------------|----------------------|---------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Same Group | 0.0349*** (11.20) | 0.0217*** (7.38) | | | 0.0227*** (7.73) | 0.0182*** (6.22) | 0.0176*** (6.19) |
| FCA* | | | 0.000871 (0.63) | -0.000438 (-0.37) | -0.00110 (-0.93) | -0.00134 (-1.08) | -0.00171 (-1.51) |
| (FCA*) × SameGroup | | | | | | 0.00619* (2.45) | 0.00631* (2.42) |
| Observations | 1447955 | 1341445 | 1447955 | 1341445 | 1341445 | 1341445 | 1341445 |
| Group Effect | No | No | No | No | No | No | Yes |
| Pair Size FE | No | Yes | No | Yes | Yes | Yes | Yes |
| Controls | No | Yes | No | Yes | Yes | Yes | Yes |
| R ² | 0.000465 | 0.00431 | 0.000461 | 0.00448 | 0.00471 | 0.00481 | 0.0157 |

t statistics in parentheses

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

Big Business group

| | Dep. Var.: Future Monthly Cor. of 4F+Ind. Res. | | | |
|-----------------------------|--|----------------------|----------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| Same Group | 0.00637* (2.22) | 0.0213** (2.72) | | 0.0172* (2.40) |
| FCA* | -0.000339 (-0.80) | -0.00157* (-2.25) | 0.0123*** (3.50) | -0.000292 (-0.69) |
| (FCA*) × SameGroup | 0.0120*** (7.57) | 0.00757** (2.66) | | 0.00898** (3.27) |
| $\rho_t(\text{Turnover})$ | 0.00515*** (8.45) | 0.00510*** (8.53) | 0.0204*** (4.88) | 0.00454*** (7.28) |
| ρ_t | 0.0246*** (17.07) | 0.0245*** (17.03) | 0.0911*** (12.29) | 0.0221*** (14.58) |
| BigGroup | | -0.00168 (-1.84) | | |
| BigGroup × SameGroup | | -0.0167* (-2.58) | | |
| BigGroup × FCA* | | 0.00154 (1.90) | | |
| BigGroup × SameGroup × FCA* | | 0.00494 (1.62) | | |
| Observations | 1459585 | 1459585 | 45678 | 1413907 |
| Controls | Yes | Yes | Yes | Yes |
| Pari Size FE | Yes | Yes | Yes | Yes |
| SubSample | All | All | Same Big Groups | Others |
| R ² | 0.00241 | 0.00276 | 0.0444 | 0.00195 |

t statistics in parentheses

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

Bearish/Bullish Market

| | Fu. Monthly Cor. of 4F+Ind. Residuals | | |
|---|---------------------------------------|----------------------|--------------------|
| | (1) | (2) | (3) |
| FCA* | 0.000363 (0.64) | 0.000363 (0.64) | 0.000464 (0.82) |
| (FCA*) \times SameGroup | 0.00966*** (6.43) | 0.00968*** (6.47) | |
| Same Group | 0.00607** (2.77) | 0.00529 (0.55) | 0.00974 (1.02) |
| Bearish Market \times SameGroup | | -0.00531 (-0.50) | 4.724 (0.99) |
| Bullish Market \times SameGroup | | 0.00513 (0.57) | 0.00659 (0.68) |
| (FCA*) \times Bullish Market \times SameGroup | | | 0.00570 (1.28) |
| (FCA*) \times Bearish Market \times SameGroup | | | -2.774 (-0.99) |
| Observations | 1665996 | 1665996 | 1665996 |
| R^2 | 0.002 | 0.002 | 0.002 |

t statistics in parentheses

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

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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

References I

- Antón, M., Ederer, F., Giné, M., and Schmalz, M. C. (2020). Common ownership, competition, and top management incentives. *Ross School of Business Paper*, (1328).
- Anton, M. and Polk, C. (2014). Connected stocks. *The Journal of Finance*, 69(3):1099–1127.
- Azar, J., Schmalz, M. C., and Tecu, I. (2018). Anticompetitive effects of common ownership. *The Journal of Finance*, 73(4):1513–1565.
- Backus, M., Conlon, C., and Sinkinson, M. (2020). Theory and measurement of common ownership. In *AEA Papers and Proceedings*, volume 110, pages 557–60.
- Barberis, N., Shleifer, A., and Wurgler, J. (2005). Comovement. *Journal of financial economics*, 75(2):283–317.
- Boubaker, S., Mansali, H., and Rjiba, H. (2014). Large controlling shareholders and stock price synchronicity. *Journal of Banking & Finance*, 40:80–96.
- Freeman, K. (2019). The effects of common ownership on customer-supplier relationships. *Kelley School of Business Research Paper*, (16-84).
- Gilje, E. P., Gormley, T. A., and Levit, D. (2020). Who's paying attention? measuring common ownership and its impact on managerial incentives. *Journal of Financial Economics*, 137(1):152–178.
- Greenwood, R. and Thesmar, D. (2011). Stock price fragility. *Journal of Financial Economics*, 102(3):471–490.
- Hansen, R. G. and Lott Jr, J. R. (1996). Externalities and corporate objectives in a world with diversified shareholder/consumers. *Journal of Financial and Quantitative Analysis*, pages 43–68.
- Harford, J., Jenter, D., and Li, K. (2011). Institutional cross-holdings and their effect on acquisition decisions. *Journal of Financial Economics*, 99(1):27–39.
- He, J. and Huang, J. (2017). Product market competition in a world of cross-ownership: Evidence from institutional blockholdings. *The Review of Financial Studies*, 30(8):2674–2718.
- He, J., Huang, J., and Zhao, S. (2019). Internalizing governance externalities: The role of institutional cross-ownership. *Journal of Financial Economics*, 134(2):400–418.
- Khanna, T. and Thomas, C. (2009). Synchronicity and firm interlocks in an emerging market. *Journal of Financial Economics*, 92(2):182–204.

References II

- Koch, A., Ruenzi, S., and Starks, L. (2016). Commonality in Liquidity: A Demand-Side Explanation. *The Review of Financial Studies*, 29(8):1943–1974.
- Lewellen, J. W. and Lewellen, K. (2021). Institutional investors and corporate governance: The incentive to be engaged. *Journal of Finance*, *Forthcoming*.
- Lewellen, K. and Lowry, M. (2021). Does common ownership really increase firm coordination? *Journal of Financial Economics*.
- Newham, M., Seldeslachts, J., and Banal-Estanol, A. (2018). Common ownership and market entry: Evidence from pharmaceutical industry.
- Pantzaalis, C. and Wang, B. (2017). Shareholder coordination, information diffusion and stock returns. *Financial Review*, 52(4):563–595.

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- Synchronicity and firm interlocks
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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

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

- 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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- Common-ownership and comovement effect

[Anton 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

Graph

Synchronicity and firm interlocks

JFE-2009-Khanna

- Three types of network

- 1 Equity network
- 2 Director network
- 3 Owner network

- Dependent variables

Using detrended 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

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

being in the same director network has a significant effect

Large controlling shareholder and stock price synchronicity

JBFB-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

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

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

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

-

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

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

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. (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. (2018)
 - Capture a specific type of externality
 - Measured at the industry level
 - Assumes that investors are fully informed about the externalities
- $GGL^A(A, B) = \sum_{i=1}^I \alpha_{i,AG}(\beta_{i,A}) \alpha_{i,B}$ Gilje et al. (2020)
 - 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 (2017), He et al. (2019)

- $Overlap_{Min}(A, B) = \sum_{i \in I^{A,B}} \min\{\alpha_{i,A}, \alpha_{i,B}\}$

Newham et al. (2018)

- $Overlap_{AP}(A, B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \frac{\bar{v}_A}{\bar{v}_A + \bar{v}_B} + \alpha_{i,B} \frac{\bar{v}_B}{\bar{v}_A + \bar{v}_B}$

Anton and Polk (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 Jr (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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