# Connected Stocks via Business Groups: Evidence from an Emerging Market

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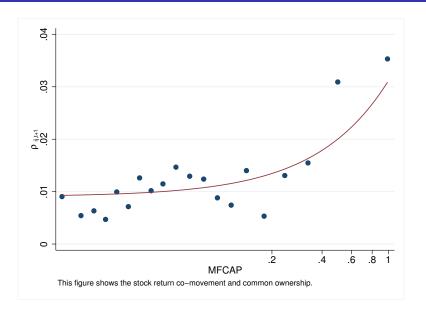
Tehran Institute for Advanced Studies

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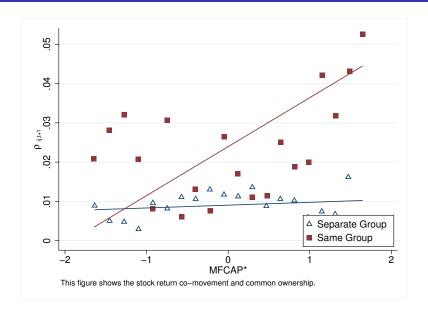
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  - Institutional Imbalance
- 6 Conclusion

# Co-movement and common ownership



# Co-movement and common ownership



## Motivation

#### Does direct or indirect common ownership cause stock return co-movement?

- common ownership:
  - ullet We connect stocks through the common ownership by blockholders (ownership > 1%) for direct common ownership
  - We connect stocks through the ultimate owner for indirect common ownership
- We focus on excess return co-movement for a pair of the stocks
- We use common ownership (direct or indirect) to forecast cross-sectional variation in the realized correlation of four-factor + industry residuals
- We demonstrate that correlated trading can be a channel of co-movement

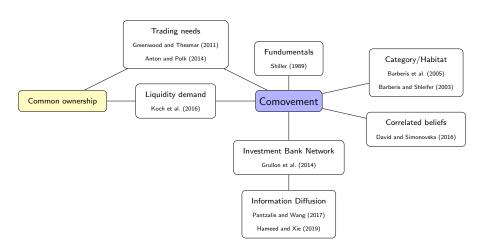
# Why does it matter?

- Covariance
  - Covariance is a key component of risk in many financial applications.
    - Portfolio selection
    - Hedging
    - 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



#### Our work

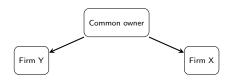
- We use daily records of block-holder ownership for firms
- We are not restricted to mutual funds ownership
- 85% of market belongs to the business groups
  - Would business groups be able to raise the co-movement of stock returns?
    - Cho and Mooney (2015):
       The strong co-movement between group returns and firm returns is explained by correlated fundamentals.
    - Kim et al. (2015):
       The increase in correlation appears to be driven more by non-fundamental factors such as correlated trading, rather than fundamental factors such as related-party transactions
  - Common ownership or business group (indirect common ownership) ?
  - Channel?

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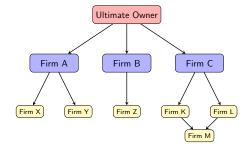
# Pair composition

Firms with at least one common owner



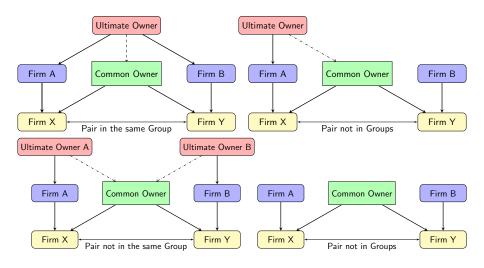
• In a business group, how can one pair be defined?

Business group



# Pair Composition and Business Group

Pair in the Business Group



# Data Summary

- Data: 2014/03/25 (1393/01/06) 2020/03/18 (1398/12/28)
  - 72 Months
  - 618 firm including 562 firms with common owners

Year	2014	2015	2016	2017	2018	2019
No. of Firms	329	349	384	469	490	554
No. of Blockholders	1430	1564	1821	2411	2613	2921
No. of Groups	37	40	42	43	39	42
No. of Firms in Groups	230	251	274	307	321	356
Ave. Number of group Members	6	6	7	7	8	8
Ave. ownership of each Blockholders	18	18	18	17	18	19
Med. ownership of each Blockholders	5	4	4	4	4	5
Ave. Number of Owners	6	7	7	7	7	6
Med. Number of Owners	5	5	5	6	5	5
Ave. Block. Ownership	77	77	76	76	75	72

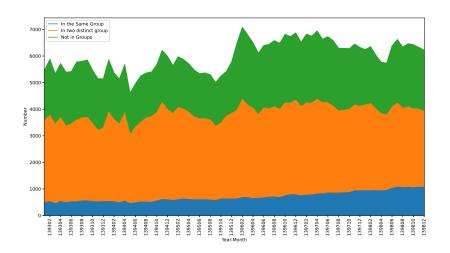
# Pair Composition

- Pairs consist of two firms with at least one common owner
  - 17522 unique pairs which is 9% of possible pairs  $(\frac{618*617}{2} = 190653)$

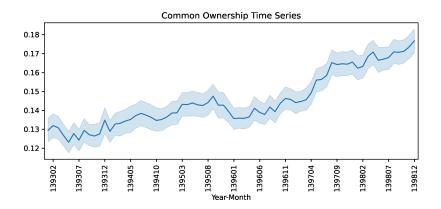
	mean	min	Median	max
Number of unique paris	5983	4610	5983	7079

Year	2014	2015	2016	2017	2018	2019
No. of Pairs	8092	8017	8316	9732	9843	10776
No. of Pairs not in Groups	2807	2515	2616	3593	3380	3822
No. of Pairs not in the same Group	4357	4594	4709	4981	5069	5322
No. of Pairs in the same Group	771	773	857	1015	1209	1408
Ave. Number of Common owner	1	1	1	1	1	1

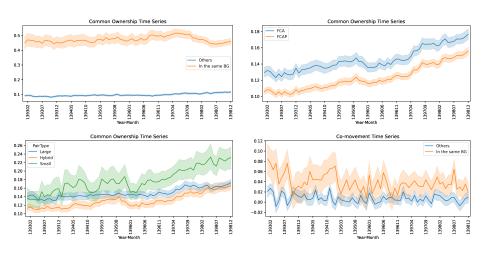
## Number of Pairs



## FCA's time series



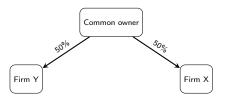
## FCA's time series



# Measuring Common-ownership

Anton and Polk (2014)

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

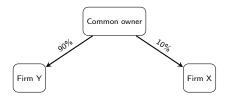


$$FCAP = \frac{50\% + 50\%}{100\% + 100\%} = 0.5$$

$$\mathsf{MFCAP} = \frac{\sqrt{50\%} + \sqrt{50\%}}{\sqrt{100\%} + \sqrt{100\%}} = 0.71$$

#### **SQRT**

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



$$FCAP = \frac{90\% + 10\%}{100\% + 100\%} = 0.5$$

$$MFCAP = \frac{\sqrt{90\%} + \sqrt{100\%}}{\sqrt{100\%} + \sqrt{100\%}} = 0.63$$

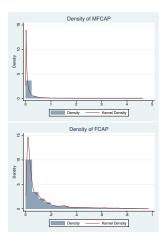
More example

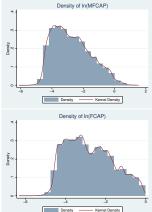
# Measuring Common-ownership

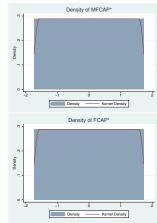
		MFCAP					FCAP				
	mean	std	min	median	max	mean	std	min	median	max	
subset											
All	0.146	0.244	0.002	0.056	4.619	0.123	0.165	0.002	0.053	0.97	
Same Group	0.473	0.412	0.004	0.407	4.041	0.378	0.255	0.004	0.372	0.967	
Not Same Group	0.097	0.158	0.003	0.042	2.899	0.085	0.114	0.003	0.04	0.97	
Same Industry	0.341	0.408	0.005	0.183	4.041	0.254	0.242	0.004	0.161	0.956	
Not Same Industry	0.116	0.191	0.002	0.049	4.619	0.103	0.139	0.002	0.047	0.97	

## MFCAP vs. FCAP Distributions

#### Monthly







## Correlation Calculation

#### 4 Factor + Industry

Frist Step:

Estimate this model on periods of three month (From two months earlier):

4 Factor + Industry :

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

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

	mean	std	min	median	max
CAPM + Industry	0.016	0.127	-0.950	0.014	0.818
4 Factor	0.033	0.136	-0.875	0.024	0.869
4 Factor $+$ Industry	0.013	0.124	-0.875	0.010	0.779
Benchmark	0.008	0.145	-0.933	0.006	0.860

content

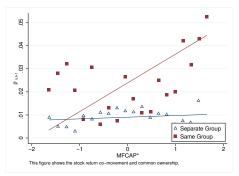
#### Controls

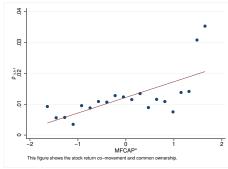
- **SameGroup**: Dummy variable for whether the two stocks belong to the same business group.
- **SameIndustry**: Dummy variable for whether the two stocks belong to the same Industry.
- SameSize: The negative of absolute difference in percentile ranking of size across a pair
- SameBookToMarket :The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

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# Co-movement and Common Ownership





### Estimation model

Use Fama-MacBeth to estimate this model

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

- Estimate the model on a monthly frequency
- Adjust standard errors by Newey and West adjustment with 4 lags  $(4(70/100)^{\frac{2}{9}}=3.69\sim4)$

Methodology

## Model Estimation

#### Normalized Rank-Transformed

	Dependent Va	ariable: Futu	re Pairs's co	-movement	
(1)	(2)	(3)	(4)	(5)	(6)
0.00507***	0.00335***	. ,	. ,	0.00118	0.00113
(7.00)	(5.27)			(1.96)	(1.90)
		0.0291***	0.0239***	0.0227***	0.0196***
		(12.16)	(9.41)	(8.88)	(7.36)
No	Yes	No	Yes	Yes	Yes
No	No	No	No	No	Yes
354209	354209	354209	354209	354209	354209
	(1) 0.00507*** (7.00) No	(1) (2) 0.00507*** 0.00335*** (7.00) (5.27) No Yes No No	(1) (2) (3)  0.00507*** 0.00335*** (7.00) (5.27)  0.0291*** (12.16)  No Yes No No No No	(1) (2) (3) (4)  0.00507*** 0.00335*** (7.00) (5.27)  0.0291*** 0.0239*** (12.16) (9.41)  No Yes No Yes No No No No	0.00507***         0.00335***         0.00118           (7.00)         (5.27)         0.0291***         0.0239***         0.0227***           (12.16)         (9.41)         (8.88)           No         Yes         No         Yes         Yes           No         No         No         No         No         No

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

### Model Estimation

#### Normalized Rank-Transformed

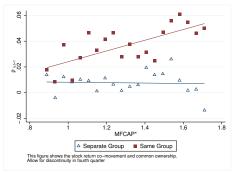
	Dependent \	/ariable: Futu	ire Pairs's co	-movement
	(1)	(2)	(3)	(4)
MFCAP*	0.00899***	0.0000371	0.0000148	0.000509
	(6.01)	(0.06)	(0.03)	(0.89)
Same Group			0.00784**	0.00521
			(2.72)	(1.68)
$(MFCAP^*) \times SameGroup$			0.0122***	0.0120***
			(10.34)	(9.74)
Sub-sample	SameGroup	Others	All	All
Business Group FE	No	No	No	Yes
Observations	43274	310935	354209	354209

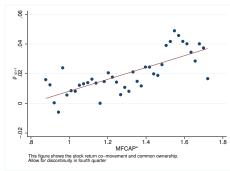
t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

# Co-movement and Common Ownership

High level of common ownership





## Fama-MacBeth Estimation

High level of common ownership (sub-sample)

		Dependent Variable: Future Pairs's co-movement							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)		
Same Group	0.0312***		0.0302***			-0.0452*	-0.0472*		
	(9.35)		(9.15)			(-2.29)	(-2.53)		
MFCAP*		0.0279***	0.00504	0.0373**	-0.00629	-0.00704	-0.0111*		
		(5.78)	(1.02)	(3.16)	(-1.18)	(-1.33)	(-2.14)		
(MFCAP*) × SameGroup						0.0477***	0.0481***		
						(3.52)	(3.75)		
Sub-sample	All	All	All	SameGroup	Others	All	All		
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Business Group FE	No	No	No	No	No	No	Yes		
Observations	91848	91848	91848	32469	59379	91848	91848		

t statistics in parentheses

 $<sup>^{*}</sup>$  p < 0.05,  $^{**}$  p < 0.01,  $^{***}$  p < 0.001

# All pairs

	Depe	endent Varia	ble: Future	Pairs' co-move	ment
	(1)	(2)	(3)	(4)	(5)
SameGroup	0.0178***		0.0170***		
	(9.12)		(7.54)		
MFCAP*		0.000908	0.000484	0.00430	0.000294
Controls	Yes	(1.62) Yes	(0.83) Yes	(1.81) Yes	(0.47) Yes
30	. 00			. 00	
Sub-Sample	Total	Total	Total	SameGroups	Others
Business Group FE	No	No	No	No	No
Observations	4439154	4439154	4439154	90553	4348601

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

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# TrunOver Koch et al. (2016)

$$\Delta \mathsf{TurnOver} = \mathsf{In}(\frac{\mathsf{TurnOver}_{i,t}}{\mathsf{TurnOver}_{i,t-1}}) = \mathsf{In}(\frac{\mathsf{volume}_{i,t}}{\mathsf{MarketCap}_{i,t}}) - \mathsf{In}(\frac{\mathsf{volume}_{i,t-1}}{\mathsf{MarketCap}_{i,t-1}})$$

	Deper	ndent Varia	ble: ΔTurr	Over;
	(1)	(2)	(3)	(4)
∆TurnOver <sub>Market</sub>	0.457***	0.351***	0.182***	0.235***
	(4.04)	(10.69)	(3.42)	(4.72)
ΔTurnOver <sub>Industry-i</sub>	0.220***	0.159***	0.0528	0.117*
	(4.28)	(4.10)	(1.03)	(2.37)
$\Delta$ TurnOver <sub>Group,-i</sub>			0.286***	0.213***
			(6.21)	(5.15)
Portfo. Weight	-	-	MC	MC
Control	No	Yes	No	Yes
Observations	746640	742341	305563	301329
R <sup>2</sup>	0.298	0.579	0.460	0.749

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

# Business group and correlation in Turnover

			Dependent Va	riable: Futur	e Monthly C	Correlation of D	Delta turnov	er	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Same Group	0.0358***	0.0180***			0.0173***			0.0150***	0.0168***
	(9.91)	(6.19)			(5.53)			(4.89)	(5.40)
MFCAP*			0.00726***	0.00219**	0.000543	0.00115	0.000372	0.000363	-0.000413
			(6.05)	(2.84)	(0.69)	(0.57)	(0.41)	(0.40)	(-0.37)
(MFCAP*) × SameGroup								0.00260	0.00296
								(1.03)	(1.19)
Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Sub-sample	All	All	All	All	All	SameGroup	Others	All	All
Business Group FE	No	No	No	No	No	No	No	No	Yes
Observations	339697	294864	339697	294864	294864	37076	257788	294864	294864

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

## Correlation in Turnover and Co-movement

	Depe	ndent Varial	ole: Future F	airs's co-move	ement
	(1)	(2)	(3)	(4)	(5)
$\rho(\Delta TurnOver)_{t+1}$	0.0474***	0.0451***	0.0447***	0.0846***	0.0385***
	(9.35)	(9.20)	(9.18)	(10.70)	(8.38)
$ ho_{t}$	0.0483***	0.0471***	0.0463***	0.119***	0.0345***
	(13.10)	(12.83)	(12.66)	(18.94)	(9.26)
Control	No	Yes	Yes	Yes	Yes
Sub-sample	Total	Total	Total	${\sf SameGroup}$	Others
Business Group FE	No	No	No	No	No
Observations	305048	305048	305048	38275	266773

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

# Residual of Monthly Turnover

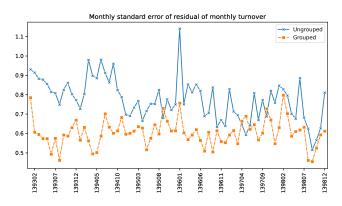
- $\bullet \ \, \mathsf{Turnover}_{i,t} = \alpha_0 + \alpha_1 \times \mathsf{Turnover}_{i,\mathit{avg}} + \alpha_2 \times \mathsf{Turnover}_{\mathit{m},t} + \boxed{\varepsilon_{i,t}}$ 
  - Turnover<sub>i,t</sub>: Monthly Turnover (Average of daily turnovers in each month)
  - Turnover<sub>i,avg</sub>: Annual average of monthly turnover
  - Turnover<sub>m,t</sub>: Market's turnover
- Assign residuals to the business groups

	$Firm \times Month$	mean	std	min	25%	50%	75%	max
Grouped								
Ungrouped	8050	-0.001	0.822	-4.789	-0.509	-0.016	0.504	4.407
Grouped	18199	0.001	0.777	-4.832	-0.481	-0.033	0.469	4.955

# Residual of Monthly Turnover

#### Standard error

Grouped	$Group \times Month$	mean	std	min	25%	50%	75%	max
Ungrouped Grouped	72 2393		0.108 0.300					



#### Low residual standard error

	Dependent Variable: Future Pairs's co-movement								
	(1)	(2)	(3)	(4)	(5)	(6)			
Same Group	0.0208***	0.0210***			0.0137***	0.0113**			
	(7.91)	(7.77)			(3.73)	(3.19)			
LowResidualStd		0.000929	0.0171***	-0.000982	-0.00107	0.00279			
		(0.84)	(3.88)	(-0.93)	(-1.04)	(1.39)			
$LowResidualStd \times SameGroup$					0.0181***	0.0183**			
					(3.65)	(3.91)			
Sub-sample	Total	Total	SameGroup	Others	Total	Total			
Business Group FE	No	No	No	No	No	Yes			
Observations	354209	354209	43274	310935	354209	354209			

t statistics in parentheses

 $<sup>^{*}</sup>$   $\rho <$  0.05,  $^{**}$   $\rho <$  0.01,  $^{***}$   $\rho <$  0.001

#### Institutional Imbalance

• Seasholes and Wu (2007)

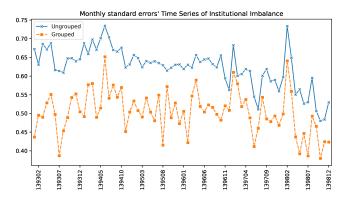
$$Imbalance_{ins} = \frac{Buy_{ins} - Sell_{ins}}{Buy_{ins} + Sell_{ins}}$$

	$Group \times Month$	mean	std	min	25%	50%	75%	max
Grouped								
Ungrouped	20197	0.010	0.630	-1.0	-0.474	0.016	0.479	1.0
Grouped	12021	-0.041	0.581	-1.0	-0.462	-0.009	0.341	1.0

#### Ins Imbalance std

#### Standard error

	$Group \times Month$	mean	std	min	25%	50%	75%	max
Grouped								
Ungrouped	72	0.624	0.054	0.48	0.601	0.631	0.655	0.735
Grouped	2057	0.502	0.251	0.00	0.337	0.503	0.647	1.414



# Low Ins Imbalance Group

	Dependent Variable: Future Pairs's co-movement									
	(1)	(2)	(3)	(4)	(5)	(6)				
Same Group	0.0208*** (7.91)	0.0205*** (7.61)			0.00614 (1.80)	0.00630* (2.04)				
Low Imbalance std		-0.00129 (-1.03)	0.0282*** (6.06)	-0.00724*** (-5.74)	-0.00597*** (-4.61)	-0.00267 (-1.85)				
Low Imbalance std $\times$ SameGroup					0.0362*** (8.78)	0.0325*** (7.48)				
Sub-sample	Total	Total	SameGroup	Others	Total	Total				
Business Group FE	No	No	No	No	No	Yes				
Observations	354209	354209	43274	310935	354209	354209				

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

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  - Institutional Imbalance
- 6 Conclusion

#### Conclusion

- Direct common ownership affects firms' co-movement.
- Firms in the business groups co-move more than other pairs
- Direct common ownership only matters for firms in the business groups.
- In the Business groups, firms are traded in the same time and also in the same direction.

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- 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  $\alpha_1$  and  $\alpha_2$ :
  - 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

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



Anton and Polk (2014)

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

**SQRT** 

Quadratic

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

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

#### Intuition

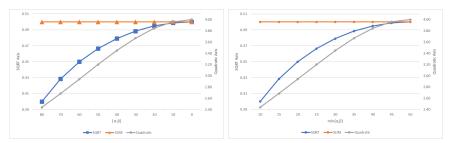
If for a pair of stocks with n mutual owners, all owners have even shares of each firm's market cap, then the proposed indexes will be equal to n. Proof

#### Example



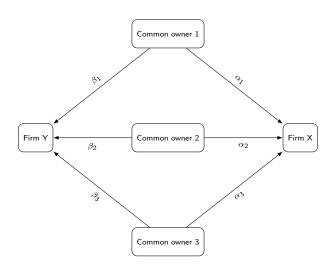
For better observation, assume that

- $\alpha + \beta = 100$
- both firm have equal market cap



Comparison of three methods for calculating common ownership

Example of three common owner



Example of three common owner

Ownership	Type I	Type II	Type III	Type IV	Type $V$	Type VI	Type VII
$\alpha_1$	1/3	20	10	20	10	5	1
$\beta_1$	1/3	10	10	20	10	5	1
$\alpha_2$	1/3	10	80	20	10	5	1
$\beta_2$	1/3	20	80	20	10	5	1
$\alpha_3$	1/3	70	10	20	10	5	1
$\beta_3$	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



#### Comparison

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

	$(\alpha_1,\beta_1),(\alpha_2,\beta_2)$									
	(10,40),(10,40) SQRT SUM		(15,35)	,(15,35)	(20,30),(20,30)					
$\frac{MarketCap_X}{MarketCap_y}$			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				

#### 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.

# Common Ownership measure

			Dependen	t Variable: F	uture Month	ly Correlation	of 4F+Indust	try Residuals		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Common Ownership Measure	0.00177***	0.00150**	0.00133**	0.00102	0.000936	0.000663	0.000536	0.000377	-0.0000197	-0.0000113
	(3.93)	(2.90)	(2.76)	(1.87)	(1.90)	(1.17)	(1.06)	(0.65)	(-0.04)	(-0.02)
Same Group			0.0156***	0.0157***	0.00774***	0.00813***	0.00575*	0.00624**	0.00503*	0.00549*
			(7.32)	(7.44)	(3.61)	(3.71)	(2.62)	(2.81)	(2.11)	(2.27)
Common Ownership Measure × SameGroup					0.0103***	0.00935***	0.0110***	0.00992***	0.0119***	0.0107***
					(7.76)	(6.72)	(7.47)	(6.49)	(7.94)	(6.97)
SameIndustry							-0.000364	-0.000312	0.000286	0.000339
,							(-0.21)	(-0.19)	(0.17)	(0.21)
SameSize							0.0133***	0.0135***	0.0131***	0.0132***
							(4.48)	(4.56)	(4.61)	(4.68)
SameBookToMarket							0.00772***	0.00772***	0.00893***	0.00893***
							(4.55)	(4.58)	(5.05)	(5.09)
CrossOwnership							0.0280*	0.0260	0.0303*	0.0283*
							(2.07)	(1.93)	(2.27)	(2.14)
Observations	1665996	1665996	1665996	1665996	1665996	1665996	1665996	1665996	1665996	1665996
Group FE	No	No	No	No	No	No	No	No	Yes	Yes
Measurement	Sum	Quadratic	Sum	Quadratic	Sum	Quadratic	Sum	Quadratic	Sum	Quadratic
R <sup>2</sup>	0.000171	0.000170	0.000348	0.000349	0.000443	0.000437	0.000898	0.000898	0.00575	0.00575

t statistics in parentheses

<sup>\*</sup> p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001

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#### Main Effect

#### 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



# Synchronicity and firm interlocks

JFE-2009-Khanna

- Three types of network
  - Equity network
  - ② Director network
  - Owner network
- Dependent variables

Using deterended weekly return for calculation

- **1** Pairwise returns synchronicity =  $\frac{\sum_{\mathbf{t}} (n_{i,j,\mathbf{t}}^{i,j,\mathbf{t}}, n_{i,j,\mathbf{t}}^{down})}{T_{i,j}}$
- $2 Correlation = \frac{Cov(i,j)}{\sqrt{Var(i).Var(j)}}$
- 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:

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

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

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

$$+ Industry Dummies + Year Dummies + \varepsilon_{i,t}$$

- 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

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

- ullet Using normalized rank-transformed as  $FCAP_{ij,t}^*$
- $\rho_{ij,t}$ : within-month realized correlation of each stock pair's daily four-factor returns

a

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

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

# Commonownership measurements

#### Model-based measures

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

$$\bullet \ \ \mathsf{MHHI} = \textstyle \sum_{j} \sum_{k} \mathsf{s}_{j} \mathsf{s}_{k} \frac{\sum_{i} \mu_{ij} \nu_{ik}}{\sum_{i} \mu_{ij} \nu_{ij}} \ \ \mathsf{Azar} \ \mathsf{et} \ \mathsf{al.} \ \mathsf{(2018)}$$

- Capture a specific type of externality
- Measured at the industry level
- Assumes that investors are fully informed about the externalities
- $\operatorname{\mathsf{GGL}}^A(A,B) = \sum_{i=1}^I \alpha_{i,A} g(\beta_{i,A}) \alpha_{i,B}$  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) =  $\sum_{i \in I^{A,B}} \alpha_{i,A} \frac{\bar{\nu}_A}{\bar{\nu}_A + \bar{\nu}_B} + \alpha_{i,B} \frac{\bar{\nu}_B}{\bar{\nu}_A + \bar{\nu}_B}$ Anton and Polk (2014)
- $Overlap_{HL}(A, B) = \sum_{i \in I^{A,B}} \alpha_{i,A} \times \sum_{i \in I^{A,B}} \alpha_{i,B}$ 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<sub>Count</sub> and Overlap<sub>AP</sub> are invariant to the decomposition of ownership between the two firms, which leads to some unappealing properties.



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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 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

$$Y_{i1} = \delta_{0,1} + \delta_{1,1}^{1} X_{i,1}^{1} + \dots + \delta_{k,1}^{k} X_{i,1}^{k} + \varepsilon_{i,1}$$

$$\vdots$$

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

Second Step

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

• 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

