A frog in every pan: Information discreteness and the lead-lag returns puzzle

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温水煮青蛙"理论

有限的认知精力使得投资者无法及时处理市场上发生的所有信息。通常来讲，相较于突发的、剧烈的变化，投资者对于温和的、小幅的变化通常更加不敏感。受此启发，我们提出一种"温水煮青蛙"（frog-in-the-pan）理论。该理论认为如果两只股票过去一段时间的累计收益相似，那么小幅缓慢上涨的股票所受到的市场关注会明显低于大幅突然上涨的股票。

动量效应（Momentum effect）一般又称"惯性效应"。 动量效应是由Jegadeesh和Titman（1993）提出的，是指股票的 收益率 有延续原来的 运动方向 的趋势，即过去一段时间收益率较高的股票在未来获得的收益率仍会高于过去收益率较低的股票

文章结论：

1.ID效应：当领先公司的回报信息连续时，经济联系的公司间的领先滞后回报模式才存在，且ID效应在不同的共动量设置中普遍存在。

2.投资者包括分析师对连续达到的领先公司的信息反应不足.

3.关注有限的原因：不是投资者未能理解关联公司的经济联系而是信息离散性作为一种认知触发器，减少了投资者的注意力不集中。

Data

The sample stocks contain common stocks traded in NYSE, AMEX, and Nasdaq. The sample period is from January 1980 to Decem- ber 2018, except for the analyst lead-lag setting，The sam- ple period of the analyst lead-lag setting is from January 1984 to December 2018

$$ID_{c,t} = sign(CR_{c,t}) \times [\%neg_{c,t} - \%pos_{c,t}], \qquad (1)$$

CR c,t is a customer firm c's cumulative return over the past three months, sign (CR c,t) is the sign of CR c,t , and % neg and % pos are the percentage of days during the past three months with positive and negative returns.

4.1 Continuous information is often overlooked by investors

Table 1

Summary statistics for the customer-supplier setting.

Panel A: Firm Characteristics

	Mean	SD	25th	50th	75th
Supplier mktcap (NYSE pctl)	0.237	0.267	0.025	0.124	0.378
Customer mktcap (NYSE pctl)	0.832	0.237	0.786	0.940	0.987
Supplier Book-to-Market	0.779	1.291	0.298	0.550	0.940
Customer Book-to-Market	0.663	0.965	0.283	0.480	0.821
Customer Return (3-month)	0.039	0.205	−0.063	0.032	0.129
ID	−0.070	0.098	−0.131	−0.065	0.000

Panel B: Supplier-Customer Link Information

	# Firm	Sales% contributed by each customer				
		1st	2nd	3rd	4th	5th
Supplier with 1 customer	513	22.99%				
Supplier with 2 customers	233	24.66%	12.50%			
Supplier with 3 customers	106	26.45%	14.62%	9.74%		
Supplier with 4 customers	42	25.08%	15.17%	11.16%	7.42%	
Supplier with at least 5 customers	31	22.25%	13.91%	10.30%	6.86%	4.54%

Panel C: Variable Correlation

|	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) CR	1.00							
(2) ID	−0.06	1.00						
(3) Size	0.03	−0.01	1.00					
(4) BM	0.03	0.01	−0.33	1.00				
(5) IVOL	−0.09	−0.01	−0.40	0.05	1.00			
(6) Turnover	−0.02	−0.03	−0.07	−0.04	0.28	1.00		
(7) IO	0.02	−0.02	0.03	−0.14	−0.02	0.44	1.00	
(8) Analyst Coverage	−0.01	−0.01	0.59	−0.17	−0.19	−0.11	−0.20	1.00

Table 2
Performance of supplier portfolios sorted by customer return and customer ID.

	Panel A: Avg Monthly Excess Returns			
	CR1 (Low)	CR2	CR3 (High)	CR 3 - 1
ID1 (Discrete)	0.30	0.49	0.50	0.21
	(0.84)	(1.67)	(1.48)	(1.10)
ID2	0.22	0.54	0.83***	0.61***
	(0.61)	(1.84)	(2.61)	(3.17)
ID3 (Continuous)	0.17	0.33	1.15***	0.98***
	(0.49)	(1.00)	(3.77)	(4.65)
ID 3 - 1	−0.13	−0.16	0.65***	0.78***
	(−0.76)	(−1.26)	(3.54)	(3.24)
	Panel B: Avg Monthly FF5 Alpha			
	CR1 (Low)	CR2	CR3 (High)	CR 3 - 1
ID1 (Discrete)	−0.24	−0.03	−0.21	0.03
	(−1.54)	(−0.32)	(−1.56)	(0.12)
ID2	−0.37***	−0.04	0.20	0.57***
	(−2.69)	(−0.37)	(1.74)	(2.95)
ID3 (Continuous)	−0.37***	−0.21	0.56***	0.93***
	(−2.62)	(−1.35)	(3.20)	(4.29)
ID 3 - 1	−0.13	−0.17	0.77***	0.90***
	(−0.75)	(−1.06)	(3.85)	(3.55)
	Panel C: Avg Monthly FF5+UMD+STREV alpha			
	CR1 (Low)	CR2	CR3 (High)	CR 3 - 1
ID1 (Discrete)	−0.17	0.01	−0.14	0.03
	(−1.05)	(0.05)	(−0.92)	(0.14)
ID2	−0.23	0.02	0.16	0.39
	(−1.49)	(0.27)	(1.42)	(1.86)
ID3 (Continuous)	−0.25	−0.21	0.43***	0.67***
	(−1.61)	(−1.44)	(2.67)	(3.22)
ID 3 - 1	−0.08	−0.21	0.56***	0.64**
	(−0.42)	(−1.32)	(2.94)	(2.39)

Fig. 2. Cumulative alphas of the CR long-short portfolios.
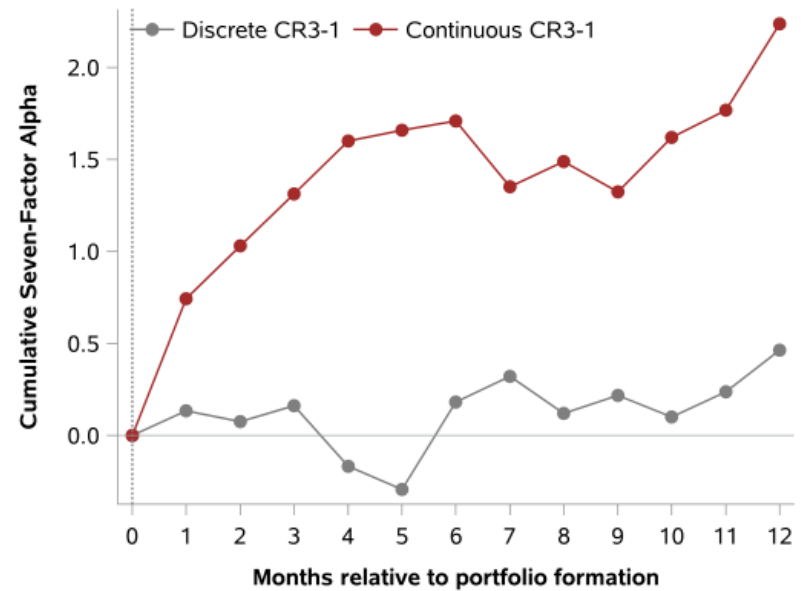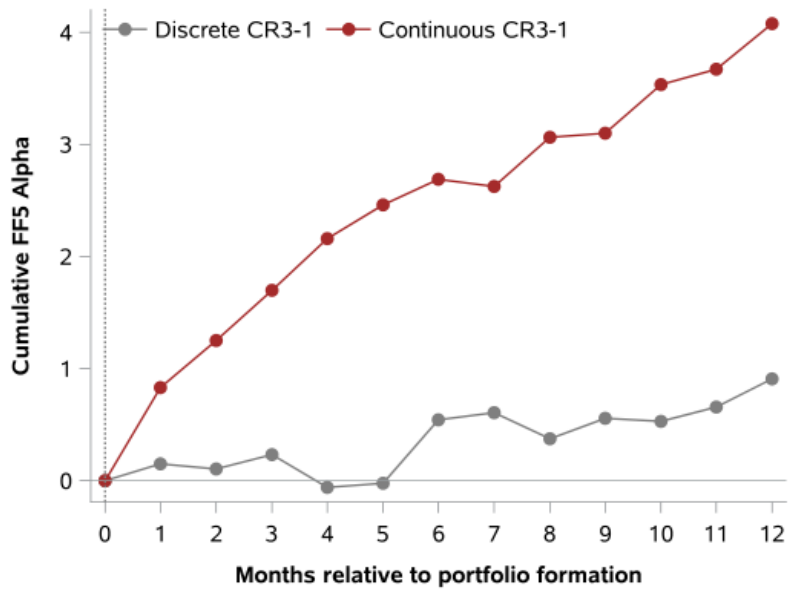
As an alternative test of returns predictability, we estimate Fama-MacBeth regressions of suppliers' future return on customer return, customer ID, and their interaction term, while further controlling for supplier firm characteristics.

$$
\begin{aligned}
Ret_{s,t+1} = a + b\, CR^s_{c,t} + c\, ID^s_{c,t} + d\, CR^s_{c,t} \\
\times\ ID^s_{c,t} + f\, Y_{s,t} + \epsilon_{s,t+1}.
\end{aligned} \tag{3}
$$

Ret s,t+1 is the monthly return of supplier firm s in month t + 1 , and CR s c,t and ID s c,t are the cumulative return and information discretenessY s,t , includes supplier characteristics, such as market capitalization, book-to-market ratio, past one-month and 12-month returns,and idiosyncratic volatility

Table 3
Estimating the ID effect through Fama-MacBeth regressions.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
CR	0.016***	0.013***	0.010**	0.008*	0.007	0.002	−0.005	−0.002
	(4.910)	(4.329)	(2.180)	(1.852)	(1.528)	(0.289)	(−0.623)	(−0.227)
CR×ID			−0.060**	−0.052**	−0.051**			
			(−2.397)	(−2.120)	(−1.998)			
ID			−0.000	−0.003	−0.004			
			(−0.039)	(−0.603)	(−0.786)			
CR×$I_{non-discrete}$						0.016**	0.018**	0.016**
						(2.037)	(2.352)	(1.987)
$I_{non-discrete}$						−0.001	−0.000	−0.001
						(−1.031)	(−0.349)	(−0.552)
Main Controls	No	Yes	No	Yes	Yes	No	Yes	Yes
Control Common Analyst	No	No	No	No	Yes	No	No	Yes
Adj. R^2	0.004	0.030	0.006	0.047	0.048	0.006	0.037	0.049

Robustness checks for the portfolio analysis of the ID effect for the customer-supplier setting

Table A.1.1 Portfolio Analysis of the ID Effect: Sequential Sorting

| | Panel A: First sort by CR then by ID | | | |
	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.06	−0.03	0.16	0.21
	(−0.36)	(−0.24)	(1.13)	(0.91)
ID2	−0.11	0.00	0.11	0.22
	(−0.97)	(−0.05)	(1.00)	(1.19)
ID3 (Continuous)	−0.31**	−0.05	0.44***	0.76***
	(−2.20)	(−0.50)	(3.19)	(4.69)
ID 3−1	−0.26	−0.02	0.28	0.54**
	(−1.92)	(−0.15)	(1.60)	(2.39)
	Panel B: First sort by ID then by CR			
	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.11	0.04	0.04	0.15
	(−0.71)	(0.32)	(0.33)	(0.62)
ID2	−0.21	0.00	0.14	0.35
	(−1.35)	(−0.05)	(1.34)	(1.69)
ID3 (Continuous)	−0.25	−0.03	0.62***	0.87***
	(−1.82)	(−0.28)	(3.64)	(4.30)
ID 3−1	−0.14	−0.07	0.57***	0.72***
	(−0.89)	(−0.41)	(2.88)	(2.86)

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Table A.1.2 Portfolio Analysis of the ID Effect: Based on One-month Customer Return and Customer ID

This table reports the results for a robustness check for Table 2 using the past-one-month customer return and customer ID calculated based on daily customer returns over the past month as the sorting variables. This table reports the average monthly alpha based on the seven-factor model that augments the FF five-factor model with the momentum factor and the short-term reversal factor. t-statistics in parentheses are computed based on standard errors with Newey-West correction of 12 lags. ** (***) denote the 5% (1%) significance level.

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.28	0.00	0.15	0.42
	(−1.65)	(0.02)	(0.87)	(1.90)
ID2	−0.38***	−0.06	0.58***	0.96***
	(−2.80)	(−0.77)	(4.62)	(5.86)
ID3 (Continuous)	−0.45***	0.00	0.70***	1.16***
	(−2.82)	(0.01)	(3.77)	(5.10)
ID 3−1	−0.18	0.00	0.56**	0.74**
	(−0.92)	(−0.01)	(2.21)	(2.19)

$$IDZ_{c,t} = sign(CR_{c,t}) \times \frac{[\%neg_{c,t} - \%pos_{c,t}]}{[\%neg_{c,t} + \%pos_{c,t}]},$$

$$IDM_{c,t} = -sign(CR_{c,t}) \times \frac{1}{N} \left(\sum_{k=1}^{N} sign(Ret_{c,k}) \times w_k \right),$$

$CR_{c,t}$ is the customer firm's cumulative return in past three months, N is the total number of trading days in past three months, $Ret_{c,k}$ is the customer firm's return on a given trading day k over the three-month period, and w_k is the weight assigned to daily returns.

Table A.1.3 Portfolio Analysis of the ID Effect: Alternative ID Measures

Panel A: Based on IDZ

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.13	0.02	−0.15	−0.03
	(−0.84)	(0.16)	(−1.08)	(−0.12)
ID2	−0.19	−0.02	0.16	0.35
	(−1.18)	(−0.29)	(1.35)	(1.63)
ID3 (Continuous)	−0.28	−0.19	0.35**	0.63***
	(−1.88)	(−1.30)	(2.42)	(2.97)
ID 3−1	−0.15	−0.20	0.50***	0.65**
	(−0.89)	(−1.21)	(2.80)	(2.48)

Panel B: Based on IDM

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.06	0.08	0.14	0.20
	(−0.29)	(0.75)	(0.90)	(0.75)
ID2	−0.23	−0.04	0.09	0.32**
	(−1.88)	(−0.54)	(0.81)	(2.19)
ID3 (Continuous)	−0.32**	−0.15	0.35**	0.67***
	(−2.05)	(−1.37)	(2.22)	(3.35)
ID 3−1	−0.26	−0.24	0.21	0.46**
	(−1.52)	(−1.48)	(1.11)	(2.27)

Table A.1.4 Placebo Test: Based on Terminated Customer-Supplier Links

	(1)	(2)	(3)	(4)
CR	0.005	0.002	0.019	0.021
	(0.634)	(0.183)	(1.310)	(1.126)
CR×ID			0.119	0.255
			(1.143)	(1.633)
ID			−0.021	−0.020
			(−1.429)	(−1.036)
Controls	No	Yes	No	Yes
Adj. R^2	0.003	0.066	0.006	0.067

4.2. Discussions of the results ： Controlling for the shared-analyst effect

First, we include controls for common analyst coverage in the regression analysis of Table 3.

Table 4
Influence of shared analyst coverage on the ID effect: spanning regressions.

	Intercept (%)	CFMOM	MktRf	SMB	HML	CMA	RMW	UMD	STREV
Panel A: Controlling for CFMOM									
CR 3 - 1 (Discrete ID)	0.15	0.00							
	(0.75)	(0.09)							
CR 3 - 1 (Middle ID)	0.47	0.07							
	(2.27)	(1.39)							
CR 3 - 1 (Continuous ID)	0.82	0.20							
	(3.43)	(3.04)							
Continuous - Discrete	0.67	0.19							
	(2.42)	(2.30)							
Panel B: Controlling for FF5+UMD+STREV+CFMOM									
CR 3 - 1 (Discrete ID)	−0.12	0.11	0.12	0.00	−0.16	0.17	0.22	−0.04	0.23
	(−0.47)	(1.44)	(1.53)	(−0.01)	(−1.13)	(0.84)	(1.62)	(−0.40)	(1.19)
CR 3 - 1 (Middle ID)	0.33	0.03	−0.02	−0.06	−0.02	0.11	0.21	0.16	−0.07
	(1.66)	(0.44)	(−0.58)	(−0.85)	(−0.23)	(0.57)	(2.56)	(2.32)	(−0.48)
CR 3 - 1 (Continuous ID)	0.62	0.11	0.00	0.23	0.13	0.08	0.16	0.26	−0.20
	(3.02)	(1.76)	(−0.05)	(3.40)	(1.37)	(0.48)	(1.60)	(4.93)	(−1.90)
Continuous - Discrete	0.74	−0.01	−0.12	0.23	0.30	−0.10	−0.06	0.29	−0.43
	(2.56)	(−0.08)	(−1.43)	(1.70)	(1.58)	(−0.39)	(−0.38)	(3.34)	(−2.47)

monthly return spreads between the top-CR and bottom-CR suppliers in all three ID groups

Table A.1.5 Analyzing the ID Effect: Common Analyst Coverage

Panel A: Customer-supplier pairs without common analyst coverage

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	−0.17	0.14	−0.09	0.07
	(−1.10)	(1.24)	(−0.65)	(0.32)
ID2	−0.29	−0.07	0.12	0.42**
	(−1.94)	(−0.66)	(0.88)	(2.18)
ID3 (Continuous)	−0.26**	−0.03	0.45***	0.71***
	(−2.11)	(−0.28)	(3.11)	(4.06)
ID 3−1	−0.10	−0.18	0.54***	0.64***
	(−0.65)	(−1.11)	(3.05)	(2.74)

Panel B: Customer-supplier pairs with common analyst coverage

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
ID1 (Discrete)	0.06	−0.04	0.61**	0.55
	(0.27)	(−0.21)	(2.37)	(1.54)
ID2	−0.18	−0.01	0.52**	0.70**
	(−0.83)	(−0.10)	(2.57)	(2.48)
ID3 (Continuous)	−0.33	0.13	0.63**	0.97***
	(−1.43)	(0.68)	(2.20)	(2.68)
ID 3−1	−0.39	0.17	0.02	0.41
	(−1.24)	(0.63)	(0.06)	(0.84)

Table 5
Analyzing the ID effect: controlling for customer characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
CR	0.017***	0.014***	0.012***	0.008**	0.005	0.004
	(5.053)	(4.955)	(4.055)	(1.988)	(1.294)	(0.976)
CR×ResID	−0.082***	−0.069**	−0.063**			
	(−2.655)	(−2.302)	(−2.053)			
ResID	0.005	0.003	0.002			
	(0.902)	(0.565)	(0.483)			
CR×I$_{non-discrete}$				0.013***	0.013***	0.012***
				(3.154)	(3.157)	(2.962)
I$_{non-discrete}$				−0.001	−0.001	−0.001
				(−1.221)	(−0.944)	(−0.785)
Main Controls	No	Yes	Yes	No	Yes	Yes
Control Common Analyst	No	No	Yes	No	No	Yes
Adj. R^2	0.005	0.046	0.048	0.005	0.047	0.048

Table A.1.7 Analyzing the ID Effect: Controlling for Supplier ID "supplier-ID-adjusted" customer ID as the residual in the cross-sectional regression of customer ID on the corresponding supplier ID

	CR1 (Low)	CR2	CR3 (High)	CR 3−1
Supplier-ID-Adjusted ID1 (Discrete)	−0.10	0.02	−0.19	−0.09
	(−0.63)	(0.18)	(−1.29)	(−0.44)
Supplier-ID-Adjusted ID2	−0.28	−0.03	0.20	0.48**
	(−1.71)	(−0.35)	(1.81)	(2.21)
Supplier-ID-Adjusted ID3 (Continuous)	−0.20	−0.17	0.33**	0.53**
	(−1.44)	(−1.24)	(2.13)	(2.49)
Continuous−Discrete	−0.10	−0.19	0.52***	0.63**
	(−0.62)	(−1.20)	(2.68)	(2.36)
Correlation between customer ID and supplier ID:				0.044

Table A.1.8 Estimating the ID Effect through Fama-MacBeth Regression: Controlling for Supplier ID

	(1)	(2)	(3)	(4)
CR	0.010**	0.008	0.008	0.006
	(2.180)	(1.852)	(1.706)	(1.509)
CR×ID	−0.060**	−0.052**	−0.062**	−0.051**
	(−2.397)	(−2.120)	(−2.424)	(−2.041)
ID	−0.000	−0.003	−0.000	−0.003
	(−0.039)	(−0.603)	(−0.026)	(−0.622)
CR×ID$_{Supplier}$			−0.033	−0.028
			(−1.443)	(−1.286)
ID$_{Supplier}$			−0.008	−0.001
			(−1.840)	(−0.258)
Controls	No	Yes	No	Yes
Adj. R^2	0.006	0.047	0.008	0.048

4.3. Investors trade more when information is more salient
Table 6
Information discreteness and abnormal trading volume.

	Customer AbnVol			Supplier AbnVol	
	(1)	(2)		(3)	(4)
ID	0.045***	0.058***		0.009***	0.009***
	(17.608)	(21.761)		(3.433)	(4.273)
Controls	Yes	Yes		Yes	Yes
Regression Method	FM	Panel		FM	Panel
Fixed Effects	–	Yes		–	Yes
No. Obs.	177,623	177,599		367,970	367,928
Adj. R²	0.078	0.217		0.010	0.132

the abnormal trading volume of a firm in a given month is the residual from the regression of the average daily stock turnover rate on the average daily market-level turnover rate.

4.4. Analysts tend to neglect continuous information

$$SUE_{s,q}=\alpha + \rho\, CR^s_{c,q} + \theta\, CR^s_{c,q} \times ID^s_{c,q} + \phi\, ID^s_{c,q}+\psi Y_{s,q}+\eta_{s,q}.$$
$$(4)$$

the analyst-based earnings surprises for each supplier firm：the actual quarterly EPS minus the analyst forecast consensus, scaled by the quarter-end stock price。
median value of all forecasts made after the start of the fiscal quarter and prior to the earnings announcement date。

Table 7
Information discreteness and analyst forecast erro

	(1)	(2)	(3)	(4)	(5)	(6)
CR	0.002**	0.001***	0.001***	−0.002	−0.002	−0.001
	(2.515)	(3.123)	(2.695)	(−1.451)	(−1.544)	(−1.095)
CR× I_{non−discrete}				0.005***	0.004***	0.003**
				(3.460)	(2.837)	(2.272)
I_{non−discrete} $(\times 10^{-2})$				−0.028	−0.021	−0.024
				(−1.813)	(−1.372)	(−1.452)
Controls	No	No	Yes	No	No	Yes
Industry FE	No	Yes	Yes	No	Yes	Yes
Time FE	No	Yes	Yes	No	Yes	Yes
No. Obs.	65,057	63,365	57,076	65,057	63,365	57,076
Adj. R^2	0.000	0.017	0.036	0.001	0.017	0.036

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4.5. Analyzing suppliers with multiple principal customers

$$R_{s,t+1} = \tau + \beta\left(\frac{1}{N_{s,t}} \sum_{c \in \text{high ID}} CR_{c,t}^s\right)$$

$$+ \gamma\left(\frac{1}{N_{s,t}} \sum_{c \in \text{low ID}} CR_{c,t}^s\right) + \pi' K_{s,t} + \epsilon_{s,t}.$$

R s,t+1 is the return of supplier s in month t + 1 , N s,t is the number of principal customers of supplier s , CR s c,t is the cumulative return of customer c over the past three months, and K s,t is a vector of control variables

Table 8
Forecasting supplier returns: suppliers with multiple principal customers

Panel A: Fama-MacBeth Regression

	(1)	(2)	(3)	(4)	(5)	(6)
CR	0.036***	0.033***	0.034***			
	(5.495)	(5.433)	(5.491)			
High-ID CR				0.022**	0.018**	0.019**
				(2.440)	(2.128)	(2.224)
Low-ID CR				0.050***	0.047***	0.047***
				(5.752)	(5.866)	(5.864)
Main Controls	No	Yes	Yes	No	Yes	Yes
Control Common Analyst	No	No	Yes	No	No	Yes
Adj. R²	0.007	0.049	0.050	0.009	0.050	0.051

Panel B: Comparing Characteristics of Low-ID and High-ID Customers

	High-ID Customers	Low-ID Customers	Difference	t-value
Ln(Size)	23.2412	23.2131	0.0281	0.9917
Ln(1+#Analyst)	2.9960	2.9852	0.0107	0.7390
IVOL	0.0142	0.0145	−0.0002	−1.4731
%Sales	17.43%	17.33%	0.10%	0.4705
$I_{common-analyst}$	27.24%	26.72%	0.52%	0.7717
Coefficient of CR	0.0190	0.0470	0.0280	2.3730

5.Information discreteness and other lead-Lag relationships

$$CFRet_{i,t} = \frac{1}{\sum_{j=1}^{N_{i,t}} n_{i,j,t}} \sum_{j=1}^{N_{i,t}} n_{i,j,t} Ret_{j,t}. \qquad (2)$$

Ret j,t is the return of a connected stock j, n i, j,t is the number of analysts covering both stock i and j, and N i,t is the total number of stocks connected to stock i in month t

Table 9
Information discreteness and co-momentum in other settings.

Panel A: Industry Momentum

	Intercept	MktRf	SMB	HML	CMA	RMW	UMD	STREV	CFMOM
IR 3 - 1 (Discrete ID)	0.13	0.05	−0.04	0.13	−0.15	0.00	0.00	−0.17	0.29
	(0.53)	(0.98)	(−0.41)	(1.33)	(−0.87)	(−0.02)	(−0.05)	(−1.30)	(4.59)
IR 3 - 1 (Middle ID)	0.66	0.07	0.01	0.01	0.07	−0.13	0.00	−0.29	0.25
	(3.45)	(1.56)	(0.17)	(0.13)	(0.76)	(−1.26)	(−0.07)	(−2.19)	(5.06)
IR 3 - 1(Continuous ID)	0.89	0.08	0.07	0.03	0.15	0.16	0.04	−0.19	0.29
	(4.24)	(1.72)	(0.96)	(0.54)	(1.24)	(1.86)	(0.94)	(−2.31)	(7.38)
Continuous - Discrete	0.76								
	(2.38)								

Panel B: Geographic Momentum

	Intercept	MktRf	SMB	HML	CMA	RMW	UMD	STREV	CFMOM
AR 3 - 1 (Discrete ID)	0.10	0.10	−0.06	−0.06	0.10	0.03	−0.15	−0.19	0.16
	(0.92)	(2.82)	(−1.15)	(−1.08)	(0.98)	(0.52)	(−3.41)	(−2.70)	(3.31)
AR 3 - 1 (Middle ID)	0.38	−0.02	−0.01	−0.02	0.00	−0.08	0.01	−0.02	0.22
	(3.31)	(−1.04)	(−0.36)	(−0.42)	(−0.01)	(−1.00)	(0.12)	(−0.31)	(4.09)
AR 3 - 1 (Continuous ID)	0.52	0.01	−0.04	0.02	−0.02	−0.03	0.00	−0.12	0.23
	(4.82)	(0.55)	(−1.04)	(0.29)	(−0.26)	(−0.51)	(−0.06)	(−1.79)	(4.88)
Continuous - Discrete	0.42								
	(2.57)								

Panel C: Conglomerate Momentum

	Intercept	MktRf	SMB	HML	CMA	RMW	UMD	STREV	CFMOM
PCR 3 - 1(Discrete ID)	0.34	0.07	−0.12	0.13	−0.09	0.11	−0.01	−0.34	0.04
	(1.72)	(0.99)	(−1.14)	(1.37)	(−0.73)	(0.87)	(−0.13)	(−3.55)	(0.56)
PCR 3 - 1 (Middle ID)	0.59	0.05	0.07	0.05	−0.04	0.09	−0.04	−0.30	0.12
	(3.49)	(1.31)	(1.41)	(0.86)	(−0.44)	(1.35)	(−0.82)	(−3.07)	(2.27)
PCR 3 - 1 (Continuous ID)	0.79	0.06	−0.02	0.21	−0.24	−0.04	0.06	−0.33	0.14
	(5.25)	(1.75)	(−0.27)	(2.31)	(−1.78)	(−0.59)	(1.34)	(−4.03)	(2.47)
Continuous - Discrete	0.45								
	(2.09)								

Panel D: Shared-Analyst Momentum

	Intercept	MktRf	SMB	HML	CMA	RMW	UMD	STREV	CFMOM
CFR 3 - 1 (Discrete ID)	1.29	0.03	0.04	0.13	−0.19	−0.09	−0.18	−0.94	-
	(4.82)	(0.57)	(0.67)	(1.45)	(−1.17)	(−0.97)	(−1.77)	(−6.99)	
CFR 3 - 1 (Middle ID)	1.55	0.07	0.07	−0.04	0.22	−0.06	−0.09	−1.14	-
	(6.64)	(1.83)	(1.24)	(−0.47)	(1.73)	(−0.57)	(−1.16)	(−7.82)	
CFR 3 - 1 (Continuous ID)	1.86	0.05	0.09	−0.07	0.28	−0.17	−0.01	−1.21	-
	(6.38)	(1.43)	(1.15)	(−0.67)	(1.71)	(−1.23)	(−0.17)	(−10.55)	
Continuous - Discrete	0.57								
	(2.40)								

Table A.2.2 Analyzing the ID Effect in Other Settings Using Fama-MacBeth Regressions: Controlling for Shared Analyst Coverage and Lead Firm Characteristics

Panel A: Industry Momentum	(1)	(2)	(3)
IR	0.084***	0.079***	0.066***
	(6.353)	(6.995)	(6.297)
IR×ResID	−0.173***	−0.139***	−0.136***
	(−2.624)	(−2.605)	(−2.632)
ResID	0.005	0.005**	0.004**
	(1.937)	(2.235)	(2.417)
Main Controls	No	Yes	Yes
Control Common Analyst	No	No	Yes
Adj. R²	0.010	0.042	0.045

Panel B: Geographic Momentum	(1)	(2)	(3)
AR	0.096***	0.076***	0.081***
	(6.358)	(6.810)	(6.849)
AR×ResID	−0.124**	−0.142**	−0.165***
	(−2.112)	(−2.516)	(−2.904)
ResID	0.003	0.003	0.003
	(1.113)	(1.031)	(1.234)
Main Controls	No	Yes	Yes
Control Common Analyst	No	No	Yes
Adj. R²	0.004	0.040	0.042

Panel C: Conglomerate Momentum	(1)	(2)	(3)
PCR	0.091***	0.093***	0.090***
	(6.090)	(6.826)	(6.556)
PCR×ResID	−0.145***	−0.136***	−0.117**
	(−2.968)	(−2.890)	(−2.572)
ResID	0.000	0.001	0.000
	(0.177)	(0.331)	(0.159)
Main Controls	No	Yes	Yes
Control Common Analyst	No	No	Yes
Adj. R²	0.010	0.047	0.050

Panel D: Shared-Analyst Momentum	(1)	(2)
CFR	0.168***	0.178***
	(7.155)	(8.494)
CFR×ResID	−0.124**	−0.116**
	(−2.495)	(−2.402)
ResID	0.000	−0.000
	(0.061)	(−0.134)
Main Controls	No	Yes
Adj. R²	0.023	0.055

5.2. Evidence from abnormal trading volume and analyst forecasts errors

Table 10
Information discreteness and abnormal trading volume in other settings.

Panel A: Industry Momentum	(1)	(2)		Panel B: Geographic Momentum	(1)	(2)
ID	0.003**	0.004***		ID	0.002**	0.002**
	(2.446)	(3.227)			(2.501)	(2.438)
Controls	Yes	Yes		Controls	Yes	Yes
Reg. Method	FM	Panel		Reg. Method	FM	Panel
Fixed Effects	-	Yes		Fixed Effects	-	Yes
No. Obs.	1,950,984	1,950,870		No. Obs.	1,634,209	1,634,175
Adj. R^2	0.032	0.075		Adj. R^2	0.033	0.084
Panel C: Conglomerate Momentum	(1)	(2)		Panel D: Shared-Analyst Momentum	(1)	(2)
ID	0.004***	0.004***		ID	0.006***	0.012***
	(3.301)	(4.433)			(5.176)	(8.860)
Controls	Yes	Yes		Controls	Yes	Yes
Reg. Method	FM	Panel		Reg. Method	FM	Panel
Fixed Effects	-	Yes		Fixed Effects	-	Yes
No. Obs.	318,566	318,541		No. Obs.	1,195,212	1,195,137
Adj. R^2	0.040	0.146		Adj. R^2	0.039	0.076

Table 11
Information discreteness and analyst forecast error in other settings.

Panel A: Industry Momentum					Panel B: Geographic Momentum				
IR	0.001**	0.001***	−0.001	−0.000	AR	0.001***	0.002***	0.001	0.001
	(2.477)	(2.761)	(−0.527)	(−0.493)		(3.010)	(4.170)	(1.343)	(1.718)
IR×$I_{non-discrete}$			0.002**	0.002**	AR×$I_{non-discrete}$			0.000	0.001
			(2.027)	(2.205)				(0.957)	(1.240)
$I_{non-discrete}$ ($\times 10^{-2}$)			−0.006	−0.004	$I_{non-discrete}$ ($\times 10^{-2}$)			−0.001	0.001
			(−1.055)	(−0.703)				(−0.266)	(0.135)
Controls	No	Yes	No	Yes	Controls	No	Yes	No	Yes
Industry FE	YES	YES	YES	YES	Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	Time FE	YES	YES	YES	YES
No. Obs.	339,432	297,702	339,432	297,702	No. Obs.	284,458	250,854	284,458	250,854
Adj. R^2	0.016	0.040	0.016	0.040	Adj. R^2	0.016	0.036	0.016	0.036

Panel C: Conglomerate Momentum					Panel D: Shared-Analyst Momentum				
PCR	0.003***	0.003***	0.001	0.001	CFR	0.002***	0.003***	0.001	0.001
	(3.486)	(3.759)	(0.523)	(0.487)		(4.105)	(4.262)	(1.218)	(1.679)
PCR×$I_{non-discrete}$			0.003**	0.003**	CFR×$I_{non-discrete}$			0.002***	0.002***
			(2.190)	(2.051)				(3.062)	(2.832)
$I_{non-discrete}$ ($\times 10^{-2}$)			−0.021	−0.016	$I_{non-discrete}$ ($\times 10^{-2}$)			0.006	0.000
			(−1.638)	(−1.241)				(0.981)	(0.075)
Controls	No	Yes	No	Yes	Controls	No	Yes	No	Yes
Industry FE	YES	YES	YES	YES	Industry FE	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	Time FE	YES	YES	YES	YES
No. Obs.	52,259	50,573	52,259	50,573	No. Obs.	301,036	264,734	301,036	264,734
Adj. R^2	0.020	0.046	0.020	0.046	Adj. R^2	0.016	0.038	0.016	0.038

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谢谢大家！