Firm Complexity and Limits to Arbitrage

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Complexity and Asset Prices

- Cohen and Lou (2012) find that conglomerates take one month longer to incorporate industry-level news
- In particular, returns to a pseudo-conglomerate that mimics the real conglomerate using single-segment firms, predict the conglomerate's returns
- Barinov, Park, and Yildizhan (2020) find that firm complexity impedes information processing
- All else equal, more complex firms have stronger post-earnings-announcement drift
- Barinov (2021) finds that there is more disagreement about conglomerates, and that leads to conglomerates having negative alphas a-la Miller (1977)

Results in This Paper

- Despite conglomerates being larger, more liquid, less volatile than single-segment firms, several anomalies are stronger / exist only for conglomerates
- Among those anomalies are:
  - The IVol effect of Ang et al. and related anomalies
  - Asset growth effect of Cooper et al. (2008)
  - Cumulative issuance effect of Daniel and Titman (2006)
  - Retained earnings effect of Ball et al. (2020)
- The anomalies are also stronger for more complex conglomerates

Measures of Complexity

- Conglomerate dummy (Conglo) - 1 if the firm has multiple segments, 0 otherwise
- Concentration (Comp) - 1-HHI, HHI (Herfindahl index) is based on segment sales
- Number of segments (NSeg) (based on 2-digit SIC codes)
- RSZ (Rajan, Servaes, Zingales, 2000) - coefficient of variation of imputed segment-level market-to-book ratios
- CV_{OL}/CV_{SGA} - coefficient of variation of imputed segment-level operating leverage/SG&A-to-assets

Information Environment of Conglomerates

Table 2, Panel B. All Firms

Dep Var =	# An	# Spec	IO	-EarnQ	Error
$log(CV_{OL})$	-0.028	-0.097	-0.013	0.038	0.014
t-stat	*-5.22*	*-14.5*	*-3.93*	*6.46*	*4.61*
Controls	YES	YES	YES	YES	YES

Table 2, Panel C. Conglomerates Only

Dep Var =	# An	# Spec	IO	-EarnQ	Error
$log(CV_{OL})$	-0.027	-0.033	-0.014	0.018	0.008
t-stat	*-2.69*	*-2.78*	*-2.21*	*1.46*	*1.32*
Controls	YES	YES	YES	YES	YES

Complexity and Information Environment

- All else equal, more complex firms
  - Are followed by less analysts, especially analysts specializing in their core industry
  - Attract less institutional ownership
  - Have lower earnings quality (more volatile discretionary accruals)
  - Have analysts that make larger forecast errors
- The relation does not hold in univariate tests, but with size adjustment it does hold
- CV_{OL} variable has a large mass at zero (single-segment firms), so the relation could be just conglomerates vs. single-segments
- The large slope on the CV_{OL} variable in the conglomerates only sample confirms complexity really matters

Complexity and IVol Effect: Five-Factor Fama-French Alphas

	Low	IVol2	IVol3	IVol4	High	L-H
All Firms	0.045	-0.041	-0.200	-0.072	-0.292	0.337
t-stat	*0.99*	*-0.73*	*-2.72*	*-0.85*	*-2.30*	*2.20*
SingleSeg	0.102	0.125	-0.102	0.146	-0.089	0.192
t-stat	*1.01*	*1.30*	*-0.88*	*1.43*	*-0.63*	*0.96*
Conglos	0.135	-0.179	-0.280	-0.123	-0.362	0.497
t-stat	*1.49*	*-2.21*	*-2.78*	*-1.09*	*-2.32*	*2.58*
C-S	0.033	-0.303	-0.179	-0.269	-0.273	0.306
t-stat	*0.29*	*-2.62*	*-1.33*	*-1.82*	*-1.44*	*1.28*

- Single-segment high-IVol firms do not have negative alphas

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- There is no IVol effect for single-segment firms

Complexity and Disagreement Effect: Five-Factor Fama-French Alphas

	Low	Disp2	Disp3	Disp4	High	L-H
All	0.062	-0.125	0.008	0.037	-0.274	0.336
t-stat	*1.11*	*-2.44*	*0.14*	*0.44*	*-2.26*	*2.35*
SingleSeg	0.254	0.156	0.091	0.251	-0.030	0.284
t-stat	*3.31*	*0.93*	*0.90*	*1.97*	*-0.22*	*2.02*
Conglos	0.118	-0.191	-0.021	0.020	-0.511	0.629
t-stat	*1.48*	*-1.26*	*-0.19*	*0.13*	*-3.37*	*3.47*
C-S	-0.136	-0.347	-0.112	-0.232	-0.482	0.346
t-stat	*-1.50*	*-1.78*	*-0.72*	*-1.51*	*-2.56*	*1.77*

- Single-segment high-disagreement firms do not have negative alphas

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- The analyst disagreement effect of Diether et al. (2002) is twice stronger for conglomerates than it is for single-segment firms

Complexity and Asset Growth Effect: Five-Factor Fama-French Alphas

	Low	AG2	AG3	AG4	High	L-H
All	-0.047	-0.047	-0.025	0.133	0.096	-0.142
t-stat	*-0.65*	*-0.78*	*-0.43*	*2.22*	*1.35*	*-1.65*
SingleSeg	0.147	0.162	0.049	0.254	0.245	-0.098
t-stat	*1.47*	*1.72*	*0.50*	*2.49*	*2.69*	*-0.78*
Conglos	-0.072	-0.047	-0.084	0.017	-0.260	0.188
t-stat	*-0.81*	*-0.46*	*-1.04*	*0.19*	*-2.30*	*1.35*
C-S	-0.220	-0.209	-0.133	-0.237	-0.505	0.285
t-stat	*-1.57*	*-1.43*	*-1.13*	*-1.62*	*-3.52*	*1.44*

- Single-segment high-growth firms do not have negative alphas (their alphas are in fact positive)

Complexity and Cumulative Issuance Effect: 5-Factor Fama-French Alphas

	Low	CI2	CI3	CI4	High	L-H
All	0.032	-0.134	0.022	0.069	-0.283	0.316
t-stat	*0.41*	*-2.29*	*0.30*	*0.90*	*-4.04*	*3.29*
SingleSeg	0.047	-0.228	0.144	0.213	-0.081	0.128
t-stat	*0.48*	*-2.10*	*1.39*	*1.89*	*-0.92*	*0.89*
Conglos	0.094	-0.069	-0.033	-0.276	-0.612	0.706
t-stat	*0.76*	*-0.97*	*-0.34*	*-2.25*	*-4.48*	*4.16*
C-S	0.047	0.159	-0.177	-0.489	-0.530	0.577
t-stat	*0.33*	*1.31*	*-1.38*	*-2.86*	*-3.18*	*2.61*

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- Cumulative issuance puzzle of Daniel and Titman (2006) is more than five times stronger for conglomerates compared to single-segment firms

Complexity vs. IVol and Disagreement Effects

Panel B. Complexity and Analyst Disagreement Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
log(Disp)	0.378	0.338	0.667	0.471	0.631
t-stat	*0.66*	*0.59*	*1.16*	*0.67*	*1.10*
Comp·Disp	-0.029	-0.065	-0.078	-0.088	-0.053
t-stat	*-0.30*	*-0.33*	*-2.06*	*-2.18*	*-1.56*

Panel C. Complexity and Idiosyncratic Volatility Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
log(IVol)	3.633	3.751	3.333	3.614	3.455
t-stat	*3.82*	*4.05*	*3.44*	*3.12*	*3.04*
Comp·IVol	1.027	-9.718	-2.890	-2.144	3.357
t-stat	*0.09*	*-0.48*	*-0.77*	*-0.59*	*0.86*

Complexity vs. Turnover and Investment Growth Effects

Panel D. Complexity and Turnover Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
log(Turn)	0.230	0.265	0.210	0.242	0.262
t-stat	*2.31*	*2.69*	*2.14*	*2.40*	*2.56*
Comp·Turn	-0.134	-0.703	-0.226	-0.160	-0.172
t-stat	*-0.69*	*-1.75*	*-3.41*	*-2.59*	*-2.73*

Panel E. Complexity and Investment Growth Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
IG	0.276	-0.126	0.048	0.126	-0.005
t-stat	*1.62*	*-1.25*	*0.35*	*0.99*	*-0.04*
Comp·IG	-0.388	0.151	-0.101	-0.096	-0.072
t-stat	*-2.65*	*0.67*	*-2.20*	*-2.38*	*-1.50*

Complexity vs. Asset Growth and Cumulative Issuance Effects

Panel F. Complexity and Asset Growth Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
AG	-0.113	0.263	0.683	0.145	0.352
t-stat	*-0.26*	*0.71*	*1.65*	*0.39*	*0.97*
Comp*AG	-0.106	-0.197	-0.293	-0.143	-0.205
t-stat	*-0.31*	*-1.80*	*-2.30*	*-1.40*	*-2.33*

Panel G. Complexity and Cumulative Issuance Effect

Comp=	NSeg	1-HHI	RSZ	CV_{OL}	CV_{SGA}
CI	-0.516	-0.442	-0.468	-0.355	-0.539
t-stat	*-2.48*	*-1.49*	*-2.01*	*-1.60*	*-2.84*
Comp*CI	-0.022	-0.101	-0.031	-0.014	-0.013
t-stat	*-2.61*	*-1.14*	*-2.72*	*-1.91*	*-1.81*

Conglomerate Complexity and Anomalies

- Conglomerate-only sample is rather small, roughly 600 conglomerates per year
- Most complexity measures show that anomalies are stronger for complex (and typically large) conglomerates even after other limits-to-arbitrage variables are controlled for
- Number of segments (NSeg) is the least successful complexity measure, variation in market-to-book or operating leverage within a segment is more tightly related to anomalies' strength (and thus to limits to arbitrage)

Conclusion

- Conglomerates are large and liquid, but they are hard to understand
- Conglomerates, all else equal, have worse analyst following, lower institutional ownership, lower earnings quality
- Many anomalies are stronger for conglomerates and especially more complex conglomerates
- Investors do not trade against the anomalies due to prudent man laws and the difficulty/cost of processing information about conglomerates