Comomentum: Inferring Arbitrage Activity from Return Correlations

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Main Idea

Claim

Comomentum is a measure that capture the presence of arbitrage activity in the momentum strategy.

- No fundamental anchor for arbitrageurs $\Rightarrow$ crowded traded $\Rightarrow$ push prices away from fundamentals $\Rightarrow$ **To late!**
- Too many arbitrageurs make the long-run buy-and-hold of a momentum strategy crash and revert.

Authors

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Outline

Introduction and Motivation

- Are arbitrage activity stabilizing or destabilizing?
  - **Stabilizing:** Arbitrageurs ensures market efficiency.
  - **Destabilizing:** Introducing more speculators in markets with no anchor increase the asymmetry of information of all players.

- **Problem:** Arbitrage activity is extremely difficult to measure at any given point in time.
  - Many arbitrageurs use leverage, short-selling and other instruments unobservable to researchers.
  - The effect of arbitrage activity on prices depends on the liquidity of the assets which vary cross-sectionally and through time.

- *Comomentum:* degree of abnormal return correlation among those stocks that an arbitrageur would speculate on.
  - One of the few anomalies that are robust to virtually all asset classes and all geographic locations.
  - Classical example of unanchored arbitrage.

- Comomentum is a success measure of the momentum crowd.
  - Correlated with existing variables linked to the size of arbitrage activity in this market.
  - Out-of-sample analysis on firm-specific level and on International Market.

- Provide evidence of the destabilizing effect of arbitrage on non-anchored markets.
  - **Placebo:** different effect on the anchored value strategy.

Data and Methodology

- **Data**
  - **CRSP:** Stock return and monthly returns of actively-managed equity mutual funds.
  - **Thompson Financial:** Institutional ownership in individual stocks.
  - **Federal Reserve Board:** Total assets of the shadow banking sector.
  - **Lipper TASS:** Assets under management of long-short equity hedge funds and monthly returns of long-short equity hedge funds.
  - **Period:** 1964 - 2010

- Sort all stocks into deciles based on their previous 12-month return.

- **Comomentum measure**

$$comon^L = \frac{1}{N^L} \sum_{i=1}^{N^L} partialCorr(r_i^L, r_{-i}^L | FF3)$$

$$comon^W = \frac{1}{N^W} \sum_{i=1}^{N^W} partialCorr(r_i^W, r_{-i}^W | FF3)$$

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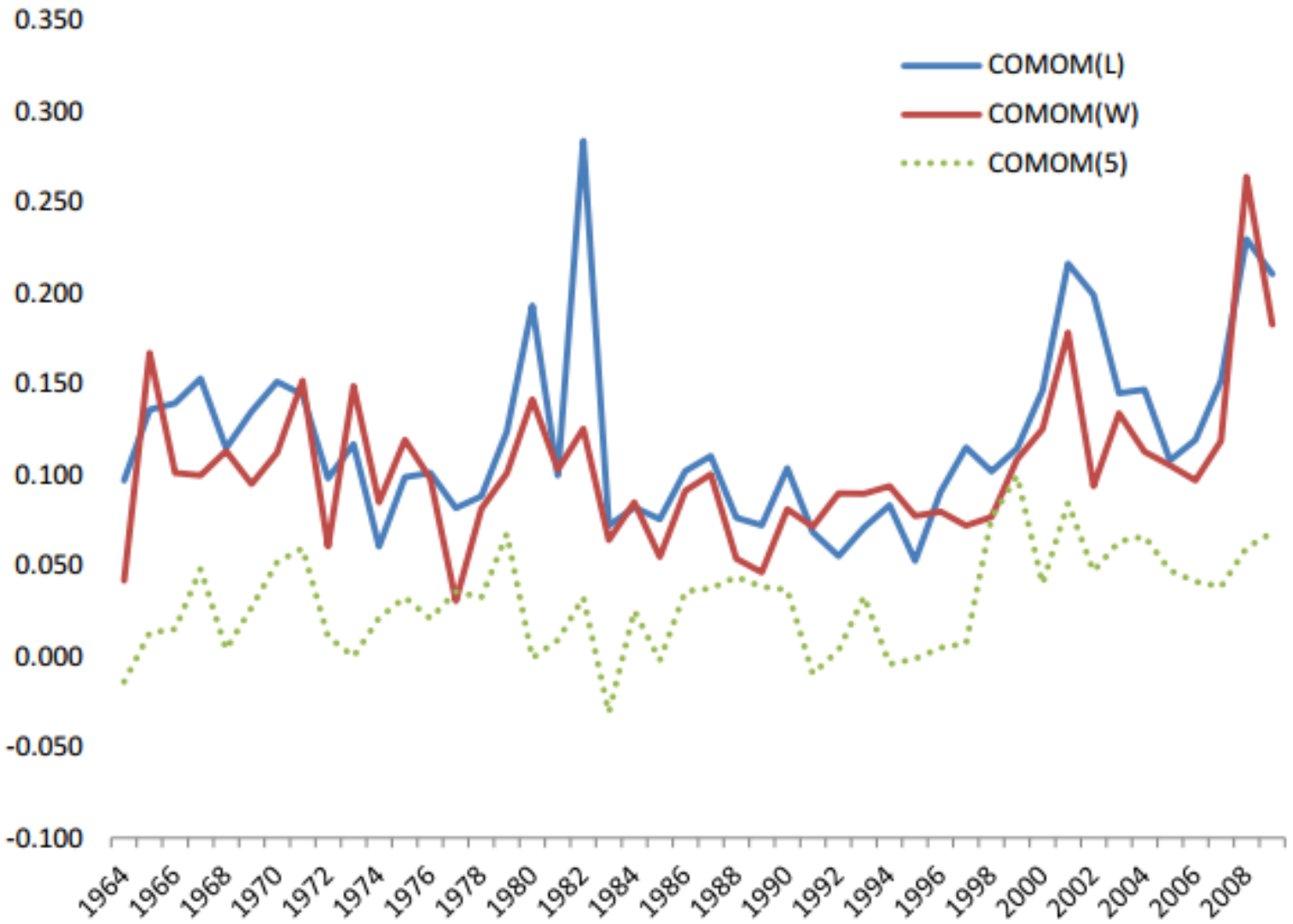
Results

Table I: Summary Statistics

Panel A: Summary Statistics					
Variable	N	Mean	Std. Dev.	Min	Max
$comom^L$	559	0.118	0.046	0.028	0.287
$comom^W$	559	0.096	0.036	0.021	0.264
mktret36	559	0.360	0.331	-0.419	1.231
mktvol36	559	0.043	0.011	0.020	0.067

Panel B: Correlation				
	$comom^L$	$comom^W$	*mktret36*	*mktvol36*
$comom^L$	1.000			
$comom^W$	0.524	1.000		
mktret36	-0.187	-0.350	1.000	
mktvol36	0.125	0.092	-0.393	1.000

Figure 1: Time series of comomentum measure



Linking Comomentum to Arbitrage Capital

- See if comomentum capture the size of arbitrage activity in the momentum strategy.
  - Aggregate institutional ownership: pih^{W}_{t-1}
  - Flow to the shadow banking system: $shadow_{t-1}$
  - Total assets owned by longs-short equity hedge funds: AUM_{t-1}
  - Return to the momentum strategy: $mom12_{t-1}$

Table II: Determinants of Comomentum

Dependent Variable	$comom_t^W$			$comom_t^L$		
	[1]	[2]	[3]	[4]	[5]	[6]
pih_{t-1}^W	0.103***	0.117***	0.190***	0.112**	0.110**	0.095**
	[0.035]	[0.035]	[0.063]	[0.050]	[0.047]	[0.045]
$shadow_{t-1}$	0.151***	0.130***	0.093*	0.256***	0.285***	0.200**
	[0.044]	[0.044]	[0.055]	[0.083]	[0.082]	[0.094]
$mom12_{t-1}$	0.203**	0.228**	0.226**	0.438***	0.383***	0.409***
	[0.091]	[0.091]	[0.113]	[0.144]	[0.140]	[0.137]
AUM_{t-1}			0.058***			0.079***
			[0.018]			[0.017]
$mktret36_{t-1}$		-0.009*	-0.009		0.011	0.001
		[0.005]	[0.007]		[0.007]	[0.010]
$mktvol36_{t-1}$		0.120	0.215		0.218	-0.290
		[0.166]	[0.358]		[0.221]	[0.341]
TREND	YES	YES	YES	YES	YES	YES
Adj-R^2	0.34	0.34	0.38	0.18	0.19	0.47
No. Obs.	357	357	180	357	357	180

Forecasting Long-run Momentum Reversal

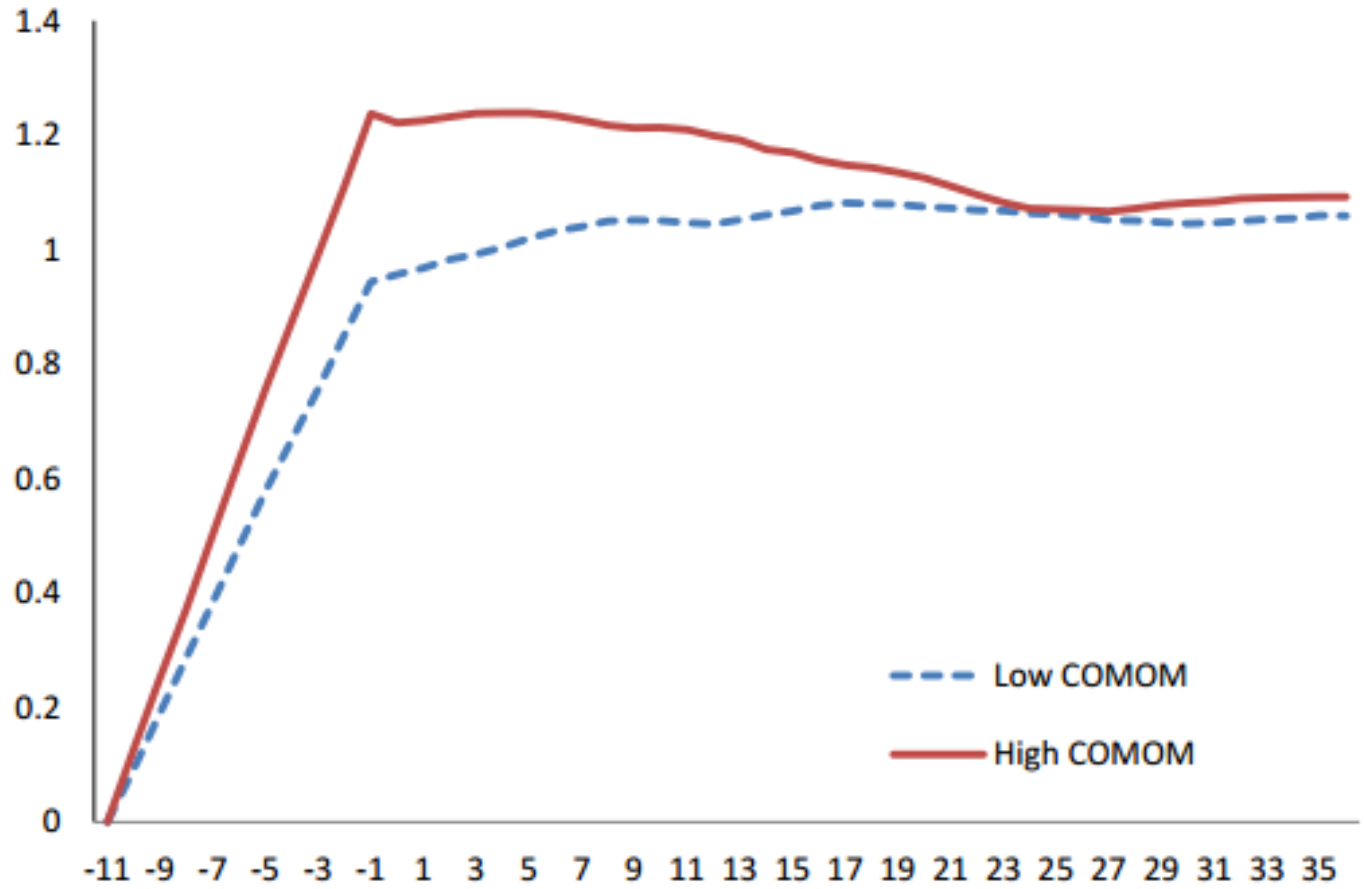
- Is comomentum able to capture the destabilizing effect of arbitrageurs in the stock market?
  - Momentum is an unanchored strategy.
- Vayanos and Woolley (2011): propose a rational theory of momentum and reversal.
  - Stock price fall $\Rightarrow$ outflow $\Rightarrow$ fund sell own assets $\Rightarrow$ prices fall even more.
- **Momentum:** If outflow is gradual (few intermediaries)
- **Reversal:** If outflow is abrupt (many intermediaries)

Table III: Forecasting Momentum Returns with Comomentum

Panel A: Raw Momentum Returns									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	110	**8.84%**	(29.59)	**0.69%**	(4.56)	0.14%	(0.56)	-0.05%	(-0.21)
2	111	**8.94%**	(24.66)	**1.05%**	(6.67)	-0.27%	(-1.09)	**-0.54%**	(-2.64)
3	111	**9.19%**	(15.66)	**0.73%**	(3.15)	-0.51%	(-1.66)	**-0.52%**	(-2.89)
4	111	**9.51%**	(16.57)	0.44%	(1.54)	**-0.58%**	(-2.39)	-0.46%	(-1.81)
5	111	**11.24%**	(13.58)	-0.18%	(-0.35)	**-1.05%**	(-2.81)	0.16%	(0.45)
5-1		**2.40%**	(2.76)	**-0.87%**	(-2.11)	**-1.20%**	(-2.72)	0.21%	(0.61)
OLS		**0.006**	(2.83)	**-0.002**	(-2.02)	**-0.003**	(-2.81)	0.000	(0.45)

Panel B: Three-Factor Adjusted Momentum Returns									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	110	**8.45%**	(24.33)	**0.70%**	(3.63)	-0.03%	(-0.10)	-0.15%	(-1.07)
2	111	**8.53%**	(19.67)	**1.06%**	(5.00)	**-0.44%**	(-2.33)	**-0.87%**	(-3.46)
3	111	**8.74%**	(13.91)	**0.61%**	(3.22)	**-0.67%**	(-3.17)	**-0.70%**	(-2.74)
4	111	**9.13%**	(14.31)	0.35%	(1.53)	**-0.61%**	(-2.35)	**-0.69%**	(-2.28)
5	111	**10.81%**	(13.14)	-0.08%	(-0.18)	**-0.80%**	(-2.31)	0.14%	(0.90)
5-1		**2.37%**	(2.64)	**-0.79%**	(-2.22)	**-0.78%**	(-2.33)	0.28%	(0.95)
OLS		**0.006**	(2.65)	**-0.002**	(-2.09)	**-0.002**	(-2.38)	0.000	(0.64)

Figure 2: returns to the momentum strategy as a function of the lagged comomentum



Robustness of Key Result

	Year 0		Years 1 and 2	
Full sample: 1963-2010	**2.40%**	(2.76)	**-1.03%**	(-2.67)
Subsample: 1963-1980	0.32%	(1.03)	-0.57%	(-1.55)
Subsample: 1981-2010	**2.76%**	(2.91)	**-1.04%**	(-2.60)
Pooling Winners and Losers	**2.06%**	(3.32)	**-0.84%**	(-2.96)
Controlling for MKT CORR	**2.70%**	(3.15)	**-1.06%**	(-2.78)
Controlling for STD(UMD)	**1.58%**	(2.09)	**-0.71%**	(-2.29)
DGTW-Adjusted Returns	**2.61%**	(2.79)	**-1.00%**	(-2.94)
Intra-Industry Returns	**2.14%**	(2.70)	**-0.82%**	(-2.39)
Sort on Months 2-7	**2.07%**	(2.45)	**-1.10%**	(-2.35)
Sort on Months 8-13	1.35%	(1.65)	-0.43%	(-1.68)

Robustness of Key Result

- Control for:
  - Market returns and market volatility.
  - Contemporaneous standard deviation of Ken Frenchs (volatility of momentum is predictable)
  - Industry-adjusted returns.
- Industry-neutral momentum strategy.
- Control for Echo effect.
  - Build a momentum strategies based on weekly stock returns in months 2-7 and 8-13.

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Table V: Robustness Checks

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Time-Varying Momentum Return Skewness

- Daniel and Moskowitz (2011): momentum crashes are forecastable.
  - Momentum return is negative skewed.
- Examine skewness of daily returns and weekly returns.

Table VI: Forecasting Momentum Return Skewness

Panel A: Momentum Skewness									
		Month 1		Months 1-3		Months 1-6		Months 1-12	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	110	-0.039	(-1.18)	-0.069	(-1.30)	-0.126	(-1.80)	-0.123	(-1.79)
2	111	**-0.180**	(-2.73)	**-0.183**	(-3.72)	**-0.339**	(-3.91)	**-0.359**	(-5.28)
3	111	**-0.164**	(-2.88)	**-0.209**	(-4.81)	**-0.249**	(-3.44)	**-0.282**	(-4.50)
4	111	**-0.212**	(-3.61)	**-0.319**	(-5.23)	**-0.363**	(-6.05)	**-0.355**	(-4.00)
5	111	**-0.300**	(-3.42)	**-0.391**	(-5.96)	**-0.536**	(-5.31)	**-0.510**	(-3.54)
5-1		**-0.261**	(-2.40)	**-0.322**	(-3.81)	**-0.409**	(-3.40)	**-0.388**	(-2.44)
OLS		**-0.049**	(-2.41)	**-0.078**	(-4.19)	**-0.084**	(-3.13)	**-0.077**	(-2.28)

Panel B: Fraction of Low-Momentum-Return Weeks					
		Months 1-6		Months 1-12	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat
1	110	**0.015**	(3.02)	**0.011**	(3.68)
2	111	**0.015**	(4.95)	**0.015**	(6.01)
3	111	**0.036**	(3.91)	**0.032**	(2.90)
4	111	**0.049**	(3.66)	**0.041**	(3.25)
5	111	**0.105**	(4.89)	**0.093**	(4.18)
5-1		**0.090**	(4.06)	**0.082**	(3.66)
OLS		**0.686**	(4.13)	**0.586**	(3.78)

A Placebo Test: The Value Strategy and Covalue

- Show that arbitrage activity is stabilizing in anchored strategies, as the Value strategy
  - Value spread as anchor: cross-sectional spread in book-to-market equity ratios.

- Study the comomentum analogue for the value strategy: **covalue.**

Table VII: Covalue and Value Strategy Returns

Panel A: Raw Value Strategy Returns									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	110	**-3.52%**	(-8.13)	0.09%	(0.39)	0.05%	(0.23)	0.46%	(1.89)
2	111	**-4.33%**	(-14.60)	0.35%	(1.66)	0.30%	(1.03)	0.11%	(0.28)
3	111	**-4.00%**	(-9.96)	0.30%	(1.06)	**0.97%**	(5.40)	**0.83%**	(5.29)
4	111	**-4.41%**	(-7.98)	**0.84%**	(2.77)	**1.29%**	(5.29)	**0.79%**	(4.21)
5	111	**-5.67%**	(-5.56)	**1.61%**	(3.82)	**1.61%**	(5.36)	**0.69%**	(1.98)
5-1		-2.16%	(-1.94)	**1.52%**	(3.18)	**1.57%**	(4.22)	0.24%	(0.56)
OLS		-0.004	(-1.86)	**0.004**	(3.35)	**0.004**	(4.92)	0.001	(1.21)

Panel B: Market- and Size- Adjusted Value Strategy Returns									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	110	**-3.12%**	(-6.27)	0.26%	(0.92)	0.24%	(0.93)	**0.56%**	(2.10)
2	111	**-4.05%**	(-12.77)	**0.64%**	(3.02)	0.43%	(1.40)	0.26%	(0.73)
3	111	**-3.75%**	(-9.98)	0.57%	(1.95)	**1.12%**	(6.20)	**1.03%**	(6.23)
4	111	**-4.29%**	(-8.13)	**0.96%**	(3.86)	**1.25%**	(4.00)	**0.87%**	(3.79)
5	111	**-5.43%**	(-5.60)	**1.65%**	(3.90)	**1.72%**	(5.07)	0.55%	(1.20)
5-1		**-2.31%**	(-2.11)	**1.39%**	(2.73)	**1.48%**	(3.46)	-0.01%	(-0.02)
OLS		**-0.005**	(-2.10)	**0.003**	(2.86)	**0.004**	(3.97)	0.001	(0.52)

Table VII: Covalue and Value Strategy Returns

Panel C: Skewness in value returns					
		Months 1-6		Months 1-12	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat
1	110	**0.199**	(3.14)	**0.264**	(4.49)
2	111	0.106	(1.28)	0.046	(0.93)
3	111	-0.012	(-0.19)	0.071	(1.18)
4	111	0.141	(1.09)	0.088	(0.77)
5	111	**0.293**	(2.13)	0.112	(0.73)
5-1		0.094	(0.62)	-0.152	(-0.92)
OLS		0.024	(0.67)	-0.025	(-0.67)

Cross-Sectional Tests

Table VIII: Institutional Ownership and the Comomentum Effect

Panel A: Stocks with Low Institutional Ownership									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	65	**10.26%**	(22.27)	**0.54%**	(2.18)	-0.20%	(-0.84)	**-0.49%**	(-2.09)
2	66	**10.36%**	(25.41)	**0.94%**	(4.00)	**-0.58%**	(-2.47)	-0.68%	(-1.56)
3	66	**10.94%**	(9.74)	0.35%	(1.09)	**-0.74%**	(-2.51)	-0.06%	(-0.10)
4	66	**11.66%**	(9.53)	-0.17%	(-0.39)	-0.26%	(-0.72)	-0.15%	(-0.28)
5	66	**12.22%**	(11.46)	-0.14%	(-0.24)	-0.59%	(-1.61)	0.01%	(0.02)
5-1		**1.95%**	(2.02)	-0.68%	(-1.09)	-0.39%	(-0.62)	0.50%	(0.90)
OLS		**0.006**	(2.10)	-0.002	(-1.57)	-0.001	(-0.35)	0.002	(1.02)

Panel B: Stocks with High Institutional Ownership									
		Year 0		Year 1		Year 2		Year 3	
Rank	No Obs.	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
1	65	**8.91%**	(21.87)	**0.65%**	(2.92)	0.23%	(0.66)	0.20%	(0.75)
2	66	**9.34%**	(25.22)	**0.90%**	(4.61)	-0.08%	(-0.26)	-0.36%	(-1.71)
3	66	**9.71%**	(10.80)	0.32%	(0.93)	-0.59%	(-1.66)	**-0.69%**	(-2.31)
4	66	**10.14%**	(11.78)	-0.13%	(-0.29)	-0.43%	(-1.52)	-0.04%	(-0.13)
5	66	**11.82%**	(14.09)	-0.29%	(-0.43)	**-1.30%**	(-2.89)	0.20%	(0.54)
5-1		**2.91%**	(2.95)	**-0.95%**	(-2.32)	**-1.53%**	(-2.77)	0.00%	(0.01)
OLS		**0.007**	(2.99)	-0.003	(-1.88)	**-0.004**	(-2.73)	0.000	(0.05)

- Examine whether the metric can identify arbitrage activity in the cross section.
  - Stock comomentum: $comom\_stockL^L = partialCorr(r_i, -r^L_{-i} | \ FF3)$
  - Different from the measure of momentum risk sensitivity.

- Do a Fama-MacBeth estimatation of cross-sectional regressions forecasting stock returns in month $t + 1$.

Table IX: An Alternative Momentum Strategy

Panel A: Fama-MacBeth Regressions					
Dependent Variable	Stock Returns in Month $t+1$				
	[1]	[2]	[3]	[4]	[5]
$comom\_stock^{L}_{t-1}$	0.023***			0.011***	0.009***
	[0.005]			[0.004]	[0.003]
$beta\_UMD_{t-1}$		0.001		0.000	0.000
		[0.001]		[0.001]	[0.001]
$ret12_{t-1}$			0.007***	0.006***	0.007***
			[0.002]	[0.001]	[0.002]
$mktcap_{t-1}$					-0.002**
					[0.001]
BM_{t-1}					0.002**
					[0.001]
$IdioVol_{t-1}$					-0.005***
					[0.001]
$turnover_{t-1}$					-0.001
					[0.001]
Adj-R^2	0.02	0.02	0.04	0.06	0.10
No. Obs.	211,042	211,042	211,042	211,042	211,042

Panel B: Portfolio Returns Ranked by $comom\_stock^{L}$									
Decile	Excess Return	CAPM Alpha	FF Alpha	Excess Return	CAPM Alpha	FF Alpha	Excess Return	CAPM Alpha	FF Alpha
	Months 1-6			Months 7-12			Year 2		
10 - 1	**0.78%**	**0.88%**	**1.13%**	0.01%	0.06%	0.36%	**-0.48%**	**-0.45%**	**-0.42%**
	(2.64)	(3.00)	(3.73)	(0.03)	(0.21)	(1.43)	(-2.16)	(-2.17)	(-2.08)

Out-of-sample analysis - International Evidence

- International Evidence:
  - Comomentum forecasts time-series variation in country-specific momentum.
  - Whether there is inter-country information in the international comomentum measures.

Figure 3: Equal-weight averages of country-specific comomentum

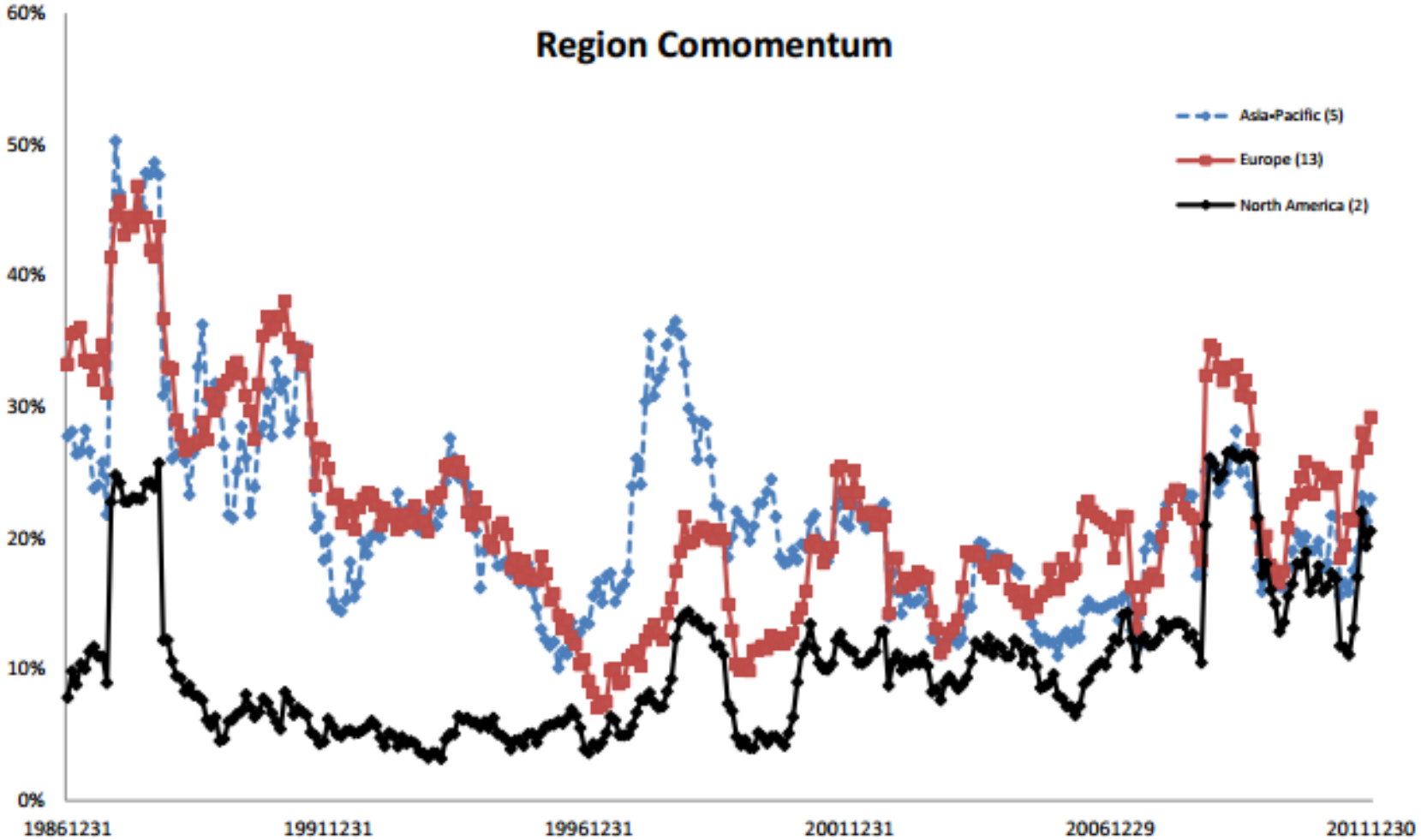

Table X: International Evidence

Panel A: Regression Coefficients in Other Countries							
Country	No months	CoefEst1	CoefEst2	Country	No months	CeofEst1	CeofEst2
AUS	302	-0.0494	-0.0351	GBR	300	-0.0501	**-0.0402**
		(-0.94)	(-0.48)			(-1.87)	(-2.11)
AUT	302	-0.0581	-0.0866	HKG	300	**-0.0646**	**-0.0796**
		(-1.76)	(-1.17)			(-3.77)	(-2.21)
BEL	300	**-0.1025**	-0.0946	ITA	300	-0.0108	-0.0239
		(-2.40)	(-1.95)			(-0.43)	(-0.73)
CAN	336	**-0.1652**	**-0.1341**	JPN	300	-0.0564	**-0.0535**
		(-2.70)	(-2.31)			(-1.63)	(-2.54)
CHE	300	-0.0347	**-0.0753**	NLD	300	**-0.0801**	**-0.0805**
		(-1.53)	(-2.35)			(-2.47)	(-2.02)
DEU	300	-0.0546	-0.0957	NOR	297	-0.0096	-0.1090
		(-1.72)	(-1.82)			(-0.16)	(-1.58)
DNK	300	-0.0248	-0.0200	NZL	271	**-0.0879**	-0.0462
		(-1.06)	(-0.63)			(-2.15)	(-1.67)
ESP	300	-0.0097	-0.0075	SGP	300	**-0.0791**	**-0.1189**
		(-0.28)	(-0.20)			(-2.36)	(-3.86)
FIN	300	-0.0110	-0.0046	SWE	300	-0.0107	-0.0091
		(-0.29)	(-0.12)			(-0.29)	(-0.11)
FRA	300	**-0.0725**	-0.0486	WLD	300	**-0.0851**	**-0.0569**
		(-2.06)	(-1.13)			(-2.60)	(-2.68)

Panel B: Long-Short Portfolios of Country Momentum					
Quintile	No Months	Excess Return	CAPM Alpha	FF Alpha	Carhart Alpha
S	300	0.24%	0.36%	**0.68%**	-0.20%
		(0.94)	(1.49)	(2.98)	(-0.96)
L	300	**1.01%**	**1.07%**	**1.49%**	**0.46%**
		(3.74)	(4.34)	(6.00)	(3.87)
L-S	300	**0.77%**	**0.71%**	**0.81%**	**0.66%**
		(3.19)	(3.04)	(3.30)	(2.33)

Conclusion

1. Propose a novel approach to measure arbitrage activity.
2. Explore this new measure on the momentum strategy: **Comomentum**
3. Showed the quality of this measure.
4. Contribute on the debate over existence of destabilizing arbitrage.

Thank you!

Lou and Polk (2013) : *Comomentum: Inferring Arbitrage Activity from Return Correlations*