



Anomalies and the Expected Market Return

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Anomalies and the Expected Market Return

想知道明天苹果公司的股票价格吗？

Sorry~我也不知道

想了解股票A为什么比B的价格高吗？

Fama & French

什么可以预测大盘下个月的收益率？

r_{LS}



Anomalies and the Expected Market Return

特征

异象

因子

□ 特征

- 1.对所有的股票，根据基本面特征排序，value-weighted decile portfolios
- 2.Long tenth-decile 组合构成多头组合，short first-decile组合构成空头组合
- 3.构成long-short portfolio，可以计算 r_{LS}

□ 异象

$$R_{i,t} = \alpha + \beta_1 f_{1,t} + \beta_2 f_{2,t} + \dots + \beta_n f_{n,t} + \varepsilon_{i,t}$$

截距项是 α 收益率，如果 α 显著不为0，则说明该特征是一个异象

□ 因子

异象之间的相关性→不是所有异象都是因子

条件：应该能够对解释资产预期收益率的截面差异有显著的增量贡献

$$R_{i,t} - R_{f,t} = a + b(R_{M,t} - R_{f,t}) + s * SMB_t + h * HML_t + e(t)$$



MOTIVATION

股票回报可预测性

□ 利用公司特征是否可以预测股票回报的**横截面**差异？

(e.g., Fama & French 2015; Harvey, Liu & Zhu 2016; McLean & Pontiff 2016; Hou, Xue & Zhang 2020))

□ 基于经济金融变量的市场超额回报的**时间序列**可预测性？

(估值比率、利率和通货膨胀; eg, Nelson 1976, Campbell 1987, Fama & French 1988, 1989, Campbell & Yogo 2006, Pastor & Stambaugh 2009)



THIS PAPER

□ 可预测性文献的两条链是否相互关联？

Engelberg, McLean, Pontiff, and Ringgenberg (2022 JFQA)

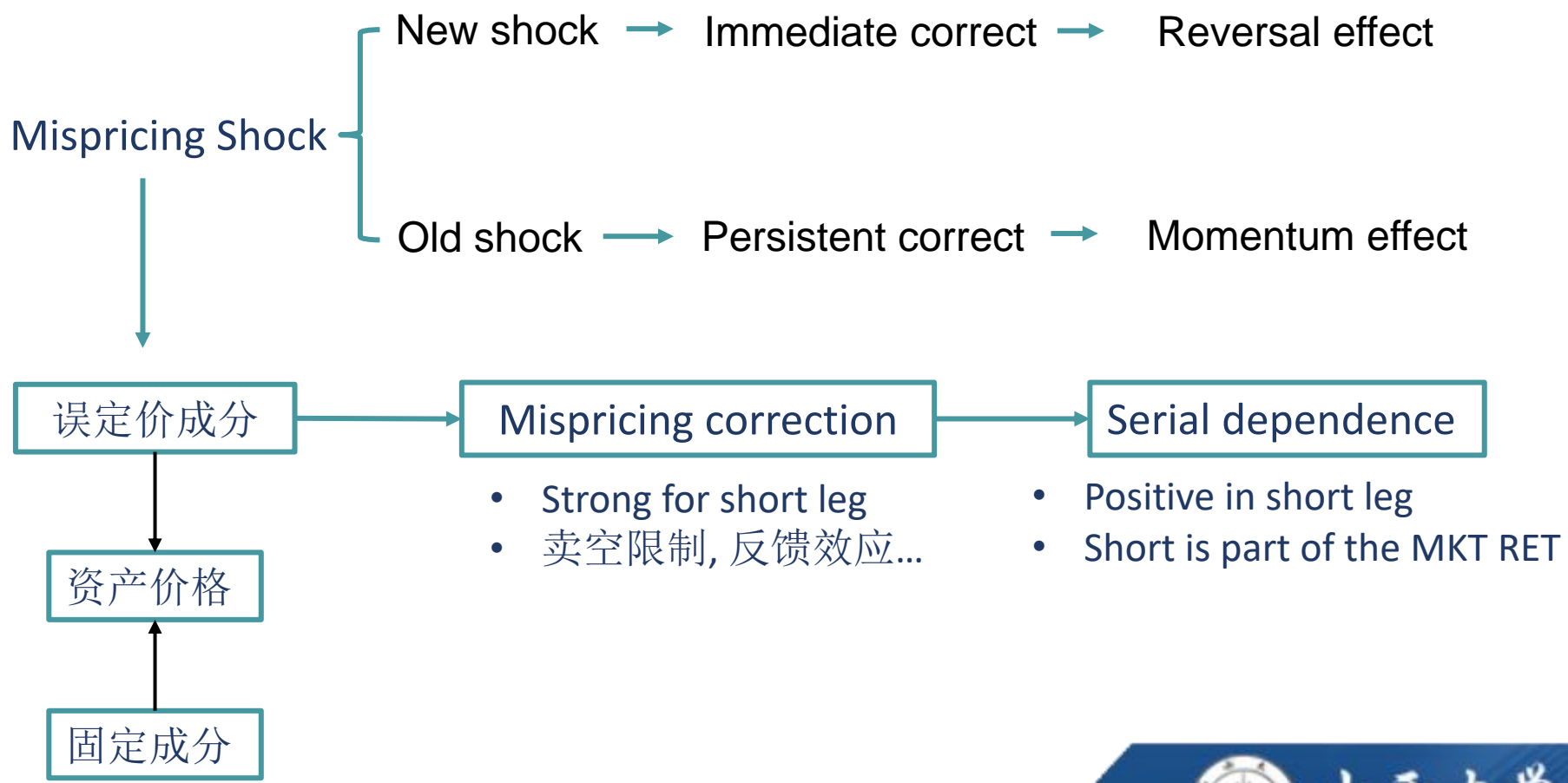
- 对于给定特征，公司层面（等值或价值加权）均值作为市场回报的预测变量
- Little evidence: characteristics on average have out-of-sample time-series predictive ability for the market return

□ Can long-short anomaly portfolio returns—the bed rock of the cross-sectional literature—predict the market return?



WHY CAN THE MKT-NEUTRAL ANOMALY RET PREDICT THE MKT RET?

□ Mechanism 1: Asymmetric Mispricing Correction Persistence (MCP)



WHY CAN THE MKT-NEUTRAL ANOMALY RET PREDICT THE MKT RET?

□ Mechanism 2: Noise Cancellation

- 市场组合很难预测
 - Goyal and Welch (2008):大多数预测变量在样本外检验中不起作用(OOS)
 - 弱式市场有效表明，不可能利用过去的市场价格走势来预测未来的市场价格走势。
- 正是因为市场回报难以预测，我们需要消除市场回报中不可预测的噪音成分
 - 多空异象投资组合回报为市场回报提供更强的预测信号
 - 多头、空头回报包含共同部分，这部分与未来市场回报无关！
 - 相减之后，过滤噪音，提供更精确的信号！



INTUITION: FRAMEWORK

□ Decomposition the prices for long/short legs of an anomaly portfolio

$$P_t \cong \text{martingale} + u_{l,t}$$

for $l = L, S$

- Common **martingale component** with period t increment f_t
- Contains a **stationary component** reflecting the level of mispricing

- In **L**ong legs: underpricing $u_{L,t} \leq 0$ 看多：价格比martingale虚低一个u
- In **S**hort legs: overpricing $u_{S,t} \geq 0$ 看空：价格比martingale虚高一个u

□ The log return (in terms of price changes) in each leg

$$r_{l,t} = f_t + \Delta u_{l,t} \quad \text{for } l = L, S, \quad (1)$$



INTUITION: FRAMEWORK

□ Long-/short-leg returns

$$r_{l,t} = f_t + \Delta u_{l,t} \quad \text{for } l = L, S, \quad (1)$$

$$\text{cov}(f_t, \Delta u_{L,t}) = \text{cov}(f_t, \Delta u_{S,t}) = 0$$

□ The long-short anomaly return

$$r_{LS,t} = \Delta u_{L,t} - \Delta u_{S,t}. \quad (2)$$

□ The market return

$$r_{M,t} = f_t + 0.5(\Delta u_{L,t} + \Delta u_{S,t}), \quad (3)$$



INTUITION: MISPRICING CORRECTION

□ Wold 表示定理

$$u_{l,t} = \sum_{j=0}^{\infty} \underbrace{\psi_{l,j}}_{\text{response}} \underbrace{v_{l,t-j}}_{\text{shock}} \quad \text{for } l = L, S, \quad (4)$$

□ 当前误定价水平可表示为当前和过去误定价冲击的函数

- $u_{l,t}$ can follow any stationary ARMA process
- $v_{L,t} \leq 0 (v_{S,t} \geq 0)$ serially uncorrelated **underpricing (overpricing) shock**
- $v_{L,t}$ and $v_{S,t}$ are uncorrelated
- $\psi_{l,0} = 1$ and $\psi_{l,j} \geq 0$ for $j \geq 1$
how each pricing error $v_{l,t-j}$ affects current mispricing level $u_{l,t}$



INTUITION: MISPRICING CORRECTION

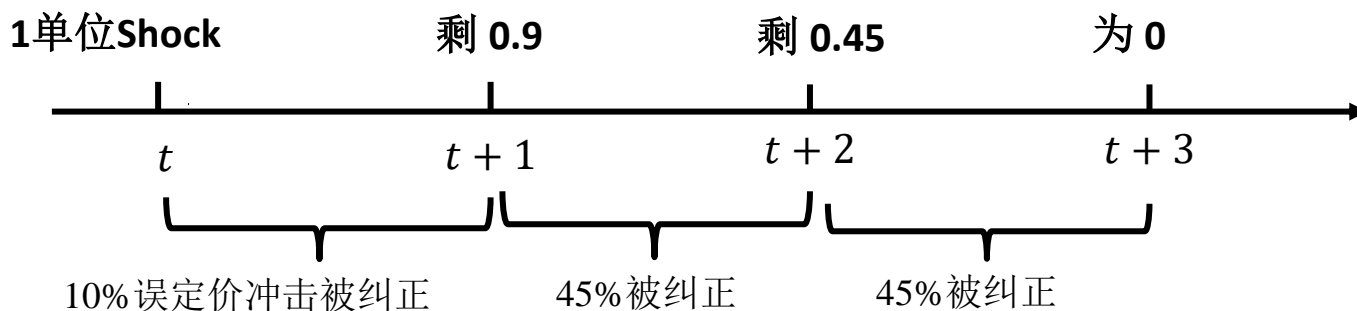
$$u_{l,t} = \sum_{j=0}^{\infty} \underbrace{\psi_{l,j}}_{\text{response}} \underbrace{v_{l,t-j}}_{\text{shock}} \quad \text{for } l = L, S, \quad (4)$$

□ MA过程可以解释为一个脉冲响应函数： $\psi_{l,j}$ 是 $u_{l,t+j}$ 对一单位 t 期的误定价冲击的响应。



考虑一单位 t 期误定价冲击，

假设 $\psi_{S,1} = 0.9$, $\psi_{S,2} = 0.45$, and $\psi_{S,j} = 0$ for $j \geq 3$.



INTUITION: MISPRICING CORRECTION

□ Mispricing correction

$$u_{l,t} = \sum_{j=0}^{\infty} \psi_{l,j} v_{l,t-j} \quad \text{for } l = L, S \quad (4)$$

一次差分得:

$$\Delta u_{l,t} = \sum_{j=0}^{\infty} \tilde{\psi}_{l,j} v_{l,t-j} \quad \text{for } l = L, S \quad (5)$$

其中 $\tilde{\psi}_{l,0} = \psi_{l,0} = 1$

$$\tilde{\psi}_{l,j} = \psi_{l,j} - \psi_{l,j-1} \leq 0 \quad \text{for } j \geq 1 \quad (6)$$

mispricing correction assumption:

套利足够活跃，保证 $t-1$ 期的 shock 对 t 期的误定价影响不会比 $t-1$ 期更严重



INTUITION: CORRECTION OF OLD VS NEW MISPRICING SHOCKS

□ Consider the predictive regression

$$r_{M,t+1} = \alpha_l + \beta_l r_{l,t} + \varepsilon_{l,t+1} \quad \text{for } l = S, L, \quad (7)$$

$$\tilde{\beta}_l = \frac{\text{cov}(r_{M,t+1}, r_{l,t})}{\sqrt{\text{var}(r_{l,t})}} = \frac{0.5 \text{cov}(\Delta u_{l,t+1}, \Delta u_{l,t})}{\sqrt{\sigma_f^2 + \text{var}(\Delta u_{l,t})}} \quad (8)$$

□ The sign of $\tilde{\beta}_l$ is determined by $\text{cov}(\Delta u_{l,t+1}, \Delta u_{l,t})$

current

$$\Delta u_{l,t} = v_{l,t} + \sum_{j=1}^{\infty} \underbrace{(\psi_{l,j} - \psi_{l,j-1}) v_{l,t-j}}_{\leq 0} \quad \text{for } l = L, S, \quad (10)$$

最近误定价的立即修正
产生回报的反转成分

所有旧的误定价的连续修正
产生回报的动量成分

future

$$\Delta u_{l,t+1} = v_{l,t+1} + \underbrace{(\psi_{l,1} - 1)v_{l,t}}_{\leq 0} + \sum_{j=2}^{\infty} \underbrace{(\psi_{l,j} - \psi_{l,j-1})v_{l,t+1-j}}_{\leq 0} \quad \text{for } l = L, S, \quad (11)$$




INTUITION: MISPRICING CORRECTION PERSISTENCE(MCP)

$$\square \quad \text{cov}(\Delta u_{l,t+1}, \Delta u_{l,t}) = \left[(\psi_{l,1} - 1) + \sum_{j=1}^{\infty} (\psi_{l,j} - \psi_{l,j-1})(\psi_{l,j+1} - \psi_{l,j}) \right] \text{var}(v_{l,t})$$

for $l = L, S$.
(9)

When the **momentum effect dominates**, MCP is sufficiently strong that $\text{cov}(\Delta u_{l,t+1}, \Delta u_{l,t}) > 0$ in equation (9) and $\widetilde{\beta}_S > 0$ in equation (8).

$$\sum_{j=1}^{\infty} (\psi_{S,j} - \psi_{S,j-1})(\psi_{S,j+1} - \psi_{S,j}) > -(\psi_{S,1} - 1). \quad (12)$$


the **return momentum outweigh** the magnitude of the **return reversal**

注：类似对Long也成立。(12)式与很多可以解释强误定价修正持续性的理论模型一致 (Andrei and Cujean (2017), Chan, Jegadeesh, and Lakonishok (1996)...)



INTUITION: MISPRICING CORRECTION PERSISTENCE(MCP)

$$\square \quad \sum_{j=1}^{\infty} (\psi_{S,j} - \psi_{S,j-1})(\psi_{S,j+1} - \psi_{S,j}) > -(\psi_{S,1} - 1). \quad (12)$$



考虑一单位 t 期误定价冲击, $\psi_{S,0} = 1$

假设 $\psi_{S,1} = 0.9$, $\psi_{S,2} = 0.45$, and $\psi_{S,j} = 0$ for $j \geq 3$.

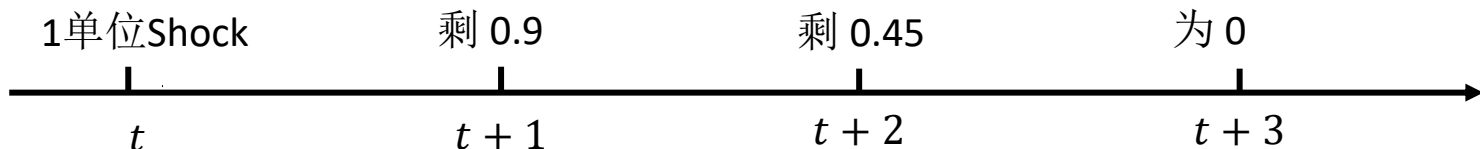
反转效应: $\psi_{S,1} - 1 = 0.1$

动量效应: $(-0.1)(-0.45) + (-0.45)(-0.45) = 0.2475$

1单位price、
return的增加

虚高纠正10%
Price falls/ return of -0.1
【反转效应 0.1】

虚高再纠正45%
Price falls
【相对上期, 动量效应】



注: (6) 式不成立即: 异象组合形成时冲击对误定价的影响加剧时, (9) 式仍成立, $cov > 0$ 仍需要误定价修正或恶化的动量效应比连续回报对中的反转效应更强。



INTUITION: MISPRICING CORRECTION PERSISTENCE

□ Consider a predictive regression **based on the L-S 异象组合回报**

$$r_{M,t+1} = \alpha_{LS} + \beta_{LS}r_{LS,t} + \varepsilon_{LS,t+1}. \quad (13)$$

$$\tilde{\beta}_{LS} = \frac{0.5[\text{cov}(\Delta u_{L,t+1}, \Delta u_{L,t}) - \text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})]}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t})]^{0.5}}. \quad (14)$$

Empirically, we find that $\tilde{\beta}_{LS} < 0$, which holds when

$$\text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t}) > \text{cov}(\Delta u_{L,t+1}, \Delta u_{L,t}), \quad (15)$$

□ Asymmetric MCP

虚高比虚低的修正持续性更强；多空异象组合回报负向预测市场回报

- Miller (1977): short-sale impediments;
- EGJ(2015) and DKP(2019) : 反馈效应和价格下跌与流动性下降相结合，可能导致虚高的持续性。
- HLS(2000), SY(2012, 2015): 异象组合的空头是异象组合回报盈利的主要原因。



INTUITION: NOISE REDUCTION

□多空异象组合回报预测比short-leg return更好

假设 $\widetilde{\beta}_L = 0$, $\text{cov}(\Delta u_{L,t+1}, \Delta u_{L,t}) = 0$

$$\tilde{\beta}_{LS} = \frac{0.5[\text{cov}(\Delta u_{L,t+1}, \Delta u_{L,t}) - \text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})]}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t})]^{0.5}} \quad (14)$$

$$\tilde{\beta}_{LS} \Big|_{\tilde{\beta}_L=0} = \frac{-0.5\text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t})]^{0.5}} \quad (16)$$

$$\tilde{\beta}_l = \frac{\text{cov}(r_{M,t+1}, r_{l,t})}{\sqrt{\text{var}(r_{l,t})}} = \frac{0.5\text{cov}(\Delta u_{l,t+1}, \Delta u_{l,t})}{\sqrt{\sigma_f^2 + \text{var}(\Delta u_{l,t})}} \quad (8)$$

The magnitude of $\tilde{\beta}_{LS}$ in (16) is greater than that of $\tilde{\beta}_S$ in (8) when

$$\text{var}(r_{LS,t}) < \text{var}(r_{S,t}), \text{ or equivalently, } \text{var}(f_t) > \text{var}(\Delta u_{L,t}). \quad (17)$$

用 $r_{L,t} - r_{S,t}$ 代替 $r_{S,t}$ 作为预测变量, 去除了公共的不确定成分 f_t , (市场难以预测, f 方差很大) 过滤+精确。实证也支持了方差大小问题。



INTUITION: NOISE REDUCTION

□多空异象组合回报预测比market return itself更好

The standardized slope coefficient for a regression of the market return on its own lag

$$\tilde{\beta}_M |_{\tilde{\beta}_L=0} = \frac{0.5 \text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})}{\underbrace{[4\text{var}(f_t) + \text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t})]}_{\text{noise}}^{0.5}}. \quad (18)$$

$$\tilde{\beta}_{LS} |_{\tilde{\beta}_L=0} = \frac{-0.5 \text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t})]^{0.5}}. \quad (16)$$

Consistent with this intuition, in Section IV.C we empirically find that the **lagged market return cannot significantly predict** the market return on an out-of-sample basis.



INTUITION: NOISE REDUCTION

□ Aggregating predictors可以减少单独预测中的噪音

$$r_{LS,t}^i = \Delta u_{L,t} - \Delta u_{S,t} + \omega_t^i \quad \text{for } i = 1, \dots, n, \quad (19)$$

$$\tilde{\beta}_{LS}^i |_{\tilde{\beta}_L=0} = \frac{-0.5\text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t}) + \text{var}(\omega_t^i)]^{0.5}} \cdot r_{LS,t} = \Delta u_{L,t} - \Delta u_{S,t}. \quad (20)$$

consider combining the information in the long-short anomaly returns by taking their period t cross-sectional average

$$\bar{r}_{LS,t} = \frac{1}{n} \sum_{i=1}^n r_{LS,t}^i = \Delta u_{L,t} - \Delta u_{S,t} + \frac{1}{n} \sum_{i=1}^n \omega_t^i. \quad (21)$$

$$\tilde{\beta}_{LS}^{\text{Avg}} |_{\tilde{\beta}_L=0} = \frac{-0.5\text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t})}{[\text{var}(\Delta u_{L,t}) + \text{var}(\Delta u_{S,t}) + \frac{1}{n}\overline{\text{var}}(\omega_t^i)]^{0.5}}, \quad (22)$$

Intuitively, 就像投资组合分散化, 预测变量取平均可以帮助过滤特殊噪音, 提供预测精度。



MACHINE LEARNING & DIMENSION REDUCTION

□ 预测构建

$\hat{r}_{M,t+1|t}$: 依据t月的信息, 得到t+1月市场超额回报的预测值

X: 100个多空异象组合收益 (过拟合)

□ The prevailing mean forecast V.S Seven forecasts

$$\hat{r}_{M,t+1|t}^{PM} = \frac{1}{t} \sum_{s=1}^t r_{M,s}$$

- Conventional Methods (OLS)
- Penalized Regression (ENET)
- Forecast Combination (Combine, CENET)
- Predictor combination (Avg, PLS, PCR)



FORECAST EVALUATION

□ Statistical Accuracy: MSFE

$$\hat{e}_{0,t|t-1} = r_{M,t} - \hat{r}_{M,t|t-1}^{\text{PM}}, \quad (23)$$

$$\hat{e}_{1,t|t-1} = r_{M,t} - \hat{r}_{M,t|t-1}, \quad (24)$$

$$\widehat{\text{MSFE}}_j = \frac{1}{T} \sum_{t=1}^T \hat{e}_{j,t|t-1}^2 \quad \text{for } j = 0, 1, \quad (25)$$

- **test for a difference in the population MSFEs** using the Clark and West (2007) procedure

$$H_0: \text{MSFE}_0 \leq \text{MSFE}_1 \ (\mu \leq 0) \text{ versus } H_A: \text{MSFE}_0 > \text{MSFE}_1 \ (\mu > 0), \quad (27)$$

- **Campbell and Thompson (2008) R_{OS}^2 statistic:**

$$R_{OS}^2 = 1 - \frac{\widehat{\text{MSFE}}_1}{\widehat{\text{MSFE}}_0}. \quad (28)$$

注：R2会很小，基于夏普比，C,T(2008)表明0.5%可以有经济显著。



FORECAST EVALUATION

□ Economic Value: to an investor

consider a mean-variance investor :在股票(市场)和无风险国库券之间配置资产

• 目标函数:
$$\arg \max_{w_{t+1|t}} w_{t+1|t} \hat{r}_{M,t+1|t} - 0.5\gamma w_{t+1|t}^2 \hat{\sigma}_{t+1|t}^2, \quad (31)$$

$w_{t+1|t}$: allocation

$\hat{r}_{M,t+1|t}$: 市场超额回报的投资者预测

$\gamma=3$: 相对风险厌恶系数

$\hat{\sigma}_{t+1|t}^2$: 市场超额回报方差的投资者预测
60个月滚动估计窗口内计算的样本方差

• (31)最大化的解:

$$w_{t+1|t}^* = \left(\frac{1}{\gamma}\right) \left(\frac{\hat{r}_{M,t+1|t}}{\hat{\sigma}_{t+1|t}^2}\right). \quad (32)$$

• average utility

$$\bar{U}_j = \bar{r}_j - 0.5\gamma \hat{\sigma}_j^2, \quad \text{for } j = 0, 1, \quad (33)$$

• average utility gain

$$\Delta = \bar{U}_1 - \bar{U}_0. \quad (34)$$

注 (34)*12: 年度投资组合管理费, 投资者愿意付费以获得A优于B的信息



DATA

100 long (short) leg and long-short portfolio returns (Common Stocks, 1970-2017, price > \$5)

市场超额回报: CRSP value-weight return minus risk-free return

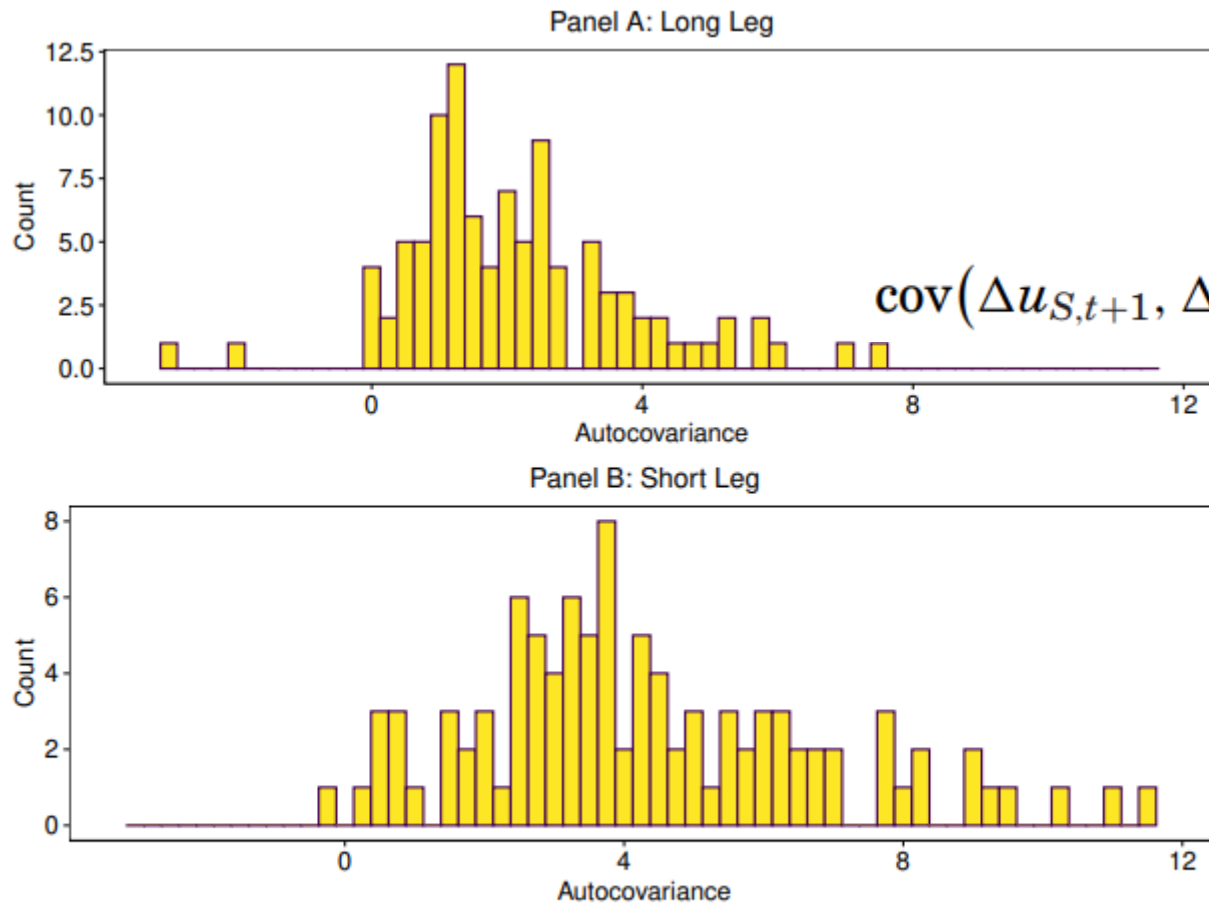
- Most anomalies are significant
- common component in L/S leg returns: ft
- Idiosyncratic components
- sharper predictive signal
 $\text{var}(r_{LS,t}) < \text{var}(r_{S,t})$

Number of anomalies	100
Fama and French (1993) three-factor model alpha	
Number of long-short anomaly portfolio returns with $ t\text{-stat.} \geq 1.645$	75
Number of long-short anomaly portfolio returns with $ t\text{-stat.} \geq 1.96$	71
Number of long-short anomaly portfolio returns with $ t\text{-stat.} \geq 2.58$	56
Number of long-short anomaly portfolio returns with $ t\text{-stat.} \geq 3$	49
Average correlation across anomaly decile rankings	0.05
Average correlation across monthly anomaly excess returns	
Long leg	0.76
Short leg	0.82
Long-short	0.08
Long-leg anomaly portfolio excess returns	
Average of sample means	0.71%
Average of sample standard deviations	5.16%
Short-leg anomaly portfolio excess returns	
Average of sample means	0.33%
Average of sample standard deviations	6.20%
Long-short anomaly portfolio returns	
Average of sample means	0.38%
Average of sample standard deviations	4.37%

70%



DATA



均值: for Short \gg for Long
(4.39 and 2.14, respectively)

$$\text{cov}(\Delta u_{S,t+1}, \Delta u_{S,t}) > \text{cov}(\Delta u_{L,t+1}, \Delta u_{L,t})$$

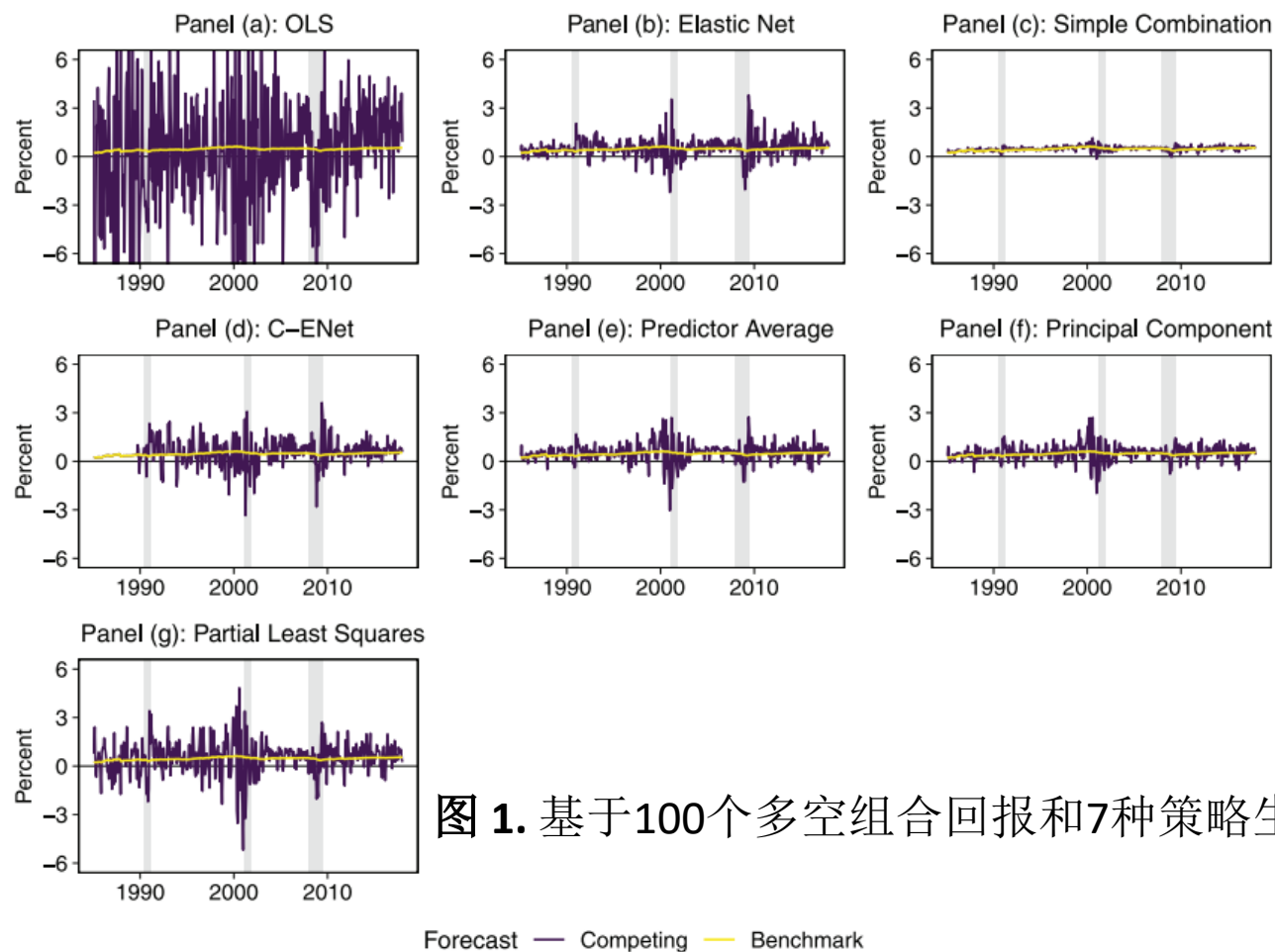
对应于虚高, 具有更强的误差修正持续性(strong MCP)

Figure IA.1. Histograms for sample autocovariances. The figure depicts histograms for the sample autocovariances for long- and short-leg excess returns for 100 anomaly portfolios.



Out-of-Sample Results

- 前十年(1970:01-1979:12): 样本内估计期
- 随后五年(1980:01-1984:12): 用来计算C-ENET预测的holdout样本外期
- 最后32年(1985:01-2017:12): 样本外预测评估期 (396个观察值)



- (a)OLS 高波动→过拟合
- (c)很强的收缩效应

- 商业周期衰退期, 预测更不稳定。多空组合回报本身在衰退期不稳定

图 1. 基于100个多空组合回报和7种策略生成的月度市场超额回报预测



Out-of-Sample Results

Table II R_{OS}^2 Statistics

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Anomaly Portfolio	OLS	ENet	Combine	C-ENet	Avg	PC	PLS
Long-short return	-2,513.86	2.03**	0.89***	2.81***	1.89**	1.25**	2.06*** (统计显著)
Long-leg excess return	-344,960.22	-0.90	0.29	-0.68	0.26	0.24	0.41 < 0.5 不显著
Short-leg excess return	-13,284.68	1.81*	0.72*	0.39*	0.75*	0.74*	0.84* > 0.5 显著

表现更加
精度更高 →

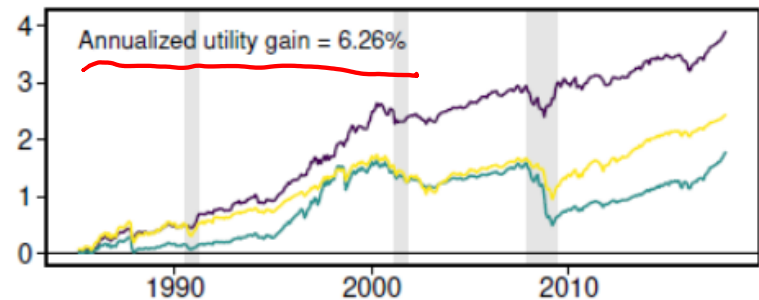
不显著 →
MCP
套利非显著 →

↓
很大负R²
过拟合困扰

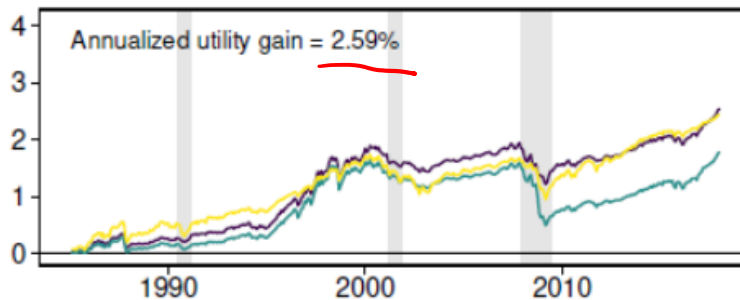
- **OLS V.S others:** 负很大，过拟合困扰; 0.5%，经济显著，MSFE显著改善
- **Short V.S Long:** 套利非对称限制 虚高比虚低更强的误差修正持续性
- **L-S V.S short:** 多空信号更精确，过滤很多和未来市场超额回报无关的公共成分

Out-of-Sample Results-累积超额回报&年化效用增益

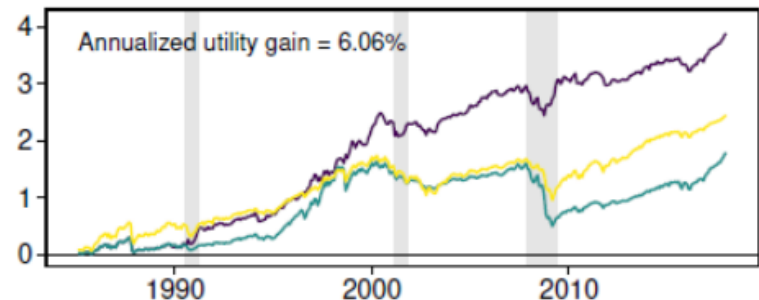
Panel A: Elastic Net



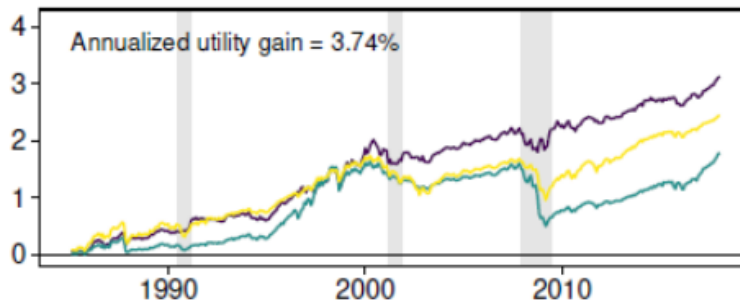
Panel B: Simple Combination



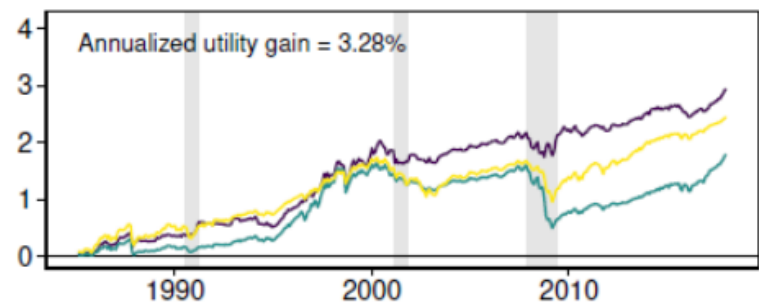
Panel C: C-ENet



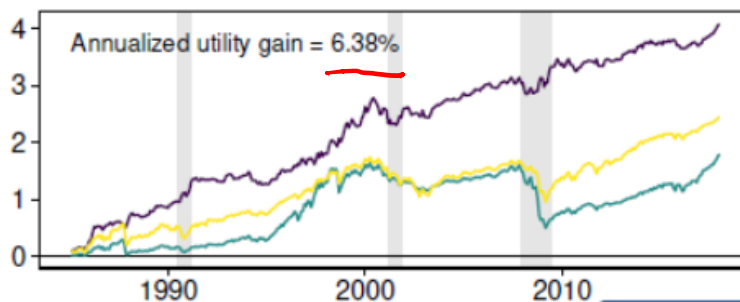
Panel D: Predictor Average



Panel E: Principal Component



Panel F: Partial Least Squares



Portfolio — Competing — Benchmark — Market

- 紫线更高
 - OLS -4.97%
 - 其他显著增益
 - 最小2.59%
- 也很大

多空异象组合回
报包含很多预测
市场超额回报有
价值的信息



Out-of-Sample Results-Additional

Additional	Results
<input type="checkbox"/> Lagged market return itself	样本外预测能力不显著
<input type="checkbox"/> Popular predictors	预测力不如L-S组合回报
<input type="checkbox"/> Forecast encompass test	L-S>>popular
<input type="checkbox"/> long-horizons (2,3,6,12 months)	越来越不显著
<input type="checkbox"/> 5个行业超额收益Y: 消费、健康、制造业、高科技、其他	消费、制造业、其他
<input type="checkbox"/> 基于特征组合的预测	更有可能构成异象的多空组合回报组对预测更有信息



ASYMMETRIC LIMITS TO ARBITRAGE

□ 相关性：套利不对称限制 & 基于多空异象组合回报的市场超额回报预测能力

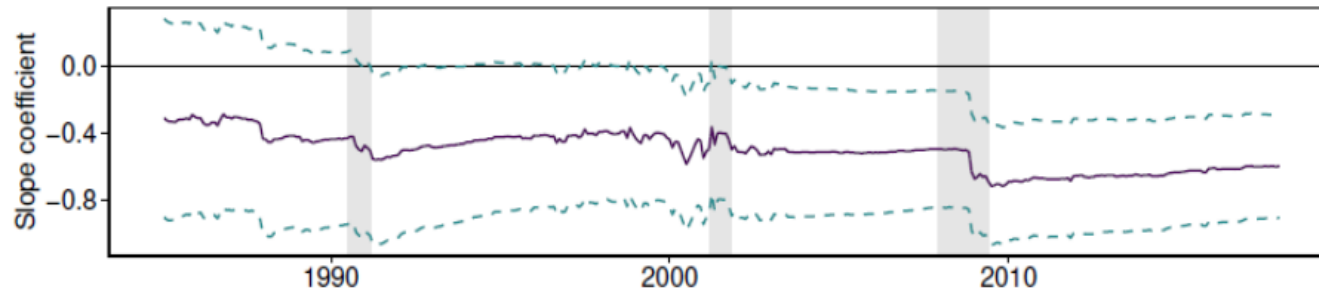
1. 标准化斜率系数 β 递归估计
2. 分市场检验
3. 分样本检验
4. 市场摩擦
5. 套利交易



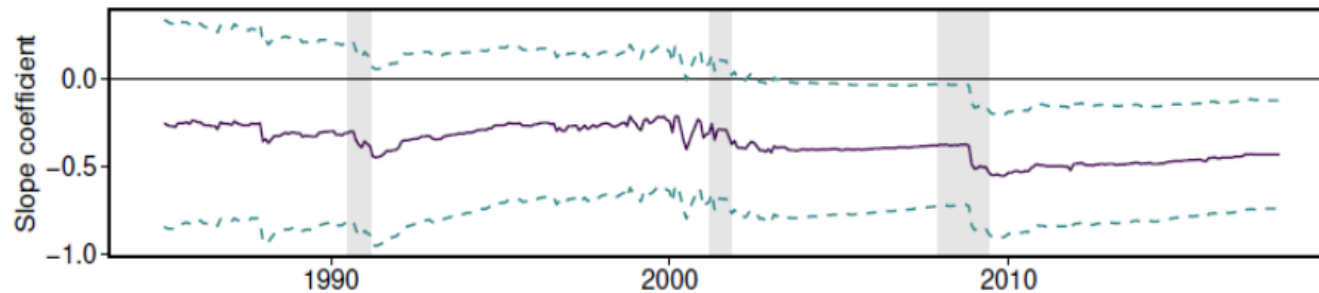
ASYMMETRIC LIMITS TO ARBITRAGE

$$r_{M,t+1} = \alpha + \beta \bar{r}_{LS,t} + \varepsilon_{t+1}, \quad (35)$$

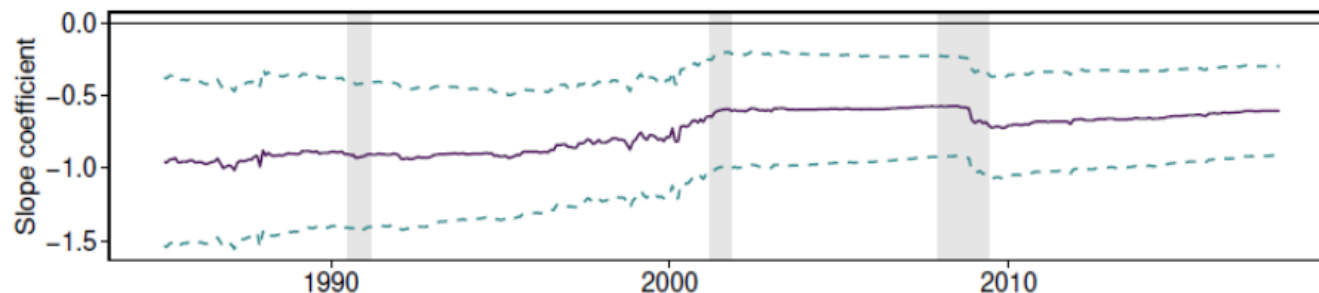
Panel A: Predictor Average



Panel B: Principal Component



Panel C: Partial Least Squares



$r_{i,t}$: long-short portfolio return for the i th

□ Anomaly rets almost always **negatively** predict the market ret

□ 90% confidence intervals tends to narrow

□ Global Financial Crisis & Great Recession



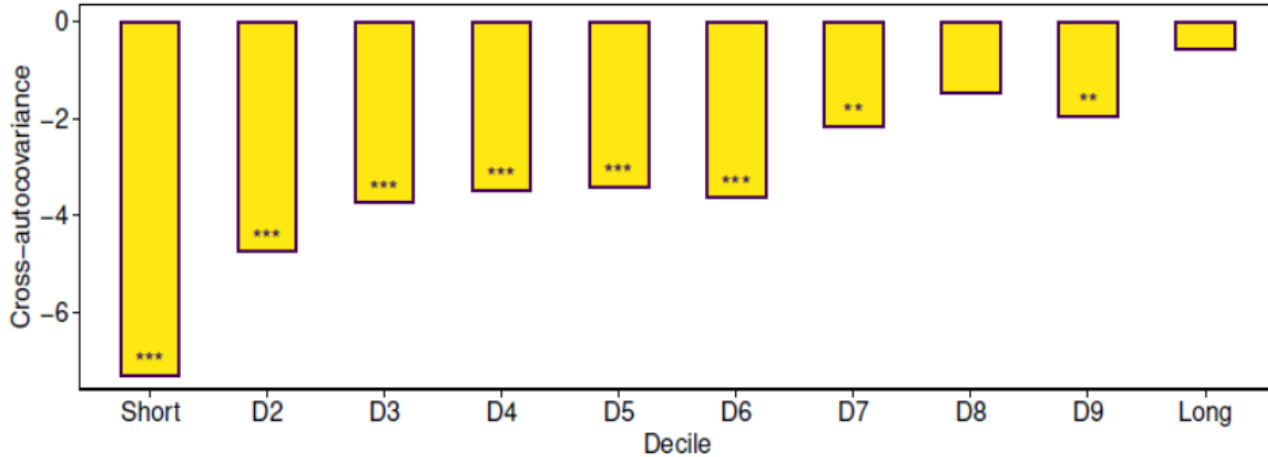
MARKET SEGMENTS

- Predictive ability β Stem from $\text{Cov}(r_{M,t+1}, r_{LS})$
 - Examine $\text{Cov}(r_{LS,t}, r_j)$ r_j : decile excess returns
 - r_{LS} 中的信息和分市场(与异象相关的分市场)的相关性
- 合并100个异象的信息，构建没有重叠股票的细分市场
- 1.对给定月份，根据每个异象特征依次对每只股票排序
 - 2.对每只股票，取它所有异象排序的均值
 - 3.根据股票的平均排名，将股票分成价值加权的decile投资组合，first decile构成最虚高的股票，
 - 4.多空组合goes long (short) the tenth (first) decile portfolio



MARKET SEGMENTS

Panel A: Unweighted Decile Returns

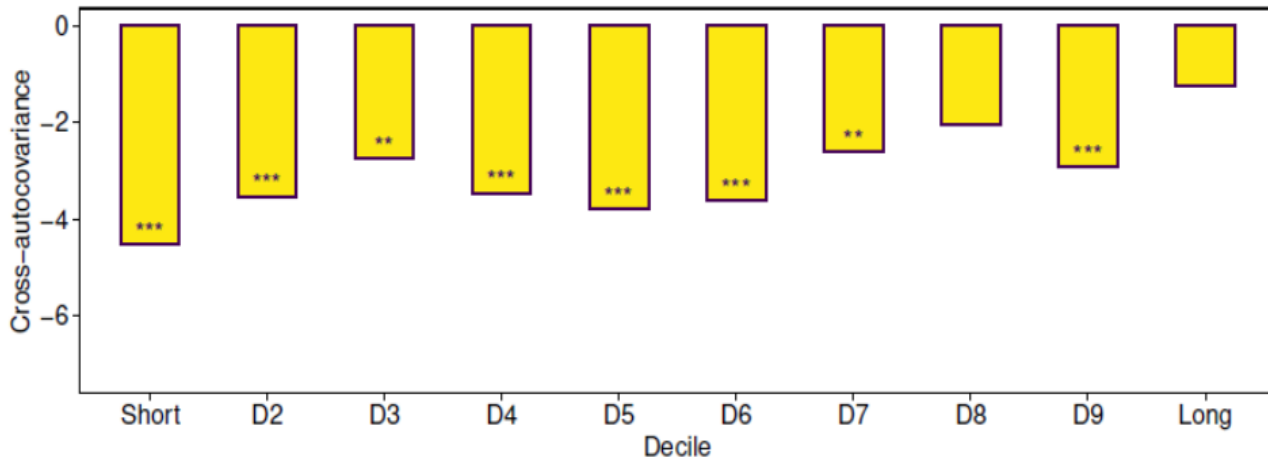


$$\text{COV}(r_{j,t+1}, r_{LS,t}) \quad j = S, D_2, \dots, D_9, L$$

负，显著，逐渐减少，Short 最大
MCP appears most relevant in the short leg

滞后LS回报似乎和包含根据异象而来的相对虚高的股票的分市场回报更相关

Panel B: Weighted Decile Returns



□ Covariance decomposition

$$\begin{aligned} & \text{cov}(r_{M,t+1}, r_{LS,t}) \\ &= \text{cov}(w_{S,t+1}r_{S,t+1}, r_{LS,t}) \\ &+ \sum_{j=2}^9 \text{cov}(w_{D_j,t+1}r_{D_j,t+1}, r_{LS,t}) \\ &+ \text{cov}(w_{L,t+1}r_{L,t+1}, r_{LS,t}) \\ & \text{COV}(w_{j,t+1}r_{j,t+1}, r_{LS,t}) \\ & \quad j = S, D_2, \dots, D_9, L \end{aligned}$$



SUBGROUPS

根据非对称套利限制的**3个代理变量**形成的异象分样本，生成样本外预测

- bid-ask spread (BA)
- idiosyncratic volatility (IDIO)
- market capitalization (SIZE)

➤ 以买卖价差为例

1. 给定月，排序，按异象特征产生十分位组合S,...,L
2. 计算S和L两个组合，买卖价差的平均值
3. 计算long组合买卖价差均值减去short组合买卖价差均值
4. 计算1970-1984时间序列上的平均值差异，得到**DTSA-BA,DTSA-IDIO,DTSA-SIZE**
5. 对100个异象，形成异象的分样本

BA-NEG, IDIO-NEG, and SIZE-NEG (BA-POS, IDIO-POS, and SIZE-POS)

更大的买卖价差，更强的特质波动率，更小的市值，对应更强的套利限制

预期：**BA-NEG, IDIO-NEG, SIZE-POS**更强的预测能力（形成union/complement）

三组代表了空头更强的套利限制的异象组合



ASYMMETRIC LIMITS TO ARBITRAGE: SUBGROUPS

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Subgroup	ENet	Combine	C-ENet	Avg	PC	PLS
Panel A: Bid-Ask Spread						
BA-NEG	3.57***	1.13***	3.65***	1.97**	1.39**	2.94***
BA-POS	-0.28	0.48**	-1.41	0.97**	0.85*	0.29**
Panel B: Idiosyncratic Volatility						
IDIO-NEG	1.63***	0.97***	2.43***	1.53**	1.24**	1.85***
IDIO-POS	1.17*	0.42**	-0.43	-0.33	0.12	-0.14
Panel C: Market Capitalization						
SIZE-NEG	0.39	0.40**	-1.01	0.43	0.19	-1.20
SIZE-POS	2.39***	1.04**	2.91***	1.60**	1.15**	1.59***
Panel D: Bid-Ask Spread, Idiosyncratic Volatility, Market Capitalization						
Union of BA-NEG, IDIO-NEG, SIZE-NEG	2.67***	0.98***	3.10***	1.93**	1.23**	2.12***
Complement of union	0.37	-0.05	-0.09	-0.26	-0.31	-0.83

对应来看，六组
POS都比NEG低

→ 强限制，强套利

→ 都显著为正，值很大，>0.5%

70.5% 70.5%

Union $R^2 >$ Complement R^2
(更强套利)

✗ POS

→ 都显著

→ 不显著，有正有负

Predictability concentrated in anomalies with higher limits to arbitrage in the short leg



Market Frictions

- 有限的风险容忍能力和交易成本等摩擦，会导致套利者对误定价反应较慢，造成MCP
- 如果预测能力的发现是由这驱动的，那么多空组合在高摩擦期应包含更多信息

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Friction	ENet	Combine	C-ENet	Avg	PC	PLS
Aggregate liquidity	4.48**	0.86**	5.20**	3.92**	3.64**	9.23**
Liquidity innovations	6.53**	1.42**	6.56**	7.82***	6.11***	13.21***
Idiosyncratic volatility	2.73*	1.06**	4.21**	4.29**	3.57**	2.05**
Trading noise	3.67**	1.49***	5.11**	8.12***	5.83***	12.42***
Short fees	10.34*	2.50**	12.56*	9.63**	8.50**	14.70**
VIX	-0.25	1.26**	4.87**	6.06**	6.10**	8.93**
Financial uncertainty	-1.28	0.02*	1.18*	3.24**	2.80**	3.94**
Macro uncertainty	1.20	0.95**	3.28*	3.97**	4.09**	7.21**
Real uncertainty	2.02*	1.10**	6.19**	4.47**	4.31**	8.02***
Economic uncertainty	1.29	0.88**	3.93*	3.67**	3.48**	3.59**
Risk aversion uncertainty	3.52**	0.60**	6.36**	4.68**	4.19**	7.38**

表4 高摩擦和低摩擦期间对市场超额回报预测的R2的差异

Higher during high-friction periods



ASYMMETRIC LIMITS TO ARBITRAGE: ARB TRADING AND NEWS TONE

□ 多空异象组合回报 → 套利者交易、市场新闻基调

如果t月多空异象回报所显示的过度定价修正只是部分的，并且在下个月扩散至整个市场预期t月多空异象组合回报的增加会导致套利者下月在整个市场(大盘)的净头寸(多头-空头头寸)减少，且主要是由于空头增加；预期下月有更多的负面新闻基调

季度套利交易与 $Y_{LS,t-1}$ 的回归系数.

$Y_{LS,t-1}$ 、新闻基调回归系数.

(1)	(2)	(3)	(4)	(5)
Strategy	Arbitrage Net Market Position	Arbitrage Long Market Position	Arbitrage Short Market Position	Financial Market News Tone
Predictor Average	-5.81***	-1.91	3.89**	-0.36***
Principal component	-4.81**	-1.18	3.63**	-0.32***
Partial least squares	-5.32***	-1.62	3.70**	-0.35***

都显著为负.

负, 显著.

值行Long时正值, 度高强, α .

□ Higher anomaly ret predicts more market wide arbitrage selling, driven by short selling, and more negative market wide news tone



CONCLUSION

- ❑ We **successfully** link cross-sectional predictability to market return predictability
- ❑ Predictors aggregated from anomaly returns **negatively predict** future market return with strong OOS R squared
- ❑ Anomaly return predictors provide significant economic benefit, especially in bad times
- ❑ **Economic channels:** Predictability arise form **asymmetric MCP** and **noise reduction**

Future research: links in other markets

how anomalies are related across countries and impact global equity markets collectively

Dong, Xi, Yan Li, David E. Rapach, and Guofu Zhou, 2021, **Anomalies and market returns across the world, Working paper (in progress)**, City University of New York, Baruch College, Southwestern University of Finance and Economics, Saint Louis University, and Washington University in St. Louis.





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[1] Media Coverage and the Cost of Debt, *JFQA*, 2020.

[2] Liquidity Risk and Mutual Fund Performance, *MS*, 2019.

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[4] Fast and Slow Arbitrage: The Predictive Power of Capital Flows for Factor Returns





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[1]Social Proximity to Capital: Implications for Investors and Firms. **RFS**. 2022.

[2]The Danger of **Investor Overconfidence**. 2017.

[3]**Investor Overconfidence**, Margin Trade and Market Efficiency: Evidence Based on a Recent Financial Market Crash. 2017



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highlights of his more recent work (between 2017-2021)?

- Econometrics (77.23%)
- Portfolio (23.76%)
- Machine learning (14.85%)

1. Out-of-Sample Equity Premium Prediction: Combination Forecasts and Links to the Real Economy **RFS(2010)**
2. Forecasting the Equity Risk Premium: The Role of Technical Indicators **MS(2014)**
3. Forecasting Stock Returns *Research Papers in Economics* (2013)
4. International Stock Return Predictability: What Is the Role of the United States? **JF(2013)**





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1. “Bayesian Inference in Asset Pricing Tests,” **JFE(1990)**. (with **Campbell Harvey**).
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篇名	作者	刊名	发表时间	被引
<input type="checkbox"/> 1 中国股票市场是否存在趋势? 北大中文核心 CSSCI	韩豫峰; 汪雄剑; 周国富 ; 邹恒甫	金融研究	2014-03-25	66
<input type="checkbox"/> 2 中国股票市场可预测性的实证研究 北大中文核心 CSSCI	姜富伟; 涂俊; David E.Rapach; Jack K.Strauss; 周国富	金融研究	2011-09-25	131



谢谢大家
欢迎提问交流

