Short-Term Reversals and Longer-Term Momentum Around the World: Theory and Evidence

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On the cross-sectional predictability of stock returns

- This research has accumulated to a veritable "factor zoo"
- The number of these strategies raises concerns about data mining (Harvey, Liu, and Zhu (2016) and Chordia, Goyal, and Saretto (2020)).
- On the other hand, we can predict returns using past returns alone

Fama-MacBeth monthly regression on lagged returns

$$r_{i,t} = \rho_0 + \sum_{j=1}^{12} (\rho_j \times r_{i,t-j}) + \epsilon_{i,t}.$$

Panel A: U.S. stocks

Period	ρ_1	ρ_2	ρ_3	...	ρ_{12}	$\sum_{i=2}^{12} \rho_i$	$\chi^2(12)$
1931 to 2020	-0.0450	0.0022	0.0181		0.0181	0.1157	354.6
	(-13.54)	(0.76)	(6.28)		(7.64)	(7.01)	
1931 to 1960	-0.0748	0.0012	0.0264		0.0265	0.1297	181.1
	(-10.66)	(0.19)	(4.08)		(4.94)	(3.43)	
1961 to 1990	-0.0480	0.0027	0.0197		0.0267	0.1630	272.5
	(-9.72)	(0.63)	(4.78)		(7.96)	(7.01)	
1991 to 2020	-0.0121	0.0027	0.0082		0.0011	0.0544	32.52
	(-2.69)	(0.61)	(2.07)		(0.35)	(2.51)	

Panel B: Non-U.S. stocks

Period	ρ_1	ρ_2	ρ_3	...	ρ_{12}	$\sum_{i=2}^{12} \rho_i$	$\chi^2(12)$
1991 to 2020	-0.0158	0.0016	0.0102		0.0091	0.0761	96.28
	(-3.62)	(0.45)	(3.16)		(3.42)	(4.86)	

Momentum and Reversals

- Momentum at 3-12 month horizons
- reversals at monthly horizons

What causes momentum?

- Informed investors make rational decisions
- Uninformed investors are "quasi-rational" $\rightarrow$ underassess the quality of signals they do not themselves produce (Odean (1998) and Luo, Subrahmanyam, and Titman (2021)).

- Uninformed provide "too much liquidity" to their informed counterparts which causes momentum.

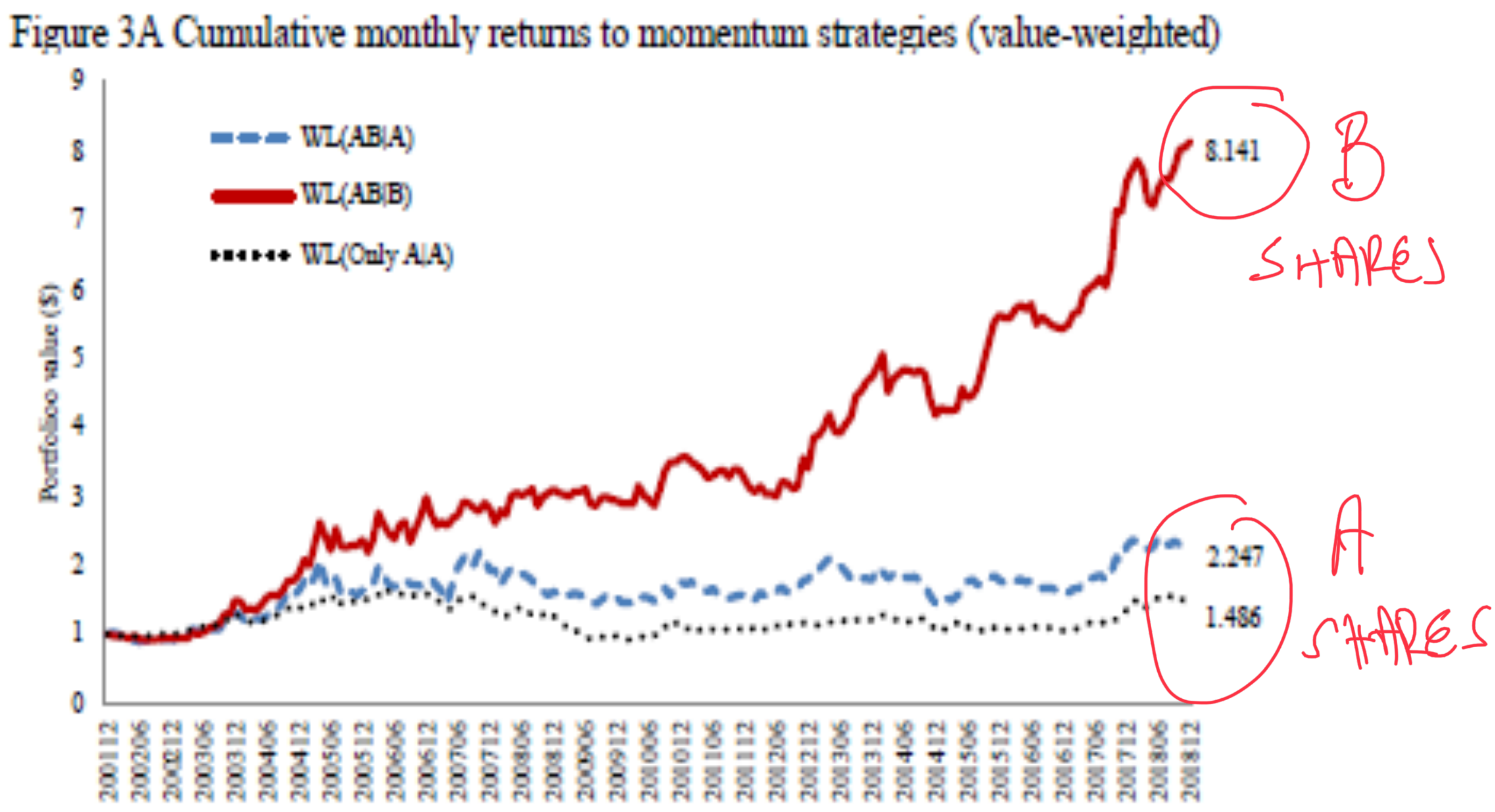
What causes reversals?

- Absorption by risk averse agents of noise trades unrelated to fundamentals.
- Noise trades temporarily move prices away from fundamentals.
- These deviations are corrected when noise trades are reversed and when information is revealed. These corrections generate reversals.

Our setting (EARLIER PAPER WITH ANDY CHUI)

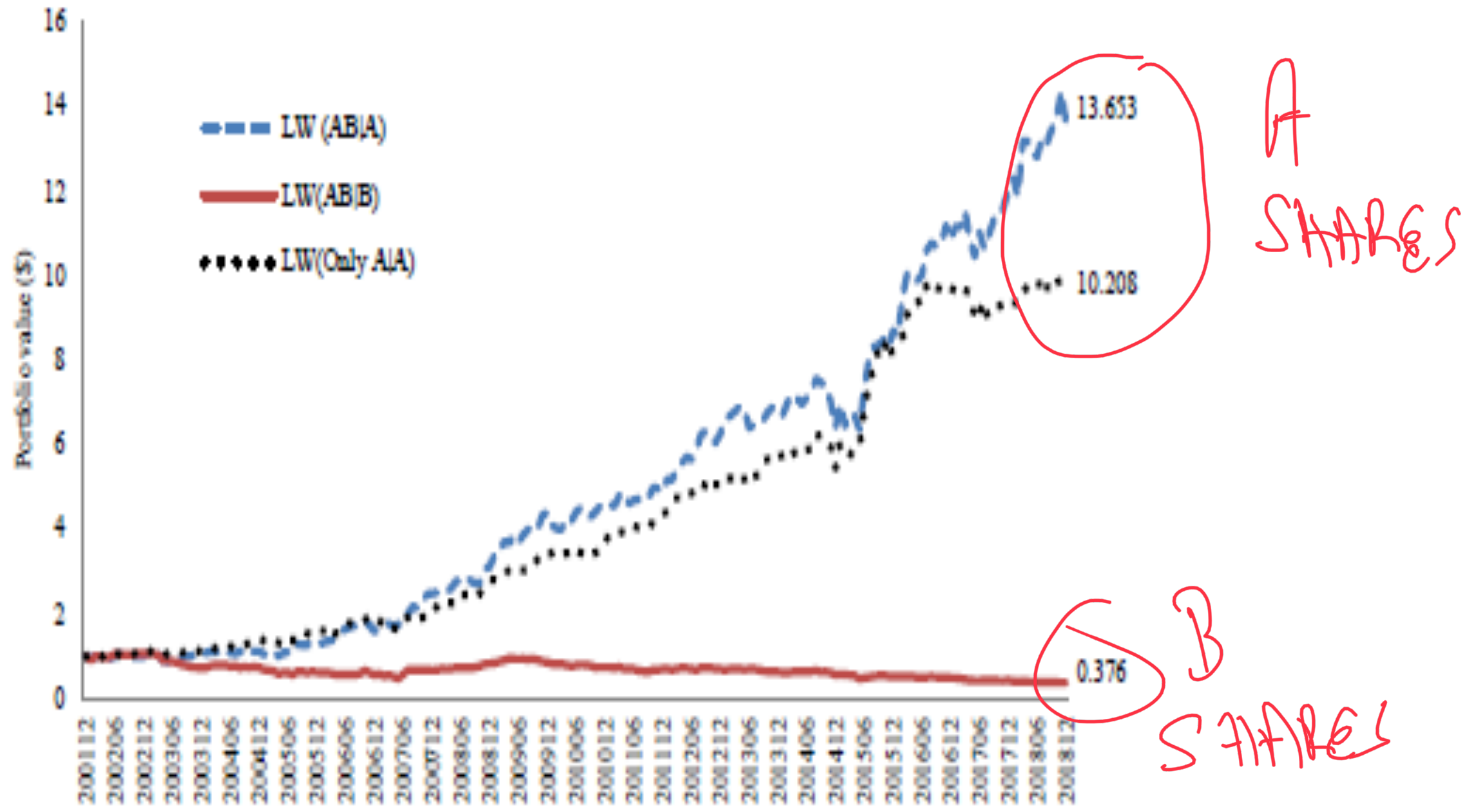
- Different share classes on same firm
  - In China, A and B shares →different clienteles.
    - A mostly retail
    - Foreign institutions virtually absent in A but materially present in B
    - Domestic institutions not allowed in B

Momentum profits, plotted



Monthly reversals, plotted

Figure 4B Cumulative monthly returns to reversal strategies (Equal-weighted)



The evidence so far

- A shares have more noise traders which means more reversals
- B shares are traded mostly by institutions which means more momentum arising from underreaction to fundamentals

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- Examine a number of explanations for momentum
- find underreaction is the most likely cause

Our paper

- There is a “gradual” transition from reversals to momentum as lag length increases
- We provide a model that allows for this transition
- Model features:
  - Two types of risk-averse active investors and noise traders
  - Risk-averse investors underreact to information, and absorb noise trades at a premium
  - Noise trades have varying horizons
- Model yields new empirical implications, which receive support

The economic setting: Assets

- Risky stock traded at Dates 0, 1, 2, and 3.
  - Its liquidation value at Date 4 is θ, where $\theta \sim N(0, \nu_\theta)$.
  - Supply of stock normalized to 0.
- Risk-free asset; price and return are set to 1.

Investors

- Unit mass of risk-averse active investors

  Each has standard exponential utility:

$$U(W_{i4}) = -\exp(-AW_{i4}),$$

  where W_{i4} is the investor's final wealth.

- Noise traders
  - At each of Dates t ($t = 1$, 2, or 3), a new noise demand z_t is drawn from $N(0, \nu_{z_t})$.
  - $(1-\mu)z_t$ is unwound at Date $t+1$; the rest of this demand, μz_t, is unwound at Date $t+2$.
  - The net noise demand is z_1 $(z_2 + \mu z_1)$ $(z_3 + \mu z_2)$ at Date 1 (2) (3).

Information

- Date 0: Starting date; no information
- Date 1: Public signal $f = \theta + \xi + \epsilon + \zeta$; ξ (ϵ) (ζ) drawn from $N(0, \nu_\xi)$ (ν_ϵ) (ν_ζ); can be an analysts' forecast or managerial guidance
- Date 2: A second public signal $F = \theta + \xi + \epsilon$; can be an earnings announcement
- Date 3: Mass λ of "informed" active investors observe a private signal $s = \theta + \xi$.

Beliefs

- Uninformed investors underassess the informativeness of s.
  - Suppose $\theta = \theta_1 + \theta_2$, where θ_1 (θ_2) is mean-zero normal with variance $\nu_{\theta_1} = \kappa^{-1}\nu_\theta$ ($\nu_{\theta_2} = (1-\kappa^{-1})\nu_\theta$).
  - Uninformed investors believe that $s = \theta_1 + \xi$, so s reveals only the component θ_1.
  - Correspondingly, they believe $f = \theta_1 + \xi + \epsilon + \zeta$ and $F = \theta_1 + \xi + \epsilon$.

Intuition

- Noise traders cause reversals
- Informed traders' underreaction to long-term fundamentals causes momentum
- Shorter noise trader horizons $\rightarrow$ short-term reversals; longer noise trader horizons implies reversals attenuate momentum
- Reversals are attenuated following information releases (due to underreaction)
- More noise trading implies stronger reversals and less momentum

Reversal and momentum measures

- The short-term predictability measure:

$$\mathcal{S} = \frac{1}{3}\Big[\mathrm{Cov}(P_1 - P_0, P_2 - P_1) + \mathrm{Cov}(P_2 - P_1, P_3 - P_2) + \mathrm{Cov}(P_3 - P_2, P_4 - P_3)\Big],$$

- The long-term predictability measure:

$$\mathcal{L} = \mathrm{Cov}(P_2 - P_0, P_4 - P_2),$$

Simple case with closed-form solution

- $\lambda = 0$; a converging case where the mass of uninformed relative to informed investors is large.
- Uninformed investors directly learn the signal s.
- The Date-3 noise trade $z_3 \equiv 0$, so that the Date-3 price fully reveals informed investors' private signal s.
- Further, we assume that $0 \leq \mu \leq 1$.
- [general case illustrated numerically]

The case without noise trades

That is, $z_t \equiv 0$ and $\nu_{z_t} = 0 \; \forall t$.

- The long-term serial covariance $\mathcal{L}^K > 0$.
- All short-term autocovariances are also positive.

The case with noise trades

Noise trades arise at Dates 1 and 2 (i.e., $\nu_{z_1} = \nu_{z_2} = \nu_z > 0$). Let $\nu_z \in [U_1, U_2]$.

- If μ is sufficiently small, then long-run predictability $\mathcal{L} > 0$.
- Short-term predictability $\mathcal{S} < 0$.
- As ν_z increases, for sufficiently small μ, $\mathcal{L}$ and $\mathcal{S}$ decrease
  - ($\mathcal{L}$ becomes less positive).
  - ($\mathcal{S}$ becomes more negative).

Skipping a period and momentum profits

- Define a parameter $\mathcal{L}^*$

$$\mathcal{L}^* \equiv \mathrm{Cov}(P_2 - P_0, P_4 - P_3),$$

  We obtain the following result:

- Skipping a period enhances the momentum effect, i.e., $\mathcal{L}^* > \mathcal{L}$.

Longer-lag return predictability

- Recall that $\mathcal{S} < 0$
- Define two parameters:

$$
\begin{aligned}
\mathcal{S}_{(2)} &= \frac{\mathrm{Cov}(P_1 - P_0, P_3 - P_2) + \mathrm{Cov}(P_2 - P_1, P_4 - P_3)}{2}, \\
\mathcal{S}_{(3)} &= \mathrm{Cov}(P_1 - P_0, P_4 - P_3).
\end{aligned}
$$

- $\mathcal{S}_{(3)} > 0$.
- If $\mu = 0$, then $\mathcal{S}_{(2)} > 0$.
- If $\mu > 0$, then as ν_z increases from zero, $\mathcal{S}_{(2)}$ is first positive and then turns negative.

Return predictability around earnings announcement dates

- Let $\mathrm{Cov}_E \equiv \mathrm{Cov}(P_2 - P_1, P_3 - P_2)$ denote the covariance around the earnings announcement

- Provided that μ is sufficiently small, and F is not too imprecise, $\mathrm{Cov}_E > \mathcal{S}$ (underreaction dominates reversals).

Empirical Implications

- Markets transition from reversals to momentum
  - reversals at short lags
  - weak predictability at longer lags
  - momentum at even longer lags.
- Momentum profits $\uparrow$ when we skip a month between formation and holding periods
- Reversals $\downarrow$ after earnings announcements
- $\uparrow$ Momentum $\rightarrow \downarrow$ reversal profits (across countries and time)
- Countries with $\uparrow$ noise trading have $\uparrow$ reversals
- Short-term reversals $\uparrow$ when absolute order imbalance of retail investors $\uparrow$

Momentum portfolio returns with and without skip-a-month

Panel A: U.S. stocks (193101 to 202012)

Panel A1: Sort by return from month $t-12$ to $t-2$ (skip-a-month)						
	Winner-Loser	Decile 1	Decile 2	...	Decile 9	Decile 10
Mean	0.0116	0.0060	0.0096		0.0149	0.0175
T-stat.	(5.26)	(1.93)	(3.71)		(7.54)	(7.65)
Panel A2: Sort by return from month $t-12$ to $t-1$						
Mean	0.0057	0.0097	0.0103		0.0137	0.0154
T-stat.	(2.39)	(3.01)	(4.08)		(7.03)	(6.85)
Panel A3: Difference between Winner − Loser returns in Panels A1 and A2						
Difference	0.0059					
T-stat.	(10.23)					

Panel B: Non-U.S. stocks (199101 to 202012)

Panel B1: Sort by return from month $t-12$ to $t-2$ (skip-a-month)						
	Winner-Loser	Decile 1	Decile 2	...	Decile 9	Decile 10
Mean	0.0108	0.0002	0.0010		0.0107	0.0110
T-stat.	(3.89)	(0.05)	(0.37)		(5.17)	(3.92)
Panel B2: Sort by return from month $t-12$ to $t-1$						
Mean	0.0084	0.0031	0.0006		0.0102	0.0115
T-stat.	(2.71)	(0.83)	(0.24)		(4.94)	(4.14)
Panel B3: Difference between Winner − Loser returns in Panels B1 and B2						
Difference	0.0025					
T-stat.	(3.41)					

Lagged return×earnings announcement dummies

$$r_{i,t} = \rho_0 + \sum_{j=1}^{12} (\rho_j \times r_{i,t-j}) + b \times EAD\ Dummy_{i,t-1}$$
$$+\phi \times EAD\ Dummy_{i,t-1} \times r_{i,t-1} + \epsilon_{i,t}$$

Panel A: U.S. stocks (197201 to 202012)

	ρ_1	ρ_2	ρ_3	...	ρ_{12}	b	ϕ
Mean	-0.0367	0.0036	0.0126		0.0113	-0.0004	0.0246
T-Stat	(-8.59)	(1.11)	(4.06)		(4.37)	(-0.85)	(7.12)

Panel B: Non-U.S. stocks (199206 to 202012)

	ρ_1	ρ_2	ρ_3		ρ_{12}	b	ϕ
Mean	-0.0304	0.0027	0.0127		0.0093	0.0014	0.0208
T-Stat	(-6.14)	(0.59)	(3.53)		(2.54)	(1.19)	(3.99)

Momentum (*MOM* - past 2-12mo) and reversal (*REV* - past 1mo) profits across countries

	(1)	(2)
	REV	*REV*
MOM	−0.166	−0.194
(*t*-stat.)	(−6.10)	(−6.35)
Constant	0.00715	0.00847
(*t*-stat.)	(19.72)	(6.24)
Month FE	Yes	No
No. of Obs.	10,325	11,045
Adj-R^2	0.170	0.049

Time-series correlations between reversal and momentum profits, country-by-country

	Corr(*MOM*,*REV*)
Average	-0.2158
Median	-0.2510
% negative	89.7%

Culture and noise trading

- We consider two cultural attributes previously considered by others
  - Individualism (IDV - Chui Titman, and Wei (CTW) (2010))
  - Uncertainty Avoidance - i.e., desire to avoid long-run ambiguity (UAI - Nguyen and Truong (2013))
- $\uparrow$ IDV $\rightarrow$ $\uparrow$ overconfidence and $\uparrow$ momentum (as in CTW)
- $\uparrow$ UAI $\rightarrow$ $\downarrow$ focus on ambiguous long-run fundamentals $\rightarrow$ $\uparrow$ noise trades and $\uparrow$ reversals (new)

Momentum, reversal, and culture
IDV - individualism, *UAI* - uncertainty avoidance

	(1)	(2)	(3)	(4)	(5)	(6)
	REV	*REV*	*REV*	*MOM*	*MOM*	*MOM*
IDV	−0.0125		0.0272	0.183		0.168
(*t*-stat.)	(−0.36)		(0.77)	(4.93)		(4.43)
UAI		0.127	0.131		−0.0745	−0.0486
(*t*-stat.)		(5.19)	(5.24)		(−2.81)	(−1.79)
Constant	0.00477	−0.00394	−0.00575	0.00344	0.0185	0.00734
(*t*-stat.)	(2.34)	(−2.39)	(−2.01)	(1.56)	(10.42)	(2.37)
Month x Developed FE	Yes	Yes	Yes	Yes	Yes	Yes
No. of Obs.	9,785	9,785	9,785	9,785	9,785	9,785
Adj-R^2	0.163	0.166	0.166	0.241	0.239	0.241

Return reversal and retail order flow

$$r_{i,t} = \rho_0 + \rho_1 \times r_{i,t-1} + \rho_2 \times |Retail\ OIB|_{i,t-1} + \rho_3 \times r_{i,t-1} \times |Retail\ OIB|_{i,t-1} + \epsilon_{i,t},$$

We use the method of Boehmer, Jones, Zhang, and Zhang (2021) to isolate retail trades. The sample period is 200611 to 202112.

Variable	(1)	(2)	(3)
$r_{i,t-1}$	−0.0212	−0.0102	−0.0181
	(−2.83)	(−1.33)	(−2.61)
$\|Retail\ OIB\|_{i,t-1}$		0.0003	
		(0.34)	
$r_{i,t-1} \times \|Retail\ OIB\|_{i,t-1}$		−0.0244	
		(−3.18)	
$\sigma(Retail\ OIB)_{i,t-1}$			0.0007
			(0.85)
$r_{i,t-1} \times \sigma(Retail\ OIB)_{i,t-1}$			−0.0138
			(−3.60)

Conclusions

- Markets transition from reversals to momentum as return lag increases
- Our model $\rightarrow$ differing noise trader horizons, overconfident informed, and uninformed
- Empirical evidence that supports the model
  - Reversals $\downarrow$ around earnings annnouncements
  - $\uparrow$ Momentum $\rightarrow \downarrow$ reversal (across countries and time)
  - Reversal profits $\uparrow$ in countries with $\uparrow$ uncertainty avoidance
  - Reversal profits $\uparrow$ in absolute retail imbalance

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