Strategic Trading and Return Predictability

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Return momentum and reversals are persistent empirical phenomena

- It is well-documented that stock return exhibit momentum at short horizons (Jegaseesh and Titman (1993)), which partially reverses at long horizons (Fama and French (1988), Poterba and Summers (1988))
  - Related: continuation after public news announcements (Bernard and Thomas (1992))
- Appear in many different asset classes (Moskowitz, Ooi, and Pedersen (2012))
- Effects persist despite wide knowledge of their existence
- Evidence that magnitude of predictability is related to belief heterogeneity (Zhang (2006), Verardo (2009))

Literature review

- Behavioral theories focus on investor over/under-reaction to news
  - Daniel, Hirshleifer, and Subrahmanyam (1998)
  - Hong and Stein (1999)
- Risk based explanations attribute predictability to changes in risk exposures and/or risk premia
  - Berk, Green, and Naik (1999)
  - Sagi and Seasholes (2007)
  - Vayanos and Wooley (2013)
  - Albuquerque and Miao (2014)

Slow aggregation of information?

- Allen, Morris, and Shin (2006) argue that price drifts can arise due to slow aggregation of info in presence of noise
- Banerjee, Kaniel, Kremer (2009):
  - Finite-horizon CARA-Normal model with long-lived rational traders, random walk supply (iid noise trades).
  - With rational expectations, agents use information in price to correct any predictability that is not due to risk premia

    $$\mathbb{E}[p_{t+1} - p_t | p_t - p_{t-1}] \propto \mathbb{E}[Z_{t+1} - Z_t | p_t - p_{t-1}] = 0,$$

    if $Z_{t+1} - Z_t$ iid.
  - More generally, relation depends only on AR coefficient of supply
    - $0 < \phi_Z < 1$, change in risk premia partially reverses $\Rightarrow$ reversals
    - $\phi_Z > 1$, change in risk premia continues $\Rightarrow$ momentum
- With $R > 1$, stationary setting (Wang (1994), Albuquerque and Miao (2014))
  - $0 < \phi_Z < 1/R \Rightarrow$ reversals
  - $1/R < \phi_Z < 1 \Rightarrow$ momentum

Contribution

- Solve dynamic Kyle (1989) model with asymmetric information
- Drifts, followed by reversals, occurs naturally when some traders account for price impact
- Intuition: A strategic, risk averse trader trades slowly towards a 'target inventory' (inventory that would be optimal in a competitive world).
  - Current inventory enters price as an adjustment to risk premium
  - Changes in inventory are persistent
    - If persistence is sufficiently large, leads to positive serial correlation in returns
  - In the long run, the target inventory reverts to zero (more generally, fixed fraction of supply), eliminating 'mispricing'
    - Returns reverse in long run

Setting

Dynamic Kyle (1989)

- Infinite horizon, discrete time
- Risky asset dividend stream

$$D_{t+1} = G_t + \sigma_D \varepsilon_{Dt+1},$$

  with persistent component

$$G_t = \phi_G G_{t-1} + \sigma_G \varepsilon_{Gt}$$

- Risky asset in zero net supply
- Risk-free asset with return $R = 1 + r$

Setting

Dynamic Kyle (1989)

- Informed trader maximizes

$$\mathbb{E}_I \left[\sum_{t=0}^{\infty} -e^{-\rho t - \alpha_I c_{It}} \right]$$

  - Observes G_t and accounts for price impact when forming demand schedule
  - Endowed with Z_t shares of a nontradeable asset with payoffs Y_{t+1}

$$Z_t = \phi_Z Z_{t-1} + \sigma_Z \varepsilon_{Zt}$$

$$Y_{t+1} = \sigma_Y \varphi_{DY} \varepsilon_{Dt+1} + \sigma_Y \sqrt{1 - \varphi_{DY}^2} \varepsilon_{Yt+1},$$

  with $\varphi_{DY} > 0$.
- Mass of competitive uninformed traders

$$\mathbb{E}_U \left[\sum_{t=0}^{\infty} -e^{-\rho t - \alpha_U c_{Ut}} \right]$$

  - Learn about G_t by observing prices and realized dividends

Equilibrium

Search for equilibrium in which agents submit linear demand schedules that specify their desired trade

$$x_{It} = \beta_{I1} G_t + \beta_{I2} Z_t + \eta_I D_t + \chi_{I1} \hat{G}_{t-1} + \chi_{I2} \hat{Z}_{t-1} - \gamma_I P_t - \delta_I \theta_{It}$$

$$x_{Ut} = \eta_U D_t + \chi_{U1} \hat{G}_{t-1} + \chi_{U2} \hat{Z}_{t-1} - \gamma_U P_t - \delta_U \theta_{Ut}.$$

where θ_{jt} = shares held immediately prior to trade at t, $\hat{G}_{t-1} = \mathbb{E}_{Ut-1}[G_{t-1}]$, and $\hat{Z}_{t-1} = \mathbb{E}_{Ut}[Z_{t-1}]$.

Uninformed investor's problem

Learning from price

- Under linear conjecture uninformed trader faces flat residual supply schedule

$$P_t = (\gamma_I + \gamma_U)^{-1}\Big(\beta_{I1}G_t + \beta_{I2}Z_t + (\eta_I + \eta_U)D_t + (\chi_{I1} + \chi_{U1})\hat{G}_{t-1} + (\chi_{I2} + \chi_{U2})\hat{Z}_{t-1} - \delta_I\theta_{It} - \delta_U\theta_{Ut}\Big)$$

Uninformed investor's problem

Learning from price

- Under linear conjecture uninformed trader faces flat residual supply schedule

$$P_t = \lambda\Big(\beta_{I1}G_t + \beta_{I2}Z_t + \eta D_t + \chi_1\hat{G}_{t-1} + \chi_2\hat{Z}_{t-1} - \delta_I\theta_{It} - \delta_U\theta_{Ut}\Big)$$

Uninformed investor's problem

Learning from price

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$$P_t = \lambda \left(\beta_{I1} G_t + \beta_{I2} Z_t + \eta D_t + \chi_1 \hat{G}_{t-1} + \chi_2 \hat{Z}_{t-1} + \delta \theta_{Ut} \right)$$

Uninformed investor's problem

Learning from price

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$$P_t = \lambda \left(\beta_{I1} G_t + \beta_{I2} Z_t + \eta D_t + \chi_1 \hat{G}_{t-1} + \chi_2 \hat{Z}_{t-1} + \delta \theta_{Ut} \right)$$

- Can infer statistic

$$\begin{aligned} S_{Pt} &= \frac{1}{\lambda} P_t - \eta D_t - \chi_1 \hat{G}_{t-1} - \chi_2 \hat{Z}_{t-1} + \delta \theta_{Ut} \\ &= \beta_{I1} G_t + \beta_{I2} Z_t \end{aligned}$$

Uninformed investor's problem

Kalman Filtering

The conditional distribution of (G_t, Z_t) given $\{D_t, S_{P,t}\}$ is normal with mean $(\hat{G}_t, \hat{Z}_t)$ and constant covariance matrix $\nu = \begin{pmatrix} \nu_G & \nu_{GZ} \\ \nu_{GZ} & \nu_Z \end{pmatrix}$.
The conditional mean satisfies the following difference equation

$$\begin{pmatrix} \hat{G}_t \\ \hat{Z}_t \end{pmatrix} = \begin{pmatrix} \phi_G & 0 \\ 0 & \phi_Z \end{pmatrix} \begin{pmatrix} \hat{G}_{t-1} \\ \hat{Z}_{t-1} \end{pmatrix} + K \begin{pmatrix} D_t - \hat{G}_{t-1} \\ S_{P,t} - \beta_{I1}\phi_G \hat{G}_{t-1} - \beta_{I2}\phi_Z \hat{Z}_{t-1} \end{pmatrix},$$

where

$$K = \begin{pmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{pmatrix}.$$

Uninformed investor's problem

Dynamic programming

- Let

$$\begin{aligned} \varepsilon^U_{D,t} &= D_t - \hat{G}_{t-1} \\ \varepsilon^U_{Pt} &= S_{Pt} - \beta_{I1}\phi_G \hat{G}_{t-1} - \beta_{I2}\phi_Z \hat{Z}_{t-1}, \end{aligned}$$

  which is iid with zero mean and constant covariance matrix. Consider state variables

$$\begin{aligned} M_{Ut+1} &= R(M_{Ut} - c_{Ut} - P_t x_{Ut}) + (\theta_{Ut} + x_{Ut})D_{t+1} \\ \theta_{Ut+1} &= \theta_{Ut} + x_{Ut} \\ D_{t+1} &= \hat{G}_t + \varepsilon^U_{D,t+1} \\ \hat{G}_t &= \phi_G \hat{G}_{t-1} + K_{11}(D_t - \hat{G}_{t-1}) + K_{12}\left(S_{P,t} - \mathbb{E}_{Ut-1}[S_{P,t}]\right) \\ \hat{Z}_t &= \phi_Z \hat{Z}_{t-1} + K_{21}(D_t - \hat{G}_{t-1}) + K_{22}\left(S_{P,t} - \mathbb{E}_{Ut-1}[S_{P,t}]\right) \\ S_{Pt+1} &= \beta_{I1}\phi_G \hat{G}_t + \beta_{I2}\phi_G \hat{Z}_t + \varepsilon^U_{Pt+1}. \end{aligned}$$

Uninformed investor's problem

Dynamic programming

- Conjecture that the value function takes exponential-quadratic form

$$V_U(M_{Ut}, X_{Ut}) = -\exp\left\{-A_{U0} - A_{UM}M_{Ut} - \frac{1}{2}X'_{Ut}Q_UX_{Ut}\right\},$$

where A_{U0} and A_{UM} are constants,
$X_{Ut} = (\theta_{Ut}, D_t, \hat{G}_{t-1}, \hat{Z}_{t-1}, S_{Pt})$, and Q_U is a symmetric 5×5 matrix.

Uninformed investor's problem

Dynamic programming

Uninformed investor Bellman equation

$$0 = \max_{x,c}\left\{-\exp\{-\alpha_U c\} + e^{-\rho}\mathbb{E}_{Ut}[V_U(M_{Ut+1}, X_{Ut+1})] - V_U(\cdot)\right\}.$$

$$\begin{aligned}
\text{s.t.} \qquad M_{Ut+1} &= R(M_{Ut} - c_{Ut} - P_t x_{Ut}) + (\theta_{Ut} + x_{Ut})D_{t+1} \\
X_{Ut+1} &= a_U X_{Ut} + b_U \hat{\varepsilon}^U_{t+1} + a_{Ux}x_{Ut} \\
P_t &= \lambda\left(\beta_{I1}G_t + \beta_{I2}Z_t + \eta D_t + \chi_1\hat{G}_{t-1} + \chi_2\hat{Z}_{t-1} + \delta\theta_{Ut}\right)
\end{aligned}$$

Optimal consumption and demand

$$\begin{aligned}
c^*_{Ut} &= \text{constant} + \frac{A_{UM}R}{\alpha_U + A_{UM}R}M_{Ut} + \frac{1}{2}X'_{Ut}m_UX_{Ut} \\
x^*_{Ut} &= \hat{H}'_UX_{Ut},
\end{aligned}$$

where m_U is a 5×5 symmetric matrix, and $\hat{H}_U$ is a 5×1 vector.

Uninformed investor's problem

Dynamic programming

- Plugging back into the Bellman equation and equating coefficients produces

$$A_{U0} = \frac{1}{r}\left(\rho - \log(rd_U) + R\log(r/R)\right)$$
$$A_{UM} = \frac{r}{R}\alpha_U,$$

  and matrix Q_U must satisfy

$$Q_U = m_U/R. \quad (1)$$

- Functional form for price and the statistic S_{Pt} implies x^*_{Ut} can be implemented by submitting a demand schedule that infers S_{Pt} from the equilibrium price

$$x^*_{Ut} = \hat{H}_U X_{Ut} - h_U P_t. \quad (2)$$

  This function must match the initial conjecture.
- Eq. (3) and (4) is system of 20 equations in 20 unknowns

Informed investor's problem

Residual supply schedule

- Under linear conjecture informed trader faces linear residual supply schedule

$$P_t(x_{It}) = \gamma_U^{-1}\left(x_{It} - \delta_U\theta_{Ut} + \eta_U D_t + \chi_{U1}\hat{G}_{t-1} + \chi_{U2}\hat{Z}_{t-1}\right)$$

Informed investor's problem

Residual supply schedule

- Under linear conjecture informed trader faces linear residual supply schedule

$$P_t(x_{It}) = \underbrace{\gamma_U^{-1}}_{=\lambda_I} \left(x_{It} - \delta_U \theta_{Ut} + \eta_U D_t + \chi_{U1} \hat{G}_{t-1} + \chi_{U2} \hat{Z}_{t-1} \right)$$

Informed investor's problem

Residual supply schedule

- Under linear conjecture informed trader faces linear residual supply schedule

$$P_t(x_{It}) = \lambda_I \left(x_{It} + \delta_U \theta_{It} + \eta_U D_t + \chi_{U1} \hat{G}_{t-1} + \chi_{U2} \hat{Z}_{t-1} \right)$$

Informed investor's problem

Residual supply schedule

- Under linear conjecture informed trader faces linear residual supply schedule

$$P_t(x_{It}) = \lambda_I \left(x_{It} + \delta_U \theta_{It} + \eta_U D_t + \chi_{U1} \hat{G}_{t-1} + \chi_{U2} \hat{Z}_{t-1} \right)$$

- Consider state variables

$$\begin{aligned}
M_{It+1} &= R(M_t - c - P_t(x_{It})x_{It}) + (\theta_{It} + x_{It})D_{t+1} + Z_t Y_{t+1} \\
\theta_{It+1} &= \theta_{It} + x_{It} \\
D_{t+1} &= G_t + \sigma_D \varepsilon_{D,t+1} \\
\hat{G}_t &= \phi_G \hat{G}_{t-1} + K_{11}(D_t - \hat{G}_{t-1}) + K_{12}\left(S_{P,t} - \mathbb{E}_{Ut-1}[S_{P,t}]\right) \\
\hat{Z}_t &= \phi_Z \hat{Z}_{t-1} + K_{21}(D_t - \hat{G}_{t-1}) + K_{22}\left(S_{P,t} - \mathbb{E}_{Ut-1}[S_{P,t}]\right) \\
G_{t+1} &= \phi_G G_t + \sigma_G \varepsilon_{G,t+1} \\
Z_{t+1} &= \phi_Z Z_t + \sigma_Z \varepsilon_{Z,t+1} \\
Y_{t+1} &= \sigma_Y \left(\varphi_{DY} \varepsilon_{D,t+1} + \sqrt{1 - \varphi_{DY}^2} \varepsilon_{Y,t+1} \right)
\end{aligned}$$

Informed investor's problem

Dynamic programming

- Conjecture that the value function takes exponential-quadratic form

$$V_I(M_{It}, X_{It}) = -\exp\left\{ -A_{I0} - A_{IM} M_{It} - \frac{1}{2} X_{It}' Q_I X_{It} \right\},$$

where A_{I0} and A_{IM} are constants, $X_{It} = (\theta_{It}, D_t, \hat{G}_{t-1}, \hat{Z}_{t-1}, G_t, Z_t, Y_t)$, and Q_I is a symmetric 8×8 matrix with zeros in the last row and column.

Informed investor's problem

Dynamic programming

Informed investor Bellman equation

$$0 = \max_{x,c} \left\{ -\exp\{-\alpha_I c\} + e^{-\rho} \mathbb{E}_{It}[V_I(M_{It+1}, X_{It+1})] - V_I(\cdot) \right\}.$$

$$\begin{aligned} \text{s.t.} \qquad M_{It+1} &= R(M_{It} - c_{It} - P_t(x_{It})x_{It}) + (\theta_{It} + x_{It})D_{t+1} \\ X_{It+1} &= a_I X_{It} + b_I \hat{\varepsilon}_{t+1} + a_{Ix} x_{It} \\ P_t(x_{It}) &= \lambda_I \left(x_{It} + \delta_U \theta_{It} + \eta_U D_t + \chi_{U1} \hat{G}_{t-1} + \chi_{U2} \hat{Z}_{t-1} \right) \\ S_{Pt} &= \frac{1}{\lambda} P_t(x_{It}) - \eta D_t - \chi_1 \hat{G}_{t-1} - \chi_2 \hat{Z}_{t-1} - \delta \theta_{It} \end{aligned}$$

Optimal consumption and demand

$$\begin{aligned} c_{It}^* &= \text{constant} + \frac{A_{IM} R}{\alpha_I + A_{IM} R} M_{It} + \frac{1}{2} X_{It}' m_I X_{It} \\ x_{It}^* &= \hat{H}_I' X_{It}, \end{aligned}$$

where m_I is a 8×8 symmetric matrix, and $\hat{H}_U$ is a 8×1 vector.

Uninformed investor's problem

Dynamic programming

- Plugging back into the Bellman equation and equating coefficients produces

$$\begin{aligned} A_{I0} &= \frac{1}{r} \left(\rho - \log(r d_I) + R \log(r/R) \right) \\ A_{IM} &= \frac{r}{R} \alpha_I, \end{aligned}$$

  and matrix Q_I must satisfy

$$Q_I = m_I / R. \tag{3}$$

- Functional form for price and the statistic S_{Pt} implies x_{Ut}^* can be implemented by submitting a demand schedule

$$x_{It}^* = \hat{H}_I X_{It} - h_I P_t(x_{It}^*). \tag{4}$$

  This function must match the initial conjecture.
- Eq. (3) and (4) is system of 35 equations in 35 unknowns

Equilibrium existence

- Equilibrium characterized by solutions to system of equations
  - In principle, 45 equations
  - Dimensionality reduced by some analytical manipulations
- Resort to numerical solutions

Definition of drifts and reversals

- Let $r_t^e = D_t + P_t - RP_{t-1}$, and $r_{t,t+k} = \sum_{j=1}^{k} r_{t+j}^e$
- Price exhibits momentum (reversal) at horizon k if

$$\mathrm{Cov}(r_{t+k}^e, r_t^e) > 0 \qquad (< 0)$$

- Alternately, can consider non-cumulative returns

$$\mathrm{Cov}(r_{t,t+k}^e, r_{t-k,t}^e) > 0 \qquad (< 0)$$

Symmetric information benchmark

- All investors observe G_t and Z_t directly
- Quasi-closed form solutions available (up to γ_j's and 6 value function parameters)

$$
\begin{aligned}
x_{It} = {} & \gamma_I \left(\tfrac{1}{R-\phi_G} G_t + \left(-\tfrac{r\alpha_I}{R} \tfrac{\varphi_{DY}\sigma_D\sigma_Y}{R} + \tfrac{R}{r\alpha_I} \tfrac{Q_{I13}\phi_Z}{R(1+Q_{I33}\sigma_Z^2)} \right) Z_t \right) \\
& + \tfrac{\gamma_I}{r\alpha_I} \left(Q_{I11} - \tfrac{Q_{I13}^2\sigma_Z^2}{1+Q_{I33}*\sigma_Z^2} - \left(\tfrac{r\alpha_I}{R}\right)^2 \left(\tfrac{\sigma_G^2}{(R-\phi_G)^2} + \sigma_D^2 \right) \right) \theta_{It} - \gamma_I P_t \\
x_{Ut} = {} & \gamma_U \left(\tfrac{1}{R-\phi_G} G_t + \tfrac{R}{r\alpha_U} \tfrac{Q_{U13}\phi_Z}{R(1+Q_{U33}\sigma_Z^2)} Z_t \right) - \theta_{Ut} - \gamma_U P_t,
\end{aligned}
$$

where

$$
\begin{aligned}
\gamma_I &= \frac{r\alpha_I}{\frac{r\alpha_I}{\gamma_U} - Q_{I11} - \frac{Q_{I13}^2\sigma_Z^2}{1+Q_{I33}*\sigma_Z^2} - \left(\frac{r\alpha_I}{R}\right)^2 \left(\frac{\sigma_G^2}{(R-\phi_G)^2} + \sigma_D^2 \right)} \\
\gamma_U &= \frac{r\alpha_U}{-Q_{U11} - \frac{Q_{U13}^2\sigma_Z^2}{1+Q_{U33}*\sigma_Z^2} - \left(\frac{r\alpha_U}{R}\right)^2 \left(\frac{\sigma_G^2}{(R-\phi_G)^2} + \sigma_D^2 \right)}
\end{aligned}
$$

Symmetric information benchmark

Equilibrium price and holdings

- With demand function parameters, equilibrium price and holdings follow

$$
\begin{aligned}
P_t &= \tfrac{1}{R-\phi_G} G_t + \underbrace{\frac{\beta_{I2}+\beta_{U2}}{\gamma_I+\gamma_U}}_{a_Z} Z_t + \underbrace{\frac{1}{\gamma_I+\gamma_U}(1-\delta_I)}_{a_\theta} \theta_{It} \\
\theta_{It+1} &= \underbrace{\frac{\gamma_U\beta_{I2}-\gamma_I\beta_{U2}}{\gamma_I+\gamma_U}}_{b_Z} Z_t + \underbrace{(1-\delta_I)\frac{\gamma_U}{\gamma_I+\gamma_U}}_{b_\theta} \theta_{It} \\
\theta_{Ut} &= -\theta_{It}
\end{aligned}
$$

- Investors' positions are mean-reverting to local mean = efficient risk-sharing

Returns

- Excess returns

$$
\begin{aligned}
r^e_{t+1} &= D_{t+1} + P_{t+1} - RP_t \\
&= \frac{\sigma_G}{(R-\phi_G)^2}\varepsilon_{Gt+1} + \sigma_D \varepsilon_{Dt+1} \\
&\qquad a_Z\left(Z_{t+1} - RZ_t\right) + a_\theta\left(\theta_{It+1} - R\theta_{It}\right),
\end{aligned}
$$

- Can show that expected excess returns follow 2-factor model

$$
\mathbb{E}_t[r^e_{t+1}] = \underbrace{a_Z(\phi_Z - R)Z_t}_{\text{Risk premium due to } Z} + \underbrace{a_\theta(b_Z Z_t + (b_\theta - R)\theta_{It})}_{\text{Risk premium due to } \theta_I}
$$

Calibration

α_I	4	U = 3/4 of "capital" $\approx$ % held MF & retail
α_U	8	
R	1.08	
ϕ_G	0.5	CK[1]
σ_G	2	CK, $\frac{\sigma_D}{\sigma_G} = 1/2$
σ_D	1	
σ_Y	2.33	$= \mathrm{Var}(D_t)$
φ_{DY}	0.7	
ϕ_Z	$\frac{1}{1.08}$	$= 1/R$
σ_Z	1	

[1] Campbell and Kyle (1993, CK) estimate a CARA-Normal model using aggregate stock market data.

Simulated series: Z_t, θ_{It}, $\theta_{It}^{\text{comp}}$

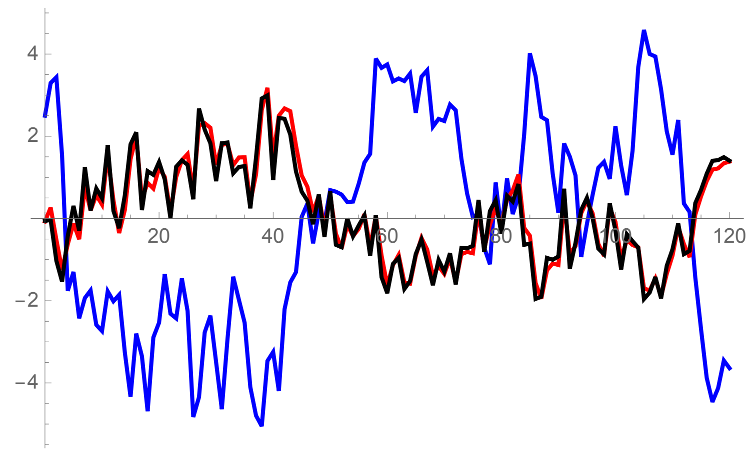

Figure: Endowment of nontradeable asset (blue), informed holdings (black), and informed holdings (red) in competitive setting.

Momentum/reversals for $k = 1$

At one-period horizon,

$$\begin{aligned}
&\mathrm{Cov}(r^e_{t,t+1}, r^e_{t-1,1}) \\
&= a_Z^2 \,\mathrm{Cov}(Z_{t+1} - RZ_t, Z_t - RZ_{t-1}) \\
&\quad + a_\theta a_Z \,\mathrm{Cov}(Z_{t+1} - RZ_t, \theta_{It} - R\theta_{It-1}) \\
&\quad + a_\theta a_Z \,\mathrm{Cov}(\theta_{It+1} - R\theta_{It}, Z_t - RZ_{t-1}) \\
&\quad + a_\theta^2 \,\mathrm{Cov}(\theta_{It+1} - R\theta_{It}, \theta_{It} - R\theta_{It-1})
\end{aligned}$$

Depends on

- Autocovariance of ('excess') innovations in Z
- Lagged cross-covariance of innovations in Z_t and θ_{It}
- Autocovariance of innovations in θ_{It}

Economic intuition for drifts/reversals at $k = 1$

- Autocovariance of Z_t.
  - Are innovations in quantity of risk Z_t positively or negatively related to future innovations
  - In competitive setting: momentum if $\phi_Z > 1/R$, reversals if $\phi_Z < 1/R$; sign same at all horizons
  - In calibrations with $\phi_Z = 1/R$ this term $= 0$
- Autocovariance of θ_{It}
  - Direct effect of predicability of changes in inventory
  - In calibrations ≈ 0
- Cross-covariances
  - Ceteris paribus, nontraded endowment $\downarrow \Rightarrow$ informed close out short positions $\Rightarrow r_t^e \uparrow$
  - As inventories (and hence prices) respond only slowly and Z_t is highly persistent, this also forecasts a net positive change in risky asset holdings next period and consequently a price increase
  - However, trading against this 'mispricing' is risky, so uninformed do not completely eliminate, leading to momentum
  - In the long run, Z_t reverts to zero, and 'mispricing' due to this shock converges to zero

Return autocovariances

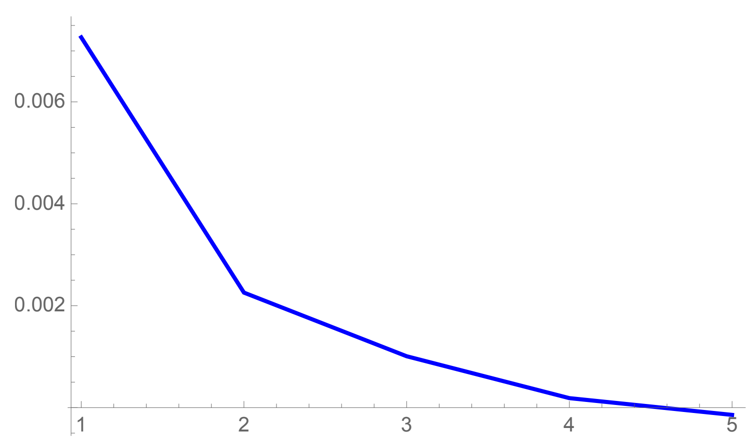

Figure: Autocovariance function of one-period returns

Conclusion

- Dynamic, strategic trading model
- Price drifts/reversals depend on:
  - Correlation of endowment shocks
  - Adjustment speed of strategic traders
- Numerical results suggest return autocorrelations larger when
  - Information asymmetry is larger
  - Residual risk is higher