Information Immobility and the Home Bias
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Discussed by Urban Jermann

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Contribution: Model with endogenous information asymmetry to study portfolio home bias

Key model features:

- CARA-normal (mean-variance) portfolio choice
- Private signals about asset payoffs
- Information acquisition subject to capacity constraint (Sims 2003)
- Noisy rational expectations equilibrium (Admati 1985)
Main findings:

- Learning amplifies initial information asymmetry
- With enough learning capacity can explain US home bias
With information advantage, optimal share holdings are given by

\[ q^* = \left( \frac{1}{\rho} \right) \Sigma^{-1} (\hat{\mu} - pr) \]

Without information advantage

\[ q^{\text{no adv}} = \left( \frac{1}{\rho} \right) \Sigma^{-1} (\mu - pr) \]

For uncorrelated assets, for asset \( i \)

\[ q_i^* = \left( \frac{1}{\rho} \right) \frac{\hat{\mu}_i - p_ir}{\hat{\sigma}_i^2} \]
Portfolio Choice with Asymmetric Information

- Assuming information advantage is from private signal and $\sigma_i^2$ is known
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Expected holding (conditional on public information)

$$E\left[q_i^*\right] = \left(\frac{1}{\rho}\right) \frac{E[\mu_i - p_i r]}{\sigma_i^2} = \left(\frac{1}{\rho}\right) \frac{\mu_i - p_i r}{\sigma_i^2}$$

clearly

with $\hat{\sigma}_i^2 < \sigma_i^2$ then $|E(q_i^*)| > \left| E\left(q_i^{\text{no adv}}\right) \right| : \rightarrow \text{Home Bias}$
Portfolio Choice with Asymmetric Information

- Assuming information advantage is from private signal and \( \hat{\sigma}^2_i \) is known
  - Expected holding (conditional on public information)
    \[
    E [q_i^*] = \left( \frac{1}{\rho} \right) \frac{E[\hat{\mu}_i - p_i r]}{\hat{\sigma}^2_i} = \left( \frac{1}{\rho} \right) \frac{\mu_i - p_i r}{\hat{\sigma}^2_i}
    \]
    clearly
    
    with \( \hat{\sigma}^2_i < \sigma^2_i \) then \( |E(q_i^*)| > |E(q_{i \text{ no adv}})| \) → Home Bias
  
- Actual holding
    \[
    q_i^* - Eq_i^* = \left( \frac{1}{\rho} \right) \frac{(\hat{\mu}_i - p_i r) - E(\hat{\mu}_i - p_i r)}{\hat{\sigma}^2_i} \leq 0
    \]
Informed agent has higher expected returns

\[ E q_i^* (f_i - p_i r) = \left( \frac{1}{\rho} \right) \left[ E (\mu_i - p_i r) \right]^2 + \text{cov} (\hat{\mu}_i, f_i) \]

than non-informed agent

\[ \left( \frac{1}{\rho} \right) \left[ E (\mu_i - p_i r) \right]^2 \]
How much information asymmetry for (expected) home bias?

- Define domestic portfolio share

\[ w_h = \frac{Eq_h}{Eq_h + Eq_f}, \quad (p = 1) \]
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Assume 2 uncorrelated assets and symmetry, with

\[ \hat{\sigma}_h^2 = (1 - \tau) \hat{\sigma}_f^2 \]
How much information asymmetry for (expected) home bias?

- Define domestic portfolio share

\[ w_h = \frac{E_{q_h}}{E_{q_h} + E_{q_f}}, \quad (p = 1) \]

- assume 2 uncorrelated assets and symmetry, with

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- then

\[ w_h = \frac{1}{2 - \tau} \]
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- Then

\[ w_h = \frac{1}{2 - \tau} \]

- \( w_h = .9 \) requires

\[ \tau = .89 \]
Information asymmetry with correlated assets

Is Home Bias still a Puzzle with a 0.8 correlation?

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Domestic holdings with information advantage for different correlations

\( \rho = 0.8 \)
\( \rho = 0.5 \)
\( \rho = 0 \)

\( (\text{with } \mu_i - p_i r = 0.08, \sigma_i^2 = 0.2^2) \)
Information asymmetry with correlated assets

\[ \mu_i - p_i r = 0.08, \sigma_i^2 = 0.2^2 \]

Is Home Bias still a Puzzle with a 0.8 correlation?
Actual position depends on additional information

\[ q^* = \left( \frac{1}{\rho} \right) \hat{\Sigma}^{-1} (\hat{\mu} - pr), \text{ with } Var(\hat{\mu}) = \Sigma - \hat{\Sigma} \]
Actual positions with information advantage

- Actual position depends on additional information

\[
q^* = \left( \frac{1}{\rho} \right) \Sigma^{-1} (\hat{\mu} - pr), \text{ with } Var(\hat{\mu}) = \Sigma - \hat{\Sigma}
\]

- How likely is a short position in domestic holdings?
Actual positions with information advantage

- Actual position depends on additional information

\[ q^* = \left( \frac{1}{\rho} \right) \Sigma^{-1} (\hat{\mu} - pr), \text{ with } \text{Var}(\hat{\mu}) = \Sigma - \hat{\Sigma} \]

- How likely is a short position in domestic holdings?
  - With \( \rho = .8 \) and \( \tau = .42 \), we have \( \hat{\mu} \sim N(1.36, 4.2) \)

  Probability of negative position is 37%
Having substituted optimal share holdings, the learning problem with 2 uncorrelated assets can be written as

$$\max_{\{\hat{\sigma}_1, \hat{\sigma}_2\}} \frac{(1 + \theta_1^2) \sigma_1}{\hat{\sigma}_1^2} + \frac{(1 + \theta_2^2) \sigma_2}{\hat{\sigma}_2^2}, \text{ with } \theta_i^2 \equiv \frac{(\mu_i - pr)^2}{\sigma_i^2}$$

s.t.

$$\hat{\sigma}_1 \hat{\sigma}_2 \geq \sigma_1 \sigma_2 \exp(-K) : \text{ capacity constraint}$$

$$\hat{\sigma}_1 \leq \sigma_1 : \text{ no negative learning}$$

$$\hat{\sigma}_2 \leq \sigma_2$$
Main result of paper

- Rewrite problem

\[
\begin{align*}
\max_{\{S_1, S_2\}} & \quad L_1 \cdot S_1 + L_2 \cdot S_2 \\
\text{with } S_i &= \frac{1}{\sigma_i^2}, \text{"precision"}
\end{align*}
\]

s.t.

\[
S_1 S_2 \leq \frac{\exp(2K)}{\sigma_1 \sigma_2} : \text{"production possibility set"}
\]

\[
S_1 \geq \frac{1}{\sigma_1}, \quad S_2 \geq \frac{1}{\sigma_2}
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Main result of paper

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with \( S_i = \frac{1}{\hat{\sigma}^2_i} \), "precision"

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\]

- Linear indifference curves + convex production possibilities frontier \(\rightarrow\) multiple/corner solutions
Reasons for a more "concrete" capacity constraint

- Variety of information problems: Why same constraint?
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  - Limited capacity for processing (freely available) information (Sims)
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- Variety of information problems: Why same constraint?
  - Limited capacity for processing (freely available) information (Sims)
  - Costly Investigation
- Exact functional form is crucial here
- Useful for quantitative analysis
Another capacity constraint: Un-Learnable Risk

Consider the following capacity constraint from VNV (2005)

\[
\left( \hat{\sigma}_1^2 - \alpha \sigma_1^2 \right) \left( \hat{\sigma}_2^2 - \alpha \sigma_2^2 \right) \geq (1 - \alpha)^2 \sigma_1^2 \sigma_1^2 \exp(-2K)
\]
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\( \alpha \sigma_i^2 \equiv \text{un-learnable risk}, \ 0 \leq \alpha \leq 1 \)
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\left( \hat{\sigma}_1^2 - \alpha \sigma_1^2 \right) \left( \hat{\sigma}_2^2 - \alpha \sigma_2^2 \right) \geq (1 - \alpha)^2 \left( \sigma_1^2 \right) \left( \sigma_1^2 \right) \exp \left( -2K \right)
\]

\(\alpha \sigma_i^2 \equiv \text{un-learnable risk, } 0 \leq \alpha \leq 1\)

Eliminating all learnable risk, \(\left( \hat{\sigma}_i^2 - \alpha \sigma_i^2 \right) \rightarrow 0\), requires infinite capacity
Home bias with learning and un-learnable risk

Portfolio share of domestic holdings

Variance reduction through learning 1-exp(-2K)

α = 0

α = 0.4

α = 0.5
Overall

- Very nice model, very nice analysis!
- I would like
  - more concreteness on the capacity constraint
  - more detailed quantitative analysis