Information Immobility and the Home Bias Puzzle

A short review

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Motivation

- Claim: Home bias arises because investors can predict home asset payoffs more accurately.

- Question: But why does access to global information not eliminate this asymmetry?

- This paper develops a learning model that explains the persistence of home bias.

Market dynamics (1)

$t = 0$:
- Investors know that $f \sim N(\mu, \Sigma)$
- The return f is realized but not observed.

$t = 1$:
- Investor j picks $\boldsymbol{\Sigma_\eta^j}$
- j observes $\hat{f}_j \sim N(f, \Sigma_\eta^j)$
- Magic happens and market has prices: $x \mapsto p(x)$
- j updates to his posterior, $f \sim N(\hat{\mu}^j, \hat{\Sigma}^j)$

$t = 2$:
- Based on p and his posterior, investor j picks a procurement function $\boldsymbol{x \mapsto q^j(x)}$.
- Market draws and reveals x.
- Market clears and prices are set.

$t = 3$: f is revealed; everyone consumes.

Let's explain all the different Σ's

The similarity transform: $\Sigma = \Gamma\Lambda\Gamma'$. Then Λ_i is the variance of the risk factor i, and Γ_i represents the loadings of each asset on the i-th factor.

1. Σ: the variance of the prior of home investors
2. $\Sigma^\star$: the variance of the prior of foreign investors
3. $\hat{\Sigma}^j$: the posterior
4. $\boldsymbol{\Sigma^j_\eta}$: j's choice of the precision about his signal
5. Σ^a_η: the averaged investor's precision about the signal; $\frac{1}{2}\Sigma^{-1} + \frac{1}{2}(\Sigma^\star)^{-1} + \sum_j (\Sigma^j_\eta)^{-1}$
6. Σ_p: the precision of prices as signals about payoffs; $\frac{1}{\rho^2\sigma_x^2}(\Sigma^a_\eta(\Sigma^a_\eta)')^{-1}$
7. $\hat{\Sigma}^a$: the posterior of the averaged investor; $\frac{1}{\rho^2\sigma_x^2}(\Sigma^a_\eta(\Sigma^a_\eta)')^{-1} + (\Sigma^a_\eta)^{-1}$

Market dynamics (2)

1. Investors start with some information difference between home and foreign risk factors.
2. They can choose to reduce the uncertainties about any of the two markets and also about any of the risk factors.
3. They do so by choosing Σ_{η}^{j}, the strength of the signal.
4. Their posteriors beliefs depend on that choice.
5. Portfolio choice depends on posterior beliefs.

Capacity constraint

Capacity is defined as the constant $K \geq 1$ such that

$$|\Sigma^j| \leq K|\hat{\Sigma}^j|.$$

It measures how much an investor can reduce the uncertainty of the payoff of one asset through learning.

No negative learning constraint

The investor cannot choose to increase uncertainty, i.e. Σ_η^j is positive semidefinite, which is equivalent to

$$\Lambda_\eta \geq 0.$$

Updating beliefs

The posterior mean is

$$\begin{aligned}\hat{\mu}_j =& [(\Sigma_j)^{-1} + (\Sigma_\eta^j)^{-1} + (\Sigma_p)^{-1}]^{-1} \\ & [(\Sigma^j)^{-1}\mu_j + (\Sigma_\eta^j)^{-1}\hat{f}^j + \Sigma_p^{-1}(rp - A)].\end{aligned}$$

The posterior variance is

$$\hat{\Sigma}_j = [(\Sigma^j)^{-1} + (\Sigma_\eta^j)^{-1} + (\Sigma_p)^{-1}]^{-1}.$$

The equilibrium condition

The equilibrium is the triplet $\left(p, \{q^j, \Sigma_\eta^j\}_j\right)$ satisfying

1.

$$(q_j, \hat{\Sigma}^j) \in \arg\max_{\tilde{q}_j, \tilde{\Sigma}_j} \mathbb{E}[U(p, \tilde{q}_j, f, \tilde{\Sigma}^j)],$$

where

$$U(p, q, f, \Sigma) = \rho q'(f - rp) - \frac{\rho^2}{2} q' \Sigma q.$$

and recall that $\hat{\Sigma}^j$ is a deterministic function of $\{\Sigma_\eta^j\}$.

2.

$$\sum_j q^j = x + \bar{x},$$

where $x \sim N(0, \sigma_x I)$ is the uncertain portion of the supply of assets.

Information Acquisition without increasing return to information

Proposition (#1)

Fix q. Then there is a K^* such that for some M,
1. $K \geq K^* \Rightarrow \hat{\Lambda}_i = M$.
2. $K < K^* \Rightarrow \hat{\Lambda}_i = \min\{\Lambda_i, M\}$.

In words, if there is enough capacity, the agents will learn as much as possible for all risk factors. If there is not, then agents will do the best they can.

Define the learning index

Definition

$$\mathcal{L}_i^j \equiv (\rho \Lambda_i^a \Gamma'_i \bar{x})^2((\Lambda_i^j)^{-1} + \Lambda_{pi}^{-1}) + \frac{\Lambda_{pi}}{\Lambda_i^j}$$

Note that
1. The second term measures the relative information in the price vector and prior.
2. Roughly speaking, the first term is the factor i's expected return, scaled by a variance.

Optimal information acquisition

Proposition (#2)

Let $i^* = \arg\max_i \mathcal{L}_i^j$. *The optimal information choice is*

1. $\hat{\Lambda}_k^j = \Lambda_k^j$ *if* $k \neq i^*$.
2. $\hat{\Lambda}_k^j < \Lambda_k^j$ *if* $k = i^*$.

That is, each investor picks one risk factor and tries to reduce its uncertainty for as much as possible.

Learning amplifies information asymmetry

Proposition (#3)

For every home risk factor h,

$$\hat{\Lambda}_h^{-1} - \Lambda_h^{-1} \geq (\hat{\Lambda}_h^*)^{-1} - (\Lambda_h^*)^{-1}.$$

Note $\hat{\Lambda}_h^{-1} - \Lambda_h^{-1}$ measures the amount of information learned from his signal and market prices.

Learning increases home bias

Proposition (#4)

The home bias is larger when investors can learn than when they cannot.

The home bias is defined as

$$\mathcal{H}^j(q) \equiv \mathbb{E}[\bar{\Gamma}_j' q] - \mathbb{E}[\bar{\Gamma}_j' q^{\text{div}}]$$

where $\bar{\Gamma}_h = \sum_{\text{all home risk factors } h} \Gamma_h$.

Summarizing the theoretical results

Result 1: Focus on only one risk factor.

Result 2: Learning intensifies the initial information difference.

Result 3: The ability to learn increases home bias.

And almost all the empirical facts could be explained through these predictions.

A1 Direct evidence of information asymmetry

- Bae, Stulz, and Tan (2008) show that home analysts have a more accurate prediction on earnings forecast.
- Guiso and Jappelli (2006) use survey data to show investors who spend more time on information collection hold a less diversified portfolio and earn a higher return.

A2 Local bias

- Coval and Moskowitz (2001) observes local bias.
- Local bias is explained by the same logic as home bias: local investors have an initial information advantage.

A3 Industry bias

- Massa and Simonov (2006) find that Swedish investors buy assets closely related to their non-financial income.
- Cohen, Franzzini, and Malloy (2007) find that fund managers invest more on companies run by their former classmates and earn a higher return.
- To explain this bias, we again observe that it is plausible that both groups probably have an initial information advantage.

A4 Under-diversified foreign investment

- Kang and Stulz (1997) show that foreign investment is concentrated in large firms.
- According to proposition 2, the investor would choose to focus on reducing the uncertainty of the one foreign risk factor that has the highest learning index. Hence, the investment is concentrated.

A5 Portfolio outperformance

- Transactions costs and behavior biases explanation do not explain the story that concentrated portfolios deliver excess returns.
- This theory predicts that non-diversified portfolios can have higher return because of informational advantages.

Discussion on capacities

The attempt to nail down the numerical value of the measurement of how much an investor can reduce the uncertainty of payoff of an asset is *problematic*.

- With $K = .22$, one can deduces that home bias is about 19.4%.
- With $K = .7$, home bias is about 59.5%.
- Home bias in a data set of U.S. investors is about 76%, which would require $K = 0.82$.

Two issues that are inconsistent with theory

1. Seashole (2004) shows that in the Taiwan market, foreign investors outperform locals.
2. Data show that there is a slight declining trend about home bias.

- Resolution for issue 1: heterogeneous capacities K for home and foreign investors.
- Resolution for issue 2: dynamic capacities K_t.

Estimating the learning index of the average investor

- They claim that the learning index can be computed for the averaged investor.

$$\mathcal{L}_i^j = (\rho \Lambda_i^a \Gamma_i' \bar{x})^2 ((\Lambda_i^j)^{-1} + \Lambda_{pi}^{-1}) + \frac{\Lambda_{pi}}{\Lambda_i^j}$$

- Then, the learning index of assets, industry portfolio, and price indices can also be computed.
- Assets with very high learning index should have a lower return.
- A country and a region's learning index should be related to the home bias of its residents' portfolios.

Main take away

Investors have an incentive to choose to learn information that others do not know.