"Information Immobility and the Home Bias Puzzle"

Van Nieuwerburgh + Veldkamp (J. Finance, 2009)

- Traditional info-based models of home bias focus on the *supply* of info.
- This paper asks why? Focuses on the *demand* for info. Info. structure is *endogenous*
- Info. immobility persists not because investors *cannot* learn about foreign assets, but because they *choose* not to.
- *Basic Idea*: Increasing returns to info. acquisition.

$$\begin{tikzcd} \text{More Info.} \arrow[d, bend left] \\ \text{More Demand} \arrow[u, bend left] \end{tikzcd} \Rightarrow \text{Corner Solution}$$

The Model

- Static 2-country RE model (Prices reveal info.)
- Eakh country populated by a continuum of identical investors
  - H investors have slight initial info. advantage for H assets
  - F " " " " " " " F assets

Timing

1.) Choose signal distribution s.t. info.-processing constraint

2.) After observing signals, chouse portfolio.

3.) Prices adjust to clear markets + payoffs realized.

Key Mechanism

Interaction between info. choice and portfolio choice.

Key Idea

Equil. prices reflect average info.

Better informed investors earn "excess returns" (info. rent)

$\Rightarrow$ Investors want to differentiate their info. sets (specialization)

Preferences

$$U = \max_{q} \; -E\left\{-\rho q'(f - rp) + \tfrac{\rho}{2} q' \hat{\Sigma} q\right\}$$

Can derive from exp. util. over terminal wealth

$W = rW_0 + q'(f - rp)$

ρ : coef. of absolute risk aversion

r : risk-free rate

q : $N \times 1$ vector of asset demands

f : $N \times 1$ vector of asset payoffs

p : $N \times 1$ vector of asset prices

$\hat{\Sigma}$: $N \times N$ posterior var-cov. matrix of payoffs

Prior Beliefs

- Note, distribution of f is Common Knowledge. What investors are learning about is the particular f that was drawn. That is, investors only learn about mean payoffs, not the variance.

$$H: \mu \sim N(f, \Sigma) \qquad F \sim N(f, \Sigma^*) \qquad \Sigma < \Sigma^*$$

Info. Acquisition

- At time 1, each investor chooses a variance Σ_η for signal

$$\eta \sim N(f, \Sigma_\eta)$$

- At time 2, each investor observes $N \times 1$ vector of signals, η, about f.

(Investors signals are indpt. of each other).

Key Simplifying Assumptions

1.) Decompose prior var-cov matrix, $\Sigma = \Gamma \Lambda \Gamma'$ > Decompose total asset risk into a set of N orthogonal "risk factors"

Λ_i = prior var. of each risk factor

Γ_i = loadings of each asset on i^{th} risk factor

2.) H & F priors have same eig. vectors, but different eig. values

⇒ Investors choose different levels of risk for the same risk factors.

⇒ Investors observe signals $\Gamma'\eta$ about risk factor payoffs $\Gamma' f$

⇒ Posterior Var : $\hat{\Sigma} = \Gamma \hat{\Lambda} \Gamma'$

$\Lambda_i - \hat{\Lambda}_i$ = decrease in uncertainty about risk factor i

Info. Processing Constraints

1.) $|\hat{\Sigma}| \geq \frac{1}{K} |\Sigma|$ $K \geq 1$ is overall "capacity constraint"

Comments : a.) This is a cost of processing info., not a cost of purchasing/acquiring it

b.) Same for all investors + assets

c.) Everybody must process their own info. Can't pay a port. manager to do it!

2.) No forgetting. Can't increase uncertainty about some risks in order to reduce other risks. $\Lambda_{\eta i} \geq 0$ where $\Sigma_\eta = \Gamma \Lambda_\eta \Gamma'$

Belief Updating

$$\hat{\mu}^j = E[f \mid \mu^j, \eta^j, p] = (\hat{\Sigma}^j)^{-1}\left[(\Sigma^j)^{-1}\mu_j + (\Sigma_\eta^j)^{-1}\eta^j + \Sigma_p^{-1}(rp - \bar{x})\right]$$

$$\hat{\Sigma}^j = V[f \mid \mu^j, \eta^j, p] = \left[(\Sigma^j)^{-1} + (\Sigma_\eta^j)^{-1} + \Sigma_p^{-1}\right]^{-1}$$

Asset Demands

$$q^j = \frac{1}{\rho}(\hat{\Sigma}^j)^{-1}\left[\hat{\mu}^j - rp\right]$$

Market-Clearing

$$\int_0^1 q^j \, dj = \bar{x} + x$$

Noise $\sim N(0, \sigma_x^2 I)$

Fixed Pt. Problem: Demand depends on info. revealed by prices
But info. revealed by prices depends on demand!

Guess + Verify: $P = A + B \cdot f + C \cdot x$

$$A = -\rho\left[\frac{1}{\rho^2 \sigma_x^2}(\Sigma_\eta^a \Sigma_\eta^{a'})^{-1} + (\Sigma_\eta^a)^{-1}\right]^{-1}\bar{x}$$

$$B = 1$$

$$C = -\left[\frac{1}{\rho^2 \sigma_x^2}(\Sigma_\eta^a \Sigma_\eta^{a'})^{-1} + (\Sigma_\eta^a)^{-1}\right]^{-1}\left(\rho \cdot I + \frac{1}{\rho \sigma_x^2}(\Sigma_\eta^a)^{-1'}\right)$$

1^{st} period Info. Choice Problem

$$\hat{U} : \max_{\hat{\Lambda}^j} E\left[\frac{1}{2}(\hat{\mu}^j - pr)'(\hat{\Sigma}^j)^{-1}(\hat{\mu}^j - pr) \,\middle|\, \mu, \Sigma\right]$$

Note, $\hat{\mu} - pr$ is a Normal r.v., so we must calculate mean of a χ^2 r.v. Can write as,

$$\hat{U} = \max_{\hat{\Lambda}^j} \sum_i \left[\Lambda_{p_i} + (\rho \Gamma_i' \bar{x} \hat{\Lambda}_i^a)^2\right](\hat{\Lambda}_i^j)^{-1}$$

s.t. info. processing constraint

Defn: Investor j's learning index for risk factor i is

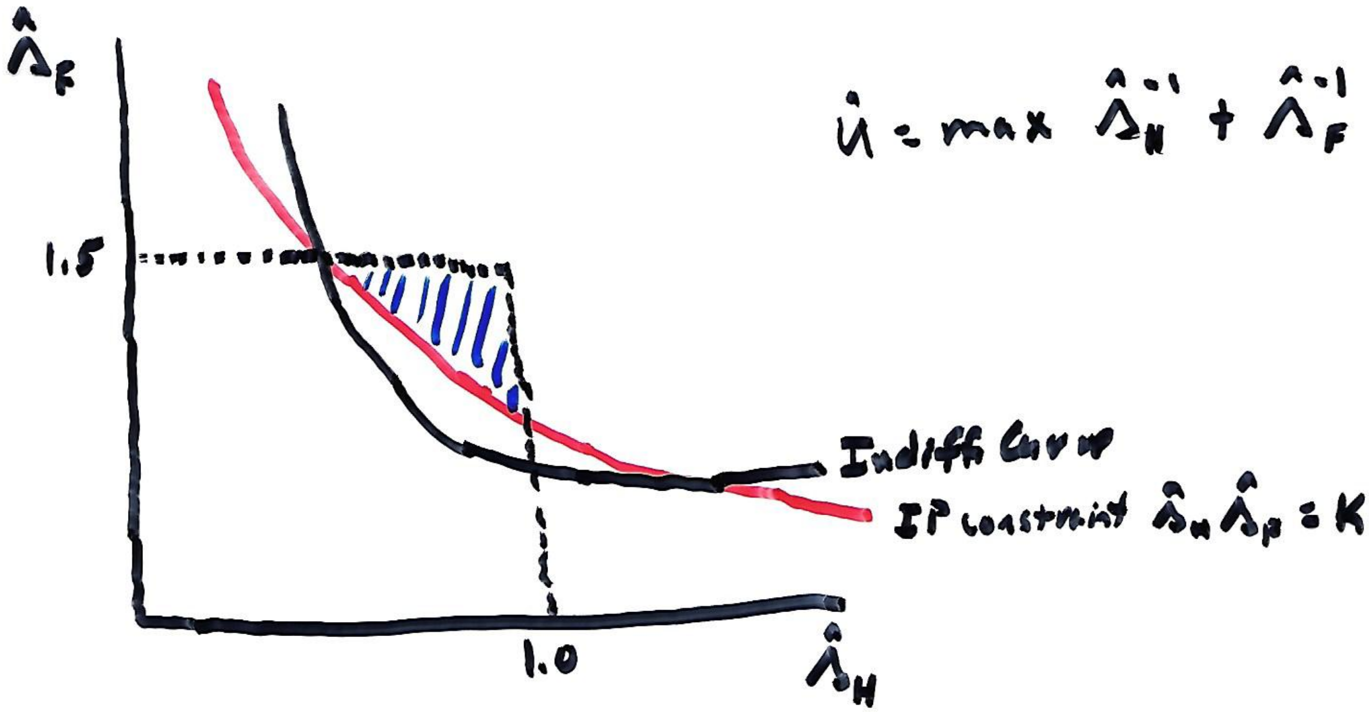
$$\mathcal{L}_i^j = (\rho \hat{\Lambda}_i^a \Gamma_i' \bar{x})^2\left[(\Lambda_i^j)^{-1} + \Lambda_{p_i}^{-1}\right] + \frac{\Lambda_{p_i}}{\Lambda_i^j}$$

Proposition: Each investor j sets $\hat{\Lambda}_k^j = \Lambda_k^j \;\; \forall\, k \neq i$ and $\hat{\Lambda}_i^j < \Lambda_i^j$ for risk factor i, where $i = \arg\max_i \{\mathcal{L}_i^j\}$. $\Rightarrow$ specialization in learning

Implications:

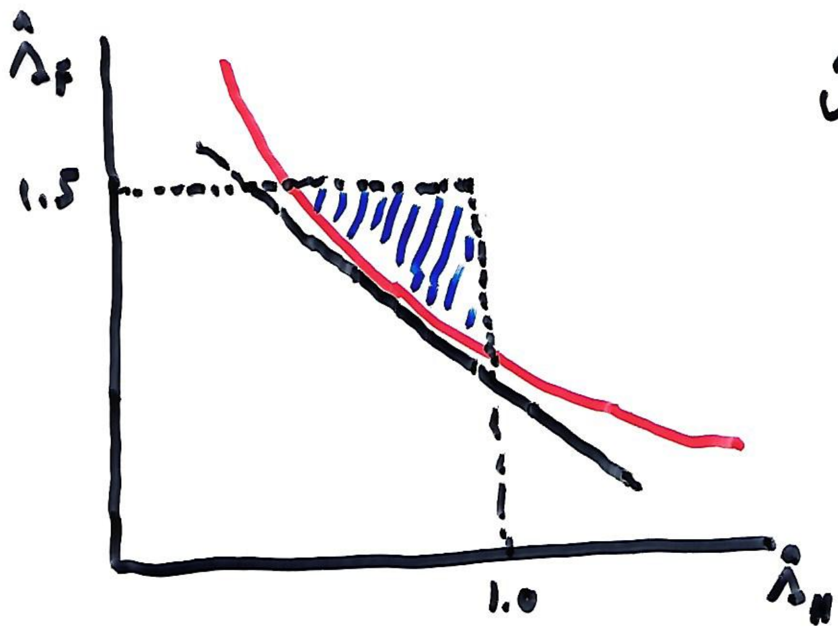
Investors learn more about:
1.) "Important" stocks ($\bar{x}$ big)
2.) Risk factors where avg. uncertainty is big ($\hat{\Lambda}_i^a$ big)
3.) Risk factors with less initial uncertainty (Λ_i^j low)

Graphical Depiction of Equil.



$\hat{U} = \max \hat{\Lambda}_H^{-1} + \hat{\Lambda}_F^{-1}$

Exog. Portfolio Benchmark



$\hat{U} = \min \hat{\Lambda}_H + \hat{\Lambda}_F$