"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.
The Model

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

Timing

1.) Choose signal distribution s.t. info.-processing constraint
2.) After observing signals, choose 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)
⇒ Investors want to differentiate their info. sets (specialization)
Preferences

\[ U = \max_{\mathbf{g}} -E\{ -p g' (f - r p) + \varphi g' \Sigma g \} \]

- \( p \) = coeff. of absolute risk aversion
- \( r \) = risk-free rate
- \( \varphi \) = \( N \times 1 \) vector of asset demands
- \( f \) = \( N \times 1 \) vector of asset payoffs
- \( P \) = \( N \times 1 \) vector of asset prices
- \( \Sigma \) = \( N \times N \) 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.

\[ H: \eta \sim N(\eta, \Sigma) \quad F \sim N(f, \Sigma^* ) \quad \Sigma < \Sigma^* \]

Info. Acquisition

At time 1, each investor chooses a variance \( \Sigma_0 \) for signal

\[ \eta \sim N(\eta, \Sigma_0) \]

At time 2, each investor observes \( N \times 1 \) vector of signals, \( \eta \), about \( f \).

(Investors signals are indpt. of each other).
Key Simplifying Assumptions

1.) Decompose prior var-cov matrix, $\Sigma = \Gamma \Lambda \Gamma'$

$\Lambda_i$: prior var. of each risk factor

$\Gamma_i$: loadings of each asset on $i^{th}$ risk factor

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

$\Rightarrow$ Investors choose different levels of risk for the same risk factors.

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

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

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

Info. Processing Constraints

1.) $|\hat{\Sigma}| \geq \frac{1}{K} |\Sigma| \quad K \geq 1$ 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. $\Lambda_{qi} \geq 0$ where $\Sigma_{ii} = \Gamma \Lambda_i \Gamma'$
Belief Updating

\[ \hat{\Sigma}^i = \mathbb{E}[f | \hat{m}^i, \hat{q}^i, \rho] = \left( \hat{\Sigma}^i \right)^{-1} \left( \hat{\Sigma}^i \right)' \hat{m}^i + \left( \hat{\Sigma}^i \right)' \hat{q}^i + \Sigma^i \right)_{\rho - \sigma} \]

\[ \hat{\Sigma}^i = \nabla [f | \hat{m}^i, \hat{q}^i, \rho] = \left[ (\hat{\Sigma}^i)' + (\hat{\Sigma}^i)' + \Sigma^i \right]^{-1} \]

Asset Demands

\[ \hat{q}^i = \frac{1}{\rho} (\hat{\Sigma}^i)' \left[ \hat{m}^i - \rho \right] \]

Market-Clearing

\[ \int_0^1 \hat{q}^i \, d\hat{s} = \bar{x} + x \]

Noise ~ \text{N}(0, \sigma^2 I)

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

Guess & Verify: \( P = A + B \cdot f + C \cdot x \)

\[ A = -\rho \left[ \frac{1}{\rho \sigma^2} (\hat{\Sigma}^i \hat{\Sigma}'^i)' + (\hat{\Sigma}^i)' \right]^{-1} \bar{x} \]

\[ B = 1 \]

\[ C = -\left[ \frac{1}{\rho \sigma^2} (\hat{\Sigma}^i \hat{\Sigma}'^i)' + (\hat{\Sigma}^i)' \right]^{-1} \left( \rho \bar{x} + \frac{1}{\sigma^2} (\hat{\Sigma}^i)' \right) \]
1st period Info. Choice Problem

\[ \hat{U} = \max_{\hat{\lambda}_i} E \left[ \frac{1}{2} (\hat{\lambda}_i - pr)' \left( \Sigma^i \right)^{-1} (\hat{\lambda}_i - pr) \right| \lambda_0, \Sigma \] 

Note, \( \hat{\lambda} - pr \) is a Normal r.v., so we must calculate mean of a \( \chi^2 \) r.v. Can write as,

\[ \hat{U} = \max_{\hat{\lambda}_i} \sum \left[ \Lambda_{pi} + (\rho \hat{\lambda}_i \times \hat{\lambda}_i)' \right] (\hat{\lambda}_i)' \]

s.t. info. processing constraint

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

\[ \tilde{L}_i = \left( e^{\hat{\lambda}_i} \hat{\lambda}_i \right)^{1/2} \left[ (\hat{\lambda}_i)' + \Lambda_{pi} \right] + \frac{\Lambda_{pi}}{\Lambda_i} \]

Proposition: Each investor j sets \( \hat{\lambda}_i = \lambda_i \) \( \forall k \neq i \)

and \( \hat{\lambda}_i < \lambda_i \) for risk factor i, where

\[ i = \arg \max \{ \tilde{L}_i \} \Rightarrow \text{specialisation in learning} \]

Implications:

Investors learn more about:

1.) "Important" stocks \( (\tilde{L}_i \text{ big}) \)

2.) Risk factors where avg. uncertainty is big \( (\tilde{L}_i \text{ big}) \)

3.) Risk factors with less initial uncertainty \( (\tilde{L}_i \text{ low}) \)
Graphical Depiction of Equil.

\[ \hat{U} = \max \hat{\Lambda}_N + \hat{\Lambda}_F \]

Indiff Curve
IP constraint \( \hat{\Lambda}_N \hat{\Lambda}_F = K \)

Exog. Portfolio Benchmark

\[ \hat{U} = \min \hat{\Lambda}_N + \hat{\Lambda}_F \]