Measures of Equity Home Bias Puzzle

Mishra, Anil

University of Western Sydney

5 December 2014

Measures of Equity Home Bias Puzzle

Anil V Mishra[a]

University of Western Sydney, School of Business, Australia

The paper develops measures of home bias for 46 countries over the period 2001 to 2011 by employing various models: International Capital Asset Pricing Model (ICAPM), Mean-Variance, Minimum-Variance, Bayes-Stein, Bayesian and Multi-Prior. ICAPM country portfolio weights are computed relative to world market capitalization. Bayesian model allows for various degrees of mis-trust in the ICAPM and Multi-Prior model's investors' ambiguity aversion. Mean-Variance computes optimal weights by sample estimates of mean and covariance matrix of sample return and Bayes-Stein improves precision associated with estimating the expected return of each asset. Paper finds that, for few countries, there is not much change in home bias measures using various models. Foreign listing, idiosyncratic risk, beta, inflation, natural resources rents, size, global financial crisis and institutional quality have significant impact on home bias. There are policy implications associated with home bias.

[a]Corresponding author: Anil V. Mishra; University of Western Sydney, School of Business, Australia; Tel. No: 9685 9230; E-mail address: a.mishra@uws.edu.au

Measures of Equity Home Bias Puzzle

1 Introduction

There is a body of literature on equity home bias[1] that focuses on the fact that investors are found to hold disproportionately large share of their wealth in domestic portfolios as compared to predictions of standard portfolio theory. In the home bias studies, the actual portfolio holdings are compared to a benchmark. Depending upon the benchmark weights, there are two main approaches to home bias studies, i.e. model based approach and return based approach. In the model based, International Capital Asset Pricing Model (ICAPM), benchmark is characterized by the weight of a country in the world market capitalization. The ICAPM approach ignores returns. The data based approach uses time series of returns and computes benchmark weights from a mean-variance optimization[2]. Sample estimates of mean and covariance matrix of asset returns is used to compute optimal weights in a mean-variance framework. The optimal weights lead to extreme positions and fluctuate substantially over time[3]. The data based approach ignores the asset pricing model[4]. These two approaches give different benchmark weights and accordingly, home bias measures are quite different. Bayesian framework considers both, ICAPM asset pricing approach and mean-variance data based approach. It is based on investors' degree of confidence in the model based approach. As the degree of scepticism about the model grows, the portfolio weights move away from those implied by the model-based to those obtained from data based approach.

---

[1] See Sercu and Vanpee (2012) for a review on home bias literature.
[2] Hasan and Simaan (2000) show that home bias is consistent with rational mean-variance portfolio choice.
[3] See Best and Grauer (1991) and Litterman (2003) for problems in mean-variance optimal portfolios. Chopra and Ziemba (1993) state that errors in estimating returns are over 10 times as costly as errors in estimating variances, and over 20 times as costly as errors in estimating covariances.
[4] See Sharpe (1966) and Lintner (1966) for explanation of capital asset pricing model.

This paper develops measures of home bias for a sample 46 countries[5] by employing various models i.e. ICAPM, Mean-Variance, Minimum-Variance, Bayes Stein, Bayesian and Multi Prior. First, the paper develops measures of home bias that take into account scepticism of investors in the ICAPM model. Pastor (2000) approaches portfolio selection in a Bayesian framework that incorporates a prior belief in an asset pricing model. Pastor and Stambaugh (2000) investigate the portfolio choices of mean-variance-optimizing investors who use sample evidence to update prior beliefs centred on either risk-based or characteristic based pricing models. Jeske (2001) raises the awareness of a number of empirical and theoretical issues concerning home bias in equity holdings. He states that US has the lowest home bias among all industrialized nations, contrary to people's belief that home bias in US is more severe than in other countries. Li (2004) examines the role of investors' perception of foreign investment risk on their portfolio choices. Asgharian and Hansson (2006) determine to what extent the estimated expected returns on European equity indices will be affected by different degrees of prior confidence in the ICAPM. They find a strong home bias in most countries, which cannot be explained by any degree of disbelief in the ICAPM.

Second, the paper develops home bias measures based on Multi-Prior model's volatility correction technique introduced by Garlappi et al (2007). The Bayesian decision maker is neutral to uncertainty (Knight, 1921). The Bayesian portfolio weights are more stable than data-based approach; however, there may still be extreme and volatile weights. Garlappi et al (2007) restricts the expected return for each asset to lie within specified confidence interval around its estimated value.

[5] Sample of countries are Argentina, Australia, Austria, Belgium, Brazil, Canada, China, Colombia, Czech Republic, Denmark, Egypt, Finland, France, Germany, Greece, Honk Kong, Hungary, India, Indonesia, Israel, Italy, Japan, Korea, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Turkey, UK, US, Venezuela.

Third, the paper develops home bias measures based on shrinkage estimation models that minimize the impact of estimation error by shrinking the sample mean toward minimum variance portfolio. Stein (1955) and Berger (1974) develop the idea of shrinking the sample mean toward a common value and state that shrinkage estimators achieve uniformly lower risk than the MLE estimator. Markowitz mean-variance approach tends to perform poorly out-of-sample. The Bayes-Stein shrinkage estimators improve out-of-sample performance as compared to Markowitz mean-variance optimization. Shrinking each asset's historical mean return toward the return of the Minimum Variance Portfolio improves precision associated with estimating the expected return of each asset. The improved estimation of expected returns results in improved out-of-sample performance[6]. Zellner (2010) states that shrinkage estimators can improve estimation of individual parameters and forecasts of individual future outcomes.

Fourth, the paper investigates the determinants of home bias for various measures. In a dynamic panel setting over the period 2001 to 2011, I relate the various measures of home bias to a set of control variables (trade, beta, idiosyncratic risk, inflation, natural resources rents, size, institutional quality, global financial crisis). Empirical estimation employs Arellano-Bover/Blundell-Bond linear dynamic panel-data methods to control for endogenous variables and for tests of robustness of results. Baele et al. (2007) investigate to what extent ongoing integration has eroded the equity home bias. To measure home bias, they compare observed foreign asset holdings of 25 markets with optimal weights obtained from five benchmark models. They find that for many countries, home bias decreases sharply at the end of the 1990s, a development they link to time varying globalization and regional integration.

Fifth, the paper takes into account the period of global financial crisis during which cross border equity holdings fell significantly in 2008 and then recovered (only partly) in

[6] See Gorman and Jorgensen (2002), Herold and Maurer (2003), Ledoit and Wolf (2003), Wang (2005) for shrinkage approach.

2009. I find that foreign listing, beta, natural resources rents, institutional quality and global financial crisis have negative and significant effect on measures of home bias. Idiosyncratic risk, inflation and size have positive impact on home bias. Trade exhibits mixed results.

The next section discusses literature review. Section 3 discusses various home bias and optimal portfolio weight models. Section 4 describes data, variables and summary statistics. Section 5 discusses validity of ICAPM and home bias measures. Section 6 discusses methodology and empirical results and finally section 7 concludes.

2 Literature Review

The literature on home bias revolves around different motives of investors, including information asymmetries, behavioural biases, hedging motives and explicit barriers to international investment. Several research papers have considered the effect of indirect barriers, such as information asymmetries, on equity investment and home bias. French and Poterba (1991) use a simple model of investor preferences and behaviour to show that current portfolio patterns imply that investors in each nation expect returns in their domestic equity market to be several hundred basis points higher than returns in other markets. Tesar and Werner (1995) state that first, there is a strong evidence of a home bias in national investment portfolios despite the potential gains from international diversification. Coval and Moskowitz (1999) state that portfolios of domestic stocks exhibit a preference of investing close to home. Huberman (2001) states that shareholders of a Regional Bell Operating Company (RBOC) tend to live in the area which it serves, and an RBOC’s customers tend to hold its shares rather than other RBOCs’ equity. People invest in the familiar while often ignoring the principles of portfolio theory. Chan et al. (2005) find robust evidence that mutual funds, in aggregate, allocate a disproportionately larger fraction of investment to domestic stocks. Campbell and Kraussl (2007) state that due to greater downside risk, investors may think globally, but instead act locally and their model’s results provide an alternative view of the home bias puzzle. Barron and Ni (2008) link the degree of home bias across portfolio managers to portfolio size. Nieuwerburgh and Veldkamp (2009) state that investors profit more from knowing information others do not know and learning amplifies information asymmetry. Mondria and Wu (2010) state that home bias increases with information capacity and decreases with financial openness. Coeurdacier and Rey (2013) review various explanations of home bias puzzle highlighting recent developments in macroeconomic modelling that incorporate international portfolio choices in standard two-country general equilibrium models.

Coen (2001) and Pesenti and Wincoop (2002) focus on non-tradables effect on home bias. Strong and Xu (2003), Suh (2005) and Lutje and Menkhoff (2007) focus on behavioral explanation of home bias. There are some papers that link corporate governance and home bias (Dahlquist et al., 2003; Kho et al., 2009). There are some studies on explicit barriers to international investment and home bias including Glassman and Riddick (2001), Moor et al (2010) and Mishra (2014).

3. Home Bias Measure and Optimal Portfolio Weight Models

3.1 Home Bias Measure

Home bias is a situation where an investor holds far too high a share of their wealth in domestic equities compared with the optimal share predicted by the theory of portfolio choice. Home bias is the relative difference between actual foreign holdings of a country and optimal foreign weights.

$$HB_i = 1 - \frac{Actual_i}{Optimal_i} \qquad (1)$$

An actual foreign holding is ratio of foreign equity holding of a country and total equity holding. The total equity holding comprises of both, foreign and domestic equity holdings.

The domestic equity holding is difference between the country's total market capitalization and foreign equity liabilities.

$$Actual_i = \frac{Foreign \quad Equity \quad Asset_i}{Foreign \quad Equity \quad Asset_i + Market \quad Capitalization_i - Foreign \quad Equity \quad Liability_i} \tag{2}$$

Optimal portfolio weights are calculated by employing various methodologies including classical mean-variance, international capital asset pricing model, minimum variance portfolio, Bayes-Stein shrinkage portfolio model, Bayesian portfolio model and Multi-Prior portfolio model. Home bias measure takes values between 0 and 1, in case when actual foreign weight is lower than optimal portfolio weight. Home bias measure takes value 0 when actual and optimal portfolio weights are equal and value 1 when the investors hold only domestic assets.

In case when actual foreign weight is greater than optimal portfolio weight, I employ the following measure of home bias:

$$HB_i = \frac{\min(|Optimal_i| \, Actual_i)}{sign(Optimal_i)\max(|Optimal_i| \, Actual_i)} - 1 \tag{3}$$

The above home bias measure takes into account the case of overinvestment abroad (negative home bias).

3.2 Optimal Portfolio Weight Models

3.2.1 Classical Mean-Variance Portfolio Model:

In the classical Markowitz (1952), mean-variance model; investor maximizes expected utility

$$\max_w w'\mu - \frac{\gamma}{2} w' \Sigma w \tag{4}$$

where w is the optimal portfolio of N risky assets, μ is the N - vector of expected excess returns over the risk-free asset, Σ is the N x N covariance matrix, γ is the risk aversion parameter. Under the assumption $w'1_N = 1$, when a risk-free rate is available and chosen as the zero-beta portfolio and when short sales are allowed,

$$w^* = \frac{\Sigma^{-1}\mu}{1_N{}' \Sigma^{-1}\mu} \quad (5)$$

The computation of w^* involves the expected excess returns and covariance matrix of returns. Expected returns are difficult to estimate. In computation of weights in (5), the expected excess returns are based on historical data. Merton (1980) states that expected return estimates based on historical data are very unreliable due to high volatility of returns. Michaud (1989) states that mean variance optimization significantly overweights (underweights) those securities that have large (small) estimated returns, negative (positive) correlations and small (large) variances. These securities are the ones most likely to have large estimation errors. Portfolio weights in (5) tend to be extreme and volatile[7] in the classical mean variance data based approach. Britten-Jones (1999) finds that the sampling error in estimates of the weights of a global mean-variance efficient portfolio is large.

3.2.2 Minimum Variance Portfolio

The minimum variance portfolio is leftmost portfolio of the mean variance efficient frontier and it has a unique property that security weights are independent of expected returns on the individual securities. Suppose there are N assets having a variance-covariance matrix Σ. The minimum variance portfolio weight as per Merton (1973) is

$$w = \frac{I.\Sigma^{-1}}{I.\Sigma^{-1}.I'} \quad (6)$$

where Σ is variance-covariance matrix of returns, I is a N-dimensional vector of 1.

3.2.3 Bayes-Stein Shrinkage Portfolio Model

[7] See Hodges and Brealey (1978), Jenske (2001) for mean variance optimal portfolios.

In the Bayes-Stein shrinkage approach, the sample mean is shrunk to mean of the minimum-variance portfolio[8]. Jorion (1985) shrinks the sample averages toward a common mean as proposed by Stein (1955) and finds that the out-of-sample performance of the optimal portfolio is substantially increased. Jorion (1986) presents a simple empirical Bayes estimator that should outperform the sample mean in the context of a portfolio. Based on simulation analysis, he finds that Bayes-Stein estimators provide significant gains in portfolio selection problem.

The Bayes-Stein estimate of expected return is

$$E[R_{BS}] = (1-\psi).\bar{R} + \psi..R_{MIN}.I \tag{7}$$

The Bayes-Stein variance-covariance matrix is

$$\Sigma_{BS} = \Sigma.\left(1+\frac{1}{T+\lambda}\right) + \frac{\lambda}{T(T+1+\lambda)}.\frac{I.I'}{I'\Sigma^{-1}I} \tag{8}$$

where $\bar{R}$ is the vector of historical mean returns, R_{MIN} is the minimum variance portfolio return, Σ is the variance covariance matrix based on historical returns, I is vector of ones.

λ is computed as

$$\lambda = \frac{(N+2)(T+2)}{(\bar{R}-R_{MIN}.I)\Sigma^{-1}.(\bar{R}-R_{MIN}.I)(T-N-2)} \tag{9}$$

where N is the number of return observations, T is the number of domestic market portfolios.

The shrinkage factor[9] ψ is

$$\psi = \lambda / T + \lambda \tag{10}$$

3.2.4 International Capital Asset Pricing Model

[8] Zellner and Chetty (1965) utilize a Bayesian approach to analyse several prediction and decision problems associated with normal regression models.

[9] The shrinkage approach states that a Bayesian investor, facing uncertainty about an asset-pricing model, assigns a weight between the unrestricted estimate and the estimate restricted by the asset-pricing model. The weight is the shrinkage factor (Wang, 2005).

The traditional international capital asset pricing model (ICAPM) predicts that an investor should hold equities from a country as per that country's share of world market capitalization (Lintner, 1965). ICAPM is model based approach.

$$R_D - R_F = \beta + \beta_D\left(R_w - R_F\right) + \varepsilon \tag{11}$$

where R_D is the return on the domestic market portfolio, R_F is the risk-free rate, R_w is the return on the world market portfolio, β_D is world beta of the domestic market, β is the intercept and ε is the error term.

The ICAPM model is valid if the estimates of the intercept $\hat{\beta}$, are zero. An intercept different from zero, even if insignificant will lead to mis-trust in the prediction of ICAPM.

3.2.5 Bayesian Mean-Variance Portfolio Model

A linear regression model takes the following form:

$$y_i = \beta + \beta_2 x_{i2} + \ldots\ldots\ldots\ldots\ldots + \beta_k x_{ik} + \varepsilon_i \tag{12}$$

where y_i is observed data on dependent variable, x_i is observed data on k explanatory variables, $x_{i1,\ldots\ldots\ldots\ldots,}x_{ik}$, for $i = 1\ldots\ldots\ldots, N$. x_{i1} is implicitly set to 1 to allow for an intercept. ε_i is an error term.

The ICAPM is valid if the estimates of the intercept, $\hat{\beta}$, are zero and an investor fully trusts ICAPM. The degree of trust is expressed in values of standard errors of the intercept σ_β. A small value of standard error of σ_β indicates a strong belief that ICAPM model is valid and optimal portfolio weights are closer to those of ICAPM. A higher value of standard error of σ_β indicates a dis-belief in the model based ICAPM approach and portfolio weights are closer to data-based mean variance approach. Full mis-trust in the model results in optimal weights that correspond to data-based optimal weights.

(i) The Prior[10]

In the Bayesian analysis, there is prior (non-data) belief in the model i.e. the belief in a zero intercept and no mispricing. The prior is updated using returns data to a certain extent depending on the chosen degree of mistrust in the model. The sample mispricing β, is shrunk accordingly towards the prior mean of β to obtain the posterior mean of β.

I use a natural conjugate prior,[11]

$$p(\beta,h)=p(\beta)p(h) \tag{13}$$

where $p(\beta,h)$ is a Normal density and $p(h)$ is a Gamma density.

$$p(\beta)=\frac{1}{(2\pi)^{\frac{k}{2}}}\left|\underline{V}\right|^{-\frac{1}{2}}\exp\left[-\frac{1}{2}\left(\beta-\underline{\beta}\right)'\underline{V}^{-1}\left(\beta-\underline{\beta}\right)\right] \tag{14}$$

$$p(h)=c_G^{-1}h^{\frac{\underline{\nu}-2}{2}}\exp\left(-\frac{h\underline{\nu}}{2\underline{s}^{-2}}\right) \tag{15}$$

where $\underline{V}$ is a $k\ X\ k$ positive definite prior covariance matrix, $\underline{\nu}$ is degrees of freedom, $\underline{s}^2$ is standard error, error precision $h=\frac{1}{\sigma^2}$, c_G is integrating constant for the Gamma probability density function.

(ii) The Posterior

The posterior is proportional to prior times the likelihood.

$$p(\beta,h|y)\alpha\left\{\exp\left[-\frac{1}{2}\left\{h(y-X\beta)'(y-X\beta)+\left(\beta-\underline{\beta}\right)'\underline{V}^{-1}\left(\beta-\underline{\beta}\right)\right\}\right]\right\}h^{\frac{N+\underline{\nu}-2}{2}}\exp\left[-\frac{h\underline{\nu}}{2\underline{s}^{-2}}\right] \tag{16}$$

Upon performing calculations,

$$p(\beta,h|y)\alpha\exp\left[-\frac{1}{2}\left(\beta-\overline{\beta}\right)'\overline{V}^{-1}\left(\beta-\overline{\beta}\right)\right] \tag{17}$$

$$\beta\mid y,h\sim N\left(\overline{\beta},\overline{V}\right) \tag{18}$$

From (17) as a function of h,

---

[10] Pastor (2000) states that his Bayesian methodology allows the investor to include prior information about the residual covariance matrix of asset returns. By simply increasing the degrees of freedom in the prior distribution of the residual covariance matrix, the sample matrix can be shrunk arbitrarily to a matrix specified a priori.

[11] Refer Koop (2003) for details.

$$p(h \mid y,\beta)\ \alpha\ h^{\frac{N+\underline{\nu}-2}{2}} \exp\left[-\frac{h}{2}\left\{(y-X\beta)'(y-X\beta)+\underline{\nu s}^2\right\}\right] \tag{19}$$

$$h \mid y,\beta \sim G\left(\bar{s}^{-2},\bar{\nu}\right) \tag{20}$$

where $$\bar{\nu} = N + \underline{\nu} \tag{21}$$

and $$\bar{s}^{-2} = \frac{(y-X\beta)'(y-X\beta)+\underline{\nu s}^2}{\bar{\nu}} \tag{22}$$

Posterior simulator called the Gibbs sampler uses conditional posteriors (18) and (20) to produce random draws, $\beta^{(s)}$ and $h^{(s)}$ for s=1,2................S, which can be averaged to produce estimates of posterior properties.

(iii) The Gibbs Sampler

Let θ be a p - vector of parameters and $p(y \mid \theta)$, $p(\theta)$ and $p(\theta \mid y)$ are the likelihood, prior and posterior, respectively. Gibbs sampler chooses a starting value, $\theta^{(0)}$. For $s = 1,................S$, take a random draw $\theta_{(1)}^{(s)}$ from $p\left(\theta_{(1)} \mid y,\theta_{(2)}^{(s-1)},\theta_{(3)}^{(s-1)},..............,\theta_{(B)}^{(s-1)}\right)$, $\theta_{(2)}^{(s)}$ from $p\left(\theta_{(2)} \mid y,\theta_{(1)}^{(s)},\theta_{(3)}^{(s-1)},..............,\theta_{(B)}^{(s-1)}\right)$...... $\theta_{(B)}^{(s)}$ from $p\left(\theta_{(B)} \mid y,\theta_{(1)}^{(s)},\theta_{(2)}^{(s)},..............,\theta_{(B-1)}^{(s)}\right)$.

Following the steps will yield a set of S draws, $\theta^{(s)}$ for $s = 1,............S$. Drop the first S_0 of these to eliminate the effect of $\theta^{(0)}$ and average the remaining draws to create estimates of posterior. In our empirical estimation, I discard an initial $S_0 = 1000$ burn-in replications and include $S_1 = 10000$ replications.

Gibbs sampling provides a function $\hat{g}s_1$,

$$\hat{g}s_1 = \frac{1}{S_1}\sum_{s=S_0+1}^{S} g\left(\theta^{(s)}\right) \tag{23}$$

As S_1 goes to infinity, $\hat{g}s_1$ converges to $E[g(\theta) \mid y]$.

(iv) Prediction and Optimal weights

The predictive density is calculated as

$$p(y^* \mid y) = \iint p(y^* \mid y,\beta,h)p(\beta,h \mid y)d\beta dh \tag{24}$$

I employ different degrees of mistrust in the ICAPM by employing different standard errors of intercept and compute optimal weights.

The Bayesian mean-variance optimal weights are computed as:

$$w^{*} = \frac{\Sigma^{*-1}\mu^{*}}{1_N{}'\,\Sigma^{*-1}\mu^{*}} \tag{25}$$

where μ^{*} is predictive mean and Σ^{*-1} is variance obtained from Bayesian approach.

3.2.6 Bayesian Multi-Prior Approach

Garlappi et al (2007) impose an additional constraint on the mean-variance portfolio optimization that restricts the expected return for each asset to lie within a specified confidence interval of its estimated value, and introduce an additional minimization over the set of possible expected returns subject to the additional constraint.

Upon imposing above restrictions, the mean variance model becomes

$$\max_{w}\ \min_{\mu}\ w'\mu - \frac{\gamma}{2} w'\Sigma w \tag{26}$$

subject to $f(\mu, \hat{\mu}, \Sigma) \le \varepsilon$ (27)

and $w'1_N = 1$ (28)

In equation (27), $f(.)$ is a vector-valued function that characterizes the constraint and ε is a vector of constants that reflects both the investor's ambiguity and his aversion to ambiguity.

The optimal portfolio is given by,

$$w^{*} = \frac{\sigma_p^{*}}{\sqrt{\chi} + \gamma\sigma_p^{*}} \Sigma^{-1}\left[\hat{\mu} - \frac{1}{A}\left(B - \frac{\sqrt{\chi} + \gamma\sigma_P^{*}}{\sigma_P^{*}}\right)1_N\right] \tag{29}$$

where

$$\chi = \varepsilon \frac{(T-1)N}{T(T-N)} \tag{30}$$

T is the number of observations in our sample and N is the number of assets.

$$A = 1_N^T \Sigma^{-1} 1_N \tag{31}$$

$$B = \hat{\mu}'\Sigma^{-1} 1_N \tag{32}$$

$$C = \hat{\mu}'\Sigma^{-1}\hat{\mu} \tag{33}$$

σ_p^* is positive real root obtained from the following equation,

$$A\gamma^2\sigma_p^4 + 2A\gamma\sqrt{\chi}\sigma_p^3 + \left(A\chi - AC + B^2 - \gamma^2\right)\sigma_p^2 - 2\gamma\sqrt{\chi}\sigma_p - \chi = 0 \quad (34)$$

The optimal portfolio of an investor who is averse to parameter uncertainty can also be written as

$$w_{AA}(\varepsilon) = \phi_{AA}(\varepsilon) w_{MIN} + \left[1 - \phi_{AA}(\varepsilon)\right] w_{MV} \quad (35)$$

where

$$\phi_{AA}(\varepsilon) = \frac{\sqrt{\varepsilon \frac{(T-1)N}{T(T-N)}}}{\gamma\sigma_p^* + \sqrt{\varepsilon \frac{(T-1)N}{T(T-N)}}} \quad (36)$$

$$w_{MIN} = \frac{1}{A}\Sigma^{-1} 1_N \quad (37)$$

w_{MIN} is the minimum variance portfolio weights.

$$w_{MV} = \frac{1}{\gamma}\Sigma^{-1}\left(\mu' - \hat{\mu}_0 1_N\right) \quad (38)$$

w_{MV} is the mean-variance portfolio weights formed using maximum likelihood estimates of expected return.

The optimal portfolio of an investor who is averse to parameter uncertainty[12] can also be written as

$$w_{AA}(\varepsilon) = \phi_{AA}(\varepsilon) w_{MIN} + \left[1 - \phi_{AA}(\varepsilon)\right] w_{BS} \quad (39)$$

where

w_{BS} is the Bayes Stein portfolio weights.

4. Data and Variables

4.1 Data

I employ weekly MSCI US $ denominated returns for 46 countries and world market over the period from January 1997 to December 2011[13]. The weekly risk-free rate is treasury

[12] Wang (2005) employs a shrinkage approach to examine the empirical implications of aversion to model uncertainty.

bill rate from Ibbotson and Associates Inc[14]. I calculate actual portfolio weights based on foreign portfolio assets and liabilities reported in IMF's Coordinated Portfolio Investment Survey (CPIS) dataset[15]. In 1992, International Monetary Fund (IMF) published the Report on the Measurement of International Capital Flows (the Godeaux Report), which evaluates the statistical practices related to the measurement of international capital flows and addresses the principal sources of statistical discrepancies in the component categories of capital account in the global balance of payments. In 1997, IMF conducted the first coordinated portfolio investment survey (CPIS), in which 29 countries participated. CPIS reports (in US currency) data on foreign portfolio asset holdings (divided into equity, long term debt, and short term debt) by the residence of the issuer. CPIS exchanges bilateral data among participating and other countries, which enables participating countries to improve their statistics on non-resident holdings of their portfolio investment liabilities and associated financial flows and investment income data. In 2001, IMF conducted second CPIS and then regularly on annual basis. CPIS data has few caveats. The data collection approach varies by country; whether to conduct the survey at the aggregate or security-by-security level, whether to survey end investors or custodians and whether to make participation in the survey compulsory or mandatory. CPIS does not address issue of third country holdings, particularly with regard to financial centres including Ireland. CPIS does not provide a currency breakdown and does not identify domestic security holdings. A number of countries do not participate in CPIS including China, Peru, Morocco and Taiwan[16]. I estimate the domestic

---

[13] I also employ monthly MSCI US $ denominated returns for 46 countries and world market over the period from January 1997 to December 2011 and construct home bias measures (Table 5) as robustness check.

[14] Weekly treasury bill rate is from http://mba.tuck.darmouth.edu/pages/faculty/ken.french/data_library.html

[15] Warnock and Cleaver (2003) show that capital flows data are ill-suited to estimate bilateral holdings because they track the flow of money between countries, and the foreign country identified in flows data is that of the transactor or intermediary, not the issuer of security. Capital flows data will produce incorrect estimates when intermediary and issuer countries differ.

[16] Data on foreign equity asset and liability holdings for China (2006-2011), Peru (2005-2011) and Morocco (2005-2011) from IMF's International Investment Position. IIP is a balance sheet of a country's annual financial assets and liabilities. Taiwan's foreign equity asset and liability data is from External Wealth of Nations Mark II database. See Lane and Milesi-Ferretti (2007) for details about the database.

equity holdings of a country by differencing market capitalization and equity liabilities. Market capitalization data is from Standard and Poor's (2012).

4.2 Variables that influence home bias:

I employ determinants of home bias from standard literature. Trade is sum of exports and imports of goods and services measured as a share of gross domestic product. Lane and Milesi-Ferreti (2008) states that bilateral equity investment is strongly correlated with the underlying patterns of trade in goods and services. Trade is expected to have a negative impact on home bias. Foreign listing is percent share of global stock market that is listed on source country's stock exchanges (either directly or has issued public debt in the source country). Ahearne et al (2004) state that foreign countries whose firms do not alleviate information costs by opting into the US regulatory environment are more severely underweighted in US equity portfolios. Foreign listing is expected to have a negative impact on home bias. Beta is end of year global market betas estimated from weekly data. Idiosyncratic risk is variance of residuals from the ICAPM regressions. This represents country specific risk and home bias is expected to increase with the level of idiosyncratic risk. Global Financial Crisis is a dummy=1 during period of global financial crisis (2008, 2009) otherwise 0 (2001 to 2007; 2010, 2011)[17]. Inflation is annual percentage change in consumer price index. Inflation hinders international risk sharing and causes home bias to rise. Natural Resources Rents is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents measured as a share of gross domestic product. An increase in natural resources rents leads to an increase in cross border investment and thus a decrease in home bias. Size is log value of a country's market share of world market

[17] During global financial crisis, cross border equity holdings fell quite significantly during 2008 and then recovered (only partly) in 2009. For example, UK foreign equity holdings were US $ 1508710 million in 2007, US $ 824018.5 million in 2008 and US $ 1079254 million in 2009. US equity holdings abroad were US $ 5247983 million in 2007, US $ 2748428 million in 2008, and US$ 3995298 million in 2009. Again, during global financial crisis, foreign equity holdings of a country in other individual countries also fell during 2008. For instance, US foreign equity holdings in Australia were US $ 138096 million in 2007, US $ 65239 million in 2008 and US $ 127872 million in 2009.

capitalization. Size is expected to have a positive impact on home bias as investors' local market share of world market capitalization increases. Institutional Quality is government effectiveness[18] indicator which captures perceptions of the quality of civil services, public services, independence from political pressures and credibility of government's commitment to such policies. Kho et al (2009) state that poor governance leads to concentrated insider ownership, so that governance improvements make it possible for corporate ownership to become more dispersed and for the home bias to fall. Institutional Quality is expected to have a negative impact on home bias. Appendix Table A.1 illustrates the data sources of variables.

4.3 Summary statistics and correlation

Table 1 illustrates summary statistics. The traditional home bias measure ranges from 0.389 for Austria to 0.998 for China. Overall, the home bias measure has a mean of 0.779. Trade variable has a mean of 0.798 and Foreign Listing variable has a mean of 1.026. Table 2 presents the correlation matrix for variables used in the paper. Trade, Foreign Listing, Beta and Institutional Quality variables have negative correlation with home bias measure. Idiosyncratic Risk and Inflation variables have positive correlation with home bias measure. The correlation matrix does not indicate serious correlation among variables.

5. Validity of ICAPM and Home Bias Measures

5.1 Validity of ICAPM

Previous studies employ traditional home bias measure based on the ICAPM[19]. The traditional model based ICAPM, predicts that an investor should hold equities from a country as per that country's share of world market capitalization. In this section, I test the credibility of model by conducting tests of ICAPM model for each country. Table 3 illustrates the OLS regressions results for equation (11)[20]. I find that alphas are not statistically different from

[18] World Bank's Worldwide Governance Indicator (www.govindicators.org).
[19] Ahearne et al (2005) and others.
[20] I use weekly data from January 3, 1996 to December 25, 1996 for each country to compute the Bayesian prior information.

zeros in all countries except Egypt, Hungary, Japan, Korea, Morocco, Portugal, South Africa and Thailand. I cannot reject ICAPM for 38 out of 46 countries. Alphas are positive and insignificant in 26 countries. Positive alphas make domestic investment more attractive to domestic investors who have incomplete trust in the ICAPM and lead to lower equity home bias measures. 12 countries have negative and insignificant alphas indicating investors to take a domestic position that is lower than the country's weight in the global market portfolio. The standard errors of alphas range from 0.106 (US) to 1.12 (Russia). In the Bayesian approach, I take standard errors on the alphas as degree of mistrust in the ICAPM. A high degree of mistrust implies the optimal weights will deviate more from ICAPM, towards data based mean variance framework. In the following section, I present the home bias measures using various approaches.

5.2 Home Bias Measures

Table 4 illustrates the home bias measures for end of year 2011, using various approaches i.e. ICAPM; classical Mean-Variance; Minimum-Variance; Bayes-Stein; Bayesian for various standard errors of alpha intercept (country specific standard errors , 0.1, 0.5, 1.12); Multi-Prior correction to data based approach; Multi-Prior correction to bayes-stein approach and Multi-Prior correction to Bayesian approach for various standard errors of alpha intercept (country specific standard errors , 0.1, 0.5, 1.12)[21]. In column (1), ICAPM home bias measure indicates that some countries are found to exhibit very high home bias: Philippines (0.9997), India (0.9986), Turkey (0.9983), Pakistan (0.9962), Indonesia (0.9961) and Russia (0.9914). High home bias is indicative of the fact that investors predominantly invest in domestic markets. Some countries are found to exhibit lower home bias including Norway (0.2536) and Netherlands (0.3285).

[21] I allow short sales in models.

Column (2) illustrates data-based Mean-Variance approach. There are changes in values of home bias as computed by ICAPM and Mean-Variance approach. For instance, as per ICAPM approach, home bias for US is 0.6118 and as per Mean-Variance, home bias for US is 0.7898. For UK, ICAPM home bias is 0.5629 and Mean-Variance home bias is 0.7744. Some countries are found to exhibit very high home bias including Philippines, India, Turkey and Pakistan in accordance with ICAPM calculations.

Column (3) illustrates the Minimum-Variance home bias measure in which individual security weights are independent of expected returns. Column (5) illustrates the Bayes-Stein home bias measures. Upon comparison of home bias measures using Minimum-Variance and Bayes-Stein, there is slight variation for few countries including US, UK, Switzerland, Japan and Denmark.

I use Bayesian approach to allow for a degree of mistrust in the ICAPM. The Bayesian home bias measures are computed using squares of standard error of the estimates of intercepts reported in Table 3. I employ several levels of squares of standard errors of the estimates of intercepts (Table 3): country specific standard errors, minimum standard error (σ_α=0.1) for US, maximum standard error (σ_α=1.12) corresponding to Russia and intermediate standard error (σ_α=0.5). Columns (7), (9), (11) and (13) illustrate home bias measures for various levels of standard errors of intercepts: country specific, σ_α=0.1, σ_α =0.5 and σ_α=1.12. I find slightly lower values of Bayesian (country standard error) home bias measures as compared to ICAPM home bias measures, for several countries in our sample.

Bayesian estimates may lead to occasionally unstable portfolio weights and home bias measures. I apply Multi-Prior approach of Garlappi et al (2007) to account for volatility correction in weights estimated by Bayesian approach. Columns (8), (10), (12), (14) illustrate home bias measures for various levels of standard errors: country specific, σ_α=0.1, σ_α=0.5

and σ_{α} =1.12. I find slightly higher values of Multi-Prior home bias measures as compared to Bayesian home bias measures, for most of countries in our sample.

I also use Multi-Prior approach of Garlappi et al (2007) to impose an additional constraint on the mean-variance portfolio optimization that restricts the expected return for each asset to lie within a specified confidence interval of its estimated value, and introduce an additional minimization over the set of possible expected returns subject to the additional constraint. Column (4) computes Multi-Prior return based home bias measures for an investor who is averse to parameter uncertainty and whose optimal portfolio weights are based on Minimum-Variance and Mean-Variance as per equation (35). I find slightly higher values of Multi-Prior return home bias measure as compared to Minimum-Variance home bias measure, for most of countries in our sample. Column (6) computes Multi-Prior return based home bias measures for an investor who is averse to parameter uncertainty and whose optimal portfolio weights are based on Minimum-Variance and Mean-Variance as per equation (39). I find slightly higher values of Multi-Prior return home bias measure as compared to Minimum-Variance measure, for most of countries in our sample. For some emerging economies like India, Indonesia, Pakistan, Philippines, and Turkey, home bias is extreme and not much affected by the way it is measured[22].

As a robustness check for home measures illustrated in Table 4, I also calculate various home bias measures using monthly MSCI US $ denominated returns for 46 countries and world market over the period from January 1997 to December 2011. Table 5 illustrates the home bias measures for end of 2011 using various approaches i.e. ICAPM; classical Mean-Variance; Minimum-Variance; Bayes-Stein; Bayesian for various standard errors of alpha intercept (country specific standard errors, 0.15,1.0, 2.15); Multi-Prior correction to data based approach; Multi-Prior correction to bayes-stein approach and Multi-Prior

[22] Home bias measure plots for 46 countries are available from author.

correction to Bayesian approach for various standard errors of alpha intercept (country specific standard errors , 0.15, 1.0, 2.15)[23]. I find lower values of Bayesian (country standard errors) home bias measures as compared to ICAPM home bias measures, for several countries in our sample. This is in accordance with results of Table 4. Bayesian (country standard errors) home bias and ICAPM home bias measures appear to be similar for few countries including Brazil, India, Indonesia, Pakistan, Philippines, Russia, Turkey and Venezuela.

I would like to provide qualitative comparison of various methods employed to measure home bias. The mean variance approach uses data for the first and second sample moments and completely ignores the potential usefulness of an asset pricing model. The minimum variance frontier comprises of all portfolios that have minimum variance for a given level of expected return. The global minimum variance portfolios are suitable for investors who focus on low-risk stocks because the minimum variance portfolios exploit correlations only to the extent of achieving sole objective of lowering risk. In the case of Bayes Stein estimation, the mean-variance efficient portfolios are shrunk toward the minimum variance portfolio. The Bayes Stein approach imposes the prior assumption that all assets have the same expected return, irrespective of their risk profile. In Bayesian approach, the tangency portfolio is shrunk toward the market portfolio. The prior expected returns are inferred from CAPM and the shrinkage effect mainly depends on investor's degree of mistrust in the CAPM. I find slightly lower values of Bayesian (country standard error) home bias measures as compared to ICAPM home bias measures, for several countries in our

[23] I use monthly MSCI US $ denominated returns for 46 countries and world market over the period from January 31, 1995 to December 31, 1996 for each country to compute the Bayesian prior information. The standard errors of alphas range from 0.1559 (US) to 2.1567 (Russia). In the Bayesian approach, I take standard errors on the alphas as degree of mistrust in the ICAPM. I allow short sales in models.

sample. I also find that for few countries, there is not much change in home bias measures using various models.

Portfolio managers use different approaches. Passive managers employ CAPM approach to invest in an index fund. Active managers investing in various asset classes use various mean-variance optimization techniques. Active management may include fundamental analysis, technical analysis and macroeconomic analysis.

6. Econometric Issues and Empirical Results

6.1 Econometric Issues

To deal with basic problems of endogenity between variables the regression equation will be based on the Arellano-Bover/Blundell-Bond linear dynamic panel-data estimation. In these models, the unobserved panel level effects are correlated with the lagged dependent variables, making standard estimators inconsistent.

$$y_{it} = \delta y_{i,t-1} + x_{it}^{'}\beta + u_{it} \qquad i = 1,........,N \qquad t = 2,............T \qquad (40)$$

where y_{it} is home bias measure, δ is a scalar, $x_{it}^{'}$ is a $1 \times K$ vector of explanatory variables and β is a $K \times 1$ vector of parameters to be estimated. The error term u_{it} is composed of an unobserved effect and time-invariant effect μ_i and random disturbance term ν_{it}.

Building on the work of Arellano and Bover (1995), Blundell and Bond (1998) propose a system estimator that uses moment conditions in which lagged differences are used as instruments for the level equation in addition to the moment conditions of lagged levels as instruments for the differenced equation. This estimator is designed for datasets with many panels and few periods. The method assumes that there is no autocorrelation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable.

6.2 Empirical Results

Results from estimating versions of equation (40) by Arellano-Bover/Blundell-Bond linear dynamic panel-data method with lags (1) and AR(2) tests are reported for 2001-2011 in Tables 6 and 7. Traditional home bias measure is the dependent variable in columns (1) to (6) and Bayes-Stein home bias measure is the dependent variable in columns (7) to (12) of Table 6. Trade appears to be negative and significant in columns (1) to (3) and (7) to (9). Investors are better able to attain accounting and regulatory information on foreign markets through trade. Investors may be inclined to hold the stocks of foreign companies with whose products they are most familiar. Foreign listing is negative and significant in all regressions. The reduction in information costs associated with foreign country's firms conforming to the source country's regulatory environment is an important determinant of the source country's equity bias towards foreign country. The result is in accordance with Ahearne et al. (2004). Beta is negative and significant in all regressions. An increase in average Beta by 10% leads to decrease in home bias by 5.62%. The result is in accordance with Baele et al. (2007). Idiosyncratic risk is positive and significant in all regressions implying higher home bias. Idiosyncratic risk is country specific risk and may not be compensated by higher expected returns. Investors may diversify globally to reduce idiosyncratic risk[24]. Inflation appears to be positive and significant. Inflation may be an obstacle for international risk sharing and may deter investment from foreigners, thus implying higher home bias. Natural Resources Rents is negative and significant. An increase in natural resources rents leads to an increase in wealth and cross border investment and thus a decrease in home bias. An increase in Natural Resources Rents by 1% leads to a decrease in home bias by 0.94%. Size[25] variable is positive and significant implying that investors' local market share of world market capitalization

---

[24] In regression results not reported, I employ correlation variable instead of beta and idiosyncratic risk. The correlation variable is correlation of weekly returns between country and world, over the years 1996 to 2011. Correlation appears to be negative and significant. Results are available from author.

[25] I also employ log value of financial wealth of country as an alternative Size variable. Results are similar and available from author.

increases, leading to higher home bias. Institutional Quality[26] is negative and significant indicating that countries with better corporate governance in place have greater holdings abroad and thus, exhibit lower home bias. The result is in accordance with Papaioannou (2009) who finds that institutional improvements are followed by significant increases in international finance. Global Financial Crisis dummy variable is negative and significant because during global financial crisis, cross border equity holdings, domestic market capitalization and foreign liability holdings fell quite significantly during 2008 and then recovered (only partly) in 2009. The Arellano-Bond test for serial correlation in the first differenced errors reported in the Table 6 indicates that there is no autocorrelation of second order.[27]

In Table 7, Bayesian (country standard error) home bias measure is the dependent variable in columns (1) to (6) and Multi-Prior (country standard error) home bias is the dependent variable in columns (7) to (12). Results are similar to those reported in Table 5. Beta, Natural Resources Rents, Global Financial Crisis variables are negative and significant in all regressions. Idiosyncratic Risk, Size and Inflation variables are positive and significant in all regressions. Trade is negative and significant in columns (1) to (3) and columns (7) to (9). Foreign Listing is negative and significant in all columns except columns (3) and (9)[28].

Overall, results indicate that foreign listing, idiosyncratic risk, beta, inflation, natural resources rents, size, global financial crisis and institutional quality has significant impact on home bias. Trade exhibits mixed results.

---

[26] I employ control of corruption from World Bank's Worldwide Governance Indicators (www.govindicators.org) as an alternative Institutional Quality variable. I also employ average value of governance indicators (voice and accountability, political stability, rule of law, regulatory quality, government effectiveness and control of corruption) from World Bank's Worldwide Governance Indicators (www.govindicators.org) as an alternative Institutional Quality variable. Results are similar and available from author.

[27] The moment conditions employed by the Arellano Bover/Blundell method are valid only if there is no serial correlation in the idiosyncratic error. The Arellano Bond test is a test for no autocorrelation in linear dynamic panel models. In our regressions results, there is no autocorrelation of second order.

[28] Results for various dependent home bias measures: Bayesian and Multi-prior home bias measures for 0.1, 0.5 and 1.12 standard errors; Multi-Prior home bias measures for mean-variance, minimum variance and Bayes-Stein are similar and available from author.

7. Conclusion

In the home bias studies, the actual portfolio holdings are compared to a benchmark. Depending upon the benchmark weights, there are two main approaches to home bias studies, i.e. model based approach and return based approach. These two approaches give different benchmark weights and accordingly, home bias measures are quite different. Bayesian framework considers both, ICAPM asset pricing approach and mean-variance data based approach. It is based on investors' degree of confidence in the model based approach.

This paper constructs measures of home bias for a sample 46 countries by employing various approaches i.e. model based ICAPM; data based Mean-Variance, Minimum-Variance; shrinkage based Bayes-Stein approach; Bayesian approach that reflects mistrust in ICAPM; and Multi-Prior approach which corrects uncertainty in sample estimates of returns and restricts the expected return for each asset to lie within a specified confidence interval of its estimated value. I find slightly lower values of Bayesian (country standard error) home bias measures as compared to ICAPM home bias measures, for several countries in our sample. I also find that for few countries, there is not much change in home bias measures using various models.

I also investigate determinants of home bias for various measures. Paper finds that country specific idiosyncratic risk and inflation have positive and significant impact on home bias. Foreign listing, Natural Resources Rents and Institutional quality play significant role in decreasing home bias. I find mixed evidence of Trade having negative impact on home bias.

Findings have policy implications. Governments should promote cross border trade in goods and services which indirectly improve cross border asset trade. Governments should aim at well-functioning institutions to facilitate cross border portfolio investment. Policies should be devised to improve natural resources rents which indirectly promote cross border portfolio investment. Stock market regulation policies should aim at devising systems those promote investment through foreign listing. Policies should be devised so that foreign portfolio investment remains aligned with the on-going financial integration.

The paper finds that even if policy induced barriers to equity flows have been lifted, there remains substantial economic or market inherent barriers. These barriers tend to remain relevant and to affect the way in which financial systems operate and integrate, even if economic policy has reduced regulatory barriers to entry. Home bias still remains a puzzle.

References

Ahearne, A.G., Griever, W.L., Warnock, F.E., 2004. Information costs and home bias: an analysis of US holdings of foreign equities. Journal of International Economics. 62, 313-336.

Arellano, M., Bover, O., 1995. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics. 68, 29-51.

Asgharian, H., Hansson, B., 2006. Home bias among European investors from a Bayesian perspective. Journal of International Financial Markets, Institutions and Money. 16, 397-410.

Baele, L., Pungulescu, C., Horst, J.T., 2007. Model uncertainty, financial market integration and the home bias puzzle. Journal of International Money and Finance. 26, 606-630.

Barron, J.M., Ni, J., 2008. Endogenous asymmetric information and international equity home bias: the effects of portfolio size and information costs. Journal of International Money and Finance. 27(4), 617-635.

Best, M.J., Grauer, R.R., 1991. On the sensitivity of Mean-Variance-Efficient Portfolios to changes in asset means: some analytical and computational results. Review of Financial Studies. 4, 315-342.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel-data models. Journal of Econometrics 87, 115-143.

Berger, J., 1974. Minimax estimator of a multivariate normal mean under polynomial loss. Journal of Multivariate Analysis. 8, 173-180.

Britten-Jones, M., 1994. The sampling error in estimates of mean-variance efficient portfolio weights. Journal of Finance. 54, 655-671.

Campbell, R.A., Kraussl, R., 2007. Revisiting the home bias puzzle: downside equity risk. Journal of International Money and Finance. 26, 1239-1260.

Chan, K., Covrig, V., Ng, L., 2005. What determines the domestic bias and foreign bias? evidence from mutual fund equity allocations worldwide. Journal of Finance. 60(3), 1495-1534.

Chopra, V.K., Ziemba, W.T., 1993. The effect of errors in means, variances, and covariances on optimal portfolio choice. Journal of Portfolio Management. 19, 6-11.

Coen, A., 2001. Home bias and international capital asset pricing model with human capital. Journal of Multinational Finance Management. 11, 497–513.

Coeurdacier, N., Rey, H., 2013. Home bias in open economy financial macroeconomics. 51(1), 63-115.

Coval, J., Moskowitz, T., 1999. Home Bias at home: local equity preference in domestic portfolios. Journal of Finance. 54, 2045-2073.

Dahlquist, M., Pinkowitz, L., Stulz, R., Williamson, R., 2003. Corporate governance and home bias. Journal of Financial and Quantitative Analysis. 38(1), 135-157.

French, K., Poterba, J., 1991. Investor diversification and international equity markets, American Economic Review, Papers and Proceedings of the Hundred and Third Annual Meeting of the American Economic Association. 2, 222-226.

Garlappi, L., Uppal, R., Wang, T., 2007. Portfolio selection with parameter and model uncertainty: a multi-prior approach. Review of Financial Studies 20, 41-81.

Glassman, D.A., Riddick, L.A., 2001. What causes home asset bias and how should it be measured? Journal of Empirical Finance. 8, 35-54.

Gorman, L.R., Jorgensen, B.N., 2002. Local versus international portfolio selection: a statistical examination of home bias. Multinational Finance Journal. 6, 131-166.

Hasan, I., Simaan, Y., 2000. A Rational Explanation for home country bias. Journal of International Money and Finance. 19, 331-361.

Herold, H., Maurer, R., 2003. Bayesian Asset Allocation and U.S. Domestic Bias. Financial Analysts Journal. 59 (6), 54-65.

Hodges, S.D., Brealey, R.A., 1978. Portfolio selection in a dynamic and uncertain world, in J.H. Lorie and R.A. Brealey (eds.), Modern Developments in Investment Management (2d ed.), Dryden Press, Hinsdale, Illionois.

Huberman, G., 2001. Familiarity Breeds Investment. Review of Financial Studies. 14 (3), 659-680.

Jeske, K., 2001. Equity home bias: can information cost explain the puzzle? Economic Review, Federal Reserve Bank of Atlanta. Q3, 31-42.

Jorion, P., 1985. International portfolio diversification with estimation risk. The Journal of Business. 58(3), 259-278.

Jorion, P., 1986. Bayes-Stein estimation for portfolio analysis. The Journal of Financial and Quantitative Analysis. 21(3), 279-292.

Kho, B.C., Stulz, R.M., Warnock, F.E., 2009. Financial Globalization, Governance and the Evolution of the Home Bias. Journal of Accounting Research. 47(2), 637-646.

Knight, F., 1921. Risk, uncertainty and Profit. Houghton Mifflin, Boston.

Koop, G., 2003. Bayesian Econometrics. John Wiley & Sons Ltd., England.

Lane, R. & Milesi-Ferretti, G. (2007). "The external wealth of nations mark II: revised and extended estimates of foreign assets and liabilities". Journal of International Economics 73, 223-250.

Lane, P.R., Milesi-Ferretti, G.M., 2008. International investment patterns. The Review of Economics and Statistics. 90(3), 538-549.

Ledoit, O., Wolf, M., 2003. Improved estimation of the covariance matrix of stock returns with an application to portfolio selection. Journal of Empirical Finance. 10(5), 603-621.

Li, K., 2004. Confidence in the familiar: an international perspective. Journal of Financial and Quantitative Analysis. 39, 47-68.

Lintner, J., 1965. The valuation of risky assets and the selection of risky investment in stock portfolio and capital budgets. Review of Economics and Statistics. 47, 103-124.

Litterman, R., 2003. Modern Investment Management: An Equilibrium Approach, Wiley, New York.

Lutje, T., Menkhoff, L., 2007. What drives home bias? Evidence from fund managers' views. International Journal of Finance and Economics. 12(1), 21-35.

Markowitz, H.M., 1952. Mean-Variance analysis in portfolio choice and capital markets. Journal of Finance. 7, 77-91.

Merton, R., 1973. An analytic derivation of the efficient portfolio frontier. Journal of Financial and Quantitative Analysis. 7, 1851-1872.

Merton, R., 1980. On estimating the expected return on the market: an exploratory investigation. Journal of Financial Economics. 8, 323-361.

Michaud, R.O., 1989. The Markowitz optimization enigma: is optimized optimal? Financial Analysts Journal. 45, 31-42.

Mishra, A.V., 2014. Australia's home bias and cross border taxation. Global Finance Journal. 25, 108-123.

Mondria, J., Wu, T., 2010. The puzzling evolution of the home bias, information processing and financial openness. Journal of Economic Dynamics and Control. 34, 875-896.

Moor, L.D., Sercu, P., Vanpee, R., 2010. The plausibility of risk estimates and implied costs to international equity investments. Journal of Empirical Finance 17, 623–644.

Nieuwerburgh, S.V., Veldkamp, L., 2009. Information immobility and home bias puzzle. Journal of Finance. 64(3), 1187-1215

Papaioannou, E., 2009. What drives international financial flows: politics, institutions and other determinants. Journal of Development Economics 88, 269–281.

Pastor, L., 2000. Portfolio selection and asset pricing models. Journal of Finance. 55, 179-223.

Pastor, L., Stambaugh, R.F., 2000. Comparing asset pricing models: an investment perspective. Journal of Financial Economics. 56, 335-381.

Pesenti, P., Van Wincoop, E., 2002. Can nontradables generate substantial home bias? Journal of Money, Credit and Banking. 34, 26-50.

Sercu, Piet, Vanpée, R. (2012). The Home Bias Puzzle in Equity Portfolios. In H. K. Baker & L. A. Riddick (Eds.), *Survey of International Finance*. Oxford University Press.

Sharpe, W., 1964. Capital asset prices: A theory of market equilibrium under the condition of risk. Journal of Finance. 19, 425-442.

Stein, C., 1955. Inadmissibility of the usual estimator for the mean of a multivariate normal distribution, in 3rd Berkely Symposium on Probability and Statistics, vol. 1, pp. 197-206, University of California Press, Berkeley.

Strong, N.C., Xu, X., 2003. Understanding the equity home bias: evidence from survey data. Review of Economics and Statistics. 85, 307-312.

Suh, J., 2005. Home bias among institutional investors: a study of the *Economist* Quarterly Portfolio Poll. Journal of the Japanese and International Economies. 19, 72-95.

Tesar, L., Werner, I.M., 1995. Home bias and high turnover. Journal of International Money and Finance. 14, 467-493.

Uppal, R., 1992. The economic determinants of the home country bias in investors' portfolios: a survey. Journal of International Financial Management and Accounting. 4(3), 171-189.

Wang, Z., 2005. A shrinkage approach to model uncertainty and asset allocation. Review of Financial Studies. 18, 673-705.

Warnock, F., 2002. Home bias and high turnover reconsidered. Journal of International Money and Finance. 21(6), 795–805.

Zellner, A., 2010. Bayesian shrinkage estimates and forecasts of individual and total or aggregate outcomes. Economic Modelling. 27, 1392-1397.

Zellner, A., Chetty, V.K., 1965. Prediction and decision problems in regression models from the Bayesian point of view. Journal of American Statistical Association. 60, 608-615.

Appendix Table A.1: Data sources of variables

Variables	Description and data sources
Traditional home bias	Traditional home bias is absolute home bias measure computed as per the ICAPM model. Source: Coordinated Portfolio Investment Survey (CPIS), Author's own calculations.
Mean Variance home bias	Mean-Variance home bias computed based on the Mean-Variance approach. Source: CPIS, DataStream, Author's own calculations.
Minimum Variance home bias	Minimum Variance home bias computed as per the Minimum-Variance framework. Source: CPIS, DataStream, Author's own calculations.
Bayes-Stein home bias	Bayes-Stein home bias computed as per the Bayes-Stein model. Source: CPIS, DataStream, Author's own calculations.
Bayesian (country standard error) home bias	Bayesian (country standard error) home bias computed in Bayesian framework for prior country specific standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream Author's own calculations.
Bayesian (0.1 standard error) home bias	Bayesian (0.1 standard error) home bias computed in Bayesian framework for prior 0.1 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Bayesian (0.5 standard error) home bias	Bayesian (0.5 standard error) home bias computed in Bayesian framework for prior 0.5 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Bayesian (1.12 standard error) home bias	Bayesian (1.12 standard error) home bias computed in Bayesian framework for prior 1.12 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (data based) home bias	Multi-Prior (data based) is multi prior correction as suggested by Garlappi et al (2007) for data based approach. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (Bayes-Stein) home bias	Multi-Prior (Bayes-Stein) is multi prior correction as suggested by Garlappi et al (2007) for Bayes-Stein approach. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (country standard error) home bias	Multi-Prior (country standard error) is multi prior correction as suggested by Garlappi et al (2007) in Bayesian framework for prior country specific standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (0.1 standard error) home bias	Multi-Prior (0.1 standard error) is multi prior correction as suggested by Garlappi et al (2007) in Bayesian framework for prior 0.1 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (0.5 standard error) home bias	Multi-Prior (0.5 standard error) is multi prior correction as suggested by Garlappi et al (2007) in Bayesian framework for prior 0.5 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Multi-Prior (1.12 standard error) home bias	Multi-Prior (1.12 standard error) is multi prior correction as suggested by Garlappi et al (2007) in Bayesian framework for prior 1.12 standard errors of alpha intercept in the ICAPM. Source: CPIS, DataStream, Author's own calculations.
Trade	Trade is sum of exports and imports of goods and services measured as a share of gross domestic product. Source: World Bank Development Indicators, Author's own calculations.
Foreign listing	Foreign listing is percent share of global stock market that is listed on source country's stock exchanges (either directly or has issued public debt in the source country). Source: CPIS. Author's own calculations.
Beta	Annual global market beta's (estimated on cumulated samples of weekly return data). Source: DataStream. Author's own calculations.
Idiosyncratic risk	Idiosyncratic risk is variance of residuals from the ICAPM regressions. Source: DataStream. Author's own calculations.
Global financial crisis	Dummy=1 during and after global financial crisis (2008,2009) otherwise 0 (2001 to 2007; 2010, 2011). Source: Author's own calculations.

Variables	Description and data sources
Inflation	Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Source: World Bank Development Indicators. Author's own calculations.
Natural Resources Rents	Natural resources rents is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents measured as a share of gross domestic product. Source: World Bank Development Indicators. Author's own calculations.
Size	Size is log value of country's market share of world market capitalization. Source: Standard & Poor's Global Stock Markets Factbook. Author's own calculations.
Institutional Quality	Institutional Quality is government effectiveness indicator which captures perceptions of the quality of civil services, public services, independence from political pressures and credibility of government's commitment to such policies. Source: World Bank's Worldwide Governance Indicators (www.govindicators.org).

Table 1: Summary Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
Traditional home bias	490	0.779	0.198	0.389	0.998
Trade	509	0.798	0.457	0.289	2.025
Foreign listing	452	1.026	1.674	0	5.931
Beta	521	0.844	0.309	0.210	1.370
Idiosyncratic risk	521	15.293	12.320	2.780	49.478
Inflation	480	3.987	4.859	-4.480	54.400
Natural resources rents	499	0.051	0.075	0	0.479
Size	497	-5.197	1.589	-9.522	-0.700
Institutional quality	521	0.864	0.908	-1.189	2.429

Note: Traditional home bias is absolute home bias measure computed as per the ICAPM model. Trade is sum of exports and imports of goods and services measured as a share of gross domestic product. Foreign listing is percent share of global stock market that is listed on source country's stock exchanges (either directly or has issued public debt in the source country). Beta is annual global market beta's (estimated on cumulated samples of weekly return data). Idiosyncratic risk is variance of residuals from the ICAPM regressions. Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Natural resources rents is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents measured as a share of gross domestic product. Size is log value of country's market share of world market capitalization. Institutional quality is government effectiveness indicator which captures perceptions of the quality of civil services, public services, independence from political pressures and credibility of government's commitment to such policies.

Table 2: Correlation

	Traditional home bias	Trade	Foreign listing	Beta	Idiosyncratic risk	Inflation	Natural resources rents	Size	Institutional quality
Traditional home bias	1								
Trade	-0.228	1							
Foreign listing	-0.410	-0.171	1						
Beta	-0.200	-0.028	0.228	1					
Idiosyncratic risk	0.520	-0.032	-0.423	0.131	1				
Inflation	0.384	-0.217	-0.272	-0.053	0.427	1			
Natural resources rents	0.362	-0.143	-0.303	-0.091	0.432	0.376	1		
Size	-0.194	-0.178	0.439	0.442	-0.335	-0.287	-0.114	1	
Institutional quality	-0.543	0.330	0.416	0.258	-0.423	-0.412	-0.443	0.408	1

Note: Traditional home bias is absolute home bias measure computed as per the ICAPM model. Trade is sum of exports and imports of goods and services measured as a share of gross domestic product. Foreign listing is percent share of global stock market that is listed on source country's stock exchanges (either directly or has issued public debt in the source country). Beta is annual global market beta's (estimated on cumulated samples of weekly return data). Idiosyncratic risk is variance of residuals from the ICAPM regressions. Inflation is measured by the consumer price index and reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. Natural resources rents is the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents measured as a share of gross domestic product. Size is log value of country's market share of world market capitalization. Institutional quality is government effectiveness indicator which captures perceptions of the quality of civil services, public services, independence from political pressures and credibility of government's commitment to such policies.

Table 3: ICAPM tests

Country	Alpha	Standard Error of Alpha	Beta	Standard Error of Beta
Argentina	0.097	0.452	1.018**	0.388
Australia	-0.001	0.256	0.875***	0.219
Austria	-0.092	0.217	0.236	0.186
Belgium	-0.008	0.171	0.548***	0.146
Brazil	0.437	0.333	0.537*	0.286
Canada	0.230	0.154	0.975***	0.132
China	0.248	0.601	0.790	0.516
Colombia	-0.052	0.394	0.722**	0.338
Czech Republic	0.322	0.319	0.072	0.274
Denmark	0.178	0.156	0.295**	0.134
Egypt	0.594*	0.318	-0.022*	0.273
Finland	0.309	0.301	0.708***	0.258
France	0.114	0.170	0.825***	0.146
Germany	0.016	0.141	0.479***	0.121
Greece	-0.053	0.270	-0.260	0.232
Hong Kong	0.260	0.270	1.375***	0.232
Hungary	1.184*	0.663	0.616	0.570
India	-0.205	0.487	0.263	0.418
Indonesia	0.251	0.329	0.782***	0.282
Israel	-0.347	0.314	1.166***	0.270
Italy	-0.029	0.331	1.078***	0.285
Japan	-0.545**	0.217	0.802***	0.186
Korea	-1.063**	0.436	0.450	0.374
Malaysia	0.207	0.197	0.675***	0.169
Mexico	0.077	0.407	0.933**	0.350
Morocco	0.430**	0.178	-0.238	0.153
Netherland	0.202	0.163	0.614***	0.140
New Zealand	0.086	0.318	0.454***	0.273
Norway	0.241	0.212	0.424**	0.182
Pakistan	-0.529	0.553	0.927*	0.474
Peru	-0.278	0.396	0.925***	0.340
Philippines	0.164	0.356	0.490	0.305
Poland	0.665	0.616	0.471	0.529
Portugal	0.446**	0.191	-0.245	0.164
Russia	1.450	1.120	1.621*	0.962
Singapore	-0.322	0.242	0.535**	0.208
South Africa	-0.606*	0.348	0.407	0.299
Spain	0.408	0.246	0.574***	0.211
Sweden	0.335	0.266	0.956***	0.228
Switzerland	-0.151	0.244	0.353*	0.209
Taiwan	0.528	0.434	0.127	0.372
Thailand	-1.133***	0.395	1.304***	0.339
Turkey	0.388	0.506	1.014**	0.434
UK	0.178	0.153	0.647***	0.131
US	0.158	0.106	1.362***	0.091
Venezuela	1.057	0.782	0.964	0.672

Note: Ordinary least square regressions of excess domestic market weekly returns on a constant and excess world market weekly return. Alpha, standard error of alpha, beta, standard error of beta are reported. *,** and *** are significance levels at 1%, 5% and 10%, respectively.

Table 4: Home Bias Measures (Weekly Data)

Country	ICAPM	Mean Variance	Minimum Variance	MPC1	Bayes-Stein	MPC2	Bayesian σ_α (country)	MPC σ_α (country)	Bayesian $\sigma_\alpha = 0.1$	MPC $\sigma_\alpha = 0.1$	Bayesian $\sigma_\alpha = 0.5$	MPC $\sigma_\alpha = 0.5$	Bayesian $\sigma_\alpha = 1.12$	MPC $\sigma_\alpha = 1.12$
Argentina	0.7916	0.8946	0.7893	0.7903	0.7842	0.7842	0.7865	0.7881	0.7874	0.7888	0.7870	0.7886	0.7872	0.7882
Australia	0.7552	0.9653	0.7736	0.7717	0.7624	0.7642	0.7565	0.7575	0.7560	0.7583	0.7550	0.7571	0.7557	0.7576
Austria	0.4036	0.6988	0.4151	0.4218	0.3998	0.3998	0.3921	0.3938	0.3886	0.3965	0.3902	0.3930	0.3880	0.3945
Belgium	0.4226	0.8797	0.4518	0.4604	0.4259	0.4259	0.4093	0.4144	0.4104	0.4175	0.4100	0.4139	0.4098	0.4153
Brazil	0.9820	0.9823	0.9833	0.9833	0.9818	0.9818	0.9820	0.9821	0.9820	0.9822	0.9820	0.9822	0.9820	0.9822
Canada	0.7034	0.9768	0.7168	0.7103	0.7107	0.7107	0.7075	0.7103	0.7084	0.7118	0.7075	0.7108	0.7080	0.7108
China	0.9714	0.9892	0.9737	0.9738	0.9734	0.9734	0.9729	0.9731	0.9730	0.9732	0.9729	0.9731	0.9730	0.9731
Colombia	0.9631	0.9953	0.9618	0.9614	0.9616	0.9616	0.9629	0.9628	0.9628	0.9628	0.9628	0.9625	0.9628	0.9627
Czech Republic	0.8239	0.9465	0.8169	0.8151	0.8158	0.8158	0.8210	0.8213	0.8215	0.8217	0.8214	0.8208	0.8214	0.8211
Denmark	0.4512	0.8973	0.3862	0.3702	0.4352	0.4352	0.4421	0.4434	0.4418	0.4453	0.4423	0.4436	0.4412	0.4434
Egypt	0.9816	0.9959	0.9812	0.9812	0.9812	0.9812	0.9814	0.9813	0.9814	0.9814	0.9814	0.9813	0.9813	0.9813
Finland	0.3894	0.2522	0.4023	0.4037	0.3736	0.3736	0.3759	0.3796	0.3765	0.3825	0.3747	0.3807	0.3758	0.3806
France	0.6345	0.5248	0.6806	0.6794	0.6507	0.6507	0.6366	0.6396	0.6372	0.6416	0.6365	0.6403	0.6367	0.6404
Germany	0.4609	0.7661	0.5264	0.5277	0.4797	0.4797	0.4573	0.4628	0.4587	0.4663	0.4586	0.4640	0.4578	0.4641
Greece	0.6790	0.8322	0.6861	0.6897	0.6780	0.6780	0.6714	0.6729	0.6727	0.6743	0.6723	0.6731	0.6727	0.6731
Hong Kong	0.7985	0.7644	0.8067	0.8063	0.8084	0.8084	0.8044	0.8046	0.8045	0.8054	0.8041	0.8051	0.8042	0.8046
Hungary	0.6316	0.7664	0.6479	0.6484	0.6155	0.6155	0.6255	0.6247	0.6233	0.6263	0.6219	0.6257	0.6231	0.6252
India	0.9986	0.9996	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986
Indonesia	0.9961	0.9964	0.9962	0.9962	0.9962	0.9962	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961
Israel	0.7296	0.7072	0.7028	0.7032	0.7199	0.7199	0.7257	0.7258	0.7268	0.7265	0.7259	0.7254	0.7266	0.7256
Italy	0.3902	0.5329	0.3954	0.4071	0.3904	0.3904	0.3791	0.3843	0.3810	0.3875	0.3811	0.3857	0.3802	0.3856
Japan	0.7916	0.8824	0.7713	0.7763	0.8017	0.8017	0.8050	0.8043	0.8044	0.8047	0.8047	0.8048	0.8042	0.8041
Korea	0.9108	0.9767	0.9144	0.9138	0.9104	0.9104	0.9101	0.9108	0.9105	0.9113	0.9101	0.9112	0.9104	0.9110
Malaysia	0.9300	0.9454	0.9278	0.9278	0.9304	0.9304	0.9296	0.9296	0.9296	0.9297	0.9298	0.9294	0.9296	0.9295
Mexico	0.9395	0.9913	0.9410	0.9400	0.9377	0.9377	0.9385	0.9389	0.9387	0.9392	0.9386	0.9388	0.9386	0.9390
Morocco	0.9872	0.9972	0.9834	0.9832	0.9865	0.9865	0.9872	0.9870	0.9871	0.9870	0.9872	0.9869	0.9871	0.9869
Netherland	0.3285	0.3706	0.3797	0.3875	0.3398	0.3398	0.3179	0.3229	0.3194	0.3265	0.3182	0.3243	0.3186	0.3242
Norway	0.2536	0.4822	0.3104	0.1921	0.2571	0.2378	0.2453	0.2434	0.2466	0.2474	0.2454	0.2440	0.2458	0.2451
New Zealand	0.6500	0.6043	0.6162	0.6752	0.6414	0.6505	0.6402	0.6439	0.6402	0.6448	0.6414	0.6439	0.6398	0.6434
Pakistan	0.9962	0.9978	0.9959	0.9960	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962
Peru	0.7503	0.7972	0.7438	0.7420	0.7390	0.7390	0.7457	0.7466	0.7467	0.7473	0.7461	0.7467	0.7466	0.7465
Philippines	0.9997	0.9998	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997
Poland	0.9410	0.9784	0.9424	0.9429	0.9394	0.9394	0.9397	0.9400	0.9398	0.9403	0.9398	0.9402	0.9397	0.9401
Portugal	0.3825	0.3240	0.3024	0.3136	0.3582	0.3582	0.3749	0.3719	0.3749	0.3731	0.3747	0.3729	0.3745	0.3707
Russia	0.9914	0.9970	0.9915	0.9915	0.9909	0.9909	0.9914	0.9914	0.9914	0.9915	0.9914	0.9914	0.9914	0.9914
South Africa	0.8564	0.8954	0.8611	0.8575	0.8542	0.8591	0.8563	0.8563	0.8564	0.8568	0.8565	0.8566	0.8562	0.8564
Singapore	0.5034	0.5148	0.5074	0.5176	0.5096	0.4923	0.5001	0.5003	0.5005	0.5019	0.4986	0.5007	0.4996	0.5004
Spain	0.8923	0.8937	0.8927	0.8897	0.8933	0.8933	0.8915	0.8926	0.8916	0.8931	0.8915	0.8927	0.8914	0.8928
Sweden	0.5035	0.5923	0.5546	0.5529	0.5111	0.5111	0.4918	0.4985	0.4922	0.5018	0.4931	0.5003	0.4910	0.5002
Switzerland	0.4614	0.3380	0.3009	0.2690	0.4403	0.4403	0.4615	0.4627	0.4622	0.4646	0.4619	0.4607	0.4620	0.4627
Taiwan	0.6917	0.7825	0.6964	0.6993	0.6947	0.6947	0.6901	0.6900	0.6893	0.6911	0.6888	0.6910	0.6889	0.6901
Thailand	0.9733	0.9798	0.9742	0.9743	0.9736	0.9736	0.9729	0.9730	0.9729	0.9731	0.9729	0.9730	0.9729	0.9730
Turkey	0.9983	0.9983	0.9984	0.9984	0.9982	0.9982	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983
UK	0.5629	0.7744	0.4814	0.4953	0.5537	0.5537	0.5641	0.5662	0.5651	0.5679	0.5633	0.5653	0.5645	0.5663
US	0.6118	0.7898	0.6579	0.6604	0.7292	0.7292	0.7388	0.7400	0.7389	0.7414	0.7379	0.7408	0.7384	0.7404
Venezuela	0.9876	0.9961	0.9868	0.9869	0.9877	0.9877	0.9875	0.9874	0.9876	0.9874	0.9876	0.9874	0.9876	0.9874

Note: Home bias measures are end of year, 2011 home bias values. Home bias measures for remaining years vary. Refer Appendix A.1 for definition of various home bias measures.

Table 5: Robustness: Home Bias Measures (Monthly Data)

Country	ICAPM	Mean Variance	Minimum Variance	MPC1	Bayes-Stein	MPC2	Bayesian σ_α (country)	MPC σ_α (country)	Bayesian $\sigma_\alpha = 0.15$	MPC $\sigma_\alpha = 0.15$	Bayesian $\sigma_\alpha = 1.0$	MPC $\sigma_\alpha = 1.0$	Bayesian $\sigma_\alpha = 2.15$	MPC $\sigma_\alpha = 2.15$
Argentina	0.7916	0.7889	0.7888	0.7905	0.7851	0.7861	0.7870	0.7886	0.7853	0.7885	0.7859	0.7876	0.7860	0.7876
Australia	0.7552	0.7684	0.7684	0.7649	0.7570	0.7601	0.7555	0.7560	0.7556	0.7571	0.7555	0.7556	0.7555	0.7556
Austria	0.4036	0.4556	0.4556	0.4547	0.3923	0.4104	0.3901	0.3902	0.3907	0.3937	0.3902	0.3896	0.3901	0.3895
Belgium	0.4226	0.4569	0.4568	0.4642	0.4169	0.4280	0.4117	0.4108	0.4118	0.4136	0.4109	0.4093	0.4109	0.4092
Brazil	0.9820	0.9839	0.9839	0.9840	0.9818	0.9824	0.9820	0.9822	0.9821	0.9823	0.9821	0.9822	0.9821	0.9822
Canada	0.7034	0.7343	0.7344	0.7288	0.7098	0.7167	0.7056	0.7055	0.7049	0.7073	0.7052	0.7047	0.7052	0.7046
China	0.9714	0.9743	0.9742	0.9745	0.9729	0.9733	0.9731	0.9731	0.9731	0.9732	0.9731	0.9731	0.9731	0.9731
Colombia	0.9631	0.9622	0.9622	0.9619	0.9622	0.9622	0.9628	0.9627	0.9628	0.9628	0.9629	0.9627	0.9629	0.9627
Czech Republic	0.8239	0.7969	0.7969	0.7956	0.8192	0.8138	0.8217	0.8212	0.8220	0.8220	0.8219	0.8214	0.8219	0.8213
Denmark	0.4512	0.3774	0.3775	0.3522	0.4443	0.4280	0.4441	0.4410	0.4439	0.4442	0.4436	0.4408	0.4436	0.4407
Egypt	0.9816	0.9816	0.9816	0.9816	0.9812	0.9813	0.9814	0.9814	0.9814	0.9814	0.9814	0.9813	0.9814	0.9813
Finland	0.3894	0.4132	0.4132	0.4104	0.3765	0.3866	0.3776	0.3817	0.3778	0.3837	0.3779	0.3814	0.3779	0.3814
France	0.6345	0.5573	0.5574	0.5421	0.6412	0.6222	0.6375	0.6391	0.6377	0.6409	0.6380	0.6389	0.6380	0.6388
Germany	0.4609	0.5245	0.5245	0.5272	0.4646	0.4819	0.4621	0.4624	0.4613	0.4637	0.4606	0.4600	0.4605	0.4599
Greece	0.6790	0.6943	0.6942	0.6983	0.6727	0.6787	0.6723	0.6733	0.6713	0.6744	0.6720	0.6728	0.6720	0.6727
Hong Kong	0.7985	0.8001	0.8001	0.8005	0.8051	0.8038	0.8036	0.8038	0.8037	0.8054	0.8039	0.8043	0.8039	0.8042
Hungary	0.6316	0.6730	0.6730	0.6733	0.6178	0.6341	0.6229	0.6266	0.6223	0.6272	0.6220	0.6257	0.6219	0.6256
India	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986	0.9986
Indonesia	0.9961	0.9963	0.9963	0.9963	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961	0.9961
Israel	0.7296	0.7094	0.7094	0.7110	0.7256	0.7215	0.7264	0.7263	0.7257	0.7263	0.7255	0.7251	0.7255	0.7251
Italy	0.3902	0.3543	0.3541	0.3810	0.3850	0.3771	0.3842	0.3866	0.3830	0.3881	0.3829	0.3855	0.3829	0.3855
Japan	0.7916	0.7715	0.7715	0.7812	0.8058	0.7977	0.8025	0.8031	0.8029	0.8045	0.8029	0.8034	0.8029	0.8034
Korea	0.9108	0.9141	0.9141	0.9129	0.9106	0.9115	0.9106	0.9112	0.9107	0.9117	0.9108	0.9115	0.9108	0.9115
Malaysia	0.9300	0.9237	0.9237	0.9233	0.9297	0.9282	0.9294	0.9293	0.9293	0.9295	0.9292	0.9291	0.9292	0.9291
Mexico	0.9395	0.9412	0.9412	0.9399	0.9383	0.9391	0.9386	0.9390	0.9388	0.9393	0.9387	0.9391	0.9387	0.9390
Morocco	0.9872	0.9851	0.9851	0.9849	0.9871	0.9867	0.9871	0.9869	0.9871	0.9870	0.9871	0.9869	0.9871	0.9869
Netherland	0.3285	0.4076	0.4075	0.4169	0.3263	0.3499	0.3121	0.3132	0.3118	0.3190	0.3123	0.3129	0.3123	0.3128
Norway	0.2536	0.3177	0.3177	0.3169	0.2384	0.2611	0.2395	0.2435	0.2360	0.2448	0.2369	0.2406	0.2369	0.2405
New Zealand	0.6500	0.5973	0.5973	0.6022	0.6452	0.6337	0.6446	0.6430	0.6452	0.6452	0.6455	0.6435	0.6455	0.6435
Pakistan	0.9962	0.9961	0.9961	0.9961	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962	0.9962
Peru	0.7503	0.7265	0.7265	0.7257	0.7430	0.7388	0.7468	0.7471	0.7459	0.7474	0.7462	0.7463	0.7462	0.7463
Philippines	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997
Poland	0.9410	0.9435	0.9435	0.9445	0.9394	0.9406	0.9399	0.9404	0.9398	0.9405	0.9398	0.9403	0.9398	0.9403
Portugal	0.3825	0.3096	0.3095	0.3225	0.3742	0.3583	0.3727	0.3709	0.3730	0.3751	0.3743	0.3722	0.3744	0.3721
Russia	0.9914	0.9920	0.9920	0.9920	0.9912	0.9914	0.9914	0.9915	0.9914	0.9915	0.9914	0.9915	0.9914	0.9915
South Africa	0.8564	0.8568	0.8568	0.8565	0.8554	0.8558	0.8562	0.8567	0.8557	0.8572	0.8559	0.8565	0.8559	0.8565
Singapore	0.5034	0.5058	0.5059	0.5007	0.4998	0.5014	0.4960	0.4977	0.4953	0.5004	0.4955	0.4968	0.4955	0.4967
Spain	0.8923	0.9025	0.9025	0.8990	0.8928	0.8955	0.8923	0.8927	0.8925	0.8932	0.8924	0.8927	0.8924	0.8927
Sweden	0.5035	0.5919	0.5919	0.5934	0.4970	0.5261	0.4954	0.4981	0.4954	0.4993	0.4943	0.4966	0.4942	0.4965
Switzerland	0.4614	0.4083	0.4084	0.3800	0.4662	0.4520	0.4633	0.4596	0.4645	0.4626	0.4645	0.4594	0.4645	0.4594
Taiwan	0.6917	0.6955	0.6955	0.6983	0.6900	0.6915	0.6906	0.6912	0.6903	0.6919	0.6901	0.6906	0.6901	0.6906
Thailand	0.9733	0.9752	0.9752	0.9752	0.9729	0.9735	0.9728	0.9730	0.9728	0.9731	0.9728	0.9730	0.9728	0.9730
Turkey	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983	0.9983
UK	0.5629	0.4567	0.4566	0.4721	0.5689	0.5440	0.5638	0.5589	0.5602	0.5618	0.5614	0.5574	0.5615	0.5572
US	0.6118	0.5315	0.5314	0.5462	0.7431	0.7082	0.7359	0.7352	0.7373	0.7387	0.7371	0.7361	0.7371	0.7361
Venezuela	0.9876	0.9871	0.9871	0.9871	0.9877	0.9875	0.9876	0.9874	0.9875	0.9875	0.9876	0.9874	0.9876	0.9874

Note: Home bias measures are end of year, 2011 home bias values. Home bias measures for remaining years vary. ICAPM is home bias measure using ICAPM framework. Mean Variance is home bias measure as per Mean-Variance framework. Minimum Variance is home bias measure as per Minimum-Variance model. Bayes Stein is home bias measure computed using Bayes Stein shrinkage factor model. Bayesian σ_α (country) is home bias measure computed in Bayesian framework for prior country specific standard errors (σ_α (country)) of alpha intercept in the ICAPM. Bayesian $\sigma_\alpha = 0.15$, Bayesian $\sigma_\alpha = 1.0$ and Bayesian $\sigma_\alpha = 2.15$ is home bias measure computed in Bayesian framework for prior standard errors ($\sigma_\alpha = 0.15$), ($\sigma_\alpha = 1.0$) and ($\sigma_\alpha = 2.15$) of alpha intercept in the ICAPM, respectively. MPC1 is home bias measure as per Multi-Prior framework applied to Mean-Variance data based approach. MPC2 is home bias measure using Multi-Prior framework applied to Bayes Stein approach. MPC σ_α (country) is home bias measure computed in Multi-Prior framework for prior country specific standard errors (σ_α (country)) of alpha intercept in the ICAPM. MPC $\sigma_\alpha = 0.15$, MPC $\sigma_\alpha = 1.0$ and MPC $\sigma_\alpha = 2.15$ is home bias measure computed in Multi-Prior framework for standard errors ($\sigma_\alpha = 0.15$), ($\sigma_\alpha = 1.0$) and ($\sigma_\alpha = 2.15$).

Table 6: Traditional Home Bias and Bayes-Stein Home Bias Results

	Traditional Home Bias						Bayes-Stein Home Bias					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Trade	-0.251**	-0.357**	-0.187*	-0.097	-0.024	-0.048	-0.259**	-0.370**	-0.195*	-0.101	-0.027	-0.049
	(0.045)	(0.019)	(0.062)	(0.393)	(0.775)	(0.496)	(0.046)	(0.019)	(0.062)	(0.389)	(0.753)	(0.497)
Foreign listing	-0.158**	-0.168**	-0.133*	-0.228***	-0.082**	-0.155**	-0.152*	-0.163*	-0.127	-0.226***	-0.077**	-0.151**
	(0.045)	(0.049)	(0.089)	(0.004)	(0.030)	(0.011)	(0.055)	(0.060)	(0.104)	(0.004)	(0.043)	(0.013)
Beta	-0.564***	-0.566***	-0.501**	-0.620***	-0.396***	-0.728***	-0.573***	-0.576***	-0.509**	-0.631***	-0.405***	-0.741***
	(0.005)	(0.008)	(0.010)	(0.001)	(0.001)	(0.003)	(0.005)	(0.008)	(0.010)	(0.000)	(0.001)	(0.002)
Idiosyncratic Risk	0.011**	0.011**	0.012***	0.013***	0.017***	0.009**	0.011**	0.011**	0.012***	0.013***	0.018***	0.009**
	(0.010)	(0.034)	(0.005)	(0.002)	(0.000)	(0.019)	(0.010)	(0.033)	(0.005)	(0.002)	(0.000)	(0.016)
Inflation		0.014*						0.014*				
		(0.075)						(0.075)				
Natural Resources Rents			-0.949*						-0.953*			
			(0.085)						(0.086)			
Size				0.157***	0.101***	0.164***				0.163***	0.105***	0.171***
				(0.000)	(0.000)	(0.000)				(0.000)	(0.000)	(0.000)
Global Financial Crisis					-0.033*						-0.034*	
					(0.070)						(0.061)	
Institutional Quality						-0.162**						-0.162**
						(0.028)						(0.027)
Observation	415	400	415	415	412	415	415	400	415	415	412	415
Wald Chi^2	138.61***	113.71***	111.85***	182.18***	214.88***	181.78***	139.67***	114.48***	114.41***	178.78***	214.36***	187.92***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano Bond Test m1	-1.375**	-1.437**	-1.373**	-1.247**	-1.996**	-1.237**	-1.385**	-1.452**	-1.379**	-1.250**	-1.962**	-1.238**
	(0.016)	(0.015)	(0.017)	(0.021)	(0.045)	(0.021)	(0.016)	(0.014)	(0.016)	(0.021)	(0.049)	(0.021)
Arellano Bond Test m2	1.274	1.355	1.288	1.210	-1.759	1.213	1.279	1.363	1.291	1.211	-1.755	1.213
	(0.202)	(0.175)	(0.197)	(0.226)	(0.785)	(0.225)	(0.200)	(0.172)	(0.196)	(0.225)	(0.792)	(0.225)

Note: Traditional home bias (column 1 to 6) and Bayes-Stein home bias (column 7 to 12) is dependent variable. Arellano-Bover/Blundell Bond Estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of traditional home bias is not reported. Lag value of Bayes-Stein home bias is not reported. Constant is not reported. P-values in brackets. Refer Appendix Table A.1 for definition of Traditional home bias, Bayes-Stein home bias, Trade, Foreign listing, Beta, Idiosyncratic Risk, Inflation, Natural Resources Rents, Size, Global Financial Crisis, Institutional Quality. ***,** and * represent significance level at 1, 5 and 10 percent, respectively.

Table 7: Bayesian (country standard error) Home Bias and Multi-Prior (country standard error) Home Bias Results

	Bayesian (country standard error)						Multi-Prior (country standard error)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Trade	-0.262**	-0.371**	-0.197*	-0.102	-0.028	-0.050	-0.260**	-0.370**	-0.196*	-0.100	-0.027	-0.050
	(0.042)	(0.019)	(0.058)	(0.384)	(0.742)	(0.491)	(0.043)	(0.018)	(0.057)	(0.388)	(0.748)	(0.490)
Foreign Listing	-0.151*	-0.162*	-0.126	-0.226***	-0.078**	-0.152**	-0.151*	-0.162*	-0.126	-0.227***	-0.078**	-0.151**
	(0.056)	(0.061)	(0.104)	(0.004)	(0.041)	(0.013)	(0.055)	(0.060)	(0.103)	(0.004)	(0.040)	(0.013)
Beta	-0.578***	-0.580***	-0.512**	-0.635***	-0.412***	-0.744***	-0.568***	-0.571***	-0.505**	-0.627***	-0.402***	-0.736***
	(0.005)	(0.008)	(0.010)	(0.000)	(0.001)	(0.002)	(0.005)	(0.008)	(0.010)	(0.000)	(0.001)	(0.002)
Idiosyncratic Risk	0.011**	0.011**	0.012***	0.013***	0.018***	0.009**	0.011**	0.011**	0.012***	0.013***	0.018***	0.009**
	(0.011)	(0.034)	(0.005)	(0.002)	(0.000)	(0.017)	(0.010)	(0.034)	(0.005)	(0.002)	(0.000)	(0.016)
Inflation		0.014*						0.014*				
		(0.076)						(0.077)				
Natural Resources Rents			-0.947*						-0.950*			
			(0.087)						(0.087)			
Size				0.169***	0.107***	0.171***				0.164***	0.105***	0.171***
				(0.000)	(0.000)	(0.000)				(0.000)	(0.000)	(0.000)
Global Financial Crisis					-0.034*						-0.035*	
					(0.066)						(0.057)	
Institutional Quality						-0.163**						-0.162**
						(0.027)						(0.028)
Observation	415	400	415	415	412	415	415	400	415	415	412	415
Wald Chi^2	138.05***	114.16***	115.05***	178.92***	214.39***	188.02***	138.43***	113.84***	113.61***	176.73***	211.92***	186.26***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Arellano Bond Test m1	-1.384**	-1.448**	-1.378**	-1.250**	-1.979**	-1.237**	-1.385**	-1.451**	-1.380**	-1.250**	-1.976**	-1.238**
	(0.016)	(0.014)	(0.016)	(0.021)	(0.047)	(0.021)	(0.016)	(0.014)	(0.016)	(0.021)	(0.048)	(0.021)
Arellano Bond Test m2	1.279	1.361	1.290	1.212	-1.760	1.213	1.281	1.365	1.293	1.213	1.758	1.214
	(0.200)	(0.173)	(0.196)	(0.225)	(0.784)	(0.225)	(0.200)	(0.172)	(0.195)	(0.225)	(0.787)	(0.224)

Note: Bayesian (country standard error) home bias (column 1 to 6) and Multi-Prior (country standard error) home bias (column 7 to 12) is dependent variable. Arellano-Bover/Blundell Bond Estimation with lags(1) and AR(2) tests. Arellano Bond test for no auto correlation. Lag value of traditional home bias is not reported. Lag value of Bayes-Stein home bias is not reported. Constant is not reported. P-values in brackets. Refer Appendix Table A.1 for definition of Bayesian (country standard error), Multi-Prior (country standard error). Trade, Foreign listing, Beta, Idiosyncratic Risk, Inflation, Natural Resources Rents, Size, Global Financial Crisis, Institutional Quality. ***,** and * represent significance level at 1, 5 and 10 percent, respectively.