Home Bias in a Changing Europe:

Has Time Eroded the Puzzle?

Lieven Baele[α] **Crina Pungulescu**[β] **Jenke Ter Horst**[γ]

Abstract

This paper claims that time working towards financial market integration works also towards eroding the home bias puzzle. On a panel of twenty-five markets we show that time (as a proxy for global factors and financial development) and regional integration (especially monetary arrangements) reduce equity home bias. To measure home bias of a country, we compare observed foreign equity holdings to a number of benchmarks. In the traditional International CAPM (I-CAPM) world, optimal portfolio weights are given by the relative world market capitalization shares. This prediction is correct only to the extent that the I-CAPM is a valid description of reality. We depart from the I-CAPM portfolio prediction by applying two recent methodological contributions in the field. First, we allow for a certain amount of mistrust in the I-CAPM and involve return data in computing the mean-variance optimal allocations and secondly, we correct for uncertainty about the sample estimates of expected returns. We obtain thus an array of home bias measures that consistently exhibit a diminishing pattern and sensitivity to integration measures.

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[α] Tilburg University, Department of Finance, CentER, and Netspar, P.O. Box 90153, 5000 LE Tilburg, The Netherlands, email: lieven.baele@uvt.nl, phone: +31 13 466 3257, fax: +31 13 466 2875.

[β] Corresponding Author. Tilburg University, Department of Finance and CentER, P.O. Box 90153, 5000 LE Tilburg, The Netherlands, email: c.pungulescu@uvt.nl, phone: +31 13 466 2020, fax: +31 13 466 2875.

[γ] Tilburg University, Department of Finance, CentER, and Netspar, P.O. Box 90153, 5000 LE Tilburg, The Netherlands, email: j.r.terhorst@uvt.nl, phone: +31 13 466 8211, fax: +31 13 466 2875.

1 Introduction

Investors tend to idealise the performance of their domestic markets and treat foreign assets with unduly distrust when making their allocation decisions (e.g. French and Poterba, 1991, Lewis, 1999, Obstfeld and Rogoff, 2000). This attitude is costly due to forgone gains from international diversification estimated in the range of 20% to 100% of lifetime (permanent) consumption (Lewis, 1996)[1]. Various factors have been directly linked to home bias behavior. Among the most important are institutional barriers to foreign investment (e.g. Lewis, 1999), transaction costs such as fees, commissions and higher spreads (e.g. Glassman and Riddick, 2001), informational asymmetries (e.g. Ahearne, Griever and Warnock, 2002), and psychological or behavioral factors (e.g. Coval and Moskowitz, 2001, Grinblatt and Keloharju, 2000, Lütje and Menkhoff, 2001). However, institutional barriers are decreasing faster than home bias (Lewis, 1999) and the costs of foreign investments are not high enough to explain observed allocations (Glassman and Riddick, 2001). Psychological and behavioral factors such as culture and language, may rationally explain home bias to the extent of their informational content. Asymmetric information and fear of the unknown translate into perceiving foreign markets as more risky and could be non trivial factors in explaining home bias (Ahearne, Griever and Warnock, 2002). However, asymmetric information, i.e. better knowledge of the domestic market, does not explain why investors do not go outside their home markets during recessions (Jenske, 2001). Attempts to disentangle the various possible causes of home bias have not succeeded in fully explaining the puzzle.

In this paper we regard home bias as the result of a complex combination of the causes, including government restrictions, cost related, informational and behavioral factors that have been pointed out in the literature. We identify several channels through which financial market integration affects many potential causes of home bias and may erode it. Integration is achieved in the first place through removing institutional barriers to investment. Costs and fees associated with foreign investment are expected to decrease in an integrated market, especially in the case of monetary arrangements. Asymmetric information is also lower when markets are integrated. Moreover, increased international trade, as well as common rules and a more

[1] Lewis (1996) compares the consumption growth paths associated with domestic returns and respectively with returns of optimal international portfolios derived using time additive constant relative risk aversion as well as Epstein-Zin-Weil utility functions. The utility functions are defined as a function of wealth, which is indirectly a function of stock returns as in Ingersoll (1987). The forgone consumption gains from diversification for certain coefficients of risk aversion indicate that foreign asset diversification could lead to almost doubling permanent consumption.

transparent business environment are expected to decrease “distance” in an informational sense, among the countries. Through competition pressure, market integration might also improve managerial skills and challenge the bounded rationality explanations to home bias behavior.

Our paper contributes to the literature dedicated to the home bias puzzle in several ways. First of all, we conjecture that financial market integration gradually erodes the home bias puzzle through its impact on the factors traditionally associated with the phenomenon. Second, we explore alternative ways to define the optimal investment benchmarks, apart from the I-CAPM market share allocation, which is traditional in the home bias literature. The prescription of the I-CAPM that domestic allocations should not exceed the relative country share in the world market capitalization is valid only to the extent that the model is a good description of the data. For countries where the asset pricing model does not hold, changing the investment benchmark provides a partial explanation to home bias behavior. We depart from the I-CAPM portfolio prediction by applying two recent methodological developments in the field. The first of these contributions, proposed by Pástor (2000) allows for a certain amount of mistrust in the model and involves return data in computing the mean-variance (MV) optimal weights. The second technique is developed by Garlappi, Uppal and Wang (2004) to correct for data volatility. In the MV framework, optimal portfolio weights are expressed in terms of the first two moments of the distribution of asset returns. In practice, to compute MV optimal weights, the alternatives are to assume an asset pricing model, such as the (I-)CAPM or to use the sample moments as estimates of the true population parameters. Following Pástor (2000) we refer to the later approach as “data-based” and to the I-CAPM approach as “model-based”. The drawback of the “data-based” alternative is that the sample average is a highly imprecise estimate of the true expected returns which reflects in unwanted volatility of the optimal weights (Merton, 1980). Pástor (2000) proposes a methodology that finds synergies in combining the data with the theoretical asset pricing model and includes different degrees of confidence in the asset pricing model in a Bayesian framework. The Bayesian investor is neither forced to accept unconditionally the pricing relation nor discard it completely in favour of the data. In this way, investors suspicious of the CAPM are not entirely abandoned to untamed “data-based” allocations. However, this hybrid approach uses sample data to some extent and consequently inherits some of its volatility. In order to address this, we adjust Pástor’s methodology by incorporating the correction method suggested by Garlappi et al. (2004) which explicitly minimizes estimation error in the sample expected returns.

These methodological variations allow us to obtain several investment benchmarks, and consequently several alternative measures of home bias. In line with other empirical evidence for the Bayesian methodology of Pástor (2000), we find that reasonable degrees of mistrust in the model lead to lower, yet mostly positive, levels for home bias measures (e.g. Li, 2002; Asgharian and Hansson, 2005). In a panel of twenty-five developed and emerging markets we find that average Bayesian home bias is lower by 30% if we depart from the rather restrictive prediction of the I-CAPM. In the case of the Netherlands, for instance, for a small degree of mistrust in I-CAPM leads to a sharp decrease in home bias which is fully eliminated in the days of the common currency.

Finally, examining the evolution of home bias across several measures and over time, we observe that the recent surge in international integration appears to challenge the "puzzle" through both its global and regional components. Time, which we interpret as a proxy for global phenomena (such as market integration, technological and financial development) appears to work against home bias. Besides a moderate negative trend, we note the sensitivity of home bias to more advanced integration processes achieved within the European (Monetary) Union. We find a negative relationship between home bias and EU membership and more importantly a sharp bias correction effect linked to the monetary union. Increased foreign participation of European countries may be directed either towards more attractive European markets due to lower transaction costs and exchange rate risk or outside the European space as a reaction to higher market co-movements in the area. The downward evolution of home bias is consistent across several measures and gives additional weight to our conjecture that market integration erodes home bias. Apparently, more intense financial integration, as in the case of the European integration and the monetary union raises a stronger challenge to home bias behaviour.

The remainder of this study is organised as follows. Section 2 reviews theoretical considerations related to computing optimal investment weights. Section 3 presents the data as well as the methodology for computing the home bias. Section 4 reports our empirical results concerning the home bias, while Section 5 examines the sensitivity of the time-varying measures of home bias to several integration proxies and factors relevant to international investment decisions. Finally, Section 6 summarizes our main findings.

2 Optimal Portfolio Weights

Home Bias is by definition a deviation from the optimum, specifically the mean-variance optimum. Naturally, different values for the benchmark result in different levels of home bias and researchers have been tempted to cut the Gordian knot and prove that the home bias is not as much a puzzle as well as a mismeasurement of the mean-variance benchmark (e.g. Li, 2002; Asgharian and Hansson, 2005). In this section, we present several candidate "benchmarks" for optimal investment.

2.1 Classical Mean-Variance Portfolio Model

The common starting point is the MV framework of Markowitz (1952) and Sharpe (1963) where the investor makes his portfolio choice in order to maximize his expected utility,

$$\max_{\boldsymbol{\omega}} \ \boldsymbol{\omega}'\boldsymbol{\mu} - (\gamma/2)\boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega}, \tag{1}$$

where $\boldsymbol{\omega}$ is the N-vector of portfolio weights allocated to N assets, i.e. domestic and foreign equity holdings $(N=2)$, $\boldsymbol{\mu}$ is the N-vector of expected returns, $\boldsymbol{\Sigma}$ is the $N \times N$ variance-covariance matrix and γ is the coefficient of relative risk aversion. Under the assumption that $\boldsymbol{\omega}'\iota = 1$ (the budget constraint), the solution of the portfolio problem becomes

$$\boldsymbol{\omega}^* = (1/\gamma)\boldsymbol{\Sigma}^{-1}(\boldsymbol{\mu} - \eta\boldsymbol{\iota}), \tag{2}$$

where η denotes the expected return on the zero-beta portfolio corresponding to the optimal portfolio and $\boldsymbol{\iota}$ is a N-vector of ones . The budget constraint effectively fixes γ for a known value of the zero-beta expected return through $\gamma = \boldsymbol{\iota}'\boldsymbol{\Sigma}^{-1}(\boldsymbol{\mu} - \eta\boldsymbol{\iota})$ and determines uniquely the optimal portfolio weights (De Roon and Nijman, 2001). If a risk-free rate is available and chosen as the zero-beta portfolio, the coefficient of risk aversion becomes $\gamma = \boldsymbol{\iota}'\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu}_e$, where $\boldsymbol{\mu}_e$ is the vector of the expected excess returns (over the risk-free rate). The analytical portfolio choice solution in the MV framework, when short sales are allowed is:

$$\boldsymbol{\omega}^* = \frac{\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu}^e}{\boldsymbol{\iota}'\boldsymbol{\Sigma}^{-1}\boldsymbol{\mu}^e}. \tag{3}$$

The solution of the optimization problem involves the true (unobserved) expected returns and variance-covariance matrix of the returns. Available returns data enables us to use the sample moments as estimates of the true parameters. Merton

(1980) shows that sample variance-covariance matrix is an accurate estimate of the true parameter but the estimation of the expected returns $\boldsymbol{\mu}$ based on historical data is very unreliable due to the high volatility of returns. The impact of the mean estimated imprecisely, is amplified in the context of portfolio choice, as the inverse of the variance-covariance matrix tends to be a large number when the correlations between the countries are high (Jenske, 2001). Therefore, this “data-based” approach directs investors to take extreme and volatile positions.

An asset pricing model, such as the I-CAPM provides an alternative for the “data-based” approach. The I-CAPM is valid in a perfectly integrated world, where the law of one price holds universally and markets clear (total wealth is equal to total value of securities). The world market portfolio can then be defined as the sum of all individual portfolios weighted by the positions held by MV investors. The portfolio implication of the CAPM is that the average MV investor holds the market portfolio (Linter, 1965). In an international setting, the optimal investment weights of a country according to this so-called “model-based” approach, are given by the relative shares of domestic and foreign equities in the world market capitalization. For a US investor this implies that domestic equity holdings should have been about 40% in 2004. The actual foreign allocations figures for the US are as high as 80%.

The I-CAPM results in the well-known linear beta relationship between risk premium on the domestic portfolio and the expected excess return on the world market benchmark:

$$E(r_d)-r_0=\beta_{dw}\left[E(r_w)-r_0\right], \tag{4}$$

where r_d is the real return on the domestic market portfolio, r_0 is the risk free rate, $\beta_{dw}\equiv Cov(r_d,r_w)/Var(r_w)$ is the world beta of the domestic market and r_w is the return on the world market portfolio (Karolyi and Stulz, 2002). Regressing excess returns of a domestic portfolio on an intercept and excess returns of the world market portfolio becomes a straightforward test of the model:

$$r_d-r_0=\alpha+\beta_{dw}(r_w-r_0)+\varepsilon. \tag{5}$$

The I-CAPM is considered valid if estimates of the intercept, $\hat{\alpha}$ are zero. On average, the intercept for our group of twenty-five countries is positive at 0.12 per week and the average standard errors are as high as 0.07. An intercept different than zero, even insignificant can be used by a Bayesian investor to question the optimality of the portfolio prediction of the I-CAPM.

2.2 Bayesian Mean-Variance Portfolio Weights

Considering the stringency of the assumptions of the I-CAPM, it is reasonable to expect that some investors do not accept the model unconditionally. Modelling their degree of belief in the accuracy of the I-CAPM as description of reality, adds another dimension to measuring home bias. In terms of the beta pricing relationship, this translates into assessing the importance that investors attach to a nonzero sample estimate of the intercept $\hat{\alpha}$ (see Pástor, 2000). The dogmatic prescription of the I-CAPM is that the intercept is zero, as the world benchmark is assumed to fully describe the asset returns and capture all sources of priced risk. In the Bayesian framework, the degree of belief in the model is expressed in values of the standard errors of the intercept σ_α and involved in the allocation decision. A small value indicates a strong belief in the relevance of the theoretical model and results in optimal portfolio weights that closely correspond to the "model based" approach. A larger value leads to a different set of optimal weights and brings us closer to the results of the "data based" approach. This interpretation is an insightful reconciliation of the "model" and "data-based" approaches. For instance, a nonzero value for $\hat{\alpha}$, even if it were insignificant according to a standard t-test (and therefore would not lead to a rejection of the I-CAPM), could become instrumental in explaining why the observed allocations deviate from the model prescriptions.

Here, the data is used for updating the prior belief in the validity of the model, i.e. the belief in a zero value for the intercept $\hat{\alpha}$. This ultimately results in different estimates for the mean and variance covariance matrix of returns, used to compute the portfolio weights. These Bayesian MV optimal weights are computed as:

$$\boldsymbol{\omega}^* = \frac{\boldsymbol{\Sigma}^{*-1}\boldsymbol{\mu}_e^*}{\boldsymbol{\iota}'\boldsymbol{\Sigma}^{*-1}\boldsymbol{\mu}_e^*}, \tag{6}$$

where $\boldsymbol{\mu}_e^*$ and $\boldsymbol{\Sigma}^*$ are the predictive mean and variance that replace in this approach the sample moments of the distribution of returns.

The predictive density is defined as:

$$p\left(r_{t+1}\middle|\Phi\right) = \int_\theta p\left(r_{t+1},\theta\middle|\Phi\right)d\theta = \int_\theta p\left(r_{t+1}\middle|\theta,\Phi\right)p\left(\theta\middle|\Phi\right)d\theta, \tag{7}$$

where $p(r_{t+1}|\Phi)$ is the probability density function of excess returns conditional on Φ (the sample data) and θ, the set of parameters of the statistical model that describes the stochastic behavior of asset returns. This form for the predictive density involves $p(\theta|\Phi)$, the conditional probability of the parameters of the model given the data available.

According to Bayes' Rule, the *posterior density* is proportional to the product of the *likelihood function* and the *prior density*:

$$p(\theta|\Phi) \propto p(\Phi|\theta)\, p(\theta), \tag{8}$$

where $p(\theta|\Phi)$ is the *posterior density*, $p(\Phi|\theta)$ the *likelihood function*, or probability distribution function for the data given the parameters of the model and $p(\theta)$, the *prior density*, that reflects the non-data information available about θ (Koop, 2003). In our setting, the prior follows from assuming a valid I-CAPM which is subsequently updated through incorporation of the information revealed by the data. The I-CAPM gives therefore the starting belief that intercepts, the sample mispricings, are zero. This information is expressed through σ_α, the standard errors of the intercept, a measure of its claim for significance in the eyes of the investors. The methodology is presented in more detail in Appendix 1.

A degree of mistrust in the I-CAPM depending on the empirical performance of the model on specific country data, may result in optimal weights that are closer to the observed allocations and thereby imply for certain countries, a lower home bias than the deviation from the market capitalization share.

2.3 Bayesian Multi-Prior Framework

The Bayesian approach uses the I-CAPM as the starting point and departs from its prediction in proportion with the investors' degree of mistrust in the model. Larger mistrust in the I-CAPM makes historical return data more relevant in estimating the optimal allocations, which become in turn, more volatile. In the extreme "data-based" case, relying on the sample mean and variance on thirty years of returns data, we obtain that over the 1980s, the US investor should have alternated selling foreign or domestic assets short. In early 1990s, the optimal investment strategy based on the sample data would have been for the US investor to short sell domestic assets. Imposing short sales constraints, the average of optimal domestic holdings for the US investor is an unrepresentative 31%. Garlappi et al. (2004) tackle the problem of volatile data by extending the MV framework to incorporate the investors' aversion to uncertainty around the estimate of the mean returns. This changes the standard mean-variance problem in two ways: (1) it binds the expected returns to a confidence interval around their estimate, thus taking into account the eventual estimation error and (2) it allows the investor to minimize over the choice of expected returns, thus manifesting its aversion to uncertainty.

The multi-prior framework of Garlappi et al. (2004) is defined by the following problem:

$$\max_{\boldsymbol{\omega}} \min_{\boldsymbol{\mu}} \boldsymbol{\omega}'\boldsymbol{\mu} - (\gamma/2)\boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega}, \tag{9}$$

subject to

$$f(\boldsymbol{\mu}, \hat{\boldsymbol{\mu}}, \boldsymbol{\Sigma}) \leq \in, \tag{10}$$

$$\boldsymbol{\omega}'\iota = 1, \tag{11}$$

where $\hat{\boldsymbol{\mu}}$ is the sample mean of asset returns. If the confidence intervals are defined jointly for all assets, f can be taken as $\frac{T(T-N)}{(T-1)N}(\hat{\boldsymbol{\mu}}-\boldsymbol{\mu})'\boldsymbol{\Sigma}^{-1}(\hat{\boldsymbol{\mu}}-\boldsymbol{\mu})$ and $\in$ as a quantile for the $F-$distribution[2], where N is the number of assets and T, the number of observations.

The constraint translates into the $P(f \leq \in) = 1-p$ for a corresponding probability level. This framework can also be extended to include uncertainty over a chosen return-generating model, such as the I-CAPM.

The solution to the multi-prior max-min problem is a set of optimal weights with a considerably smoother behavior compared to the ones obtained through the direct influence of the data. Appendix 2 summarizes the analytical results obtained by Garlappi et al. (2004) for the case when short sales are allowed.

[2] If asset returns are normally distributed and $\boldsymbol{\Sigma}$ is known, f has a χ^2 distribution with N d.f. If $\boldsymbol{\Sigma}$ is not known, it follows a F distribution with $N, T-N$ d.f. (Garlappi et al. 2004)

3 Home Bias Measures and Data Issues

The previous section presented alternative ways of defining optimal portfolio allocations. This section introduces our measure of home bias in terms of actual and optimal portfolio weights, as well as the main characteristics of the required dataset.

3.1 Home Bias Measures

In line with other works in this field[3], we quantify home bias of country $[i]$ as the relative difference between actual $(\mathrm{ACT_i})$ and optimal $(\mathrm{OPT_i})$ foreign portfolio weights as:

$$\mathrm{HB_i} = 1 - \frac{\mathrm{ACT_i}}{\mathrm{OPT_i}}. \tag{12}$$

Alternative sets of optimal portfolio weights are computed according to the methodologies described in Section 2. The actual portfolio holdings are determined using data from the International Investment Position (reported to the IMF as part of the Balance of Payments) as follows.

The share of international portfolio of country [i] is computed as the ratio of foreign equity holdings of the reference country[4] $(\mathrm{FA_i})$, to the total (foreign and domestic) equity holdings.

The domestic equity holdings are computed as the difference between the market capitalization of the country $(\mathrm{MC_i})$ and the total domestic equity stocks held by foreign investors[5] $(\mathrm{FL_i})$:

$$\mathrm{ACT_i} = \frac{\mathrm{FA_i}}{\mathrm{FA_i} + \mathrm{MC_i} - \mathrm{FL_i}}. \tag{13}$$

In the typical case, when actual foreign involvement is lower than the optimal share of international assets, and the country is subject to home bias, the measure takes values between 1 (when the investors hold only domestic assets) and 0 (when actual and optimal portfolio weights are equal). For instance, if a country should optimally hold 80% of its portfolio in foreign stocks and has an actual allocation of 20%, its home bias is as high as 0.75. However, at times, the data might offer cases when the actual weights exceed optimal weights, for instance when negative or very low weights are

[3] Mann & Meade (2002) present a similar measure of home bias.
[4] Reported in International Investment Position / Assets / Portfolio Investment / Equity.
[5] Reported in International Investment Position / Liabilities / Portfolio Investment / Equity.

assigned to the world market index in the optimization framework. This can be the case when the world market index has a high variance and covariance with the domestic index and with a lower mean.

In such cases, when the country does not exhibit home bias, but on the contrary, it overinvests abroad, the former measure of home bias would be misleading. Therefore, we modify the formula to take into account the case of overinvestment abroad (negative "home bias") and obtain comparable results, as follows:

$$\widetilde{\mathrm{HB}}_{\mathrm{i}} = \frac{\min\left(\left|\mathrm{OPT_i}\right|, \mathrm{ACT_i}\right)}{\mathrm{sign}\left(\mathrm{OPT_i}\right)\max\left(\left|\mathrm{OPT_i}\right|, \mathrm{ACT_i}\right)} - 1. \tag{14}$$

We use this formula to compute a negative measure of "home bias" when optimal allocations are lower than the observed foreign investment. For example, if actual foreign holdings are 20% and the optimal weight in foreign assets is 1%, the negative "home bias" is -0.95. This extended formula has a lower bound at -1 for the cases when it the optimal foreign stock holdings are zero. It achieves values below -1 when short sales are allowed and optimal strategies result in negative weights for the world market index. In this range, home bias is no longer monotonically increasing in the difference between optimal and actual weights. If actual foreign holdings are 20% but the optimal weight is -5%, the resulting negative "home bias" value is -1.25. By construction, this formula also smoothes out the effect of any extreme values in the optimal weights. For instance, if a country should optimally sell short foreign equities (in proportion of -500%) and holds 20% in foreign assets, the corresponding negative "home bias" is -1.04. A negative value implies that the country is overinvesting abroad, and a value lower than -1, indicates that short sales of foreign equities are optimal.

3.2 Data and Possible Biases

Home bias behavior is tested on a sample of twenty-five countries of which nineteen are European: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Italy, The Netherlands, Poland, Portugal, Spain, Switzerland, Sweden, United Kingdom, Turkey and six form a non European control group: Australia, Canada, Hong Kong, Japan, New Zealand and United States. The variation of this group, combining developed as well as emerging countries, members of European Union (EU) and European Monetary Union (EMU) together with outsiders, is useful for isolating any EU/euro effect in the evolution of home bias. However, the heterogeneity of the sample results into an unbalanced panel, with distinctively better data coverage for the more developed countries. Several types of data serve our analysis.

First, in order to compute optimal portfolio weights, we use weekly series for returns of varying lengths within January 1971 – December 2004 for the twenty-five countries in our panel as well as for the Total Market Index as a proxy for the global market portfolio, obtained from Datastream. The global risk free rate is the simple weekly rate that compounds to the one-month Treasure Bill rate from Ibbotson and Associates, Inc, available on Kenneth French's website[6]. Market capitalization figures are obtained from Datastream (for developed countries) and Standard & Poor's Emerging Markets Database, respectively.

A second set of data, used to compute actual portfolio weights, refers to the International Investment Position (IIP) in foreign portfolio assets and liabilities (a chapter of the Balance of Payments) recorded with annual frequency in the IMF's International Financial Services database. The IIP is defined by the IMF as a balance sheet of a country's stock of financial assets and liabilities at the end of year. It distinguishes between direct investments, portfolio investments (holdings of less than 10% of the share capital of the company) and other investments (including financial derivatives).

Table 1 presents average portfolio holdings of foreign assets and liabilities (in millions USD) for the twenty-five countries in our dataset for the full sample as well as for half samples. For all countries, without exception, average foreign assets and liabilities increase dramatically in the second half of the sample, suggesting a boom in international portfolio exposure over the 1990s. Some countries in our sample take clear net positions of in the international financial markets. Foreign assets holdings are several times higher than liabilities in Belgium, Iceland, Italy, Canada and New Zealand. Net receivers are Czech Republic, Denmark, Finland, Greece, Hungary, Poland, Spain and Turkey. Market capitalization figures (as percentages from the world market) are relatively stable, though there is a discernable shift from US, Japan and Canada towards the European countries in the relative market shares. The data shows that the trend in the home bias measure that takes I-CAPM as the benchmark reflects the evolution of actual rather than optimal foreign allocations.

The information on IIP presented above is gathered during *periodical* benchmark surveys, conducted by the government to obtain the current value of domestic holdings of foreign securities, surveys that take place several years apart. The

[6] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

yearly figures presented in IIP are *estimated* stocks based on the transactions involving non-residents, which are reported yearly to the central government according to the Balance of Payments accounting and the periodical benchmark surveys. Data on capital flows, or transacting data, are then used to extrapolate the foreign investment positions in the years between surveys (Tesar and Werner, 1995). IMF has conducted Coordinated Portfolio Investment Surveys (CPIS) in 1997 and 2001 for twenty-nine, respectively sixty-four countries, in which most countries take an aggregate approach and report foreign holdings by country in a reliable fashion.

The IIP data is a virtually unique source for international portfolio holdings of relatively wide geographical and temporal coverage. However, there are several possible in-built biases associated with it. The eventual biases that have been identified in the literature may arise in several situations. First, if a foreign subsidiary located in the reference country invests (for the ultimate benefit of its foreign owner) in a third country, the reference country appears as the foreign investor and not the country of the parent company. Also, the accuracy of data collection (Tesar and Werner, 1995) and the choice of price index used for revaluation in estimating IIP holdings (Griever, Lee and Warnock, 2001) can be questioned. Warnock (2001) points out that use of a 1994 benchmark survey in US to re-estimate positions in foreign holdings for the previous years led to serious upward corrections with consequently lower figures for home bias. However, given that the frequency of surveys increases, the chances of significant backward corrections in the future are lower.

The third type of data we use consists of development and financial indicators that are based on data from International Financial Services and on the updated version of the database on the structure and development of the financial sector compiled by Beck, Demirgüç-Kunt and Levine (2000).

Last, we use two corporate governance indices from the Martynova-Renneboog corporate governance database, the shareholder protection index, increasing in the power of shareholders to mitigate opportunistic behaviour of managers, and the rule of law index which measures the extent to which the rules of society are observed by agents, and covers issues such as the effectiveness and predictability of the judiciary system and the enforceability of contracts (see Goergen, Martynova and Renneboog, 2005).

4 Empirical Results

The last decade has been associated with increased international openness for most participants to the world financial market. This phenomenon is reflected in the upward trend of actual foreign holdings which influences directly the measurement of home bias. We assess the appropriateness of I-CAPM as the return generating model for our dataset and consequently the scope for expanding the set of possible investment benchmarks using the Bayesian approach of Pástor (2000) and the Multi-Prior correction of Garlappi et al (2004). We compare the evolution of time series of home bias measures obtained from a number of alternative investment benchmarks.

4.1 I-CAPM

The classical definition of home bias assumes the I-CAPM is a valid description of the data. The model imposes that the relative market capitalization share of a country is the optimal domestic allocation. This implies that average domestic allocations of should not exceed 10% for any European country. In the twenty-five countries of our sample only Japan and USA can justify in the I-CAPM framework, domestic holdings (as annual averages) of over 20% and over 40% respectively.

We test the I-CAPM for each of the countries in our sample in order to assess its credibility as a data generating process. The sample we use for testing the model excludes the first two years of data (needed for computing the Bayesian prior information). Table 2 presents the results of the I-CAPM test for the remaining sample, which correspond to estimates of optimal portfolios and measures of home bias at the end of 2004. Only one country, Iceland, has very low correlation with the world market benchmark, with a beta of 0.08. In the tests for Denmark, Greece, Iceland and Turkey, alphas are significantly different from zero, thus raising direct challenges to the I-CAPM. Germany and Switzerland, on the other hand stand out with slight negative but very close to zero estimates of the intercept and respective standard errors of 0.04 at the end of our sample of data, which gives a strong example in which the model holds and suggests that the I-CAPM allocation benchmark is not inappropriate at this time for computing home bias. Deviating from the model, might actually worsen the puzzle, since the domestic markets appear underperfoming relative to the world benchmark. Japan is a similar situation with a negative intercept of -0.06 and standard errors of 0.04. However, the remaining countries in our set exhibit positive intercepts, averaging at 0.12 per week with the average estimated standard errors as high as 0.07. In view of this evidence, the expectation that all investors believe dogmatically in the I-CAPM, common to the largest part of home bias studies, may be overly stringent.

We therefore compare the results for home bias based on the I-CAPM benchmark with alternative allocation strategies, applying the Bayesian approach of Pástor (2000) and the Multi-Prior correction of Garlappi et al. (2004).

4.2 Home Bias Measures

We compute optimal portfolio holdings and home bias under five optimization frameworks which allows us not only to test the evolution, but also the persistence of the phenomenon across several measurement options. The first case is traditional in the home bias literature and assumes that I-CAPM is a valid description of the data. Optimal holdings are given by the relative country shares in the world market capitalization. The second case follows a pure data-based approach, where the sample moments are substituted in the solution to the MV portfolio choice problem. The third case is the Bayesian conciliation of the first two, proposed by Pástor (2000), where a certain degree of mistrust in the model is taken into account to determine the predictive moments of distribution. These are substituted in the analytical solution of the MV optimal weights. The remaining two alternative measures of home bias result from applying the Multi-Prior correction of Garlappi et al. (2004) to the pure data-based approach and to the Bayesian approach respectively in order to obtain smoother series. In the latter case, the predictive moments of distribution rather than the sample estimates are used in the Multi-Prior optimization setting.

Initially, short sales are allowed in all optimizations. As expected, the pure data based approach and the Bayesian approach of Pástor (2000), are most sensitive to data fluctuations and occasionally result in large negative positions in either the domestic or the world market index. Table 3 shows this in the large increase of the standard deviation of the home bias from the model to the data based measure. For many countries (Belgium, Finland, France, Germany, Hungary, Iceland, Netherlands, Portugal, Spain, Switzerland, UK, Turkey, Australia, New Zealand and USA) the standard deviation increases by five to ten times. Average home bias is halved. A second set of optimizations is done numerically imposing short sales constraints with results are qualitatively unchanged.

The Bayesian home bias results are reported for a value of σ_α^2 of 0.05, which corresponds to the higher levels of the standard errors reported in the previous subsection. In computing the Multi-Prior home bias the value of $\in$ (the bound on the added constraint) is chosen so that the percentage size of the confidence interval for $F_{N,T}$ implied by $\in$ is 90%. This rather high value results in substantial smoothing of the optimal portfolio weights and subsequently of home bias figures.

Figure 1 shows time series of home bias obtained under the five different settings. The measures exhibit significant heterogeneity among countries and across the five different measures of home bias. However, the most common trend is decreasing I-CAPM home bias, most intense at the end of the '90s. Only Greece, Hungary, Iceland, Poland, Turkey and Canada except from this trend. This behavior is in many cases mimicked by the alternative measures. Moreover, reasonable measurement corrections, in the Bayesian and the Multi-Prior cases, succeed in eliminating home bias in Belgium, Iceland, The Netherlands. On the other hand, in some countries home bias is high and insensitive to the way it is measured. These countries are Czech Republic, Japan, and Poland and under the Multi-Prior correction framework, also Greece, Hungary and Turkey.

Table 3 presents summary statistics of five home bias measures computed without imposing short sales constraints. They confirm several characteristics of home bias behavior in our sample. Taking the I-CAPM perspective, we obtain generally the highest figures for home bias. In all markets, home bias is higher than 0.50, with most countries averaging yearly home bias around 0.70-0.80. For many countries, the mean is slightly lower than the median, suggesting a stronger decreasing trend in the second half of the sample. Greece, Hungary, Poland and Turkey are insignificantly involved in the foreign markets. In the I-CAPM world, they stand to lose the most from their lack of international diversification. The "data based" approach, where the investor completely disregards the I-CAPM, changes this perspective for some of the countries in our sample. One feature of the "data based" home bias is that it is in most cases lower than the I-CAPM measure. These differences in home bias figures are large improvements for Austria, Belgium, Finland, Germany, Iceland, The Netherlands, Portugal, Spain, UK and Turkey (where average "data-based" home bias is more than halved compared to the I-CAPM measure) and insignificant for countries such as Czech Republic, Poland and Japan. Occasionally, average home bias is slightly negative (for Belgium, The Netherlands and UK) consistent with times where benefits of international diversifications are insignificant by comparison to the performance of the domestic market, which is optimally dominant in the portfolio. However, the classical critique raised by Merton (1980) with respect to the volatility of the "data based" optimal weights is appropriate in the present case too and relatively large values for the standard deviation show that the figures for this home bias measure should be regarded with caution. The Bayesian approach, combining the previous two measures, results in more moderate home bias figures, less volatile but also closer to the I-CAPM home bias levels. The degree of mistrust in the model incorporated in the Bayesian approach is able to decrease to a large extent the average home bias in Belgium, Iceland and UK and reverse it to negative values for the Netherlands. The differences among the first three alternative measures to home bias show that the phenomenon is to a large extent sensitive to measurement choices and the responses are significantly country dependent. However, highly volatile allocation prescriptions make noisy variables for analysis and difficult objectives to be implemented by the investor. The final two alternative home bias measures use the Multi-Prior correction of Garlappi et al. (2004) to benefit from the advantages of methodologies that depart from the I-CAPM with minimum expense in terms of volatility of series. Smoother series of home bias confirm the previous findings. Austria, Belgium, Iceland and the Netherlands, are the countries where departing from home bias contributes significantly to solving the puzzle. The average I-CAPM home bias for these countries takes values between 0.55 (Belgium) to 0.74 (Iceland). The corresponding home bias figures computed using the Multi-Prior correction for the "data-based" approach range from 0.08 (Austria) to 0.24 (Iceland). On the other extreme, Turkey, Japan, Poland, Greece and Hungary exhibit high and persistent home bias regardless of our choice of benchmarks. Investors in these countries choose to forego significant diversification benefits and the investment puzzle in these countries seems insensitive to methodological solutions.

5 The Link between Financial Market Integration and Home Bias

Investment benchmarks proposed as alternatives to the classical I-CAPM paradigm may lead to lower figures of home bias. This can be regarded as a methodological attempt to solve the home bias puzzle for a certain country only to the extent to which I-CAPM is not the appropriate model for that market. Consequently, regardless of these measurement aspects, remaining home bias behavior can objectively be linked to the combination of causes that have been put forward in the literature that we conjecture are eroded by financial market integration.

In this section we test the relationship between home bias and several proxies for financial market integration and we control for a large set of factors, which might have a bearing on the portfolio choice of investors.

5.1 Hypotheses

We propose three hypotheses regarding the time-variation of home bias and a choice of control variables that may be affect our measure of home bias through any of its components (market capitalization, foreign assets or domestic assets held by foreign investors).

Hypothesis 1. Home Bias exhibits β-convergence.

In an extension of the notion used in the growth economics, β-convergence is defined as the speed of adjustment of deviations relative to their prior values (Adam, Jappelli, Menichini, Padula and Pagano, 2002). We test for β-convergence by estimating the response of the growth rate of home bias in the current year to the level of home bias in the previous year. A negative coefficient indicates convergence and its size can be interpreted as the speed of the convergence process.

Hypothesis 2. Home Bias exhibits a negative trend.

Time stands as a proxy for universal processes such as globalization, technical and financial developments that accommodate increasingly cross-border transfers. This hypothesis follows the intuition that technological progress fostering market integration may render macroeconomic puzzles obsolete in time (Engel, 2000). We test this hypothesis by introducing a trend as an explanatory variable for the growth rate of home bias.

Hypothesis 3. Home Bias is reduced through more intense financial integration.

Deeper financial market integration might affect home bias through creating incentives for investors to hold more foreign assets for a variety of reasons. On one hand, intense integration eliminates traditional investment barriers, decreases transaction costs and creates a more transparent and competitive cross-border business environment. The European integration and especially its monetary core offer an advanced experiment in market integration, meant to make the intra-European investment space more attractive relative to domestic investments. However, higher correlations across the European markets that have been documented by Bekaert, Hodrick and Zhang (2005) might induce investors to search for diversification benefits outside the European space. Regardless of which of these tendencies is dominant, intensive market integration as in the case of the European (Monetary) Union is expected to decrease home bias. We test this hypothesis using three possible proxies for financial market integration: time-varying I-CAPM betas (end of year values, obtained from testing the I-CAPM relationship on cumulative samples of returns computed with weekly frequency), as well as EU and respectively EMU dummy variables intended to isolate the specific effects of membership on home bias.

The set of control factors connected with the international portfolio choice of investors that we link to our home bias measures includes:

1. (Relative) Market Capitalization

The size and growth of the domestic market capitalization are fundamental to the classical measure of home bias, as the relative share of a country in the world market capitalization dictates I-CAPM optimal domestic portfolio weights. Growth of the (relative) market capitalization puts downward pressure on home bias through decreasing optimal weights for foreign equity but might also have the opposite effect through decreasing actual holdings, if foreign investors are slow to adapt their portfolios in account of relative changes in the world market capitalization and foreign liabilities are not increasing sufficiently. For the domestic investors, growth of (relative) market capitalization may also explain an increased interest for the domestic market, to the extent that it is interpreted as a signal for a faster developing, better performing domestic market. This might trigger an overvaluation of the benefits of domestic investments and be consistent with higher home bias based on asymmetric perceptions.

2. Idiosyncratic risk

Idiosyncratic risk defined as the variance of the residual from the I-CAPM regressions (Aba Al-Khail, 2003) brings additional incentives for international diversification. The presence of idiosyncratic risk should make a country less attractive at the same time to domestic (decreasing home bias) and foreign investors (increasing home bias). The final effect on home bias depends on the relative difference of the investors' reactions to idiosyncratic risk. If domestic investors are slower to recognize the riskier environment, the result could be increased home bias. Moreover there could be an inverse relationship between the (decreasing) idiosyncratic risk and (increasing) market integration, which would suggest a positive relationship between the two variables.

3. Sharpe ratios

For the MV investors, Sharpe ratios should not bring any new information other than the information already incorporated in the optimal weights. However, we test whether the Sharpe ratios of domestic markets, interpreted as a direct signal of the performance of a country has potential subjective information content beyond the standard MV optimization framework. Aba Al-Khail (2003) proposes the Sharpe ratio as a control variable in a model explaining the foreign portfolio choices of Finnish investors.

4. Intercepts

Sample mispricings, reflected in the I-CAPM estimates of the intercepts are interpreted as a sign of over or underperformance of the domestic index relative to the world market. We use end of year I-CAPM estimates of the intercepts from testing he model on cumulative samples of returns computed with weekly frequency.

5. Volatility

In the same information content interpretation, standard deviation of returns may influence the investment strategies of investors. In a model of demand of assets from mutual funds, Falkenstein (1996) finds a non-linear relationship to volatility, with a strong aversion towards low volatility. The impact of volatility on our measure of home bias depends of the way information is processed by domestic and respectively foreign investors. If volatility acts more successfully as a deterrent to foreign investors rather than as a driver for international diversification to the domestic investors, home bias might increase.

6. Size

Size of the market relative to the size of the economy may be instrumental in explaining the international portfolio decisions of investors, as it may be perceived as a signal of development and quality of the domestic financial market. A larger stock market, consistent with lower cost of financial intermediation and more investment opportunities, is more attractive to investors, domestic and foreign alike, with opposite effects on home bias. Therefore, the relationship between stock market performance and home bias may be suggestive of differences in perceptions and reactions between foreign and domestic investors. We use the ratio of stock market capitalization to the GDP from the development database of Beck et al. (2000).

7. Turnover

Liquidity could be an indication of the investors' sensitivity to transaction costs (Falkenstein, 1996). As an indicator of liquidity (and transaction costs) we use the stock market turnover ratio, the ratio of total shares traded to market capitalization which measures the activity of a stock market relative to its size, taken from the development database of Beck et al. (2000). A more liquid market can be more attractive to investors, since it implies initial investors can relatively cheaply and surely sell their stakes in long run projects (Levine and Zervos, 1996).

8. Trading Volume

The trading volume defined as the ratio of the stock market total value traded to GDP indicates the amount of liquidity provided by stock markets to the economy. While high turnover might indicate a small but liquid market, the trading volume also proxies the importance of the stock market for the entire economy. The variable is available in the development database of Beck et al. (2000).

9. Bank Assets

The ratio of deposit money bank assets to GDP can be taken as a proxy for the importance of bank finance in a reference country. A higher share of bank assets interpreted as a sign of lower financial diversity has been associated with less attractiveness for foreign investors (Mann and Meade, 2002). Also a stronger bank sector might be associated with a lower market capitalization. Both these effects translate into a higher weight of actual foreign holdings and thus add a downward pressure on home bias.

10. International Trade Openness

The growth of international trade, defined as the sum of exports and imports divided by the GDP can be an indicator of a country's international links which may reduce the information asymmetries that are traditionally suggested as an explanation to home bias.

11. Foreign Direct Investment

In the same vein, the growth of foreign direct investment, defined as the sum of foreign direct investments in and from a country, scaled by the GDP can be an indicator of its overall participation in international securities transactions, an informational channel to the extent that foreign direct investment decisions are underlying portfolio investment decisions.

12. Private Bond Market

The size of the private bond market capitalization (the amount of outstanding domestic debt securities issued by private entities) relative to the real economy can be indicator of the financial structure of a country and higher relevance of the private bond market may diminish the importance of the stock market for the economy. Time series of the ratio of private bond market capitalization to GDP is available in the development database of Beck et al. (2000).

13. Shareholder Protection Index

The corporate environment may influence the investment decisions, by rendering a country more attractive to investors, especially considering the higher uncertainty associated with foreign equity investments. We use the shareholder protection index from the Martynova-Renneboog corporate governance database (see Goergen, Martynova and Renneboog, 2005), as an indicator of the ability of shareholders to overcome agency problems.

14. Rule of Law Index

Similarly, countries with a better judiciary system have reason to be privileged in the international markets. We use for this, the rule of law index described in Goergen, Martynova and Renneboog, 2005.

5.2 Model Specification

We test our main hypotheses using panel data and allowing for fixed country effects, in the following framework:

$$\Delta HB_{it} = \alpha_i + \beta_1 \cdot HB_{it}(-1) + \beta_2 \cdot TIME + \beta_3 \cdot INTEGRATION_{it} + \beta_4 \cdot X_{it} + \varepsilon_{it}$$

where: ΔHB_{it} - annual growth rate (in percentages) of home bias of country [*i*], measured using the different methods presented in the previous section;

$HB_{it}(-1)$ - level of home bias in the previous year;

$TIME$ - trend variable;

$INTEGRATION_{it}$ - a proxy for market integration which is in turns reflected by the time varying I-CAPM betas $(BETAS_{it})$ or the $I_{it}(EU/\,EMU)$, an indicator function taking the value 1 if country [*i*] is a member the European Union (respectively the European Monetary Union) at time [*t*] and 0 otherwise;

and X_{it} - a set of control variables that includes:

ΔRMC_{it} - annual growth rate (in percentages) of relative share of market capitalization of the country [*i*] in the world market capitalization;

$\Delta IDSYN\ RSK_{it}$ - annual growth rate (in percentages) of the variance of the residuals from the I-CAPM regressions;

$\Delta SHARPE\ R_{it}$ - annual growth rate (in percentages) of the Sharpe Ratios computed on cumulative samples of weekly data;

$ALPHAS_{it}$ - annual estimates of intercepts from the I-CAPM regressions;

$\Delta STDEV_{it}$ - annual growth rate (in percentages) of the standard deviation of returns computed on cumulative samples of weekly data;

$\Delta STMKTCAP_{it}$ - annual growth rate (in percentages) of the stock market capitalization of a country scaled by GDP;

$\Delta STTURNVR_{it}$ - annual growth rate (in percentages) of the stock market turnover of a country scaled by GDP;

$\Delta STVALTRD_{it}$ - annual growth rate (in percentages) of the stock market total value traded of a country scaled by GDP;

$\Delta DBAGDP_{it}$ - annual growth rate (in percentages) of the deposit money bank assets of a country scaled by GDP;

ΔOPN_{it} - annual growth rate (in percentages) of the openness index of a country, measured as the ratio of foreign trade (import and export) of the country to its GDP;

ΔFDI_{it} - annual growth rate (in percentages) of the foreign direct investments (assets and liability) of a country scaled by GDP;

$\Delta PRBOND_{it}$ - annual growth rate (in percentages) of the private bond market capitalization of a country scaled by GDP;

$SHLD\ PROT_{it}$ - Shareholder Protection Index;

$RULE\ LAW_{it}$ - Rule of Law Index.

5.3 Estimation Results

We test the model presented in the previous section on three different measures of home bias, depending on the investment benchmark used: the I-CAPM home bias, the "data based" and the Bayesian home bias. In the latter two cases we use the smoothed variables obtained by applying the correction methodology proposed by Garlappi et al. (2004).

Tables 4A and 4B present the results for the first case, when the depended variable is the I-CAPM home bias. Our three main hypotheses, β -convergence, negative trend and negative link with proxies for financial market integration are consistently supported empirically in the presence of a large number of control variables.

The previous year level of home bias enters the regressions with a consistent negative sign, statistically significant at 1%. A higher level of home bias leads to an adjustment downward of about a fifth of a percent per year. This speed of convergence is virtually invariable across our specifications.

Additionally, we find that home bias exhibits a strong decreasing trend. With time, the percentage change in home bias decreases by about a third of a percent per year. The result is statistically significant at 1% and also consistent across all specifications.

The link between the evolution of home bias and the process of financial integration is tested using three possible proxies for integration: time-varying world market betas from the I-CAPM regressions as well EU and respectively EMU dummy variables. We find a negative link between the percentage change in home bias and the three proxies of integration. The process of deeper integration in the world financial markets, reflected in the increase of the world market betas of most of the countries in our sample over time is associated with a decrease in home bias of 9.28% per year. In the EU member states, the percentage change in home bias is lower by 3.29%. In the countries that adopted the euro, this tendency is stronger and annual home bias decreases by more than 5%.

We check the persistence of the latter result, relating our most intense form of financial integration, the adoption of the common currency, to a sharp correction of home bias in the presence of several other factors related to the international investment decision. The coefficient of the EMU dummy variable remains highly significant and similar in size across all subsequent specifications.

The additional control variables allow us to make several inferences about the possible drivers of home bias. As they might be affect differently the variables used in computing home bias, the empirical results ultimately reveal the dominating effect. Caeteris paribus, home bias decreases when actual foreign holdings increase to match optimal investment weights. Actual foreign holdings increase when foreign assets increase, stock market capitalization decreases or foreign liabilities increase.

Empirically, we find a positive and statistically significant relationship between the home bias and idiosyncratic risk, measured as the variance of residuals from the I-CAPM regressions. This may be the case when foreign investors exhibit higher aversion to idiosyncratic risk in the receiving countries than domestic investors, who are slower in responding to the incentives of international diversification. Moreover, decreasing idiosyncratic risk can be also interpreted in terms of higher integration with the world markets, the positive link bringing additional support to our hypothesis that market integration foster better investment decisions and lower home bias.

Our second control variable, the Sharpe ratio has no added value for describing home bias, consistent with the fact that our measure of home bias already accounts for the optimal investment behaviour of a MV investor.

As a measure of market performance, the intercepts in the I-CAPM regressions exhibit a sizeable and negative relationship to home bias, statistically significant at 10%. To the extent that foreign investors react strongly to this performance measure, the resulting increase in foreign liabilities could be the channel through which home bias decreases more sharply in countries that outperform the world market.

The elasticity of home bias with respect to market volatility, computed as the standard deviation of returns, is very small and statistically significant at 10%. The information content of this variable is similar, but noticeably lower than for idiosyncratic risk, which appears thus a more relevant measure of risk from the point of view of international investments.

Our next three variables proxy different stock market characteristics: size as a measure of development, turnover and traded volume as measures of liquidity (and possibly lower transactions costs) and relevance as a channel of resources (liquidity provided) for the economy. In these three regressions we exclude the relative market capitalization variable to which they are highly correlated. Home bias is related positively to all these characteristics of the stock market. The elasticity of home bias is higher with respect to the market capitalization relative to the world market capitalization and respectively relative to the size of the economy, than with respect to the liquidity proxies, but the same pattern is present for all the stock market development variables. In view of our measure of home bias, this positive relationship suggests that domestic investors are more reluctant to leave a thriving market than foreign investors are eager to enter.

A higher share of bank assets, interpreted as a sign of lower financial diversification has already been associated with less interest from foreign investors (Mann and Meade, 2002). To the extent that the expansion of the banking sector is done at the expense of the capital market development and foreign investors react by decreasing their involvement in these countries, actual foreign holdings are lower which might explain the decreasing effect on home bias. Also a less diversified financial sector might make foreign markets more attractive to domestic investors.

Furthermore we test the relationship between two variables related to the international exposure of a country, international trade in goods and services and foreign direct investments. Higher international involvement could lead to better knowledge and trust of foreign markets that might in turn challenge the information asymmetries explanations given to home bias. International trade openness appears significantly but positively linked to home bias while foreign direct investment has a negative but insignificant coefficient. Thus we do not find sufficient support for the beneficial information spillovers from international trade to portfolio investment.

We also find that a positive relationship between home bias and the size of the private bond market, which contradicts the hypothesis that a larger private bond market implies a slower developing stock market and hence lower home bias.

Last, we do not find a significant relationship between home bias and better corporate governance and business environment.

Our additional results for the I-CAPM home bias support the view that domestic investors appear to overvalue the development of their domestic stock market in contrast to foreign investors who are deterred possibly by exaggerated indications of risk. Nevertheless, the overall effect is decreasing home bias, a tendency that is more pronounced in the countries that are members of EMU.

Furthermore we test the same set of specifications on two other measures of home bias, the volatility corrected "data based" and the Bayesian home bias. Tables 5A and 5B report the results for (corrected) "data based" home bias and tables 6A and 6B correspond to (corrected) Bayesian home bias. Though paying a price in terms of instability, these series follow the same pattern. We find evidence of β-convergence, a negative trend and strong and highly significant negative coefficient on the EMU dummy. By construction of these measures of home bias, optimal foreign weights already account for additional information incorporated the sample returns data. Above this information, we find for "data based" home bias a significant added value of explanatory variables related to the financial diversification (growth of bank assets as a proportion of GDP) and importance of the stock market as a channel of liquidity to the economy (growth of traded volume scaled by GDP). Bayesian home bias exhibits as well negative elasticity with respect to bank assets and also with respect to international trade in goods and services and foreign direct investments.

Overall these tests substantiate the fact that home bias is consistently decreasing over time and more intensely in the EMU. This suggests that developments within the eurozone are evening out the differences of perceptions between foreign and domestic investors that are the essence of home bias behaviour.

6 Concluding Remarks

In this study we investigate home bias behavior in a group of twenty-five countries and we observe its response to two challenges. The first one involves the effects of market integration. We find that the financial market integration, and especially its most intense form in the EMU relates significantly to the decrease of home bias. The second challenge is methodological. We apply alternative measures of home bias that depart from the standard I-CAPM framework, allowing for certain degrees of mistrust in the model and also correcting for the uncertainty about the sample estimates of expected returns. These alternative measures achieve two goals. First, they show that for many countries, home bias becomes significantly lower when these concerns are taken into account and the I-CAPM framework is not always an appropriate investment benchmark. Second, these measures offer a more robust view of the phenomenon and support our conclusion that financial market integration has overall a beneficial impact on international investment strategies.

Appendix 1

The Bayesian Framework

This appendix outlines the steps of deriving the moments of the predictive distribution of excess returns, r_{t+1}, conditional on the set of sample data, Φ in terms of the prior and the likelihood function.

The Prior

The way in which the prior distribution incorporates the information given by the estimated intercept reflects the degree of belief in the model. Complete belief in the model assumes that the eventual nonzero intercepts are merely a result of sampling or estimation error and ignores them when computing the expectations of excess returns (the fitted value of the dependent variable) while complete disbelief in the model uses the sample mean as the estimate of expected returns.

As our main interest lies in the intercept it sufficient to construct a prior which is informative only with respect to α and diffuse (highly volatile, non-informative) for the other parameters. Pástor (2000) chose a normal inverted Wishart **prior** for the intercept:

$$\alpha\Big|\Sigma \sim N\left(0, \sigma_\alpha^2\left(\frac{1}{s^2}\Sigma\right)\right),$$

with Σ following a inverted Wishart distribution: $\Sigma^{-1} \sim W(H^{-1}, \upsilon)$, with H^{-1} the parameter matrix of the Wishart distribution and υ, the degrees of freedom. The expectation of the inverted Wishart distribution is given by $E(\Sigma) = H/(\upsilon - N - 1)$, where N is the number of asset returns in our time series. We can rewrite the expectation for the prior residual covariance matrix, as $E(\Sigma) = s^2 I_N$, for $H = s^2(\upsilon - N - 1)$. The prior involves a diagonal and homoskedastic covariance matrix for the residuals, which is set to be non-informative, by choosing υ=15, the equivalent of the sample of 15 observations. The prior of homoskedasticity can easily be reversed under the pressure of data that enters the computation of the posterior density.

At this point, taking expectation of the conditional prior distribution of α, leads to an unconditional distribution in the from:

$$\alpha \sim N\left(0, \sigma_\alpha^2 I_N\right),$$

where σ_α^2 incorporates the degree of disbelief in the model. Based on the interpretation that the intercepts different than zero reflect omitted sources of risk from the model, the size of this mispricing is directly linked to the size of the residual covariance matrix. If the variance of the intercepts has been large, the model is consequently less trusted.

The asset pricing model is linear in the benchmark risk factor, the world returns under the I-CAPM [7]: $R_t = \alpha + \beta F_t + \varepsilon_t$, assuming $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon_t') = \Sigma$, $E(F_t) = \mu_F$, $E\left[(F_t - \mu_F)(F_t - \mu_F)'\right] = \Omega_F$, $\operatorname{cov}(F_t, \varepsilon_{i,t}) = 0,\ \forall i = \overline{1,N}$.

The **prior joint distribution** is:

$$p(\theta) = p(\alpha \mid \Sigma)\, p(\Sigma)\, p(\beta)\, p(\mu_F)\, p(\Omega_F),$$

where only the priors on the last three distributions are diffuse as derived by Pástor and Stambaugh (2000):

$$p(\alpha \mid \Sigma) \propto |\Sigma|^{-\frac{1}{2}} \exp\left\{-\frac{1}{2}\alpha' \left(\frac{\sigma_\alpha^2}{s^2}\Sigma\right)^{-1} \alpha\right\},$$

$$p(\Sigma) \propto |\Sigma|^{-\frac{\upsilon+N+1}{2}} \exp\left\{-\frac{1}{2} trH\Sigma^{-1}\right\},$$

$$p(\beta) \propto 1,$$

$$p(\mu_F) \propto 1,$$

$$p(\Omega_F) = \Omega_F^{-1}.$$

The Likelihood

In the linear model for asset returns, the disturbances are assumed uncorrelated and homoskedastic. The benchmark returns are assumed i.i.d., normal, independent over time and independent of the error terms. Under these independence assumptions, the **likelihood function** can be written as a product of two normal likelihood functions, for the returns on the assets and respectively for the returns on the benchmark factor:

$$p(\Phi \mid \theta) = p(R \mid \theta, F)\, p(F \mid \theta).$$

[7] Pástor (2000) derives the results for the general case of N assets and K benchmarks. In the case of International CAPM, the only benchmark is given by the world returns. Notation follows closely Asgharian and Hansson (2005).

The product terms are further expanded using computational results of Pástor and Stambaugh (2000*)* into*:*

$$p(R \mid \theta, F) \propto |\Sigma|^{-\frac{T}{2}} \exp\left(-\frac{T}{2} tr\,\hat{\Sigma}\Sigma^{-1} - \frac{1}{2}\left(b-\hat{b}\right)\left(\Sigma^{-1} \otimes F'F\right)\left(b-\hat{b}\right)\right),$$

$$p(F \mid \theta) \propto |\Omega_F|^{-\frac{T}{2}} \exp\left(-\frac{T}{2} tr\hat{\Omega}_F\Omega_F^{-1} - \frac{1}{2}(\mu_F - \hat{\mu}_F)(\mu_F - \hat{\mu}_F)'\Omega_F^{-1}\right),$$

where $b = vec(B)$[8] and $B = (\alpha \quad \beta)'$.

The Posterior Density

We return to the key relation of Bayesian analysis, that defines the posterior distribution via proportionality with the product of prior density and likelihood functions. Pástor and Stambaugh (2000) combine the results for the priors with the ones for the likelihood functions separately for the regression parameters and for the benchmark returns.

The **posterior means** of the model parameters result from:

$$b \equiv E(b \mid \Phi) = \left(I_N \otimes P^{-1}X'X\right)\hat{b},$$

where $\hat{b}$ is the vector of OLS estimates of the model on the dataset, $X = (\iota_T \;\; F)$, $P = D + X'X$, $\underset{[2\times2]}{D}$ is a matrix with the first element, $d_{(1,1)} = \dfrac{s^2}{\sigma_\alpha^2}$ and the rest of the elements $d_{(m,n)} = 0$, $m, n \neq 1$.

The **posterior variance** of the model parameters is given by:

$$Var(b \mid \Phi) = \tilde{\Sigma} \otimes P^{-1},$$

where $\tilde{\Sigma} = E(\Sigma \mid \Phi) = \dfrac{\left(H + T\hat{\Sigma} + \hat{B}'Q\hat{B}\right)}{T - \nu - N - K - 1}$, $Q = X'\left(I_T - XP^{-1}X'\right)X$ and $\hat{\Sigma}$ and $\hat{B}$ result from estimating the model on the available sample.

Finally, the **predictive means** and **variance** of asset returns are defined using the posterior moments.

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[8] The transformation vec applied to a matrix, stacks its columns resulting into a vector.

The **predictive means** can be computed as:

$$\mu^* \equiv E[R_{T+1} \mid \Phi] = \tilde{\mu} = \tilde{\alpha} + \tilde{\beta}\tilde{\mu}_F \,,$$

where $\tilde{\mu}, \tilde{\alpha}, \tilde{\beta}, \tilde{\mu}_F$ are posterior means and parameters.

The **predictive variance –covariance** matrix of asset returns is given by:

$$\operatorname{cov}\left(R_{i,T+1} R_{j,T+1} \mid \Phi\right) \equiv \tilde{\beta}_i' \Omega_F^* \tilde{\beta}_j + tr\left[\Omega \operatorname{cov}\left(\beta_i, \beta_j \mid \Phi\right)\right] + \tilde{\sigma}_{i,j} + [1\ \tilde{\mu}_F'] \operatorname{cov}\left(b_i, b_j' \mid \Phi\right) [1\ \tilde{\mu}_F']' \,,$$

where $\tilde{\sigma}_{i,j}$ is the respective (i, j) of the posterior variance covariance matrix, $\tilde{\Sigma}$ and Ω_F^* is the predictive covariance matrix factor employed by the model explaining the returns: $\Omega_F^* = \tilde{\Omega}_F + Var(\mu_F \mid \Phi)$, where $\tilde{\Omega}_F = \dfrac{T\hat{\Omega}_F}{T-3}$, $Var(\mu_F \mid \Phi) = \dfrac{\hat{\Omega}_F}{T-3}$.

The analytical result for the **predictive variance covariance matrix** for the asset returns is:

$$\operatorname{cov}(R, F \mid \Phi) = \tilde{\beta}\tilde{\Omega}_F + \tilde{\beta} Var(\mu_F \mid \Phi) \,.$$

Appendix 2

The multi-prior framework

Garlappi et al. (2004) prove that the multi-prior optimization problem in the case when uncertainty about the estimation of expected returns is expressed jointly for all assets, is equivalent to the maximization problem:

$$\max_{\boldsymbol{\omega}} \ \boldsymbol{\omega}'\boldsymbol{\mu} - (\gamma/2)\boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega} - \sqrt{\varepsilon\boldsymbol{\omega}'\boldsymbol{\Sigma}\boldsymbol{\omega}},$$

subject to

$$\boldsymbol{\omega}'\iota = 1,$$

where $\varepsilon = \in \dfrac{(T-1)N}{T(T-N)}$.

Without imposing short sales constrains, the problem can be solved analytically and the optimal weights are given by:

$$\boldsymbol{\omega}^* = \frac{\sigma_P^*}{\sqrt{\varepsilon} + \gamma\sigma_P^*}\boldsymbol{\Sigma}^{-1}\left(\hat{\boldsymbol{\mu}} - \frac{1}{A}\left(B - \frac{\sqrt{\varepsilon} + \gamma\sigma_P^*}{\sigma_P^*}\right)\boldsymbol{\iota}\right),$$

where σ_P^* is the variance of the optimal portfolio and the (unique) positive real solution to the polynomial equation:

$$A\gamma^2\sigma_P^4 + 2A\gamma\sigma_P^3 + \left(A\varepsilon - AC + B^2 - \gamma^2\right)\sigma_P^2 - 2\gamma\sqrt{\varepsilon}\sigma_P - \varepsilon = 0,$$

and $A = \boldsymbol{\iota}'\boldsymbol{\Sigma}^{-1}\boldsymbol{\iota}$, $B = \hat{\boldsymbol{\mu}}'\boldsymbol{\Sigma}^{-1}\boldsymbol{\iota}$ and $C = \hat{\boldsymbol{\mu}}'\boldsymbol{\Sigma}^{-1}\hat{\boldsymbol{\mu}}$.

Table 1 Descriptive statistics – International Investment Position

This table presents some descriptive statistics (number of observations, mean of the full sample (Mean) and means of the first and second halves of the sample, (Mean1 and Mean2)) for the main data needed to compute home bias: portfolio holdings of foreign assets and foreign liabilities (in million USD) reported in the International Investment Position of the Balance of Payments and recorded in IMF International Financial Services Database, as well as relative market share in percentages (computed as the ratio of the domestic market capitalization to the MSCI World Market Capitalization). All series are recorded with annual frequency.

Country	Foreign Assets (million USD)				Foreign Liabilities (million USD)				Relative Market Share (%)			
	#	Mean	Mean 1	Mean 2	#	Mean	Mean 1	Mean 2	#	Mean	Mean 1	Mean 2
Austria	24	10267	1522	23450	24	6628	756	16206	32	0.11	0.05	0.16
Belgium	23	53038	17438	91874	23	8355	2771	14447	32	0.55	0.49	0.62
Czech Rep	6	30	484	2361	6	138	2549	4899	7	0.07	0.07	0.07
Denmark	11	1254	9440	41699	11	3213	6001	22107	11	0.26	0.19	0.34
Finland	24	5235	45	14825	18	50777	4116	108635	17	0.44	0.19	0.70
France	15	116820	51334	223024	15	232100	91366	417806	32	2.51	1.51	3.63
Germany	24	173700	27447	373783	24	125660	42031	240094	32	4.04	4.30	3.73
Greece	6	1551	1269	3476	6	11512	11127	17650	30	0.24	0.21	0.26
Hungary	7	209	103	489	7	3454	3045	5854	14	0.06	0.02	0.09
Iceland	13	946	109	2388	9	37	16	519	8	0.03	0.01	0.04
Italy	32	48164	2867	117044	18	22415	7200	48199	32	1.39	0.99	1.84
Netherlands	22	98040	25866	205155	22	136290	43871	255755	32	1.98	1.79	2.19
Poland	8	76	25	316	10	3619	2668	6767	14	0.08	0.03	0.13
Portugal	8	7244	6124	10321	11	13991	8037	25491	28	0.12	0.05	0.19
Spain	24	15706	742	30671	24	44111	7455	87431	18	1.23	1.04	1.46
Switzerland	21	117170	40034	214524	21	169330	69452	295332	24	2.61	2.49	2.73
UK	24	292620	121646	526320	24	291360	57633	605335	32	8.11	7.29	9.02
Sweden	21	31836	4539	69124	21	36957	6809	78412	23	0.67	0.38	0.96
Turkey	8	23	5	72	8	6701	7113	8545	28	0.15	0.04	0.17
Australia	18	38735	16329	61142	18	61867	27231	96503	32	1.34	1.21	1.48
Canada	6	131240	115033	147447	6	60054	51527	68580	32	2.40	2.50	2.28
Hong Kong	5	126190	92887	176140	5	115830	106733	129480	32	1.32	0.84	1.86
Japan	10	229420	190930	267914	10	240890	72159	419317	32	23.57	27.28	19.35
N. Zealand	14	4989	1141	8837	14	2885	920	5130	17	0.12	0.13	0.10
USA	25	741070	110252	1424461	25	638190	177118	1137665	32	44.62	48.27	40.48

Table 2 Test of I-CAPM

This table reports the results of the OLS regressions of weekly (excess) returns on domestic market indices on a constant and the (excess) returns on the World Market Index for 25 countries. As the length of time series varies across the countries, the date of the first observation included in the estimation is reported in the second column of the table. Values of the coefficients, their respective standard errors and R^2, as a measure of goodness of fit of the model are reported subsequently. Significance is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

Country	1st obs.	Alpha	Std. Err.	Beta	Std. Err.	R^2 (%)
Austria	09/01/1975	0.03	0.05	0.35***	0.02	9
Belgium	09/01/1975	0.05	0.04	0.53***	0.02	23
Czech Rep	16/11/1995	0.10	0.12	0.57***	0.06	11
Denmark	09/01/1975	0.10*	0.05	0.42***	0.02	11
Finland	22/03/1990	0.13	0.12	1.09***	0.06	25
France	09/01/1975	0.08	0.05	0.73***	0.02	26
Germany	09/01/1975	-0.00	0.04	0.65***	0.02	29
Greece	09/12/1993	0.26*	0.14	0.70***	0.07	11
Hungary	17/06/1993	0.27	0.13	0.92***	0.07	18
Iceland	05/01/1995	0.25***	0.06	0.08***	0.03	1
Italy	09/01/1975	0.10	0.07	0.61***	0.03	13
Netherlands	09/01/1975	0.04	0.04	0.69***	0.02	35
Poland	07/03/1996	0.00	0.19	0.91***	0.10	12
Portugal	09/12/1993	0.02	0.07	0.58***	0.03	24
Spain	09/03/1989	0.08	0.07	0.84***	0.03	36
Switzerland	09/01/1975	-0.00	0.04	0.60***	0.02	31
UK	11/01/1973	0.08	0.05	0.76***	0.02	31
Sweden	12/01/1984	0.10	0.07	0.93***	0.04	30
Turkey	11/01/1990	1.09***	0.23	0.85***	0.12	5
Australia	09/01/1975	0.08	0.05	0.58***	0.02	19
Canada	09/01/1975	0.02	0.03	0.72***	0.01	45
Hong Kong	09/01/1975	0.13	0.09	0.92***	0.04	17
Japan	09/01/1975	-0.06	0.04	0.76***	0.02	37
New Zealand	11/01/1990	0.07	0.07	0.46***	0.03	14
USA	09/01/1975	0.01	0.02	0.99***	0.01	71
Average		*0.12*	*0.07*	*0.69*	*0.03*	*23*

Table 3 Descriptive statistics – Home Bias Measures

This table presents some descriptive statistics (mean, median and standard deviation) of the measure of home bias: (1) home bias computed in I-CAPM framework, (2) data based home bias, (3) home bias computed in a Bayesian framework (σ_α^2=0.05), (4) home bias computed by applying the Multi-Prior correction to the data based approach, (5) home bias computed by applying the Multi-Prior correction to the Bayesian approach (σ_α^2=0.05). All results correspond to end-of-year data.

Country	**(1) I-CAPM**			**(2) DATA**			**(3) BAYESIAN (σ_α^2=0.05)**			**(4) MPC DATA**			**(5) MPC BAYESIAN (σ_α^2=0.05)**		
	Mean	Med	Std	Mean	Med	Std	Mean	Med	Std	Mean	Med	Std	Mean	Med	Std
Austria	0.58	0.61	0.20	0.24	0.50	0.70	0.24	0.50	0.70	0.08	0.40	0.77	0.07	0.40	0.78
Belgium	0.55	0.54	0.06	-0.03	0.20	0.60	0.00	0.23	0.59	0.23	0.24	0.12	0.24	0.26	0.32
Czech Rep	0.88	0.90	0.08	0.88	0.86	0.06	0.88	0.89	0.07	0.87	0.88	0.08	0.87	0.89	0.08
Denmark	0.69	0.71	0.09	0.37	0.46	0.22	0.47	0.54	0.18	0.47	0.52	0.17	0.51	0.56	0.15
Finland	0.87	0.94	0.14	0.28	0.84	0.93	0.33	0.85	0.91	0.84	0.93	0.18	0.84	0.93	0.18
France	0.77	0.78	0.03	0.42	0.50	0.22	0.49	0.56	0.17	0.62	0.63	0.08	0.63	0.65	0.07
Germany	0.73	0.70	0.13	0.25	0.60	0.86	0.29	0.60	0.81	0.61	0.58	0.17	0.61	0.58	0.17
Greece	0.98	0.98	0.01	0.07	0.65	1.01	0.66	0.94	0.75	0.95	0.97	0.03	0.96	0.97	0.02
Hungary	0.98	0.98	0.02	0.69	0.96	0.70	0.70	0.96	0.71	0.97	0.97	0.01	0.97	0.97	0.01
Iceland	0.74	0.74	0.06	0.06	0.05	0.41	0.11	0.11	0.40	0.24	0.17	0.26	0.27	0.20	0.25
Italy	0.82	0.90	0.11	0.69	0.82	0.23	0.71	0.84	0.21	0.75	0.85	0.17	0.76	0.86	0.16
Netherlands	0.60	0.63	0.08	-0.09	0.02	0.58	-0.03	0.11	0.56	0.21	0.25	0.20	0.24	0.28	0.19
Poland	0.99	0.99	0.00	0.99	0.99	0.00	0.99	0.99	0.00	0.99	0.99	0.00	0.99	0.99	0.00
Portugal	0.79	0.82	0.07	0.31	0.55	0.85	0.38	0.57	0.82	0.68	0.69	0.11	0.69	0.69	0.11
Spain	0.91	0.96	0.10	0.25	0.79	0.94	0.47	0.88	0.79	0.85	0.95	0.16	0.87	0.95	0.14
Switzerland	0.61	0.62	0.04	0.38	0.63	0.81	0.38	0.63	0.80	0.57	0.52	0.18	0.55	0.52	0.14
UK	0.69	0.69	0.03	-0.06	0.10	0.63	0.07	0.26	0.60	0.47	0.49	0.10	0.52	0.54	0.07
Sweden	0.73	0.70	0.13	0.51	0.54	0.29	0.61	0.58	0.20	0.63	0.59	0.16	0.65	0.61	0.16
Turkey	0.99	0.99	0.00	0.32	0.99	1.00	0.77	0.99	0.66	0.99	0.99	0.00	0.99	0.99	0.00
Australia	0.83	0.83	0.02	0.69	0.71	0.10	0.72	0.74	0.08	0.75	0.76	0.05	0.76	0.77	0.04
Canada	0.81	0.82	0.04	0.64	0.66	0.13	0.65	0.67	0.13	0.68	0.69	0.08	0.68	0.69	0.08
Hong Kong	0.77	0.77	0.04	0.61	0.58	0.08	0.70	0.67	0.05	0.71	0.70	0.04	0.74	0.73	0.04
Japan	0.90	0.90	0.02	0.94	0.95	0.00	0.94	0.94	0.00	0.91	0.91	0.01	0.91	0.91	0.01
N. Zealand	0.83	0.86	0.15	0.50	0.81	0.60	0.69	0.83	0.36	0.74	0.83	0.25	0.75	0.83	0.23
USA	0.82	0.83	0.09	0.45	0.76	0.64	0.46	0.77	0.64	0.79	0.79	0.16	0.79	0.79	0.16
Average	*0.80*	*0.81*	*0.07*	*0.42*	*0.62*	*0.49*	*0.51*	*0.67*	*0.48*	*0.68*	*0.69*	*0.19*	*0.67*	*0.70*	*0.14*

Table 4A Estimation Results for Home Bias – the I-CAPM measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), annual I-CAPM betas (estimated on cumulated samples of weekly return data) (BETAS), EU/EMU dummy variables -I(EU/EMU)-, annual growth rate (in percentages) of the variance of the residuals from the I-CAPM regressions (IDSYN RISK), annual growth rate (in percentages) of Sharpe Ratios, intercepts of the I-CAPM regressions (ALPHAS), annual growth rate (in percentages) of standard deviation of returns (STDEV), annual growth rate (in percentages) of stock market capitalization scaled by GDP (STMKTCAP). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficents is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure				**I-CAPM**				
No Obs.	358	358	358	357	358	358	358	285
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC	0.06***	0.07***	0.07***	0.06***	0.07***	0.07***	0.06***	
(Std. Err.)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	
LEVEL(-1)	-0.26***	-0.23***	-0.27***	-0.25***	-0.27***	-0.26***	-0.24***	-0.29***
(Std. Err.)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)
TIME	-0.35***	-0.31***	-0.27***	-0.25***	-0.27***	-0.25***	-0.25***	-0.20***
(Std. Err.)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)
BETAS	-9.28***							
(Std. Err.)	(1.78)							
I(EU)		-3.29**						
(Std. Err.)		(1.47)						
I(EMU)			-5.90***	-5.80***	-5.89***	-5.63***	-5.82***	-7.07***
(Std. Err.)			(0.85)	(0.85)	(0.85)	(0.84)	(0.85)	(1.15)
IDSYN RSK				0.07***				
(Std. Err.)				(0.02)				
SHARPE R					0.00			
(Std. Err.)					(0.00)			
ALPHAS						-5.59*		
(Std. Err.)						(3.32)		
STDEV							0.00*	
(Std. Err.)							(0.00)	
STMKTCAP								0.02**
(Std. Err.)								(0.00)
Adj R^2	81%	80%	87%	78%	87%	87%	76%	29%

[1]-n.r.-=not reported

Table 4B Estimation Results for Home Bias – the I-CAPM measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), EMU dummy variable -I(EU/EMU)-, annual growth rate (in percentages) of stock market turnover ratio (STTURNVR), capitalization scaled by GDP (STMKTCAP), annual growth rate (in percentages) of stock market total value traded scaled by GDP (STVALTRD), annual growth rate (in percentages) of deposit money bank assets scaled by GDP (DBAGDP), annual growth rate (in percentages) of international trade (imports plus exports) scaled by GDP (OPN), annual growth rate (in percentages) foreign direct investments (assets and liabilities) scaled by GDP (FDI), annual growth rate (in percentages) of private bond market capitalization scaled by GDP (PUBOND), Shareholder Protection Index (SHLD PROT) and Rule of Law Index (RULE LAW). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficients is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure				**I-CAPM**				
No Obs.	358	292	358	358	352	247	208	232
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC			0.05***	0.06***	0.06***	0.05***	0.05***	0.05***
(Std. Err.)			(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
LEVEL(-1)	-0.28***	-0.26***	-0.25***	-0.20***	-0.21***	-0.33***	-0.32***	-0.30***
(Std. Err.)	(0.04)	(0.05)	(0.04)	(0.03)	(0.04)	(0.04)	(0.06)	(0.06)
TIME	-0.18***	-0.15***	-0.24***	-0.24***	-0.23***	-0.27***	-0.34**	-0.22**
(Std. Err.)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.12)	(0.09)
I(EMU)	-6.73***	-6.86***	-5.66***	-5.28***	-5.38***	-7.13***	-6.19***	-6.69***
(Std. Err.)	(1.11)	(1.11)	(0.98)	(0.82)	(0.85)	(1.12)	(1.36)	(1.23)
STTURNVR	0.01***							
(Std. Err.)	(0.00)							
STVALTRD		0.01**						
(Std. Err.)		(0.00)						
DBAGDP			-0.06**					
(Std. Err.)			(0.02)					
OPN				0.04***				
(Std. Err.)				(0.01)				
FDI					-0.00			
(Std. Err.)					(0.00)			
PRBOND						0.03*		
(Std. Err.)						(0.02)		
SHLD PROT							-0.06	
(Std. Err.)							(0.24)	
RULE LAW								-5.02
(Std. Err.)								(3.92)
Adj R^2	64%	37%	47%	83%	49%	70%	34%	33%

[1]-n.r.-=not reported

Table 5A Estimation Results for Home Bias – the Multi-Prior Correction of the Data Measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), annual I-CAPM betas (estimated on cumulated samples of weekly return data) (BETAS), EU/EMU dummy variables -I(EU/EMU)-, annual growth rate (in percentages) of the variance of the residuals from the I-CAPM regressions (IDSYN RISK), annual growth rate (in percentages) of Sharpe Ratios, intercepts of the I-CAPM regressions (ALPHAS), annual growth rate (in percentages) of standard deviation of returns (STDEV), annual growth rate (in percentages) of stock market capitalization scaled by GDP (STMKTCAP). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficients is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure	**Multi-Prior Correction DATA**							
No Obs.	358	358	358	357	358	358	358	285
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
(Std. Err.)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
LEVEL(-1)	-0.11*	-0.09	-0.13**	-0.12**	-0.13**	-0.13**	-0.13**	-0.09
(Std. Err.)	(0.06)	(0.05)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.08)
TIME	-0.42***	-0.31**	-0.29**	-0.26*	-0.30**	-0.27*	-0.29**	-0.16
(Std. Err.)	(0.14)	(0.13)	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)	(0.21)
BETAS	-3.43							
(Std. Err.)	(5.09)							
I(EU)		-2.35						
(Std. Err.)		(1.71)						
I(EMU)			-7.75***	-7.30***	-7.99**	-7.46***	-7.32***	-8.01**
(Std. Err.)			(1.91)	(2.05)	(1.98)	(2.00)	(2.00)	(3.23)
IDSYN RSK				0.03				
(Std. Err.)				(0.06)				
SHARPE R					0.00			
(Std. Err.)					(0.00)			
ALPHAS						0.76		
(Std. Err.)						(5.69)		
STDEV							0.00	
(Std. Err.)							(0.00)	
STMKTCAP								0.01
(Std. Err.)								(0.01)
Adj R^2	9%	7%	14%	14%	14%	13%	14%	8%

[1]-n.r.-=not reported

Table 5B Estimation Results for Home Bias – the Multi-Prior Correction of the Data Measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), EMU dummy variable -I(EU/EMU)-, annual growth rate (in percentages) of stock market turnover ratio (STTURNVR), capitalization scaled by GDP (STMKTCAP), annual growth rate (in percentages) of stock market total value traded scaled by GDP (STVALTRD), annual growth rate (in percentages) of deposit money bank assets scaled by GDP (DBAGDP), annual growth rate (in percentages) of international trade (imports plus exports) scaled by GDP (OPN), annual growth rate (in percentages) foreign direct investments (assets and liabilities) scaled by GDP (FDI), annual growth rate (in percentages) of private bond market capitalization scaled by GDP (PUBOND), Shareholder Protection Index (SHLD PROT) and Rule of Law Index (RULE LAW). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficients is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure	**Multi-Prior Correction DATA**							
No Obs.	280	292	334	358	352	247	232	232
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC			0.01	0.01	0.01	0.03	0.01	0.01*
(Std. Err.)			(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.00)
LEVEL(-1)	-0.35***	-0.34***	-0.17**	-0.10	-0.13**	-0.27**	-0.27***	-0.21**
(Std. Err.)	(0.08)	(0.07)	(0.06)	(0.06)	(0.06)	(0.10)	(0.10)	(0.10)
TIME	-0.34	-0.34*	-0.37**	-0.26*	-0.30**	-0.53	-0.53*	-0.23
(Std. Err.)	(0.22)	(0.19)	(0.15)	(0.15)	(0.15)	(0.33)	(0.31)	(0.32)
I(EMU)	-12.69***	-11.83***	-7.49***	-7.30***	-7.71***	-9.58***	-10.96***	-9.62***
(Std. Err.)	(0.01)	(2.83)	(1.88)	(2.03)	(2.06)	(3.46)	(3.04)	(3.56)
STTURNVR	0.00							
(Std. Err.)	(0.01)							
STVALTRD		0.01**						
(Std. Err.)		(0.00)						
DBAGDP			-0.19***					
(Std. Err.)			(0.06)					
OPN				-0.13				
(Std. Err.)				(0.08)				
FDI					-0.05			
(Std. Err.)					(0.04)			
PRBOND						-0.01		
(Std. Err.)						(0.05)		
SHLD PROT							0.56	
(Std. Err.)							(0.70)	
RULE LAW								-6.22
(Std. Err.)								(10.67)
Adj R^2	35%	49%	19%	10%	10%	14%	10%	10%

[1]-n.r.-=not reported

Table 6A Estimation Results for Home Bias – the Multi-Prior Correction of the Bayesian (σ_α^2=0.05) Measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), annual I-CAPM betas (estimated on cumulated samples of weekly return data) (BETAS), EU/EMU dummy variables -I(EU/EMU)-, annual growth rate (in percentages) of the variance of the residuals from the I-CAPM regressions (IDSYN RSK), annual growth rate (in percentages) of Sharpe Ratios, intercepts of the I-CAPM regressions (ALPHAS), annual growth rate (in percentages) of standard deviation of returns (STDEV), annual growth rate (in percentages) of stock market capitalization scaled by GDP (STMKTCAP). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficients is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure	**Multi-Prior Correction BAYESIAN (σ_α^2=0.05)**							
No Obs.	358	358	358	357	358	358	358	285
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC	0.01	0.02	0.01	0.01	0.01	0.01	0.01	
(Std. Err.)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
LEVEL(-1)	-0.04	-0.01	-0.11**	-0.09**	-0.11**	-0.11**	-0.09**	-0.12*
(Std. Err.)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)
TIME	-0.23***	-0.22**	-0.25**	-0.23**	-0.26***	-0.24**	-0.23**	-0.27**
(Std. Err.)	(0.05)	(0.08)	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)	(0.13)
BETAS	-6.45**							
(Std. Err.)	(3.19)							
I(EU)		-0.46						
(Std. Err.)		(1.62)						
I(EMU)			-6.67***	-6.19***	-6.50***	-6.55***	-6.32***	-6.79***
(Std. Err.)			(1.53)	(1.69)	(1.57)	(1.57)	(1.72)	(2.10)
IDSYN RSK				1.15				
(Std. Err.)				(6.03)				
SHARPE R					0.14			
(Std. Err.)					(0.19)			
ALPHAS						-1.85		
(Std. Err.)						(5.16)		
STDEV							-0.00	
(Std. Err.)							(0.00)	
STMKTCAP								0.01
(Std. Err.)								(0.01)
Adj R^2	8%	7%	14%	12%	13%	13%	13%	12%

[1]-n.r.-=not reported

Table 6B Estimation Results for Home Bias – the Multi-Prior Correction of the Bayesian (σ_{α}^{2}=0.05) Measure

This table reports the results of panel regressions of annual growth rate of home bias (in percentages) on selected variables including: annual growth rates (in percentages) of the relative market capitalization (RMC), previous year levels (LEVEL(-1)), the trend (TIME), EMU dummy variable -I(EU/EMU)-, annual growth rate (in percentages) of stock market turnover ratio (STTURNVR), capitalization scaled by GDP (STMKTCAP), annual growth rate (in percentages) of stock market total value traded scaled by GDP (STVALTRD), annual growth rate (in percentages) of deposit money bank assets scaled by GDP (DBAGDP), annual growth rate (in percentages) of international trade (imports plus exports) scaled by GDP (OPN), annual growth rate (in percentages) foreign direct investments (assets and liabilities) scaled by GDP (FDI), annual growth rate (in percentages) of private bond market capitalization scaled by GDP (PUBOND), Shareholder Protection Index (SHLD PROT) and Rule of Law Index (RULE LAW). The results are obtained through feasible GLS, to control for cross-section heteroskedasticity. Values of the coefficients, standard errors corrected for period heteroskedasticity and serial correlation and adjusted R^2, are reported. Significance of the coefficents is denoted by *** (at 1%), ** (at 5%) and * (at 10%).

HB Measure	**Multi-Prior Correction BAYESIAN** (σ_{α}^{2}=0.05)							
No Obs.	280	292	334	358	352	247	232	232
Intercept	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
(Std. Err.)	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-	-n.r.-
RMC			0.00	0.01	0.02	0.03*	0.02	0.01
(Std. Err.)			(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
LEVEL(-1)	-0.28***	-0.31***	- 0.16***	-0.08*	-0.10	-0.27***	-0.20**	-0.12*
(Std. Err.)	(0.06)	0.06)	(0.05)	(0.04)	(0.06)	(0.09)	(0.08)	(0.07)
TIME	-0.24**	-0.24**	-0.30***	-0.21**	-0.20	-0.51**	- 0.44*	-0.29
(Std. Err.)	(0.12)	0.11)	(0.10)	(0.10)	(0.13)	(0.21)	(0.24)	(0.18)
I(EMU)	-10.68***	-11.81***	-7.35***	-6.67***	-7.66***	-7.20***	- 8.75***	-6.61***
(Std. Err.)	(2.09)	(1.92)	(1.68)	(1.58)	(2.54)	(2.47)	(2.66)	(2.37)
STTURNVR	0.00							
(Std. Err.)	0.01							
STVALTRD		0.00						
(Std. Err.)		0.00)						
DBAGDP			-0.16**					
(Std. Err.)			(0.07)					
OPN				-0.13*				
(Std. Err.)				(0.07)				
FDI					-0.15***			
(Std. Err.)					(0.05)			
PRBOND						-0.02		
(Std. Err.)						(0.06)		
SHLD PROT							0.47	
(Std. Err.)							(0.56)	
RULE LAW								-4.76
(Std. Err.)								(6.66)
Adj R^2	18%	27%	15%	13%	8%	10%	11%	15%

[1]-n.r.-=not reported

Figure 1 Home Bias (short sales allowed)

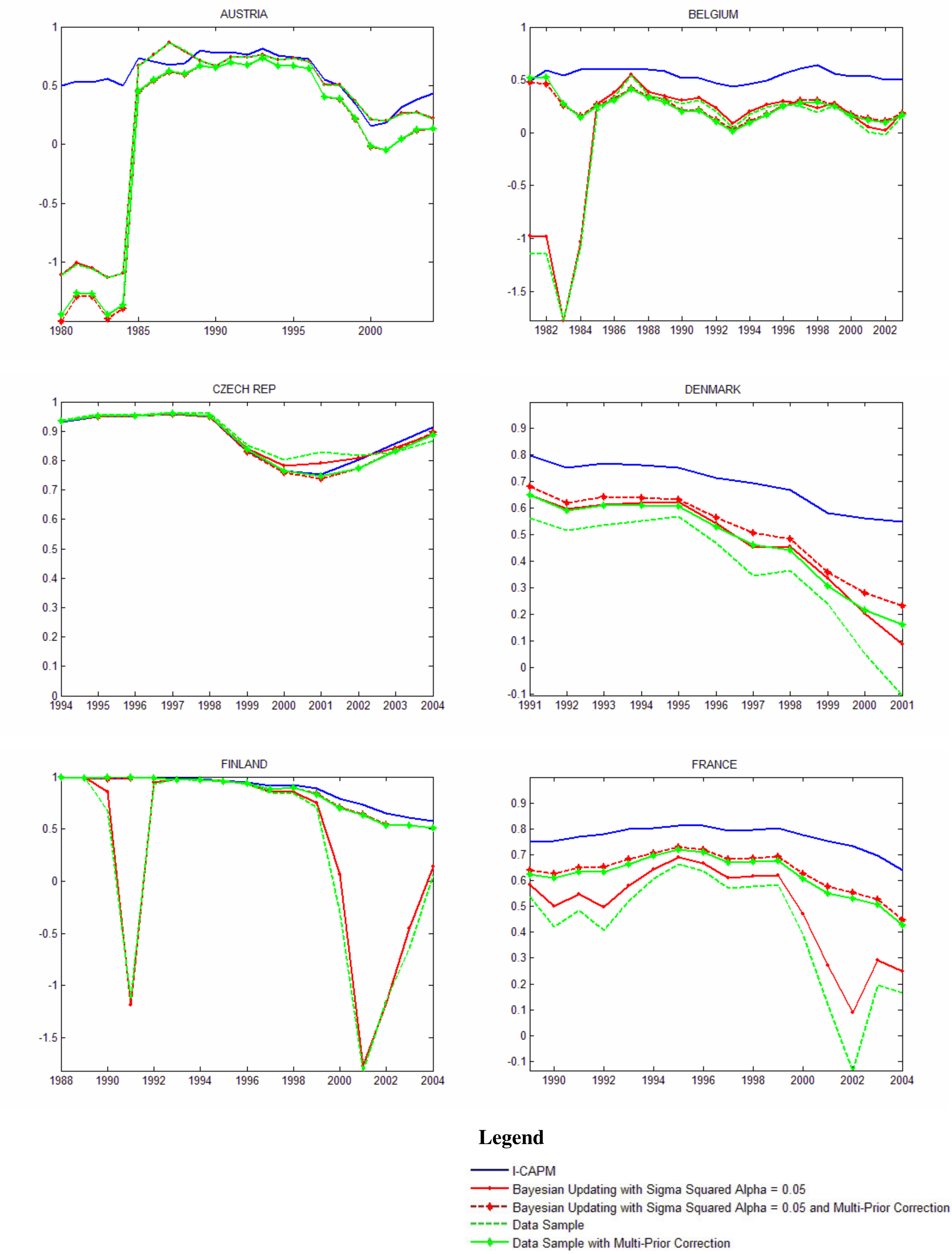
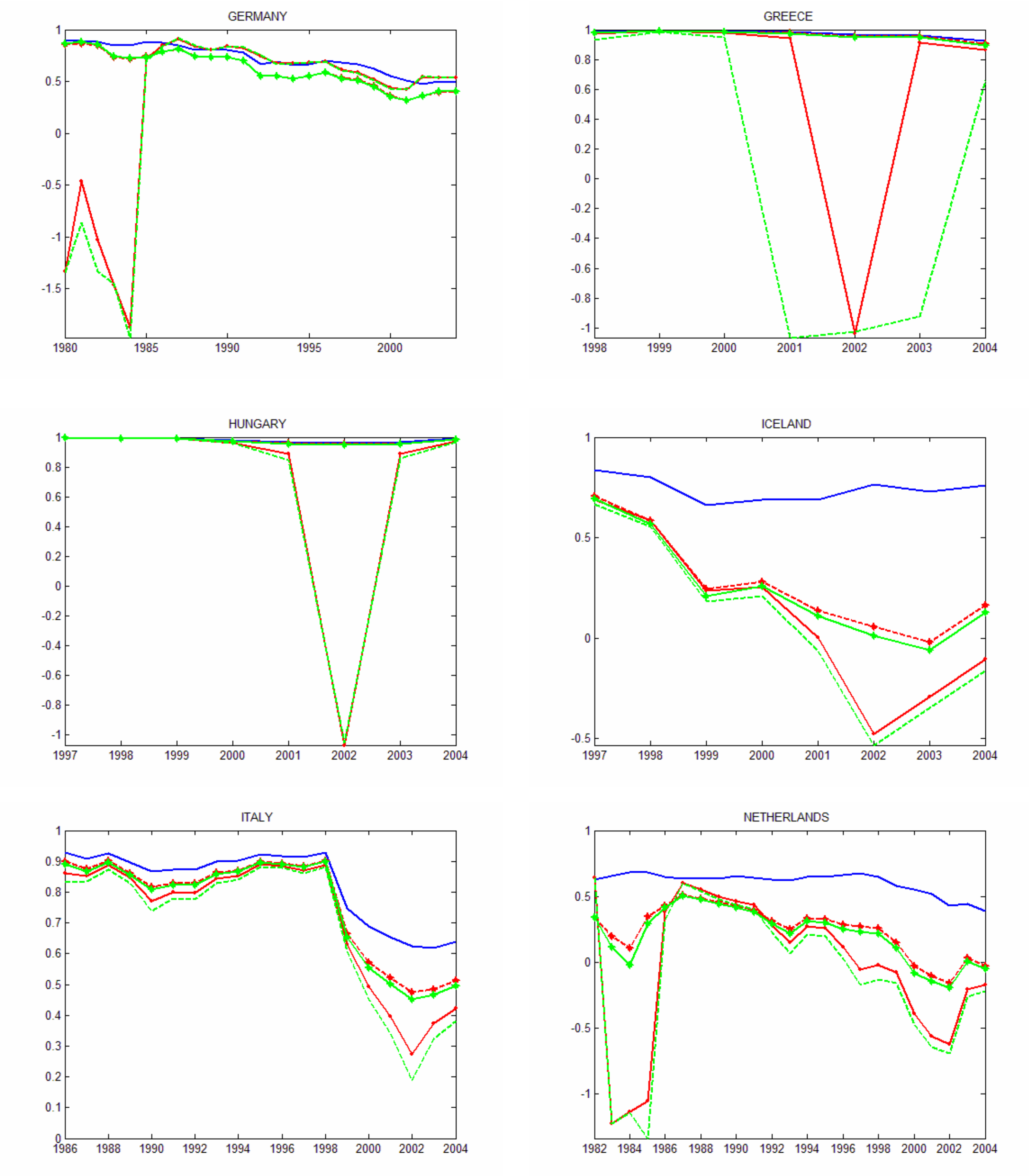


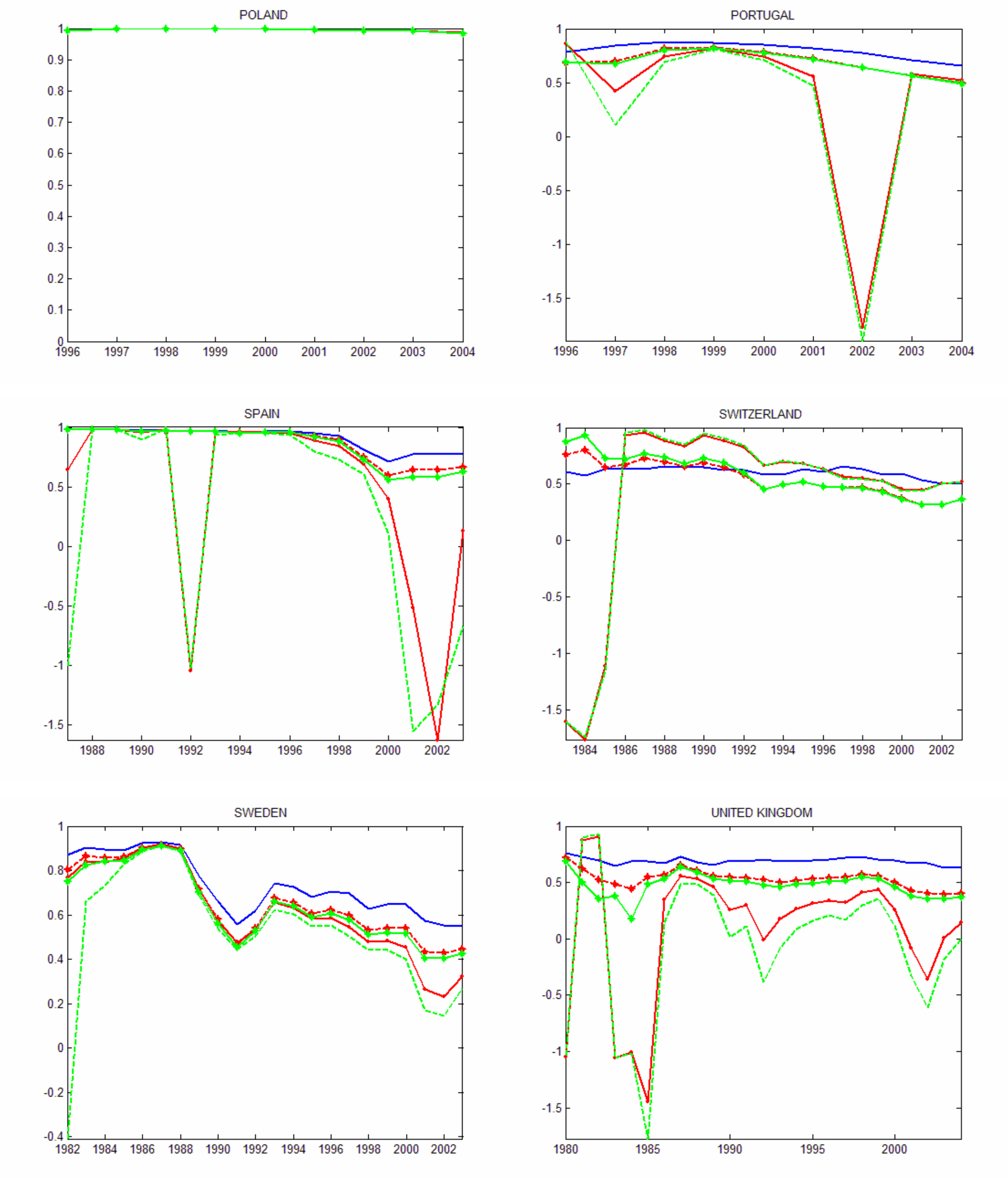
Figure 1ctd Home Bias (short sales allowed)



Legend

- I-CAPM
- Bayesian Updating with Sigma Squared Alpha = 0.05
- Bayesian Updating with Sigma Squared Alpha = 0.05 and Multi-Prior Correction
- Data Sample
- Data Sample with Multi-Prior Correction

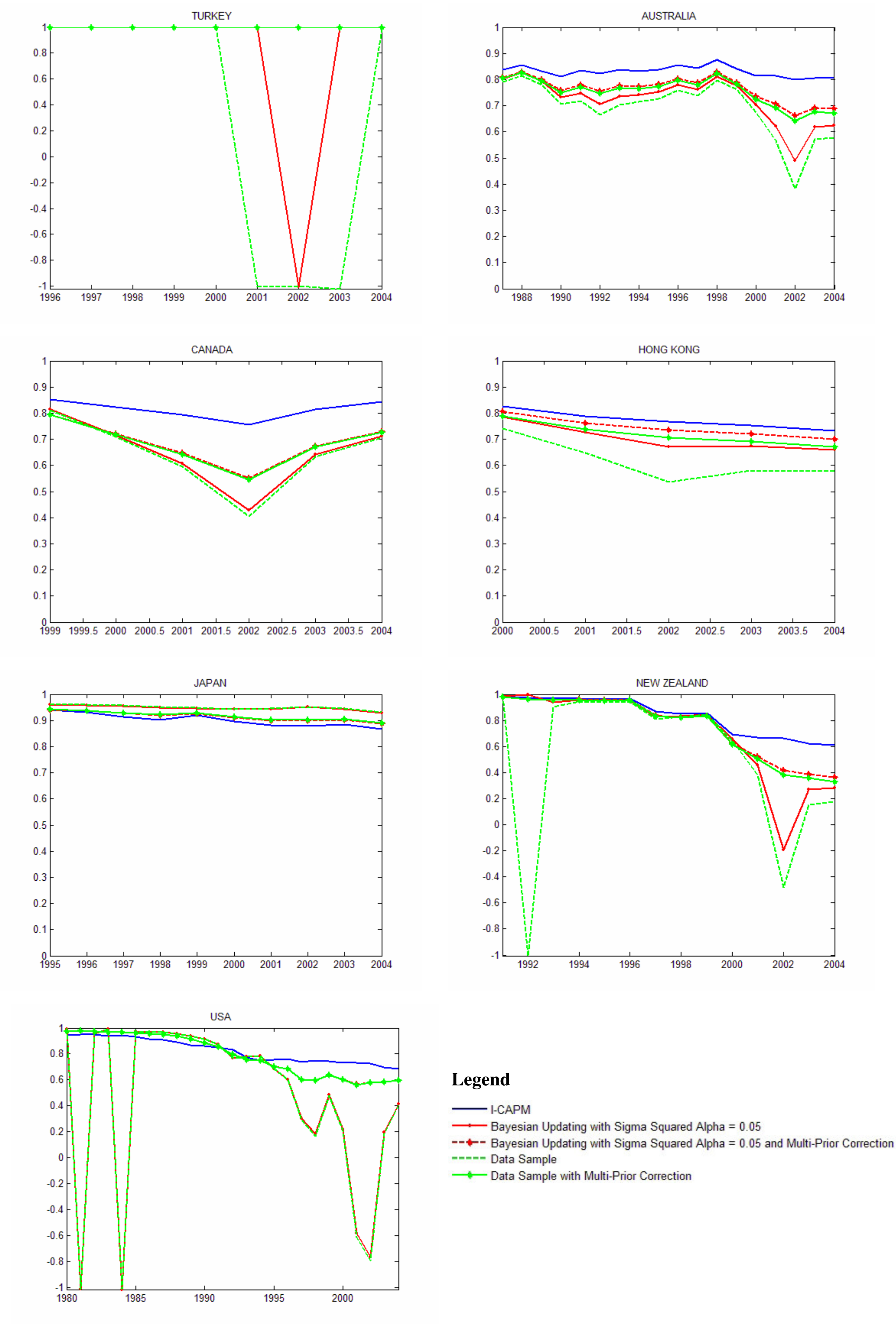
Figure 1ctd Home Bias (short sales allowed)



Legend

- I-CAPM
- Bayesian Updating with Sigma Squared Alpha = 0.05
- Bayesian Updating with Sigma Squared Alpha = 0.05 and Multi-Prior Correction
- Data Sample
- Data Sample with Multi-Prior Correction

Figure 1ctd Home Bias (short sales allowed)



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